

SPECIAL CHRISTMAS NUMBER

Popular Wireless

4^D

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REGISTERED AT THE
C.P.O. AS A NEWSPAPER

& TELEVISION TIMES

WE WISH

ALL OUR READERS

A

VERY

HAPPY

CHRISTMAS



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By **JOHN SCOTT-TAGGART**

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Among Friends

ONCE again our gay outer cover, the words CHRISTMAS NUMBER, and the unwonted politeness of tradesmen's boys herald the coming of Yuletide. And once again it is my privilege to wish you, one and all, the compliments of the season.

My comparatively new friends will, I am sure, excuse me for a moment while I step aside to have a word with old pals who have read "P.W.'s" Christmas Numbers for years past. How goes it, old-timers? Every year at this time the nip of the frost is offset by the warm glow of the spirit of companionship as I salute the Old Brigade. The DX-ers, headed by wily old "Medium Wave" of Workop; the crafty pen-pushers, led by "Romeo the Quaker;" and the innumerable other choice spirits who have long been united in love of radio—I salute you all.

The Season's Greetings

THE noble company of the Veterans having passed in review, I have the pleasure of visualising the up-and-coming readers—and, Generally speaking, a very keen lot they appear to be. Young, enthusiastic, and up to date, they take up the great game of radio experiment with ardour equal to that of the old-timer; they missed the birth-pangs of radio, and the excitement of crystal-set pioneering, but they can experience the growing-pains and the thrills of development.

It's rather wonderful to think that for more than fifteen years "P.W." has mirrored the charms of radio—its new circuits, its expanding technique, its evolution of theory. And yet the game is as fascinating as ever, and still breeds a friendly spirit of fellow feeling among its devotees.

So I fill my glass and drink to all of you, young or old, rich or poor, highbrow or low-brow. May the Christmas festivities delight your digestions, enrich you with worldly goods, and advance you towards your heart's desire.

From Here and There

SUEZ is to have a new wireless station, the Government of Egypt having decided that it might come in very handy in one of those emergencies which nowadays threaten to pop up overnight and surprise everybody bar the Sphinx.

Lithuania's National Broadcasting Corporation has got permission from the Government to publish a weekly radio

A HAPPY XMAS TO ALL

THIS year has nearly ended. Xmas is upon us. And once again it is our pleasant task to extend the greetings and good wishes appropriate to the season to all our readers. And, believe me, it is done with complete sincerity. We are very conscious of a closer and more direct link with you than normally exists between journals and their readers. It is evident on your side in the hundreds of friendly letters you write in which such phrases as "Good old 'P.W.'" frequently occur. It is evident also in the terms of friendly familiarity with which you personally address individual contributors and members of the staff. We are grateful that we can share in this-expression of good fellowship through our "good old 'P.W.'" THE EDITOR

magazine, available to all set-owners there. By some Lithuanian legerdemain of finance it is to be free; and very nice too.

About three-and-half years ago, when licences became compulsory in the Dutch East Indies, there were 5,000 listeners; at any time now they expect to register the 50,000th licence, though the cost is about five times as much as in Great Britain. Good going.

Resign Yourselves To This

FOR some little time there had been a halt to those resignations from the B.B.C. of public favourites, but now we must resign ourselves to a heavy loss, Bryan

Michie. His name as compère or producer of a programme was a sure sign that it was worth listening to, but now he is going on to the stage to compère in one of Jack Hylton's shows.

He has left the B.B.C. on the friendliest terms, after eight years of successful hard work. Beginning as one of the B.B.C. Effects men, he soon determined to cause rather than to effect, and in four years he gained a name as compère and as a wily "putter across."

Bryan Michie is 31 years of age. He was formerly a schoolmaster, but has always had a leaning to the stage, and has had quite a bit of experience including repertory work.

His new job starts early in the New Year; and we wish him all the best, don't we, chaps?

Government Gus Becomes Listener-Conscious

IF sceptics ever had much doubt about the eventual popularity of all-wave reception they must now admit that such doubt is not shared by the more important Governments of the world. This year has seen long-range radio reception become an important part of international politics.

The British decision to equip Daventry as a news-centre, speaking foreign languages, is paralleled by the decision of the United States to use some of its more powerful short-wavelength stations to present the U.S. viewpoint to other nations in their own languages.

Germany and Italy have long been committed to the method; and now Austria's little 1.5-kw. short-wave station at Rosenhugel is to be replaced by a 50-kilowatt, to extend the Viennese viewpoint to the rest of the world.

John Listener is not specially impressed by all this, or he would feel quite flattered at the attentions now paid to him by Government Gus.

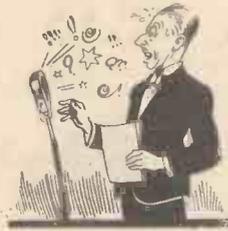
(Continued overleaf.)

NEXT WEEK : MORE ABOUT THE SUPER QUALITY 14-WATT RECEIVER By JOHN SCOTT-TAGGART

RADIO LICENCE FIGURES STILL INCREASING

Radio Mind-Reading

AN interesting experiment in the possibilities of mind-reading is being carried out by Chicago broadcasting stations, relayed all over the U.S.A.



To test the reactions of listeners' minds, a number of selected persons who claim telepathic gifts are invited to concentrate on something—such as a particular colour—before the microphone, and the un-

seen audience is invited to send in reports. The radio link enables a very large audience to keep closely in touch with what is going on in the studio, and it is hoped that the response will be correspondingly large and convincing.

Won't it be wonderful if, some day, the reverse process will become possible, so that the people in the studio will know what the unseen audience is thinking? Oh, boy! what a day that would be!

Lifeboats de Luxe

THE sister ship to the Queen Mary at present unchristened and known only as No. 552, will carry twenty-six lifeboats that are in themselves to be marvels of shipbuilding.

They are to be built in Govan by Messrs. Hugh McLean & Sons, and each boat will be sufficiently sturdy to make an Atlantic crossing by itself, if the need ever arose. The whole fleet of lifeboats will be fitted with wireless, and two of the boats—the port and starboard king-pins—will have transmitting as well as receiving equipment.

In this manner boats could be kept together in an emergency, and could communicate with the shore or with other vessels.

Good for Hyderabad

INDIAN ink is flowing freely in praise of the new broadcasting station erected just outside Hyderabad City. Its wavelength is 411 metres, and although its



purpose is admittedly cultural and uplifting, its programmes are sure to include those occasional scraps of tommy-rot and hilarity which mankind so persistently prefers to the noble thought and the higher education.

Hyderabad's power is nominally five kilowatts, but the designers have prudently made allowance for this to be doubled very easily if and when required.

A low-powered relay is in course of erection at the neighbouring town of Aurangabad, and it is hoped that others will follow if aerials go up and programmes go down satisfactorily.

Figuratively Speaking

DURING October the number of radio licences in issue increased by 24,000 compared with the previous month, rising to the new record total of 8,732,000. During the last twelve months the increase has been 518,831.

Every month since broadcasting began in 1922 has seen a growth in the total of the licence figures, says the *Daily Telegraph and Morning Post*, though in recent months the rate of increase has been slower than formerly as saturation point is reached. The potential maximum figure for Britain and Northern Ireland, indicated by the number of families, is more than 11,600,000.

NEW B.B.C. VARIETY FEATURE

Yet another regular weekly variety feature to be broadcast on Wednesday evenings is to be introduced to B.B.C. programmes in the New Year. It is to be called "Band Wagon."

Though the success of this type of entertainment has been proved by the popularity of "Monday at Seven," the new show is to have an experimental run of about six weeks. John Watt, B.B.C. Director of Variety, will then decide whether its success warrants its continuation.

Recently he outlined his plans for "Band Wagon."

"The feature, as its title suggests, is to be based upon the dance band. It will be produced by Gordon Crier, who is joining the Variety Department, as producer, from television. It will be a definite show, with Arthur Askey as resident comedian.

"We have not yet come to a decision about the band we shall use. Whenever we can get them, we shall have guest stars of variety in the bill—not just other people's crooners.

"Inspector Hornleigh" has been such a success in "Monday at Seven" that we are incorporating in this new programme a weekly problem feature called "What Do You Think?" Hans W. Priwin, creator of "Hornleigh," is writing this feature. Each week listeners will be set a problem—sometimes a problem in law; some of them will be real brain dusters and will probably lead to quite a lot of argument. We hope they do, so that there will be plenty of interest by the time the next week's show is broadcast, when we shall give a reasoned explanation of the preceding problem.

"Another little feature for which we shall find room in the 'Band Wagon' will bring to the microphone artists who have never before had a chance of broadcasting, though they have passed a B.B.C. audition. A good many people we know have waited a long time for their first broadcast, and if all goes well we shall use about three such people in each programme."

"Band Wagon" will run for forty-five minutes.

That Morse on 600 Metres

HAVING received several rather snooty letters about Morse interference on wavelengths adjoining 600 metres I ought, I suppose, to come over all indignant at this trespassing on the broadcasting preserves. Being in awkward mood, however, I refuse to do anything of the kind. So put that in your briar, and inhale it.

I know, as well as you do, that it's no joke to have a lot of Morse muscling-in on music; but have you thought of what those messages may mean to the seaman, buffeted by a world of crazy waters? He is not listening there for fun—as you are—but because he knows that the Morse on 600 metres is always liable to be a matter of life and death for somebody, perhaps for him.

We have all the other broadcasting wavelengths to rope in our programmes, so let's not grudge the seaman enough ether-room to throw out a life-line when necessary.

Anyhow, we shall not have to wait very much longer before the ships which use rough and raucous spark transmitters are refitted with more modern apparatus.

Arctic Circle Notes

I HEAR that, after her usual long summer voyage in the Arctic, that great little steamer the Nascopic has returned to Halifax, Nova Scotia. She belongs to the Hudson Bay Company, and it can never be said of her she cuts no ice, for her occupation seems to be nothing else but!

This summer she found that radio in the Arctic was getting positively crowded, for the Canadian Government has put up a new station at Port Harrison, and gingered up the Nottingham Island transmitter. Small transmitters are appearing at the trading posts and missions, most of them having to rely on their batteries being kept charged by windmill power.

Ungava Bay is now equipped with radio, and can talk with other outposts including such places as Arctic Bay, Dorset (Baffin Island) and Cape Smith (Hudson Bay). They all know the little Nascopic up that way; and I once spent a night ashore in Montreal with her wireless operator, who swore he would show me the Northern Lights. I'll say he kept his word!

Radio Cryptogram

SOLVERS of puzzles, codes, and cross-words will sympathise with a lady who went through her husband's pockets one day and found a note which read:

"DID YOU 49-92m.

GOOD TIMES

WITH 352-9m.?"

Underneath, in her husband's writing

was his reply: "NO

SUCH LUCK.

238-5m. WAS

THERE."

The good lady

tried for a long time

to puzzle out the meaning of these messages,

and at last she took them to an expert, who

consulted a list of wireless stations and

then said: "Pardon me, but is your

Christian name Florence?"

"Yes," was the reply, "but how did

you guess that?"

He explained that it had occurred to him

that the mysterious figures looked like

wavelengths, so he had filed in the appropriate

stations' names, and the result was

as follows:

"Did you Havana good times with

Sofia?"

"No such luck, Florence was there."

ARIEL





RADIO XMASSES

By The
QUERY
EDITOR

“Even after sixteen years of it, there is a dickens of a lot to be learned about radio ‘vetting,’” says the Query Editor. And in that time his department has dealt with well over three-quarters of a million queries, so he should know

SIXTEEN Christmases — representing nearly sixteen years of radio journalism! That is the “past” which looms up behind me as I look back over the years.

Nearly sixteen years—for “P.W.” began in 1922—and about 150 queries a day six days of the week, with a double dose on Mondays—for you fellows don’t lay down your pens on Saturday, no, nor Sunday,



“You are still asking questions while your youthful sons (and some daughters) have already commenced writing queries themselves.”

either—giving a glorious total of—well, you work it out. I make it somewhere round about 873,600 queries!

No wonder I have increased my height so much that I am coming through my hair! That’s not the worst, either. I’ve had queries of all sorts and from all sorts. But the terrible thing about it is the fact that the radio constructor is like the Chinese—start him off asking queries and not only does he never stop till he is dead, but his offspring carries on the good work.

Queries Are More Difficult Now

They say the Chinese could march four abreast past any point for ever, because by the time the present generation had got past the next would be sufficiently grown up to carry on.

You are like that—with this difference. You are still asking questions while your youthful sons (and some daughters) have already commenced writing queries themselves.

They are nastier questions than the old ones you used to send me in 1922. Instead of “What is a crystal set?” I get “Please let me have a diagram for converting my five-valve all-wave super into a seven-wave all-super (but I’m getting mixed up). I mean a seven-valve all-wave super radiogram with television and a cocktail bar.

Some of the queries you have read in the Questions and Answers columns. Those are the easy ones that I can answer. The

others that I pass on to colleagues you do not hear about. After all, what is the use of being a Query Editor if you can’t pass the buck to someone else when you come to a difficult one?

A nasty spirit? Not at all. I am not such a bad sort of fellow. Not as bad as I sound, or look, which is a good thing. But I am human.

Incidentally, you have no idea how much psychology comes into this query business. The study of men from manuscript is both interesting and necessary.

Did this query come from a man with a beard or from a young girl? You cannot always tell, as many people give only initials and no indication of sex. The old chap with the whiskers does not always leave traces of hirsute evidence concerning his fungus, nor does the young lady leave lip-

stick on the envelope. Yet it is important to know something of the person in many cases. For instance,



“What is the use of being a Query Editor if you can’t pass the buck to someone else?”

I once had a query from some person or persons unknown, as they say in Scotland Yard, asking for details of a crystal set.

Yes, it was some time ago. But I was worried. If that old fellow with the whiskers was writing it would be useless to give him a design with a delicately balanced cat’s-whisker. Apart from any electric strain set up by rivalry between the two kinds of whisker, how could a fellow with such a shrubbery manage to adjust a cat’s-whisker crystal?

No, the man with the “doings” would have to get a permanent crystal even if he had no permanent wave in his

whiskers. On the other hand, the young lady with delicate fingers would find sheer joy in tickling the crystal, and a permanent detector for her would be a sad neglect of appreciation of her slim fingers.

Till I entered the query battlefield—yes, it is that, it’s a constant struggle of wits—I never suspected the British were such a nation of gamblers. The number of queries I have had beginning with “A friend of mine bet me that . . .” or “In order to settle a wager, can you tell . . .”

Wives Have One Constant Bet

Some people will bet about anything! Radio constructors, I mean. Their wives have one constant bet which goes like this—it is stated at intervals after every “P.W.” boom set and during odd periods of the year besides.

“I bet that new set won’t stay there long. You’ll be fiddling about with it within a week.”

And, I am glad to say, the bet is always won by the lady.

Yes, I am glad, for if she did not win I should not have my job! It’s the glorious desire to fiddle with the set, to alter this, change that, try the other, that brings the query bag from about 20 to its 150 a day.

Yes, sir, it is. “Excelsior!” shouts the constructor as he rips out a condenser from his set and proceeds to make some “small adjustment.” The result is not “Excelsior!” but the opposite. And with the aid of the P.M.G. a letter is sent to me.

“Dear Sir,” it reads, “The other night my set suddenly ceased to function. It had been going wonderfully well until about 9.30” (note that the time coincides with the National news bulletin, and the exploring fever of the constructor is given full rein during such uninteresting times),

(Continued overleaf.)



It would be useless to give the old fellow with the beard a crystal set with a delicate cats-whisker to manipulate.

16 RADIO XMASES

(Continued from previous page.)

"then it went dead. I tried several things" (he certainly did), "but all to no avail. I have used everything in the set as per your instructions and list of parts."

I have italicised those words because they are the most used words in the English language—as far as home constructors are concerned.

And, of course, our fiddling friend is right. He has used everything as per instructions. And until he started to mess about with the set and remove some of the things the receiver went all right.

Unconscious humour abounds in the radio queries. From the early question from the young lady with the crystal set to the latest request from the superhet owner, we have oases of humour in the technical desert.

"Every time I listen to the announcer a funny feeling runs through me."

There's sex appeal for you. But the young lady with the phones on, attached to the 1923 crystal set, thought the funny feeling might be "the electric waves from 2LO."

Money Transactions Not Permitted

An Indian reader in this country bought an all-wave set kit. He wrote to us after a time and said he had been listening to some native broadcast from Nairobi.

"He is grand," he wrote. "Everything is very large. The native tum-tums specially are very big."

I answered that I was glad that the drums were coming over so loudly.

Once upon a time readers used to send me money. Not for myself, I must hasten to add, but for the purpose of purchasing parts for them. I once had £10 from a reader in Australia asking me to get him a certain kit of parts. There's trust for you!

Another sent two complete sheets of twopenny stamps. Very sticky! Unfortunately I could not oblige, for it has always been a rule of the paper that money transactions cannot be carried out.



"Un grand Anglais avec son habituel sangfroid... a tall Englishman with his usual—cold."

Letters will be forwarded to firms, but no purchasing can be done by the paper or its staff on behalf of readers.

I suppose the query side of a paper is the one which offers the most interesting—if occasionally trying—aspect. It is the one which gives the best insight into the mind of the reader, though that insight is always very sketchy.

Postal friends are made by the score, and we look forward each week to certain "regulars" who can be relied on to write and ask something or other.

Not always technical questions are asked, either. We get the preponderance of letters containing requests for resistance values, valve types, circuit alterations, but many of the letters ask for adjudication on some point connected with radio or radio listening which the writers are not sure about.

Last month, for instance, one of the readers—who could not have been taking advantage of the "P.W." French lessons which were run some months ago—wrote to tell me he had been listening to one of the French stations telling a story. He could understand a certain amount of French, but one phrase seemed to work out all wrong as far as the story was concerned.

"Un grand Anglais avec son habituel sangfroid" was the part of the sentence



"Everything is very large. The native tum-tums specially are very big."

that worried the listener. He translated it to read:

"A tall Englishman with his usual—cold." Literal, perhaps, but not quite right.

The query game is a great one and I like it. It has its dreary side and its ticklish problems, but on the whole it is a most interesting occupation.

Those Who Want to Modify

At the moment my desk is snowed under with problems from readers who have built the S.T.900. Not people grumbling that it won't work, but those who want to do something different.

It is amazing what a number of you want something else from that which we have given you.

At least twenty per cent., I should say off-hand.

"I read the description of your latest 'Five,' writes our typical reader in this category. "I think it is an ideal set except for one or two things.

"I wonder if you could let me have details for changing it slightly."

Then comes the sting. The set as published is a five-valve receiver using all-wave tuning and a superhet circuit and battery power supply.



"I have used everything in the set as per your instructions and list of parts."

The reader has these "few" alterations to suggest:

"I should like the super part of it converted into a straight. I think a straight is so much quieter than a super, don't you? It has less background on short waves—I never listen to them. Not worth hearing, I say. So the all-wave part can be simplified (thanks so much) to medium and long waves.

"Finally I should want my set to be A.C. and not battery driven."

Believe me, readers (that 80 per cent. of you), that fellow is really peeved when I write and tell him that I am afraid he cannot have his alterations, as they are tantamount to a completely new and different design.

I have been rather light-hearted in this article. I have made fun here and there. Believe me when I say that not a bit of it is bitter, pointed or sarcastic. I should hate anyone to feel that this Christmas "P.W." contained an acid drop from the Query Department.

How Querists Can Help

I find every letter interesting, and I like to try to lend a hand. Only one thing worries me sometimes—just sometimes. When I have a particularly nasty fault to try to diagnose and cure I send some sort of a suggestion to the reader and—hear nothing. Many of you write and tell me what happened when you tried the "cure." Many of you write to say that it didn't work.

That is to be expected when radio doctoring is carried on by post, though a second shot usually puts things right. But I wish more of you would write and tell me when the cure has worked. It would help me in the diagnosis of other people's troubles.

And, believe me, even after sixteen years of it there is a dickens of a lot to be learned about radio "vetting." When the spirit of radio (not the Christmas spirit) gets into some sets it takes a great deal of work and thought getting it out. Nothing is more trying than a radio set which is perfectly O.K. in every respect except that it won't work. There are heaps of them about—the spirit of radio (as I call it) has entered into them.

May your set have no such visitation during the Christmas season.

If you do, I shall expect to read some hectic and energetic letters when I get back to work after Boxing Day.

Let's hope it is only a bit of plum pudding dropped by the kids and nestling gently between the terminals of some condenser.

THINGS THAT CAME

THE morning session at the Civic Historical Centre had just concluded and the audience was filtering out through the shimmering silver and blue exit corridors. From concealed electrical reproducers a mellow voice clearly intoned road-line and air-line information for the benefit of those visitors whose residences were in other towns or countries. In the roofless vestibule the propellers of a fifty-engined gyroplane were humming quietly.

"I suggest we take the 'sub' to the Rivington," said a tall, elderly man to his younger companion.

"A most agreeable plan, Sutor, I am both very hungry and extremely thirsty."

They paused before the row of lift-mobiles, above each of which gleamed an illuminated route indicator.

"This one," said Sutor, "we shall have to transfer at Point Twenty."

They passed through the latticed gate and secured two adjacent seats. Very quickly the necessary complement of twelve passengers was completed and the gate noiselessly closed.

"Which has saved us a ten-minute wait," observed Sutor with satisfaction.

Smoothly the lift-mobile sank down its vertical shaft. At the bottom it joined the main subway track, neatly slipping into its place among the hundreds of others speeding their ways in both directions through the dimly-lit tunnel.

"A marvellous system; even now the wonder of it rather overcomes me at times." And as he said this Sutor gripped the younger man's arm and pointed through a window at the junction which they were then passing. At this intricate network of tracks scores of lift-mobiles and plane-cars were automatically diverting and diverging, each swinging with mechanical precision into the line that its destination necessitated. Very few indeed completely stopped, and their own lift-mobile threaded its way through without diminishing speed.

"And yet you sub-travel almost every day, I suppose?" Alva laughed.

"Being an individual with prehistoric ideas, I prefer to walk when I can. You know, Alva, ninety per cent. of the homes of the country could throw away their ray-therapy apparatus if there were more walking and less of this mechanical method of travel."

"Administrator Sutor's original thought for the day," grinned the other. "Here, have a smoke-stick and be human." He held out his cigarette case invitingly.

"Thanks, yes, if to smoke is a human quality, I am fully equipped in that respect. By the way, did you notice that the excerpt of that ancient 'Things To Come' film which we saw this morning failed to include a single glimpse of the historic and still widely-enjoyed 'cigarette'?"

By H. A. R. BAXTER

A Story That Will Interest All Who Like to Dwell on the Future Possibilities of Radio

"Not at the time, but now you mention it— However, thank goodness that Wells fellow was not one of those pill-food prophets. Good lord, that idea always seemed to me to be the most foolish one ever conceived. Fancy anyone ever wanting to do away with solid eats! Can you visualise anything more absurd? Supposing all they could spread out for us at the Rivington were three pills and a beaker of distilled water!"

Sutor smiled indulgently. "You enjoy your food, Alva, don't you?"

"And why not? To eat and enjoy your eating is one of the strongest human instincts. Not that I should welcome a return to the crude, animal meals of the twentieth or twenty-first century, though." Alva shuddered at this revolting thought.

Arrived at the Rivington the two men seated themselves at one of the crystal-topped tables in the huge, domed luncheon hall.

Pressing a small ivory-coloured button Sutor waited until a dull red light shone faintly around the bowl of flowers, and then gave their orders to the concealed microphone. For a few minutes the two men conversed desultorily. A quiet buzzing interrupted them, and Alva reached beneath the table and lifted into view a tray on which the meal they had ordered was tastefully displayed. But he caught his arm on the side rest of his chair and the tray swayed dangerously. A spot of fluid splashed on to his blue satindyne jacket. Carefully placing the tray on the table he vigorously rubbed at the spot with his serviette.

"If that Wells chap had had his way, I'd have blotted a nice white cape or robe," he grunted good-humouredly.

"Give the fellow his due, Alva," laughed

Sutor, "after all, we have our prophets even to-day still to predict a return to toga-type togs. But clothes are a detail. In many ways time has proved Wells to be as good a prophet as any of them. It is not given to humans to foretell the future far ahead with accuracy, and I don't suppose it ever will be. There are always quite unanticipated events, undreamt of developments to throw awry calculations as to—to—well, 'Things To Come' if you like."

"I agree. Who, in Wells' day, three hundred and fifty years ago, foresaw the extraordinary state of affairs which resulted from the great Turko-Indo struggle?"

"Who, for that matter, foresaw that either Turkey or India or the Perso-Arabics would in turn dominate world politics? It was all Japan, Germany and Soviet Russia in the 'little days' of the twentieth century. World peace or the end of civilisation!"

They both laughed loudly at Sutor's mention of this ancient catch-phrase.

"It would be an awful shock for many people if our present war were to stop," chuckled Sutor.

"Do you have anything to do with it?" asked Alva curiously.

"No; I am a Civic Administrator. Of course, I watch it now and then. It is extremely fascinating."

"Do you think— Would it be possible—"

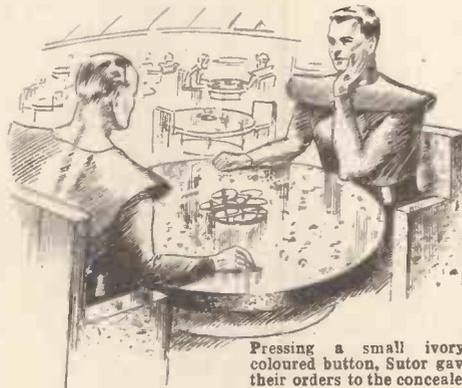
"For you to see them at work? Yes, of course; I had intended that you should do so after we had wandered round the C.A. and seen my own people operating."

Alva expressed his thanks for that, but he grumbled considerably when the older man insisted that they should walk to the buildings of the Central Ad-

ministrative offices. However, he was mollified when he discovered that they had perforce to adopt a mechanical motivation as soon as they arrived there, because all the corridors had moving surfaces and escalators connecting all the different levels.

"My department," announced Sutor succinctly as they entered a large glass-roofed hall containing hundreds of men and women busily engaged at long rows of tables.

(Continued overleaf.)



Pressing a small ivory-coloured button, Sutor gave their orders to the concealed microphone.

THINGS THAT CAME

(Continued from previous page.)

"You might explain to an ignorant industrialite something of your methods," implored Alva.

"It is all very simple," replied Sutor; "by means of radiovision one projects administration from headquarters (that is here) into the Civic Centres of the various towns."

"We owe a lot to the discovery of the Uniplanic principle of radio communication," observed Alva sentimentously.

"You mean the system whereby a million radio channels can exist where previously ten radio stations constituted a crowd in the ether?"

"Of course, real progress would have been impossible without it."

"It certainly would. But as I was saying, by radiovision one can extend a perfect administrative control from the central organisation. Let me give you a demonstration."

Sutor led the way into a small room and, beckoning his companion to stand beside him, took up a position before a screen let into the wall.

"Suggest a town," he said. Alva thought for a moment.

"Why not my own town, Hego?"

"Hego!" repeated Sutor loudly as he flicked over a gleaming metal switch.

Immediately the screen lighted and the three-dimensional view of a sparsely furnished office formed on it. The figure of a man, uncanny in his seeming solidity, walked into the centre of the stereoscopic picture.

"Greetings, Sutor," he said. "You require?"

"A personal inspection of the sanitary sections," replied Sutor.

The figure in the screen nodded, turned round and spoke into a table receptor.

"Mobile unit, section three. Central executive."

At once the picture changed and showed a panoramic view of orderly rows of small buildings. Sutor gripped a large knob beneath the screen.

"With this," he explained, "I can direct exactly the movements of a small mobile radiovision unit through which I can see and speak to, or be seen and spoken to by anyone within its immediate vicinity. You see that man coming out of the third gateway. We will meet him. I rotate this knob and you see he becomes a 'close-up' on the screen.

"Greetings! You are, I believe, Grade Nine Civic Centre sanitary engineer?"

"Yes, you require?"

For a while Sutor conversed with the man about purely technical matters and then bid him good-afternoon.

"Now you will know exactly what I meant by the projection of administration," he said to Alva, "for all practical purposes I am in the town of Hego, able to wander where I will. All administration is centralised in this manner."

"But supposing you wish to go to a place which is not equipped with fixed or mobile radiovision?" asked Alva.

"There is no place which cannot be equipped if required."

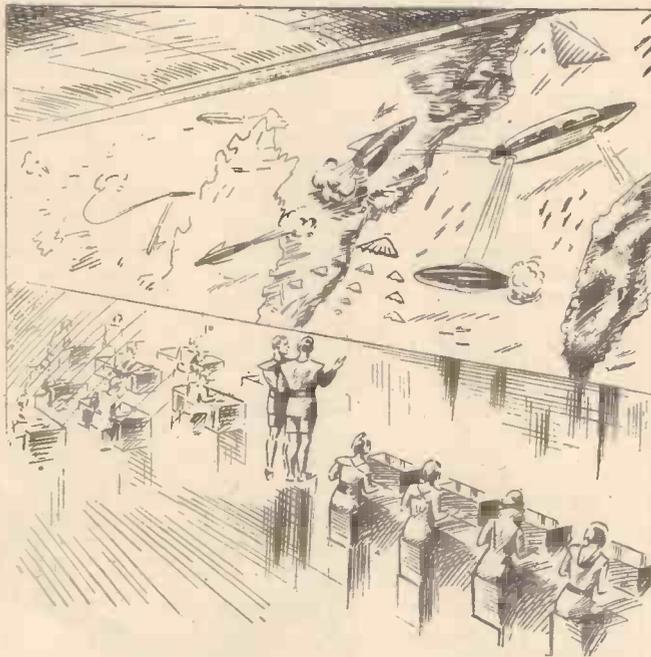
"By sending a unit to it? But that would take some time."

"Very little time. There are emergency aerial units positioned all over the country and outside it, too. We contact the nearest one, and by means of radio control we can make it an element of administrative projection just as easily as the one you have just seen in action."

"And you marvelled at a simple 'sub' system. Sutor, your Central Administration here is miles above anything like that." The face of the younger man registered genuine admiration.

"Wait until you see the war," laughed Sutor. "Come along, let us adjourn to the Central War Control Department."

This was situated in the same building, but to reach it they had to travel along about half a mile of moving corridors and escalators.



"There you see the whole of the area of operations projected in stereoscopic television."

"It used to be underground, some five hundred feet, but, of course, that is unnecessary now, and it has been found more convenient to use the lower floors for instrument checking and adjustment," explained Sutor, as he stood aside to allow Alva to enter one of the largest enclosed spaces this young man had ever seen. The hall was at least two thousand feet long and nearly as wide. And the whole of one side was occupied by an enormous relief map brightly lighted and showing an expanse of land and sea in the most intimate detail. Standing out from it at varying distances up to two or three

feet and in swimming gentle motion were clouds of tiny aeroplanes. On the shimmering surface of the area representing the sea various diminutive water-craft could be seen moving hither and thither.

"There you see the whole of the area of operations projected in stereoscopic television," said Sutor, smiling at the obvious amazement of his companion.

"But how?" gasped Alva. "Surely no one transmitting unit could embrace so vast a panorama?"

"It is a composite construction built from the co-ordinated transmissions of hundreds of sighting aircraft. It is the work of that group over there to maintain the co-ordination."

Sutor pointed to a row of tables at which were seated ten young women who appeared to be juggling with the adjustments of a long row of miniature television receivers. The greater part of the remaining floor space was occupied by seemingly numberless individual tables, each having one man or woman sitting at it all facing the gigantic television screen. Up and down, between the thousand or more tables, strode elderly men carrying sheaves of papers, some they distributed and others they continually consulted with an air of considerable concentration.

There was no noise save a murmur of quiet conversation like the rustling of wind through long grass. At the extreme end of the hall and overlooking all from the vantage point of a raised dais sat three very old gentlemen.

Looking in their direction:

"Professor Ruston, the War Chief, and his two head assistants," said Sutor as he threaded his way through the hall towards them.

The two visitors mounted the dais by means of broad steps, and it wasn't until they were actually standing beside him that the central learned professor raised his eyes and smiled a welcome.

"So you have come, Sutor, with your young friend. I am glad," he said simply.

"You knew we were coming?" Alva exclaimed, glancing questioningly at Sutor.

But the latter adroitly side-stepped the conversation.

"Alva knows little about the war operations, professor, would it be possible

"I am afraid it is apt to be somewhat overlooked these days," chuckled the scientist as he removed his spectacles and laid them down beside the pile of papers in front of him. "But it is extremely simple. Maybe, most have forgotten what it is all about."

He stood up and, placing a frail hand on Alva's shoulder:

"You see that island," he said, indicating with the other hand a small oval piece of land that was lying almost in the dead centre of the vast television relief scene at the other end of the hall; "that is our present objective. Possession of Helos will give the one side or the other an immense advantage. It is interesting to note that there is now not one single human being within the area of operations. Since last year all aircraft, all seacraft and, when such is used, all landcraft on both sides, have been entirely distance-controlled.

(Please turn to page 335.)

S.T.900

by John Scott-Taggart

FOLLOW THIS RAPID CONSTRUCTION GUIDE AND ENSURE SUCCESS

THIS rapid construction guide is based on the same principles as those in previous years. Experience has shown that not only is the absolute novice assisted, but even the experienced constructor, by being told exactly what to do and when. Actually, you can build the S.T.900 from the wiring chart alone, but for extra speed and certainty of success you cannot do better than follow the rapid guide in detail. Naturally, the guide is based on the actual components used in my original set.

If you have bought a complete author's kit, including the panel, side-pieces, coil-platform, screen and terminal strips, or if you have bought these items ready prepared, cross out appropriate sections (C, (D), (E), (F), (G)).

(A) Collect and examine required components. If you have the author's specification kit, check each item to see that it corresponds to my list of parts actually used. Handle J.B. tuning condenser with care, keeping moving vanes closed. Bending of vanes would affect calibration of station names.

(B) Tighten terminal securing nuts (not terminal heads) on components where necessary.

(C) Remove metallising by scraping with pen-knife where indicated in Fig. 5.

Using Fig. 1, mark out on the front (not back) of panel the positions of the holes. With a fine-pointed bradawl prick all the hole positions. Using a 1/8-in. twist drill, start 1/8-in. holes carefully, using light pressure and turning the drill in a reverse direction at first; this is to avoid splitting the veneer. Continue drilling these 1/8-in. holes in the ordinary way. Centre bits are recommended for all the remaining large holes in panel, but twist drills may be used. Drill these holes.

(D) Drill side-pieces as shown in Figs. 3 and 4.

(E) Drill terminal strips as indicated in Fig. 7.

(F) Drill two 1 1/2-in. diameter holes for coil holders in coil platform, and make three holes with bradawl for anchoring screws in positions shown in Fig. 2.

(G) Bend and drill aluminium screen as indicated in Fig. 6.

(H) Fit terminals to terminal strips.

(I) Screw terminal strips to side-pieces, using two 1/2-in. round-head brass screws in each. The terminal strips are screwed at the bottoms of the back edges of the side-pieces (this is not obvious from the wiring chart which shows the plan view), the terminal strip containing the aerial terminal being fixed to the side-pieces with the 1/4-in. hole in it.

(J) Fit aerial coupler to left-hand side-piece in hole indicated in Fig. 3. Also fit two Clix parallel sockets to same side-piece. A 1/4-in. x 1/8-in. hole brass washer must be fitted under each fixing nut of these sockets. Fit a Clix socket to the right-hand side-piece, using washer as with other sockets.

(K) Screw the two coil holders to coil platform using four 1/4-in. No. 4 round-head brass wood screws for each. The positions of the coil holders are clearly shown on the wiring chart. At the top of the wiring chart is a drawing of the two coil holders looking up at the underneath of the platform. Do not

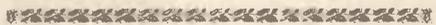
valve holders, two B.T.S. H.F. chokes, three Lissen .000-mfd. fixed condensers, one Lissen .0005-mfd. fixed condenser, two Lissen .00005-mfd. fixed condensers, Varley Niclet.

(M) Using the two 1/4-in. countersunk holes in the panel and which are 6 1/2 in. from bottom of panel, fit coil platform to back of panel, with two 1/2-in. No. 4 countersunk brass wood screws. The panel should project beyond each end of coil platform by 1/2 in. Fit aluminium screen as indicated in Fig. 5 with two 1/4-in. No. 4 round-head brass wood screws.

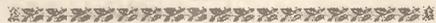
(N) Screw the following components on the back of panel, using the sizes of screws indicated (remembering that if you used too long a screw it would project through the panel). T.M.C. block condenser (four 1/4-in. No. 4 round-head brass screws), valve holders (each is fixed with two 1/2-in. No. 4 round-head brass screws), two B.T.S. H.F. chokes (each is fixed with two 1/4-in. No. 4 round-head brass screws), three Lissen .006-mfd. fixed condensers (each is fixed with two 1/2-in. No. 4 round-head brass screws), Lissen .0005-mfd. fixed condenser (two 1/2-in. No. 4 round-head brass screws), two .00005-mfd. Lissen fixed condensers (each is fixed with two 1/2-in. No. 4 round-head brass screws), Varley Niclet (two 1/2-in. No. 4 round-head brass screws).

(O) Fix "X" reaction condenser and anode reaction condenser, having removed knobs in each case. In each case a 1/4 in. x 1/8 in. hole .20-gauge brass washer should be fitted to fixing bush before inserting bush through the panel. Remove knob, pointer, and pointer locking-nut of the aerial-balancing condenser (.0005-mfd. Polar slow-motion air condenser). Remove fixing nut and fit condenser to panel, replacing fixing nut on front of panel. Remove fixing nut from bush of slow-motion driving spindle. Remove fixing nut from the main J.B. tuning condenser, and pass the fixing bush on the condenser through the appropriate hole in the panel, holding the condenser up against the back of the panel. Fit bush of slow-motion driving spindle through its appropriate hole in panel from the front, so that the remaining hole in the metal spacing strip slips over the main bush of the tuning condenser. If this upper hole does not slip over the main bush, it indicates that the distance between the two holes in the wooden panel is not accurate, and you will require to elongate the lower hole in the appropriate direction to rectify matters, e.g. with a round file. Fit the fixing nut to the main bush of the main tuning condenser at the front of

(Please turn to page 313.)



WE HAVE GREAT PLEASURE IN PRESENTING A CONCISE GUIDE TO THE CONSTRUCTION AND OPERATION OF THE S.T.900, ALL CONTAINED WITHIN THE COMPASS OF A FEW PAGES, AND THUS PROVIDING FOR FACILE REFERENCE AND CHECKING PURPOSES.



get the foil holders wrong way round. The little bulging slot of each coil holder must point away from the panel. Make sure that the sockets of the coil holders are in their correct relative positions. This is where you will probably go wrong. I repeat that the view of the coil holder sockets is from the underneath of the platform. If you imagine it is the top or get the little bulging slot pointing the wrong way it is entirely your own fault. This is absolutely essential. Fit three anchoring screws to coil platform, in positions shown in Fig. 2. Each screw is 1/4-in. No. 4 round-head brass, and a 1/4 in. x 1/8 in. hole brass washer must be used under each screw. Do not screw fully in, as various wires will be connected to them.

(L) Lay the panel face downwards on a cloth-covered table (to avoid scratching veneer). Lay the following components on the panel in the positions they occupy on the wiring chart, and prick through the panel the fixing holes of these components, the bradawl actually going through the fixing holes in the components themselves: T.M.C. block condenser,

WHAT THEY SAY ABOUT THE S.T.900:

"... From 10-2,000 metres the S.T.900 is consistently excellent in reception. During the short period in which I tested it I pulled in over 300 stations, amateurs and broadcasters!"—LESLIE W. ORTON.

hear a station, then it's pretty certain that that station's not on the air... the S.T.900 will open your eyes with its terrific performance."—W. L. S.

LESLIE A. PERRINS, 101, Sycamore Road Birmingham 6.

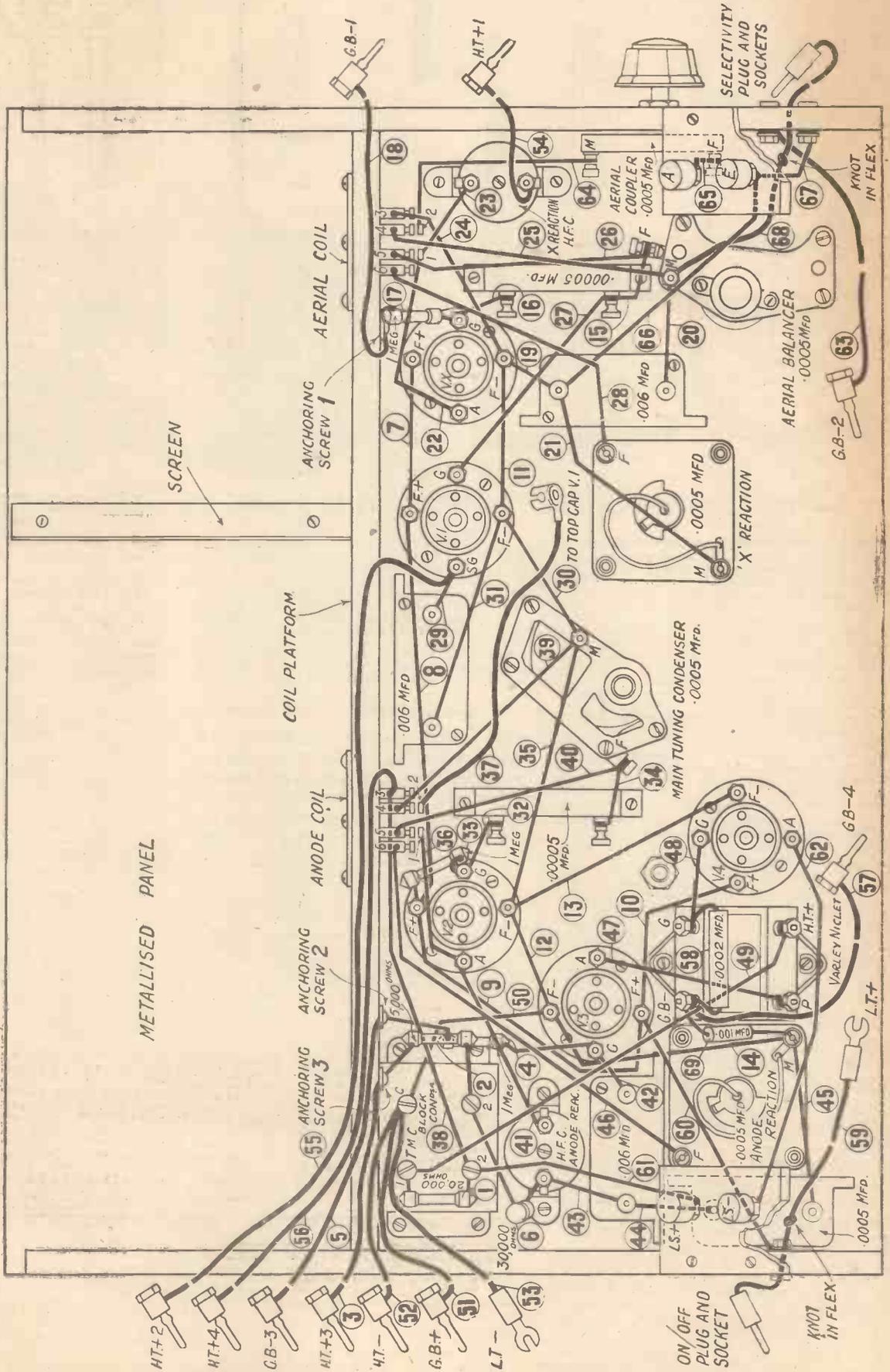
"I consider that the 900 stands alone among all-wavers for its efficiency apart from its low price... It is certainly a winner of winners."—K. D. ROGERS.

"... If you build the S.T.900 and can't

"The quality is superb... the set is the finest all-waver I have ever handled."

S.T.900

WIRING CHART



FRONT-OF-PANEL DRILLING DIMENSIONS

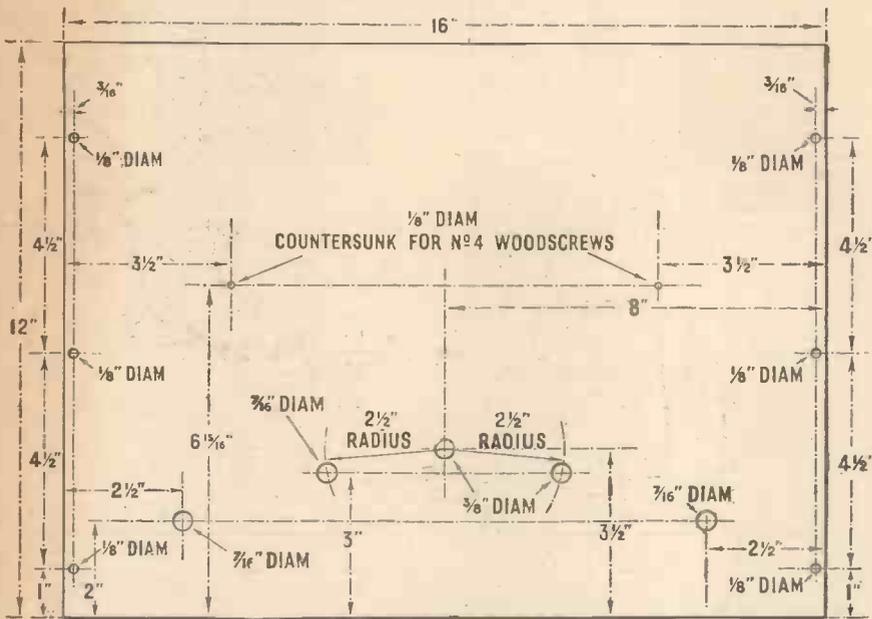
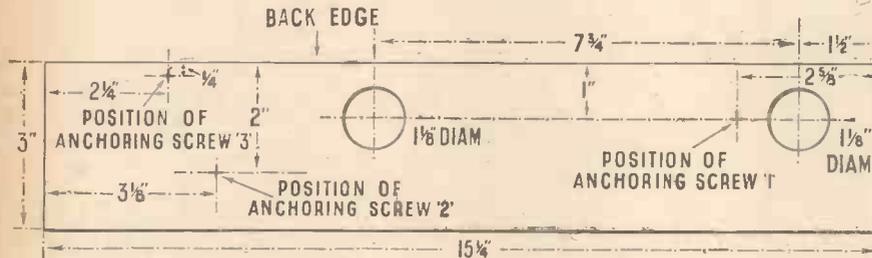


Fig. 1. All the front-of-panel drilling dimensions are given in this diagram.



COIL PLATFORM (UNDERSIDE) 3/8" PLYWOOD

Fig. 2. Here are details of the positions of the coil-holder holes and of the anchoring screws.

the panel. Fit fixing nut to bush of driving spindle at the back of the panel.

THIS COMPLETES THE FIXING OF COMPONENTS.

Now you are going to wire the components. For this you need the wiring chart. Place a tick against each wire as it is completed.

Lay panel face downwards, resting it on two books or cloth-covered blocks of wool; this is to prevent scratching of the veneer, and to prevent pressure on control spindles.

The wires on the wiring chart are numbered strictly in their order of connection, which has been carefully worked out for speed and simplicity of construction.

The essential wire is S.W.G. 18 tinned copper wire. Over each wire connection is slipped a suitable length of 1 1/2-in. insulating sleeving. It is important to use this wire for all high-frequency circuits for technical reasons in connection with short waves, and therefore it is best to wire the whole set with this wire. Incidentally, the method of wiring is just as easy, if not easier than any other method.

The best procedure for wiring is as follows: Lay a length of sleeving in the position which will ultimately be occupied by the wire itself between the two terminals. Cut the sleeving to the required length. The wire itself requires a little stretching to take out the kinks. This can be done in several ways: you can hold one end in a vice and pull on the other end of the wire. The wire should be pulled sufficiently hard till you feel it "gives" a little, after which it will be found that the wire is stiff and straight. The wire may also be stretched straight between two persons each having an end wrapped round pliers or a piece of wood. Cut the wire into approximately three-foot lengths for easy handling. When wiring up two points in the set, slip the correct length of sleeving, as described above, over a three-foot length of wire. Now cut the wire so that it projects outside the sleeving at each end by 1/2 in. This method of wiring makes it necessary for the initial length of sleeving to be correct, and the measurement of the sleeving should therefore always be done accurately from the side of one terminal to the side of the other terminal, following the line of the wiring as shown in the illustrations. The 1/2 in. at each end should be shaped into a round loop. Now have a cup of tea.

(P) USING WIRING CHART, WIRE-UP THE SET UP TO No. (58), and then fit side-pieces to panel

using 6 1/2-in. No. 4 round-head brass screws through panel, and 1 1/4-in. No. 4 countersunk brass screw through each side-piece into coil platform. Complete wiring by adding wires (59), (60), (61), (62), (63), (64), (65), (66), (67), (68) and (69). It is vitally important to get the right wander plugs on the right wires.

In tightening the terminals on condenser block

avoid over-tightening, as this will cut the wire; do not finally tighten these or any other terminals till all the wires are on.

The leads going to the grid-bias battery, the H.T. battery, and the accumulator may be 14/36 single rubber-covered flex or Maxamp wire, which latter is stiff wire with insulation which may be slipped back. Leave 1/2 in. bare at each end of wire. Bend one of the ends 1/2 in. from the end back on itself and push the loop so formed into the hole in the side of the appropriate Belling and Lee Midget wander plug, having loosened the head of wander plug. Tighten head of wander plug. Fit other end of wire to correct component.

None of the wander plugs is in the actual list of components of the set, because constructors may already have these. The make specified is especially recommended.

Carefully check the whole of the wiring of the set against the wiring chart. Make certain the battery leads are correctly labelled. A mistake is highly likely and may burn out your valves.

(Q) FIT DIAL AS FOLLOWS: Place the dial in the approximate position it will occupy on the panel. Now accurately position the dial as follows: The distance between edge of dial and side of panel should be equal on both sides. At the left side will be found a black band carrying waveband markings. The bottom edge of this band should be exactly 3 1/4 in. up from the bottom of the panel, while the bottom of the black band in the corresponding position on the other side should also be 3 1/4 in. from the bottom of the panel. If dial is of card or celluloid, prepare ordinary plated brass pins (if a pin is of a type that could be bent it can be used) by cutting them diagonally with wire cutters or pincers about 1/2 in. from their heads. You have now very short and pointed pins. Any other type of very short miniature nails may be used.

Keep the dial flat on panel, and prick through suitable pin positions with some thin, pointed instrument (I used a drawing pin) for about 1/4 in. into the wood. Insert a prepared pin into each hole and push home with any hard, flattish-ended instrument (I used the handle of a screwdriver).

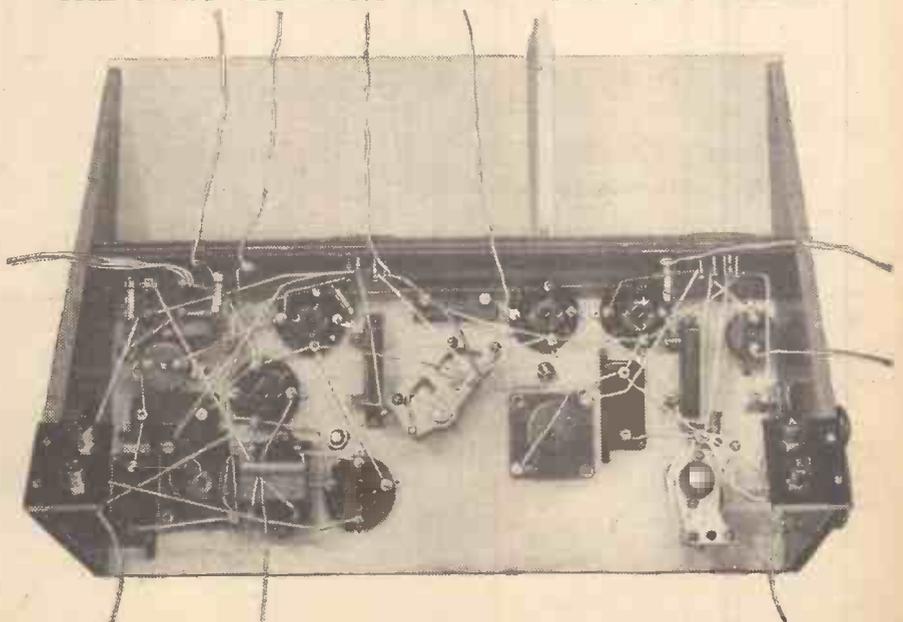
Dial cards (cardboard) are supplied free with kits by Peto-Scott Co., Ltd. Washable white celluloid printed dials are obtainable for 2s. 6d., post free, from Celluloid Printers, Ltd., Kingston By-pass, Surbiton, Surrey.

(R) STAND SET IN ITS NORMAL POSITION WITH DIAL FACING YOU. Turn spindles of "X" reaction condenser and anode reaction condenser fully anti-clockwise (fully to left). Fit their knobs with their white spots pointing exactly in a horizontal direction to the left. Tighten up their grub screws.

Turn the spindle of the aerial balancing condenser fully anti-clockwise (fully to the left) so that the vanes are completely open. Screw on pointer to the screwed spindle, so that 1/2 in. of the spindle is exposed between the pointer and the end of the spindle, seeing that the pointer points exactly horizontally to the left. Fit the lock-nut to the end of the spindle, thus locking the pointer, taking care that the pointer is not moved round from its correct horizontal position pointing to the left as the lock-nut is tightened, the pointer being held to prevent this occurring. Now fit the knob on the plain (as distinguished from the screwed) spindle.

(Continued overleaf.)

THE MOST EFFICIENT SET OF THE "S.T." RANGE



Although inexpensiveness and efficiency are outstanding features of the S.T.900, it is also amazingly simple to build, and, as this photograph of the completed receiver shows, the wiring is entirely straightforward. Components are mounted on the metallised panel, but the two coil holders are on the platform.

(Continued from previous page.)

Remove the knob from the driving spindle of the slow-motion drive. Remove spring and sleeve washer from spindle of drive. Turn main spindle fully anti-clockwise (fully to the left) so the condenser vanes are fully open. Place pointer disc on spindle of condenser with the pointer pointing exactly to the bottom edge of black band carrying waveband markings on the dial, care having been taken that the pointer disc just rests on the flange of the driving spindle. Now tighten the grub screw in boss of pointer-disc. Replace sleeve washer on drive spindle. Place spring over this washer. Place knob on drive spindle, and press down an appropriate amount and tighten grub screw. The correct pressure for the drive for best results may be found by varying the pressure of the knob. Fit knob on aerial coupler, so that when turned fully clockwise, spot on knob points towards front of set.

YOUR SET IS NOW COMPLETE. (See separate articles on installation and operation.) It is desirable to check the wiring before attempting to install.

INSTALLING THE S.T.900

BEFORE connecting any batteries to the S.T.900 see that the free end of lead (37), which is for later connection to the anode, i.e. top of H.F. pentode valve, is "in the air." If it touches any metal it may cause a short-circuit when the batteries are first connected. An extra precaution would be to wrap the free end in paper temporarily.

Turn set (without valves) with dial facing you. Place loudspeaker on right of set and preferably not pointing directly towards it. The triple extractor is not connected at this stage, or not connected at all unless swamping is experienced. The two-volt accumulator is placed behind the right-hand end of set. The high-tension battery, which should be of the 120-volt type (the bigger capacity types are always cheaper in the long run), is placed behind the left-hand end of set. The grid-bias battery can be placed between the accumulator and the high-tension battery—the position of these batteries is not very important, but the leads should not be long. Long leads to the accumulator especially may result in a drop of voltage at the valve holders.

Connect the aerial lead (after scraping or sand-papering) to terminal A on one of the terminal strips and connect the earth lead (a short earth lead is desirable, if possible)—after similar treatment—to terminal E. The loudspeaker is connected to terminals L.S.+ and L.S.—. There is no special way round in the case of a moving-coil loudspeaker. All connections to wander-plugs should be absolutely perfect. Many troubles, crackles, and often disconnections altogether are due to faulty connections in wander-plugs. I strongly favour testing all leads by the aid of a voltmeter or a flash-lamp battery and bulb, or other method, as much more trouble than you imagine is caused by faulty contacts in leads.

Join the L.T.+ and L.T.— to the correct terminals on the accumulator. Insert the H.T.— plug in the negative socket of 120-volt H.T. battery. Insert H.T.+ 1 plug in + 84 volts (or near voltage) socket. Insert H.T.+ 2 in 72-volt socket. Insert H.T.+ 3 plug in 60-volt socket and H.T.+ 4 plug in 120-volt socket. The constructor can experiment with tappings H.T.+ 1 and H.T.+ 3 if he wishes, and if the H.T. begins to run down he may have to use higher voltages on H.T.+ 1 and H.T.+ 3.

The grid-bias plugs are fitted as follows: G.B.+ is inserted in the G.B.+ of the battery, which should be of the 164-volt type; the G.B.—1 is connected in —1½ volts; the G.B.—2 is inserted in —4½ volts; this position can be altered according to the degree of selectivity required; the G.B.—3 is inserted in —3 volts; the G.B.—4 is inserted in —12 volts, the exact position of this being dependent upon the desire for H.T. economy. Actually, the higher voltage you can make this the better from the point of view of H.T. economy, provided distortion is not noticed.

Check all the above connections most carefully preferably getting someone to read them out slowly to you while you follow the wires. An astonishingly large number of constructors get their leads on to the wrong terminals; this may cause a serious short-circuit, or may affect the efficiency of the set, and the constructor may not know of it for weeks. There is no excuse for this on the S.T.900, as all the plugs and terminals are easily identified, and none of them is duplicated. All terminals should be firmly tightened up. The plugs should also make good contact and should not be smeared with bitumen.

"Switch on" by inserting plug in socket on right-hand side-piece.

A good precaution now is to connect a voltmeter or flash-lamp bulb across the filament terminals on each valve holder in turn, taking care that it is across the filament terminals.

The lamp should light up normally. If a very bright light is obtained, or the bulb is fused, external wiring, and if necessary internal wiring, should be checked. If a voltmeter is used, it should read about two volts. If it reads much more, check wiring.

"Switch off" set by removing right-hand plug. Take out the H.T.— plug from the H.T. battery.

Insert "X" valve (Hivac L 210 Met.) in valve holder nearest aerial coil holder.

Insert H.F. pentode (Hivac VP 215 Met.) in valve holder next to "X" valve. Connect free end of wire (37) which has been "in the air" to top of this

(Please turn to page 316.)

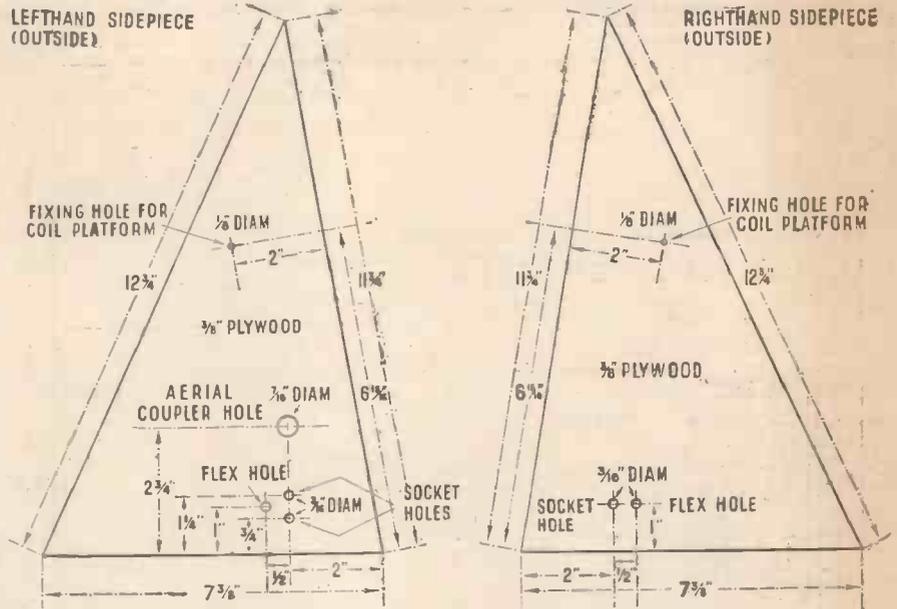


Fig. 3 & 4. These two side-pieces support the S.T.900 panel and coil platform. The panel is attached to the 11 1/4-in. sides, and the two side-pieces are both of exactly the same overall dimensions.

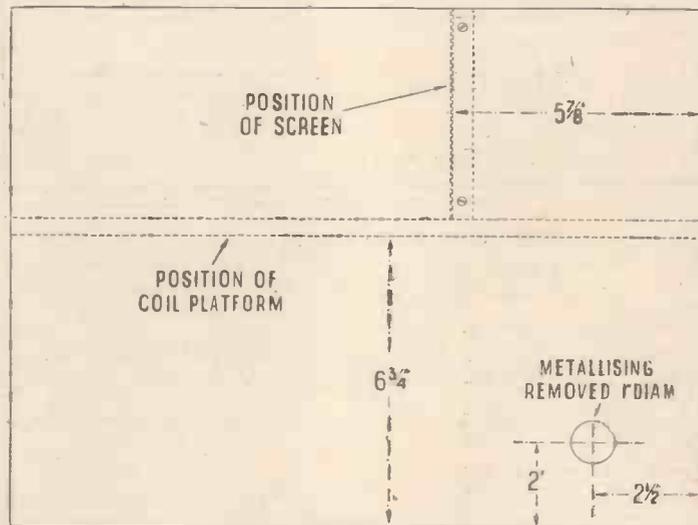


Fig. 5. The whole of the back of the panel is metalised, a small circular portion being removed for a diameter of 1 inch to prevent the aerial balancer making contact with the metalising.

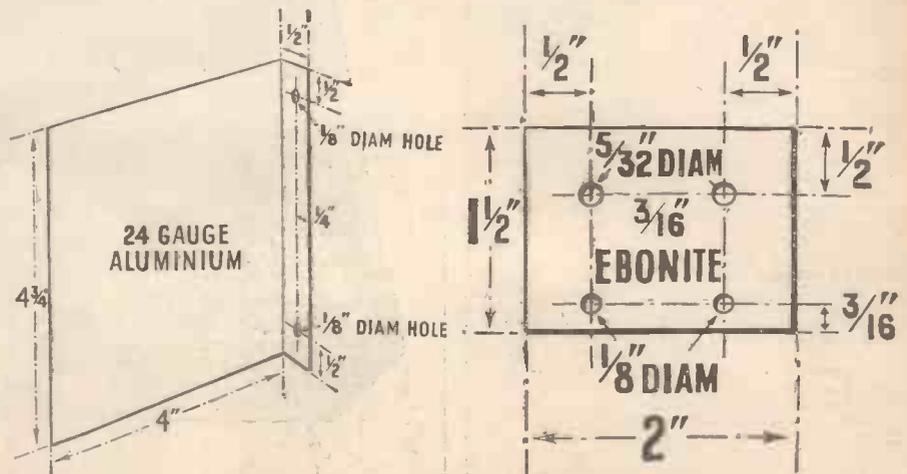


Fig. 6. This screen, which is screwed to the panel, is mounted between the aerial and anode coils in the position shown in Fig. 5.

Fig. 7. There are two terminal strips, the dimensions of which are the same, viz. as given above.

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With 4 British Valves.
Screened coils, slow-motion tuning, wave-length dial, Gramo, pick-up sockets, 2½ watts output. Waverange 200/2,000 metres. A.C. Mains 200/250 volts, 40/80 cycles. Cash or C.O.D. £3/10/0, or 5/- down and 12 monthly payments of 5/-. **5/- DOWN**

CABINET MODEL. Specification as above, and complete with 8" Field Energised moving-coil speaker, and housed in the beautiful walnut veneered and inlaid cabinet illustrated above. Overall dimensions: 19½" high, 16" x 11". Absolutely complete and ready to play on A.C. mains 200/250 volts, 40/80 cycles.

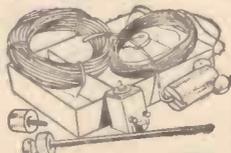
LIST VALUE £8:10:0 **OUR PRICE** £6:10:0 or 7/6 deposit and 18 monthly payments of 3/6.

Ensure Good Xmas Listening With a

Peto-Scott ALL-WAVE AERIAL

Increases signal strength on all bands. Improves selectivity.

Waterproof and Weatherproof. Two transformers. Outfit comprises Duplex lacquered aerials, insulators, waterproof "lead-in" wire, aerial and set transformers, with instructions for erection. Cash or C.O.D. 17/6, or 8 monthly payments of 2/6.

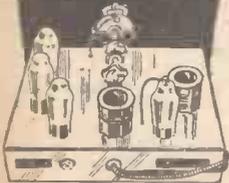


2/6 DOWN

AN IDEAL XMAS GIFT PILOT 8-IN-1 EXPERIMENTERS KIT

Buy this new Kit for Xmas and you can build 8 short-wave sets one after another. Never before has the constructor been given such a wonderful opportunity for experimenting.

Every Circuit a Winner
8-IN-1 KIT



Comprises all highest grade components, ready drilled chassis, panel, and cruckle finished steel cabinet. 8 coils and 16 working drawings to build 8 sets. Cash or C.O.D., £4/8/0, or 7/6 deposit and 11 monthly payments of 7/6. **7/6 DOWN**

Set of 4 Valves, £1/7/6, or add 2/9 to deposit and 2/6 to each monthly payment.

ORDER NOW FOR XMAS

BUY YOURSELF A NEW SPEAKER FOR XMAS

MODEL 38S (Illustrated). Further improvement on the famous W.B. Senior 378. New higher flux density and increased sensitivity. Microtone device for matching any receiver. Cash or C.O.D. Carr. Pd. £2/2/0, or 2/6 down and 11 monthly payments of 4/-.

MIDGET MODEL 38M. A new thoroughly efficient permanent magnet moving-coil speaker in extremely compact form. Complete with 3-ratio transformer. Cash or C.O.D. Carr. Pd. 17/6, or 2/6 down and 7 monthly payments of 2/6.

W.B. "ELLIPSE" MODEL. With elliptical cone for receivers where height of speaker opening restricted. Nipermag magnet. Whiteley speech coil. Microtone universal matching device. Cash or C.O.D. Carr. Pd. £2/2/0, or 2/6 down and 11 monthly payments of 4/-.

All the new W.B. Chassis Pedestal and Cabinet models on similar Easy Terms. **2/6 DOWN**



S.T.900

FREE! S.T.900 FULL-SIZE AUTODIAL CARD with every PILOT AUTHOR KIT.

KIT "A" Cash or C.O.D. 55/6
Carriage Paid

Pilot Author Kit of Components exactly as FIRST specified and used by Mr. J. Scott-Taggart, with Mr. J. SCOTT-TAGGART'S S.T.900 AUTO-DIAL CARD, but LESS coils, Konectakit, wander plugs, accumulator connectors, valves, extractor kit, cabinet and speaker. **5/- DOWN**

Cash Price, Carriage Paid, 55/6, or 5/- down and 11 monthly payments of 5/3.

B.T.S. ONE-SHOT INDUCTORS

Type 9/M.W. (178 to 580 metres) per pair	5	6
Type 9/L.W. (900 to 2,000 metres) " "	5	6
Type 9/S.2. (15 to 43 metres) " "	5	0
Type 9/S.3. (24 to 70 metres) " "	5	0
Type 9/S.1. (9.5 to 27 metres) " "	5	0
Type 9/S.0. Television Sound " "	5	6

KIT "A.10" Cash or C.O.D. £4:5:0

As KIT "A." but with KONECTAKIT and 10 B.T.S. COILS. 3/6 deposit and 11 monthly payments of 8/-. **8/6 DOWN**

S.T.900 VALVES

5 Specified Valves, £1/10/3, or 3/6 down and 11 monthly payments of 2/9.

KIT "CC" Cash or C.O.D. £7:14:9

Including 10 Coils, 5 Valves, Speaker and Console Cabinet. 16/3 deposit and 11 monthly payments of 14/7. **16/3 DOWN**

KIT "CT" £6:14:9

As "C.C." but with Table Cabinet. 13/9 deposit and 11 monthly payments of 12/9.

KIT "CE" £8:18:3

As "C.C." but with Console Cabinet. 19/3 deposit and 11 monthly payments of 16/9.

EXTRACTOR KIT

Add 13/6 to Cash Price, or 1/3 to deposit and 1/3 to each monthly payment.

300 to 900 CONVERSION KIT

Includes panel, platform, screen, all necessary components, with 10 coils, 1 valve and FREE S.T.900 Dial Card. Cash or C.O.D. £2 9/3, or 4/- down and 11 monthly payments 4/9. **4/- DOWN**

S.T.900 FINISHED INSTRUMENTS

Console Model with celluloid dial, valves, 10 B.T.S. coils and Peto-Scott P.M. Speaker. £19/10/0, or 21/- down and 11 monthly payments of 19/9. **21/- DOWN**

Chassis model with celluloid dial, valves, 10 B.T.S. coils, less cabinet and speaker £7/5/0, or 15/- down and 11 monthly payments of 13/6. **15/- DOWN**

CONSOLE MODEL

The Battery Version Console Model Finished Instrument illustrated is supplied with aerial coupler control extended to operate outside cabinet. Complete with set of first specified valves and 10 B.T.S. One-Shot Inductors covering Long, Medium, and 3 Short-Wave bands; also Peto-Scott Type No. 210 P.M. Moving-coil speaker, housed in Peto-Scott walnut finished Console Cabinet (illustrated), with spare coil rack, less batteries. CASH or C.O.D. Carr. Paid, £11/15/0, or Deposit 27/6 and 11 monthly payments of 22/-. **27/6 DOWN**



ORDER NOW FOR XMAS DELIVERY

K.B. Model 437

LIST PRICE £8:8:0

BARGAIN

£2:17:6



SHOP-SOILED ONLY, these sets are offered in thorough working order and ready for immediate use.

Efficient circuit utilises H.F. amplifier, detector and output triode valves. K.B. station name dial. Waverange 200-2,000 metres. Highflux, large diameter moving-coil speaker. Wonderful volume and selectivity. Provision for pick-up. Less batteries. Housed in walnut, veneered and inlaid cabinet. Overall dimensions: 17½" high, 13½" wide, 9½" deep. Cash or C.O.D. Carriage Paid, £2/17/6, or 5/- down and 12 monthly payments of 5/7. **5/- DOWN**

XMAS RADIO DE-LUXE

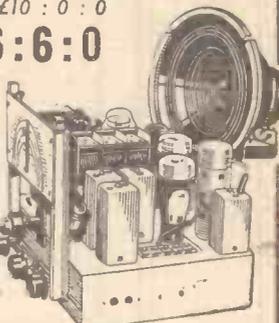
5-valve ALL-WAVE A.C. SUPERHET RADIO/GRAM CHASSIS

with 5 British Valves and Moving-Coil Speaker

LIST VALUE £10:0:0

OUR PRICE £6:6:0

- 3 Wavebands—18-50, 200-550, 900-2,000 metres.
- Automatic volume control on two stages.
- Bandpass on all stages.
- Mains input filter.



Dimensions: 10" high; 11" wide; 8½" deep.

5 British Valves: Hexode as Detector and oscillator. Variable-mu H.F. Pentode as I.F. amplifier. Double diode-triode for second detection. A.V.C. and 1st L.F. amplification. High slope output pentode. 4 position wavechange switch for 3 bands and gram. Each band separately dial lighted. Provision for extension speaker. Combined on-off switch and volume control. Separate tone control. A.C. Mains, 200-260 volts, 50-100 cycles. Output 3 watts. Complete with Valves and High-Fidelity Field-Energised 8" cone Moving-coil Speaker illustrated. Cash or C.O.D. £6/6/0, or 7/6 down and 15 monthly payments of 7/11. **7/6 DOWN**

GIVE YOUR FAMILY XMAS RADIO IN EVERY ROOM

With only one additional Speaker

The EXTENSYSTEM

provides sockets in any part of the house desired, in which the speaker may be plugged as and when wanted. No alterations necessary to your permanent receiver, which need not be moved. Neat and unobtrusive, the EXTENSYSTEM is ready assembled for instant installation, a speedy and simple matter. Price complete with 7/6 instructions (Post 6d. extra.)



POST THIS COUPON NOW

PETO-SCOTT CO. L.D., 67 (P.W.14), City Road, London, E.C.1, or 72 (P.W.14), High Holborn, London, W.C.1.

Please send me..... for which I enclose £.....: Cash/H.F. Deposit. Also please send me gratis the Peto-Scott Radio and Television Catalogue, and the Pilot "Short-Wave Experimenter." I enclose 2d. (stamps) to cover postage.

NAME..... ADDRESS.....

All P.O.'s must be crossed and currency registered.

(Continued from page 314.)

valve. Insert detector triode valve (Mazda L2 Met.) in valve holder nearest anode coil holder. Check carefully, as the type of detector valve is important. Insert "first L.F." valve (Osram or Marconi L21, clear or metallised) in valve holder next to triode detector. Insert power valve (Hivac PX 230) into valve holder nearest bottom edge of panel.

Check valves to see that they are in their correct valve holders.

Check once again all battery voltages, including those of the grid-bias plugs. A vast amount of trouble is caused by grid-bias plugs being in their wrong positions, and yet frequently quite good results are obtainable even when these plugs are in their wrong positions, the constructor not realising for that reason that he could get much better results if the plugs were correctly placed.

Put H.T. plug back into H.T. socket on H.T. battery.

The aerial lead, it should be noticed, should be kept away from the loudspeaker side of the set, and the H.T. battery, and similarly the leads to the loudspeaker should not trail round the left-hand side of the set. The aerial lead should always be kept away from the earth lead.

Set the pointer of your main tuning condenser to a local Regional station name. Insert a medium-wave coil in each coil holder. Turn the aerial coupler about half-way. Turn anode and "X" reactions fully anticlockwise (fully to the left). Turn aerial balancer knob so that the pointer points in a direction approximately parallel with the direction of the main pointer. Insert plug in socket on right-hand side-piece, and insert plug in lower socket on left-hand side-piece.

If it is found that the pointer points a little to either side of the name of the identified station, about the centre of the dial, the position of the pointer-disc on the main spindle can be altered by slackening the grub-screw, holding the vanes, and turning the disc one way or the other to a small extent by turning the driver knob. Then tighten grub-screw.

Use of Mains Units. If a mains unit is employed, the H.T.+1 connection is taken to high intermediate tapping on the mains unit; the H.T.+2 connection is taken to the S.G. tapping. The H.T.+3 goes to the medium intermediate socket on the mains unit. H.T.+4 goes to maximum. As many mains units will give 150 volts, the maximum grid bias, G.B.—4 may be increased to 15 volts.

THE CONTROLS OF THE S.T.900

EXAMINE the photograph which shows the front of the set.

Looking from the front, on the left side-piece of the easi-cabinet, the knob controls the aerial coupler condenser and will be called the "aerial coupler." Below this on the side-piece is a plug which goes into one of two sockets. This is the Selectivity Plug. When in the bottom socket you have normal selectivity; when in the upper socket you have ultra-selectivity (obtained on the second circuit, a negative voltage being applied to the grid of the H.F. pentode valve).

On the right-hand side-piece there is also a plug and socket. This replaces what would be an on-off switch. But as I hold all radio-switches accursed, you do not switch on, you plug-in. It is as easy and a thousand times safer, and more reliable.

Now for the front panel. All the controls are at the bottom, thus giving the S.T.900 the most handsome front-view of any of my sets. The knob on the left is that of the aerial circuit tuning condenser which tunes the grid circuit of the H.F. pentode, i.e. the first tuned circuit. This knob is called the aerial balancer. It has a small pointer on it.

The next knob to its right is the aerial reaction control. The next knob turns the main tuning condenser by a slow-motion movement. The knob on the right is the ordinary anode reaction knob.

HOW TO OPERATE THE S.T.900

REMEMBER always that there are two tuned circuits in this set. Each has two adjustments

to make it more selective. Intelligent operation depends on linking these adjustments with the correct circuit.

The first circuit is tuned by the aerial balancer. It is fed with radio-frequency currents through the aerial coupler. Its selectivity is thus under control. Also the "X" aerial reaction knob controls the circuit. It improves selectivity and signal strength. These three knobs are used together.

The second circuit is tuned by the main tuning condenser with its long pointer and dial. The selec-

tion (to the left of) the main tuning pointer. Tuning is done after main pointer has been set.

Selectivity Plug. When in upper socket, set is at ultra-selective, but set is not fully sensitive. When plug is in lower socket, signals are loudest but selectivity is only normal.

"X" Aerial Reaction. Turning to right (clockwise) signal strength and selectivity improved.

Main Tuning Knob. Tunes the second circuit, i.e. the anode circuit. Alteration of reaction should be followed by slight readjustment of this knob.

Calibrating the S.T.900. You should start logging as soon as possible so as to get a few easily recognised stations marked with a dot. As the aerial balancer is not calibrated, "old hands" may find things a little strange at first, but this feeling disappears rapidly as you mark up a few stations. Pick up your locals first and reduce their strength, e.g. by turning aerial coupler to left and selectivity plug in upper socket. Apply reaction so as to get a fine tuning point. The aerial balancer should be tuned to give loudest signals, its pointer being approximately parallel or a little to left of main pointer. Mark a dot in pencil where main pointer crosses the dot-line nearest the outer ring of stations. Join dot by pencil line to end of station name.

If the pointer does not point at the station name you can slightly slacken grub-screw which holds condenser drive disc to the condenser spindle. The pointer-disc can then be turned a little to left or right as the case requires: the grub-screw is then tightened.

Having marked your local you can always go back to it by setting the main pointer to it and then turning the aerial balancer until the station comes in. (Do not forget to adjust the aerial balancer.) Repeat the process on other easily recognised medium-wave stations.

Intermediate stations are easily found by noting the general angle of the junction lines to the station names.

When the set is not in its most selective condition it is possible for the main pointer to be set at a foreign station, and the aerial balancer as it is turned may bring in some other station, due to its not being correctly adjusted. For example, the local station may come in. You rapidly learn to ignore these stations and continue to turn the aerial balancer until the actual station wanted comes in.

The final test to make sure you have the wanted station is to move the main pointer to each side of its correct position. Signals should weaken whichever way you move the main pointer. If they do not weaken (unless signals are already very strong) it means you are on the wrong station, due to an incorrect setting of the aerial balancer.

The simplest way of tuning is to set your main pointer to the station dot, make the set oscillate with reaction. You will no doubt hear a whistle. Then turn the aerial balancer to a point where the whistle suddenly changes note. Loosen reaction, and there is your station. This system, although fool-proof, is only used for logging very weak stations, but the system can be recommended for short waves owing to sharpness of tuning on those bands.

Tuning the Short Waves, 1st Method. The short waves may be received with aerial balancer pointer fully to the left and "X" aerial reaction to the left, tuning being accomplished with the main pointer and reaction, the selectivity plug being inserted in lower socket. The set may be made to oscillate with the anode reaction and the main pointer turned to around the middle of a group of short-wave stations. Heterodyne whistles will be heard. Gradually reduce reaction until set stops oscillating, and by careful tuning on main pointer and by keeping reaction critical you will pick up a number of stations. This method is most inefficient but easy.

2nd Method. Having received a station you can make it much louder by turning the aerial balancer knob until the signal comes into tune on the balancer. You may find that as it does this the set oscillates. In that case you will have to reduce the anode reaction. This second method is usually only advised when the short-wave signals are strong.

(Continued on next page.)

COILS FOR THE S.T.900

The full list of approved coils appears below. No others have been approved.

DIAL REF.	S.T.900 RANGE	MAKE	TYPE No.
L.W.	800-2,000 metres	B.T.S. "One-Shot"	9/L.W.
M.W.	170-580 metres	B.T.S. "One-Shot"	9/M.W.
S.3.	24-70 metres	Eddystone	6P.
S.2.	15-45 metres	B.T.S. "One-Shot"	9/S.3.
S.1.	9-27 metres	Raymart	C.X.6.
S.O.	6-8 metres	B.T.S. "One-Shot"	9/S.2.
		Eddystone	6/L.B.
		Raymart	C.A.6.
		B.T.S. "One-Shot"	9/S.1.
		B.T.S. "One-Shot"	9/S.O.

IMPORTANT NOTE.—The above coils, and these only, should be used in the S.T.900.

The addresses of the firms supplying the coils are as follows:

B.T.S.: Peto-Scott Electrical Instruments (Holdings) Ltd., Pilot House, Stoke Newington Church Street, London, N.16.

Eddystone: Stratton & Co., Ltd., Bromsgrove Street, Birmingham.

Raymart: 44, Holloway Head, Birmingham.

J. S.-T.

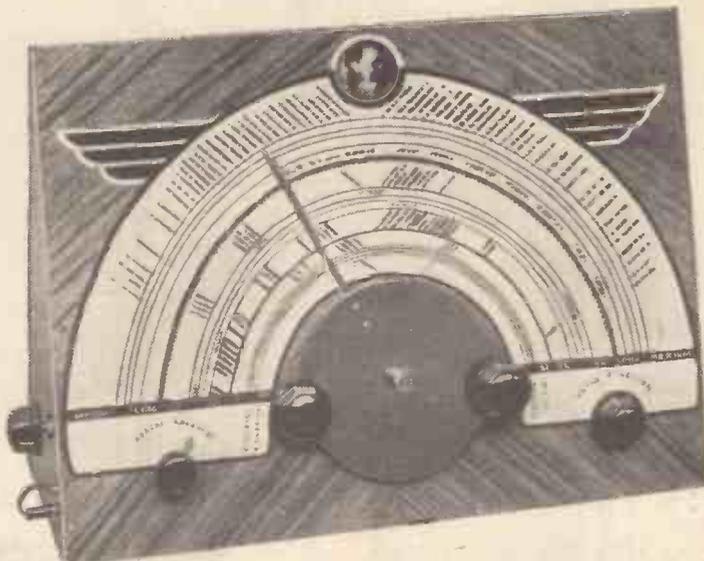
tivity plug governs the selectivity and signal strength of this circuit. Anode reaction is applied to this circuit, and improves selectivity and signal strength. These three settings are used together.

Aerial Coupler. Normally about a third from the left. Turn left for reducing signal strength or improving selectivity. Turn right for stronger signals (but selectivity is reduced). Tuning is not appre-

wave stations. Intermediate stations are easily found by noting the general angle of the junction lines to the station names.

When the set is not in its most selective condition it is possible for the main pointer to be set at a foreign station, and the aerial balancer as it is turned may bring in some other station, due to its not being correctly adjusted. For example, the local station may come in. You rapidly learn to ignore these stations and continue to turn the aerial balancer until the actual station wanted comes in.

THE S.T.900 AS YOU'LL BUILD IT



On the panel there are four controls, which, from left to right, are: Aerial Balancer, "X" Reaction, Main Tuning and Anode Reaction. The knob on the left of the set is the Aerial Coupler, and to the side of it the plug and sockets for selectivity adjustment can be seen. With the plug in the lower socket normal selectivity is obtained; when in the upper socket ultra-selectivity is realised. The "on-off" plug and socket are on the right. The S.T.900 needs no extra cabinet.

ciably affected. Main dial not affected at all, but very slight readjustment on aerial balancer may improve signals after alteration of aerial coupler.

Aerial Balancer. As this tunes the aerial circuit it is a vital control; if not accurately tuned you will not properly receive the desired station. You do not, however, need to know or remember its position. Its pointer will point approximately parallel to (or a

little to the left of) the main tuning pointer. Tuning is done after main pointer has been set.

(Continued from previous page.)

3rd Method. Make the set oscillate by use of plenty of anode reaction (use more than is necessary just to start oscillation). Keep the aerial balancer pointer more or less parallel but a little to the left of the main pointer. Pick up a station on the main pointer by its heterodyne whistle. Leave go of the main tuning control and turn the aerial balancer either way until the whistle suddenly changes character. This will only occur at one point. You will find that you can get a silent point adjustment on the aerial balancer and that if you tune the balancer to either side the note of the whistle will rise. At the silent point the aerial balancer may be regarded as in tune. Leave it alone. Now go back to the main tuning knob and adjust it while reducing reaction to the normal critical non-oscillating condition.

4th Method. A final polish for the satisfaction of experts may be given as follows: Tune a trifle below the station on the aerial balancer and get the station at its loudest by trial "swinging" of the main tuning control. Then tune very slightly higher on the aerial balancer, repeating the swinging. Signal should be louder. Keep on with this process till signals are at their loudest. If you over-tune on the aerial balancer signals will begin to fall off in strength. During these tests (which actually take only a second or two) anode reaction should be kept critical.

Note.—As usual on straight sets, as you tune higher up the dial more reaction is needed, this applying to all wavebands. Another point useful to note is that an increase of reaction may require tuning down a trifle on the main pointer, and vice versa.

Use of X-Aerial Reaction: After picking up a station apply aerial reaction by turning knob to right, slightly re-tuning aerial balancer. When searching, a little aerial reaction should be constantly left in use. If signal too strong, reduce aerial coupler.

S.T.900
THE POWER SUPPLY

Batteries: H.T. 120 v. — Drydex, G.E.C.,
Aerialite, Milnes H.T. Unit,
Lissen, Fuller.
G.B. 16'5 v.—Drydex, Lissen.
L.T. 2 v.—Exide, Lissen, Fuller.

Mains Units: Ekco, Atlas.

SUITABLE
LOUDSPEAKERS

W.B., Rola, Blue Spot, Amplion, Wharfedale
(No significance attaches to the order of
makes.) J. S.-T.

How to Adjust the Triple Extractor (see page 335). Connect Triple Extractor Unit between aerial lead and aerial terminal of set. Aerial lead goes to terminal 1 on Triple Extractor, while terminal 4 on Triple Extractor is joined by a wire to aerial terminal on set.

(a) At first have all three extractor condenser adjusters turned fully clockwise (to right).

(b) Tune the S.T.900 set to receive your local National medium-wave station, or your relay station if this causes swamping. Signals should be loud but not made unnecessarily so. Reduce aerial coupler and reaction if necessary. Now slowly alter that knob on the Triple Extractor which is nearest terminal 1, until the local National is cut out. On either side of the silent point the National will become louder.

(c) Tune S.T.900 to receive your other medium-wave local—the Regional. Signals should be loud but not be allowed to overload set. Reduce reaction and aerial coupler if necessary. Now slowly adjust preset on the Triple Extractor nearest to terminal 4 until Regional disappears.

(d) Switch S.T.900 to long waveband and tune-in Droitwich in the ordinary way, not permitting it to overload the set. Reduce volume if necessary. Now slowly adjust middle preset on Extractor until Droitwich disappears.

(e) You can now slightly readjust any of the three presets to allow just as much B.B.C. signal to get through to main set as you wish. Remember which station each Triple Extractor preset controls.

(f) Never let the Triple Extractor presets be "just anywhere." They may be extracting the very station you are looking for. Midland Regional listeners may set both outside presets to Midland Regional. When not needed, it is best to take the whole Triple Extractor out of circuit. Its extreme usefulness will, however, be appreciated in all districts suffering from B.B.C. swamping. J. S.-T.

COMPONENTS FOR THE S.T.900 BATTERY MODEL

Component	Make Used by Designer	Suitable Alternative Makes
1 0005-mfd. main tuning condenser with drive	J.B. as used in S.T.800. (6/6)	
1 0005-mfd. aerial balancer condenser	Polar as used in S.T.800. (5/6)	
2 6-pin coil holders	B.T.S. (self-locating type). (2/-)	B.T.S. (mention S.T.900).
1 0005-mfd. aerial coupler condenser	GRAHAM-FARISH log-mid-line as used in S.T.800 (2/-)	
1 0005-mfd. "X" aerial reaction condenser	GRAHAM-FARISH log-mid-line as used in S.T.800. (2/-)	B.T.S. (mention S.T.900).
1 0005-mfd. anode reaction condenser	GRAHAM-FARISH log-mid-line as used in S.T.800. (2/-)	B.T.S. (mention S.T.900).
1 Block condenser 2+2+1 mfd.	T.M.C. type B1007. (4/-)	
3 006-mfd. mica fixed condensers	LISSEN. (3/-)	Dubilier type 610. T.C.C. type S
1 0005-mfd. mica fixed condenser	LISSEN. (6d.)	Dubilier type 610. T.C.C. type S
2 00005-mfd. mica fixed condensers	LISSEN. (1/-)	Dubilier type 620. T.C.C. type 34
1 0002-mfd. tubular condenser	T.M.C. (9d.)	
1 001-mfd. tubular condenser	T.M.C. type T10 (9d.)	
3 1-meg. resistors	DUBILIER 1/2 watt. (1/6)	Erie 1 watt. Polar-N.S.F. 1 watt
1 30,000-ohm resistor	DUBILIER 1/2 watt. (6d.)	Erie 1 watt. Polar-N.S.F. 1 watt
1 20,000-ohm resistor	DUBILIER 1/2 watt. (6d.)	Erie 1 watt. Polar-N.S.F. 1 watt
1 5,000-ohm resistor	DUBILIER 1/2 watt. (6d.)	Erie 1 watt. Polar-N.S.F. 1 watt
2 All-wave H.F. chokes	B.T.S. as used in S.T.800. (3/6)	
1 L.F. transformer	VARLEY "Nictet" 3-5/1. (7/6)	
5 4-pin baseboard valve holders	W.B. small type. (3/4)	
4 Terminals marked A, E, L.S.—, L.S.+	BELLING & LEE type R. (1/2)	Clix type A. Bulgin type TL
3 Parallel sockets	CLIX No. 8. (3d.)	
2 Master wander plugs	CLIX No. 5. (3d.)	
1 Polished wood panel (Metaplex reverse) 16x12x 1/4 in.	PETO-SCOTT. (3/9)	
1 Pair side-pieces	" " (1/6)	
2 Terminal strips 2x1 1/2 x 3/8 in.	" " (6d.)	
1 Wood platform 15 1/2 x 3 x 3/8 in.	" " (1/-)	
1 Aluminium Screen	" " (6d.)	
SCREWS, WIRES, ETC.		
2 1/2 x 1/8 in.-hole 20-gauge brass washers	" " "	
3 3/8 x 1/8 in.-hole 24-gauge brass washers	" " "	
3 3/8 x 1/8 in.-hole 22-gauge brass washers	" " "	
30 1/2-in. x No. 4 brass R.H. wood screws	" " "	
15 3/4-in. x No. 4 brass R.H. wood screws	" " "	
10 1/2-in. x No. 4 brass R.H. wood screws	" " "	(26)
2 1/2-in. x No. 4 brass C.S. wood screws	" " "	
2 1/2-in. x No. 4 brass C.S. wood screws	" " "	
16 feet 18-gauge T.C. wire	" " "	
5 Lengths 1 1/2-mm. insulating sleeving	" " "	
20 feet 14/36 rubber-covered single flex	" " "	

URGENT WARNING

No components, valves, celluloid dial or coils not specifically mentioned on this page should be used. Kits using substituted components (even though principal parts are author's choice) are not authorised. There are very important technical reasons (especially on shortest wavelengths) for my choices. J. S.-T.

OPTIONAL

10 Wander plugs marked H.T.—, H.T.+1, H.T.+2, H.T.+3, H.T.+4, G.B.—, G.B.—1, G.B.—2, G.B.—3, G.B.—4	BELLING & LEE (1/8) BELLING & LEE (1/-) J.B. (4d.)	Clix, Bulgin Clix, Bulgin
2 Accumulator Connectors		
1 Extra knob similar to main drive (for aerial-reaction knob)		
1 Extra matching knob for aerial balancer	PETO-SCOTT (4d.)	No Alternative
Celluloid Dial	Celluloid Printers Ltd. (2/6 post free)	

VALVES

V.X Hivac L210 (met.) (3/9) or Mazda L2 (met.) (4/9)	V.1 Hivac V.P.215 (met.) (9/6)	V.2 Mazda L2 (met.) (4/9)	V.3 Marconi/Osram L21 (4/9) or Mazda L2 (4/9)	V.4 Hivac P.X.230 (7/6)
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TRIPLE EXTRACTOR

1 Triple Extractor coil unit	WEARITE (7/6)
3 0005-mfd. pre-set condensers	COLVERN (5/3)
1 Wood baseboard 4 1/2 x 4 x 1/8 in.	PETO-SCOTT (6d.)
2 1/2-in. x No. 4 R.H. brass wood screws	} (3d.)
6 1/2-in. x No. 4 R.H. brass wood screws	

Build a set identical with mine. You substitute, except for the above alternatives, at your own risk. J. S.-T.
--

FINAL NOTE

Build a set identical with mine. You substitute, except for the above alternatives, at your own risk. J. S.-T.

On the SHORT WAVES

STARTING AGAIN

By W. L. S.

THE best possible start to this page is "Happy Christmas, Everybody." I know that home readers will not even be unduly "het up" about Christmas by the time they read this, but overseas readers and exiles of Empire will probably be right in the throes of the festive season. Anyway, it's a Christmas number, and there's nothing to stop me from wishing you all another happy one in the December 25th issue!

Talking of starts, I have been asked to help readers to make a fresh one, hence the title of this article. There are heaps of new readers coming along who want to know all about this single-valver racket; and there are, apparently, also heaps of old ones who want to begin all over again, just for fun.

Short Wiring Achieved

So here we are, back in our second childhood, if you like, examining in detail a poor, harmless little single-valver receiver. The circuit is on this page. Apart from the fact that the H.T. is series-fed and that a resistance is used instead of an H.F. choke, there's nothing particular that you need notice about it. When you come to the layout diagram, however, things are somewhat different (and I nearly said "more than somewhat"!)

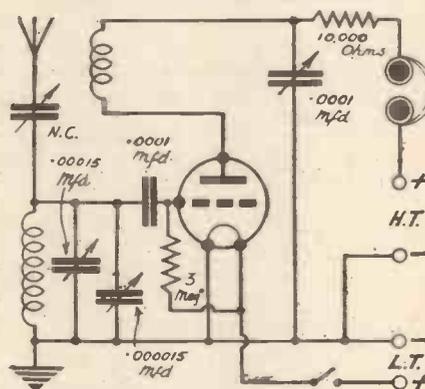
I haven't shown any wiring, because at the present stage it would merely confuse the issue. I only want you to notice the exact way in which the parts have been placed. The two condensers on the front panel are both for tuning purposes, the reaction condenser being ticked round at the side. This arrangement makes for very short wiring in the reaction circuit, which is the main advantage of it; but anyone who hasn't tried a reaction control at the side of a set can have no idea of how comfortable it is to operate, once you have become used to it.

The coil holder and valve holder are set close together, with the anode terminals away from the panel. The grid condenser forms the wiring link between the grid terminal of the valve holder and that of the coil holder. The negative terminal of the valve holder and the adjacent terminal of the coil holder, which carries the bottom end of the grid coil, are connected together and to the chassis at a point between them.

The two anode terminals are connected together by a straight piece of wire, thus joining the anode of the valve to one end of the reaction coil. The other end comes

out to the terminal on the coil holder which is nearest to the reaction condenser. This terminal is linked by a short length of wire to the fixed plates of the reaction condenser, and is also connected to one end of the 10,000-ohm resistance, the other end of which goes to the headphones and then to H.T. positive. If chassis construction is used, this resistance may be under the chassis and immediately beneath the reaction condenser.

SERIES-FED REACTION

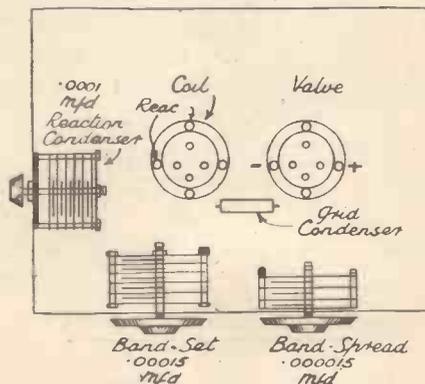


The simple single-valve circuit referred to by W. L. S. Note the series-fed reaction and the use of a resistance instead of an H.F. choke.

The moving plates of the reaction condenser are connected to the chassis by the shortest possible route. If the condenser is mounted on a metal bracket, that's it.

Now we are left with the most important feature of all. Old-timers will heave a sigh here, and new readers will wonder what's coming (perhaps). The main tuning

A GOOD LAYOUT



The layout arrangement of W. L. S.'s suggested one-valver. Note how the variable condensers are placed.

circuit of this receiver, which is, of course, the detector grid circuit, is the most important part of the set. Upon its "goodness" or "badness" depends the sensitivity and the selectivity of the receiver. One might truly say that the success or failure of the set depends upon the way this circuit is treated.

What does this tuned circuit include? Well, it's the grid coil, the condenser which tunes it and all that comes in between them. This last includes wiring, twisted connections, bits of a coil holder, and so on. And these externals have got to be kept as inconsiderable as possible.

Earthing the Moving Plates

With the layout shown, the fixed plates of the two tuning condensers—bandsetter and bandspreader—can be connected together by a very short piece of wire and then connected to the grid terminal of the coil holder. The moving plates must not be left to "find their own way back to earth," but a separate wire should be taken from the moving plates of each condenser to the point where L.T. negative and the bottom of the grid coil are connected on to the chassis.

When I say "chassis," by the way, I mean either a pukka metal affair or a home-built one with metallised plywood. I am not taking ordinary plywood into consideration at all.

If you want to make a really efficient job of this little set, or if you want to get down to 5 metres with it, it will pay you ten times over to raise the baseboard so high (cutting away part of it, if necessary) that the grid terminals of the valve holder and coil holder come within an inch of the fixed plates of the two tuning condensers.

You see, any wiring between condensers and coil becomes part of the tuned circuit. As such, it's far better to have it in the coil than out of the open air. For one thing, it will have its share of coupling to the reaction winding, which it certainly won't if it's straight wiring out away from the coil.

Until you've tried it out for yourself, you won't believe what an effect this can have. Here's a concrete example for you, taken from my own experience: A set with the baseboard mounted at the bottom of the panel received the 5-metre band with four-turn coils, and it came in near the bottom of the condenser. Raising the baseboard up till the coil holder was right beside the condenser made it possible to use 6-turn coils with the same condenser reading, and signal strength was tremendously increased thereby.

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CROONING and HOME BROADCASTING COMPLETE OUTFITS



7-watt A.C. AMPLIFIER only. 4-valve push-pull circuit. Undistorted output 7 watts. For microphone or pick-up. Circuit: triode, resistance transformer coupled to 2 power amplifier valves in push-pull, valve rectifier, consumption 60 watts. Steel chassis. Size: 7 1/2 in. high, 4 in. wide, 10 in. long. For A.C. Mains 200/250 volts, 40/80 cycles. Complete with 4 valves ready for immediate use.

List Value £4/19/6. **BARGAIN, Cash or C.O.D. £3/10/0** or 5/- down and 12 monthly payments of 6/-.

5/- DOWN

Enlarged Speaker of required handling capacity, 37/6, or 2/6 down and 12 monthly payments of 3/3.

4-watt BATTERY AMPLIFIER, Q.P.P. output, providing quality reproduction on gram, and microphone. Dimensions: 7 in. long, 5 in. deep, 7 1/2 in. high. For use with ordinary H.T. battery 135-150 volts. With 3 valves, fully tested. List Value £4/4/0. **BARGAIN, Cash or C.O.D., £2/15/0**, or 4/6 down and 12 monthly payments of 4/9.

Recommended Speaker. Goodman's P.M. Special Type, 19/6, or 2/6 down and 8 monthly payments of 2/6.

MICROPHONES. Transverse current type for use with above amplifiers. Faithful reproduction at all musical and speech frequencies. Complete with transformer and ready for instant attachment. Table Model, 21/-, or 2/6 down and 8 monthly payments of 2/9. Telescopic Floor Model, 2 Gns., or 2/6 down and 11 monthly payments of 4/-.

The PILOT

"ALL-IN" SHORT-WAVE KIT

Comprising every item to build alternatively 8 RECEIVERS

LIST VALUE £7:0:0 **BARGAIN** Cash or C.O.D. £5:15:6

Complete with Valves, Coils and Steel Cabinet.

Essential and ideal gift for the Short-wave Experimenter, young or old. Kit contains components consistently specified in all technical papers and cables you to build any one of the following efficient short-wave receivers: Short-wave Converter; Two 1-valve Receivers (4 or 6-pin Coils); 2-valve Receiver; Two 3-valve Receivers (4 or 6-pin Coils); Two 4-valve Receivers (4-pin and 4 and 6-pin Coils). Kit complete with 8 Coils (4 to 97 metres). Battery, S.G., Det., L.F. and Pentode valves, steel cabinet, 8 Blueprints and comprehensive operating instructions. Cash or C.O.D., £5/15/6, or 7/6 down and 12 monthly payments of 10/-.

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STRAIGHT 3 BATTERY RECEIVER



A wonderful opportunity. New type highly selective circuit. Slow-motion illuminated dial. Pick-up sockets. Metal chassis. Low H.T. consumption. Complete in cabinet as illustrated, with valves and moving-coil speaker, less Batteries.

LIST PRICE £4:19:6

BARGAIN £2:10:0

Cash or C.O.D., Carriage Paid, or 5/- down and 12 monthly payments of 4/3.

5/- DOWN

* SPECIAL OFFERS *

HEADPHONES, New lightweight, super quality ideal for short-wave work and testing 3/6. Post 6d.

VALVES. Give your set a tonic. Fit a new set of valves. Huge purchases enable us to offer at greatly reduced prices. Long and efficient service guaranteed.

Battery Types: Det., L.F. and H.F., 2/9. Power, 3/6. S.G., V.M., H.F., and L.F. Pentodes, 6/-. Mains Type: A.C./H.L. 5/-. All A.C. S.G., A.C. V.S., Pentodes and H.F. Pentodes, 7/-. Octodes and Hexodes, 9/-. D.H. Full Wave Rectifiers, 350-0-350, 120 m/a., 5/-. Postage extra.

S.T.900 KITS

EVERY PART GUARANTEED TO SPECIFIED VALUES—MATCHED—PROVED—TESTED

KIT "1" Carriage Paid 45/-

Comprising all parts for S.T.900 battery version, including EXCLUSIVELY SPECIFIED Peto-Scott polished and drilled panel, side pieces, platform, terminal strips and screen, Varley Niclet L.F. transformer, B.T.S. H.F. chokes, J.B. S.T.900 S/M drive and pointer, and T.M.C. block condenser, less valves and coils, but including ALL WIRE, FLEX, SCREWS, KNOBS, and FREE full-size station name dial card. Yours for 4/- down and 12 monthly payments of 4/-.

4/- DOWN

N.T.S. S.T.900 6-PIN COILS

Expertly wound exactly to specification, on special low-loss formers with high-grade copper wire. These coils are worthy additions to the already popular range of N.T.S. plug-in type tuners.

MEDIUM WAVE (190-550 metres) per pair 4 6
LONG WAVE (900-2,000 metres) per pair 5 6
SHORT WAVE, three wave ranges (15-43, 24-70, 9.5-27 metres) per pair 4 0

If complete set of 10 coils required, add 22/- to Kit cash price, or 2/- to deposit and to each monthly payment. If 10 coils required separately, send 2/6 only and 9 monthly payments of 2/6.

5 British matched, guaranteed and tested valves, £1.

KIT "2" Comprising all parts as in Kit "1," but including set of 5 matched and guaranteed valves, less coils, cabinet, and speaker. Carriage Paid £3/5/0, or 5/- with order, balance in 12 monthly payments of 5/9.

KIT "3" Comprising all parts as in Kit "1," but including 5 matched valves and Peto-Scott table cabinet, less coils and speaker. Carriage Paid £4/4/6, or 7/9 with order, balance in 12 monthly payments of 7/7.

N.T.S. S.T.900 FINISHED INSTRUMENT

Housed in PETO-SCOTT walnut table cabinet with extended aerial coupler, station name dial, and 5 valves fitted. Complete with 5 pairs of N.T.S. 6-pin coils covering long, medium, and 3 short-wave bands. Aerial tested on all wavebands. Cash Price, £6:6:0

Or 10/6 down and 12 monthly payments of 11/3.

PETO-SCOTT S.T.900 PILOT AUTHOR KITS

KIT "A" Cash Price Carriage Paid 55/6

Or 5/- down and 11 monthly payments of 5/3. Comprising all components exactly as FIRST specified by Mr. John Scott-Taggart, with S.T.900 auto-dial card, less coils, Konectakit, wander plugs, accumulator connectors, valves, extractor kit, cabinet, and speaker.

KIT "A4" As Kit "A" but with Konectakit and 4 B.T.S., medium and long-wave One-Shot Inductors. Cash Price, Carr. Paid, £3/10/0, or 7/- down and 11 monthly payments of 6/7.

KIT "A10" As Kit "A," but with Konectakit 10 B.T.S. One-Shot Inductors, covering long, medium, and 3 short wavebands. Cash Price, Carr. Paid, £4/5/0, or 8/6 down and 11 monthly payments of 6/1.

S.T.900 SPECIFIED VALVES. If set of 5 first specified valves is required with any of the above kits, add £1/10/3 to cash price, or 3/6 to deposit and 2/9 to each of the 11 monthly payments.

S.G.3 CHASSIS

with knobs & escutcheon, less valves

LIST VALUE 60/- **BARGAIN** 19/6

● Latest Screened Grid. H.F. Detector and Pentode output circuit.
 ● Screened coils. ● Only 9 m.a. H.T. Consumption. ● Illuminated and Wavelength Calibrated Dial. ● Wave-range 200-2,100 metres.

Or Complete with 3 British Valves. List Value £4/4/0. Bargain £2/2/0. Cash or C.O.D., or 2/6 down and 12 monthly payments of 4/-.

2/6 DOWN



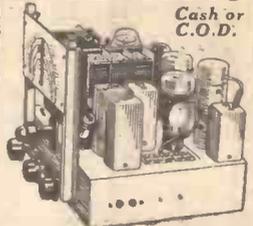
1938 ALL-WAVE 5-valve

A.C. SUPERHET CHASSIS

Amazing Offer! Immediate Delivery!

List Value 8 Gns. **BARGAIN £4:17:6**

COMPLETE WITH 5 VALVES, KNOBS & ESCUTCHEON



● 3 wavebands: 18-50, 200-550, 900-2,000 metres. ● A.V.C. bandpass on all bands ● Input to triode hexode detector oscillator, V.M. H.F. pentode, double diode-triode 2nd detector triodes, resistance capacity stage coupled to high-slope output pentode. ● Output 3 watts. ● Combined on-off switch and volume control. ● Separate tone control. ● 4-position wave-change and gram-switch. ● Illuminated rectangular full-vision slow-motion dial, 80-1 and 9-1 reductions, scale engraved station names and wave-lengths. ● Overall dimensions: 10" high, 11" wide, 8 1/2" deep. For A.C. mains: 200/250 volts, 40/80 cycles.

7/6 down secures; balance 14 monthly payments of 7/11. If required with matched moving-coil speaker add 27/6 to Cash Price, or 7/6 down and 17 monthly payments of 8/9.

ORDER NOW TO AVOID DISAPPOINTMENT

New 4-valve BANDSPREAD Battery SHORT-WAVE KIT

List Value £4:9:6 **BARGAIN 42/-**



A PERIODIC H.F. re-acting detector, resistance and transformer L.F. Stages, Pentode Output. Slow-motion full-vision bandspread tuning SIMPLIFIES WORLD RECEPTION! Efficient low-loss reaction condenser. Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 scales calibrated in degrees and tenths.

KIT "1" comprises every part for assembly including 26-pin coils, wiring, and assembly instructions, less valves only. Cash or C.O.D. Carr. Pd. 42/-, or 2/6 down and 11 monthly payments of 4/-. **KIT "2"** with British Valves, £3/9/0, or 5/- down and 11 monthly payments of 6/6.

2/6 DOWN

1-VALVE 3-in-1 SHORT-WAVE KIT. For use as Adaptor, Converter, or efficient One-valve Receiver. 12-94 metres. List Value 37/6. **BARGAIN 25/-**. Or 2/6 down and 10 monthly payments of 2/6.

With valve, 28/9, or 2/6 down and 11 monthly payments of 2/9.

2-VALVE BANDSPREAD SHORT-WAVE KIT (12-94 metres). Will bring a lifetime of fascinating short-wave entertainment. Complete Kit, List Value 59/6. **BARGAIN 32/6**, or 2/6 down and 11 monthly payments of 3/4. With 2 matched valves, 41/9, or 2/6 down and 11 monthly payments of 4/-.

ELIMINATORS



and TRICKLE CHARGERS, fully guaranteed. All A.C. Models employ metal rectifier. **COMBINED A.C. MODEL.** This outstanding unit incorporates a Trickle Charger, which re-charges a 2-volt L.T. accumulator at 0.5 amp. For A.C. Mains 200/250-v. 40/100 cycles. Westinghouse Metal Rectifier. Four H.T. tapping Screen, Detector, Medium Power, High Power Output 20 m/a. at 120 volts. Cash or C.O.D. Carriage Paid, 49/6, or 2/6 down and 12 monthly payments of 4/4.

MODEL A.C.12. This efficient model is suitable for sets operating on outputs of up to 12 m/a. For A.C. Mains 200/250-v. 40 to 100 cycles. Output 120-v. at 12 m/a. 4 tappings: 60-v., 75-v., 90-v., and 120-v. Cash or C.O.D. Carriage Paid, 30/-, or 2/6 down and 10 monthly payments of 3/1.

2/6 DOWN

New Times Sales Co.

56 (P.W.48), LUDGATE HILL, LONDON. E.C.4.

Please send me CASH/G.O.D./H.P.:

together with your Free Short-wave Booklet and 1938 Receiver and Component Bargain Lists.

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SHORT-WAVE BOOKLET, describing in detail, with actual photographs, 5 entirely new N.T.S. Bargain Bandspread Short-Wave Kits, together with Complete General Bargain Lists—Receivers, Accessories, Components, etc. etc. Post the Coupon to-day. N.T.S. supply all leading makes Radio and Television. Send us a list of all your Radio requirements for quotation by return.

A SUPER QUALITY 14-WATT RECEIVER

By

JOHN SCOTT-TAGGART

M.I.E.E., F.Inst.P., M.Am.I.E.E.,
M.Am.S.Mech.E., Fel.I.R.E.

A SET FOR THE MUSIC-LOVER,
AND THE LISTENER WHO
DESIRES SOMETHING EXCEP-
TIONALLY GOOD IN THE
WAY OF REPRODUCTION

IT has been a consistent contention of mine that radio receivers offered to the constructor should be of a kind not normally supplied by the radio industry. Some extra feature or quality, calling perhaps for some little extra skill, may be embodied to the great benefit of the user of such a receiver, if he is a little more intelligent or a little keener than the average listener. Apart, however, from technical features calling for some additional operating skill, there are other departments in which the home constructor can gain what he wants.

Mains Valves Essential

There is little demand, comparatively speaking, for a wireless receiver which will give a superlatively good performance as regards quality of reproduction. This matter of "quality" is always a relative one, and no amount of arguing will convince one class of listener that their reproduction is inferior to what it might be. There are many battery set users who are convinced that no mains receiver could excel their own particular set. As regards background noise, when searching for distant stations it is true that a battery set is frequently to be preferred to the ordinary commercial "superhet." On the other hand, there is no doubt that genuine quality of reproduction calls for mains valves.

Probably the reproduction of the bass notes has a great deal to do with this. If



The radio and L.F. amplifier unit. A bandpass H.F. input circuit is used and the power grid detector is resistance coupled to an L.F. valve which in turn is coupled to two large output valves in push-pull.

you do not appreciate a full-bodied bass probably you do not appreciate the quality of reproduction given by mains valves. By bass I do not mean the boomy quality which at one time seemed so representative of the average mains receiver, especially in America where the trouble was particularly bad. Artificial bass and boom can be intensely annoying, and when it is accompanied by an anemic upper register, the words "good quality" have no place at all in any description of such a set.

If you have learnt to do without bass, you are probably as happy as a vegetarian without a steak. But a gourmet would hardly be satisfied with meals consisting solely of fruit and vegetables.

In music, we cannot hope to reproduce exactly the original performance, but goodness or badness of quality should surely be measured as the distance we depart from the original music. Probably most listeners judge the quality of their set by the pleasant reproduction of the news bulletins. Now speech is the easiest thing to reproduce well on a wireless receiver. There are, of course, many subtleties in human speech giving it

certain distinctive features. But when we hear speech on the radio we do not look for any subtleties, because we do not hear the speaker face to face in our private lives. If the speaker were someone you knew very well indeed, you might at once recognise the difference in timbre between a very good receiver and one that you had thought was good.

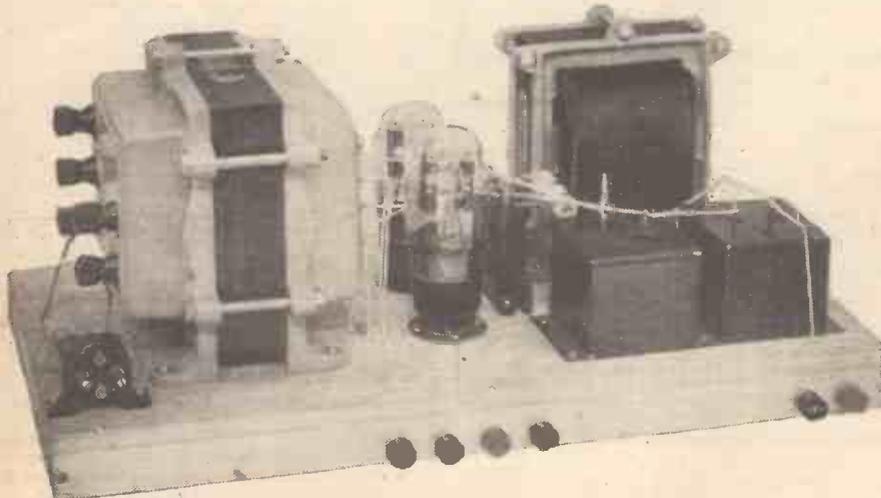
It is in music, and especially in certain kinds of music, that the really good set shows up so well, and the indifferent set shows up so poorly.

Important Considerations

We can regard quality of reproduction from three broad angles. There is the question of distortion and the production of harmonics. There is the question of the loudspeaker's ability to reproduce certain notes. There is the question of the loudspeaker resonating or developing certain notes to an excessive extent. On the other hand, the speaker may not reproduce adequately the lowest or the highest notes, although quite satisfactory in the middle register. Then there is the question of volume. If you increase the volume, does your set begin to distort? Do unpleasant startling noises develop, which may be the fault of the speaker or the set itself? Even if you turn down the volume, and so avoid wholesale distortion or unpleasantness, you will get less obvious distortion during loud passages of music.

Let us consider this question of loudness in relation to quality. It is no use saying that "I want quality not quantity." Real loudness, of course, does not mean anything at all except knocks on the wall or a policeman at the front door. The chief merit of a receiver of large output rating is that it is capable of handling brief passages of music or even single notes without strain. The average receiver may be quite capable of dealing with music of average loudness, but a crash of cymbals or a rattle of drums, or a magnificent climax in a symphony concert may be badly distorted simply because the valves become overloaded. If you insert

(Please turn to page 333.)



The power-pack of the 14-watt receiver. Two rectifiers are employed.



GIVE RADIO THIS XMAS

THESE HINTS WILL HELP YOU TO CHOOSE SUITABLE XMAS GIFTS

"THANK goodness Christmas comes only once a year," says the paterfamilias, as he scratches his head and wonders what on earth to buy his family and his friends. But this Christmas present problem is one that affects everybody, and it is certainly difficult to know just what to give the menfolk.

Well, the problem is solved if they should happen to be radio set constructors or experimenters—a new battery, transformer, variable condenser or some other component may be just the thing they are wanting. And it is not only a question of what to give to others, for Christmas is an excellent occasion upon which to treat oneself to a new set. This is the time of the year when listening is at its peak, and when the programmes are at their best. During Christmas itself many special and highly attractive programmes are put on the air by the B.B.C., and a 1938 set is just the thing to do full justice to them.



★ This Exide "Hycap" accumulator is fitted with a special indicator which shows the condition of the cell at any time, and thus tells the listener whether his L.T. is in a proper state of charge.

★ How many people are there at the present time who are using ancient and obsolete receivers? There must be many thousands! Why not make a break now

and scrap or trade-in that old set for one of the new season's range? In a great many instances this will be looked upon as an ideal Christmas gift by the family as a whole because they enjoy their broadcasting perhaps even more than you. The womenfolk who are at home all day will appreciate a first-class modern receiver because it is they who are in a position to get the maximum entertainment out of broadcasting. So from both points of view, namely radio as a gift to



★ A W.B. "Stentorian" speaker, complete with volume control. It is the model 388C.

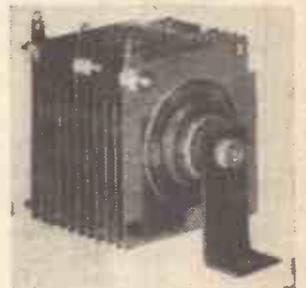
yourself or to others, there is a lot to be said in its favour.

Some idea of the terrific hold which broadcasting has on this country is shown by the recent licence figures, which are in excess of eight and a half millions, and they are still increasing!

Before we deal with complete sets, let us consider some of the less expensive items, such as components and accessories.

★ Suppose you have a son who is keen on experimental and constructional work, or a friend to whom you would like to give a small present. There are a whole host of things that are suitable.

For example, does the potential recipient of the gift use batteries? If so, you can "bet your life" that a new H.T. battery or a two-volt L.T. cell will be very acceptable. H.T. batteries are consumable articles, and have to be replaced at intervals in any case, and a gift such as

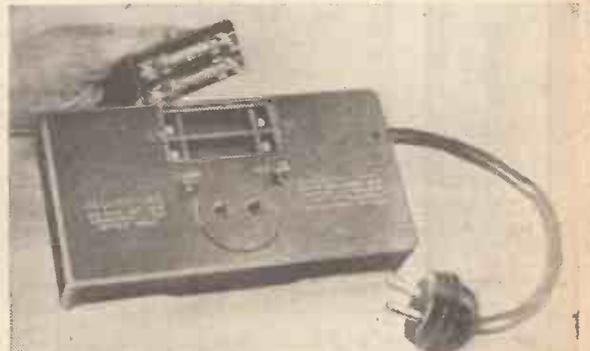


★ One of the popular metal rectifiers made by Westinghouse—the H.T.14

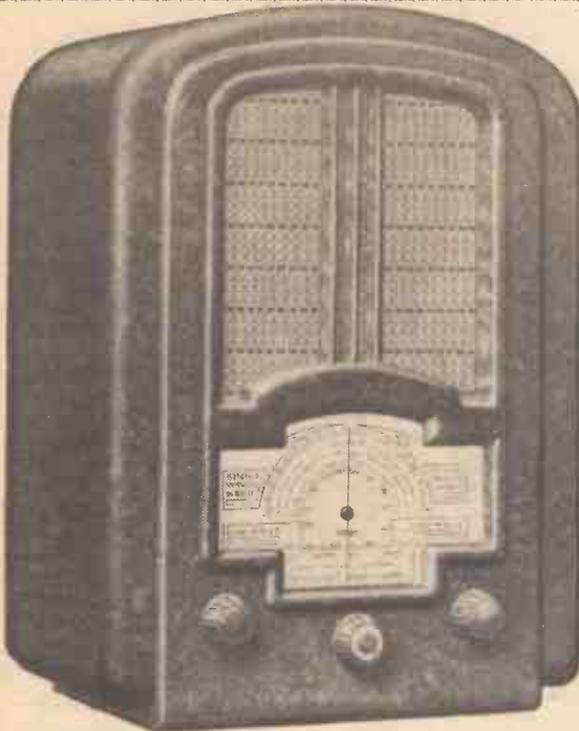
★ this won't cost you a lot of money—less than half a guinea. If you buy an L.T. battery, take a look at one of the Exide "Hycap" series, which have an ingenious indicator to keep the owner *au fait* with the condition of the cell at all times. He can see at a glance whether it is fully charged, or only half charged or empty, and therefore requiring recharging.

Then there is another useful gift for battery set-owners, provided they are on A.C. mains, and that is a battery charger. You can buy a Tom Thumb charger made by Heayberd's for as little as 12s. 6d., yet it will trickle-charge an L.T. battery

(Continued overleaf.)



★ A Belling-Lee set lead suppressor which stops interference getting into the set via the mains.



The Ferranti Model 837 all-wave set, which costs nine guineas.

(Continued from previous page.)

at a current of half an ampere and save the user the cost and trouble of having his battery charged at the local charging station.

Also, of course, there are those invaluable components, variable condensers, L.F. transformers and sundry fixed condensers and resistances. No experimenters can have too many of these. A Varley "Niolet" transformer, which is a first-class component, costs only 7s. 6d., and there is a wide selection of variable condensers to choose from in the J.B. and



The Universal AvoMinor is a splendid gift for the service engineer or experimenter. Every conceivable measurement can be made with its aid.

Polar ranges, and, more particularly for the short-wave enthusiast, in the Eddy-stone range.

For those who are mains-set enthusiasts there are the efficient Westinghouse metal rectifiers in all types. These are also

suitable for home-constructed charging units.

The younger members of the family are usually keen short-wave enthusiasts, and in this connection we will say a few words about the Pilot Experimenter Kits marketed by Peto-Scott Co., Ltd. The idea is to have a perfectly standard chassis and panel upon which the experimenter, starting with a simple single valver, can progress through the various stages to a de luxe four-valver. This is an excellent method of carrying out short-wave work, and is both instructive and economical.

The complete kit of parts for a one-valve set costs £1 9s. 6d., a saving of 10s. 10d. on the individual parts if bought separately.

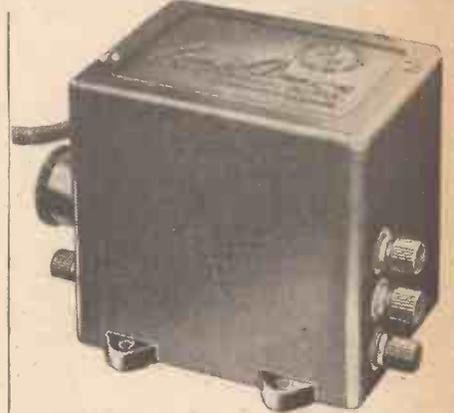
Afterwards other components may be added from time to time, but no parts will have to be scrapped, and the panel and

chassis hold good for every type of circuit. Peto-Scott's supply all the necessary wiring charts and instructions for building and operating—a grand scheme this.

People who live in the vicinity of electrical machinery often suffer from that irritating type of interference known as man-made static. They hear crackling, buzzing and frying noises in the loud-speaker and sometimes think that the set

is at fault. But this is not necessarily the case and, in fact, in the majority of instances, assuming the set to be in good working order, the trouble emanates from some nearby electrical apparatus which is inflicting its waves either directly on the aerial or into the electricity supply mains. All very irritating, but often curable. If you have a

friend who suffers in this way, then you can do him a good turn by buying him an anti-interference aerial or suppressor to fit to his mains.



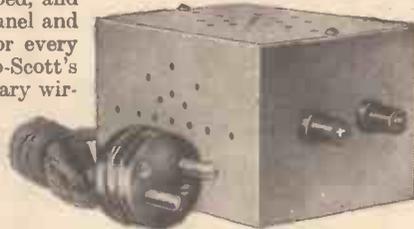
With the W.B. Long-Arm control the set can be switched on and off from the extension point.

Belling-Lee are specialists in the elimination of this type of interference, and they market suppressors for fitting on to the mains supply as well as those which can be attached to household electrical equipment. Anti-interference aerials are made by Messrs. Belling-Lee, H.M.V., Marconiphone, and other firms.

A word of advice here. It is desirable to enlist the aid of the Post Office Engineering Department—which help, incidentally, is given

free of charge—to track down and localise the source of interference, because in some cases an internal suppressor is needed, and in others an anti-interference aerial. It just depends on how the interference is getting to the set.

It has been said that one day we shall have radio in every room. Well, we haven't got quite so far as that yet, but (Please turn to page 324.)



Heayberd's market this "Tom Thumb" charger. It costs 12s. 6d.

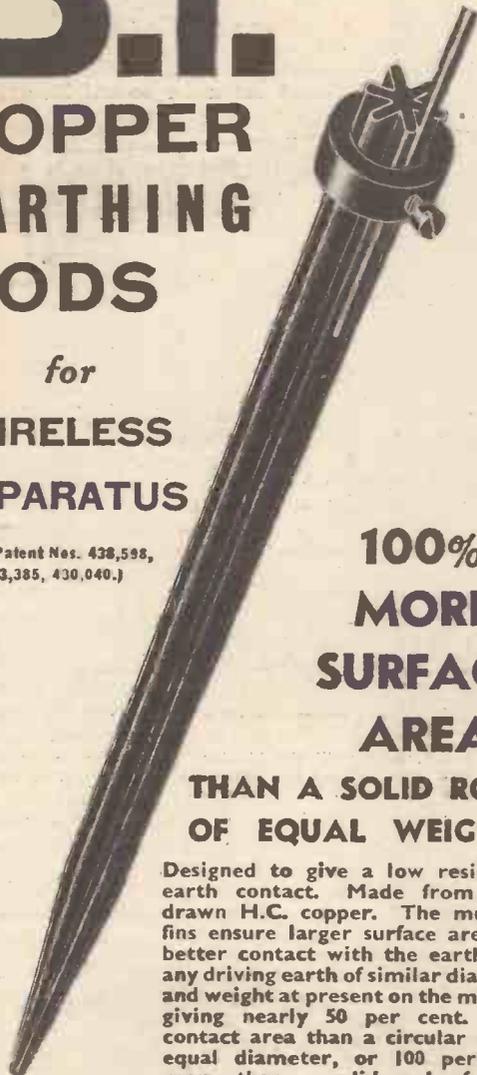


One of the Marconiphone new season's sets. It is a six-valve all-waver for A.C. mains and costs 12½ guineas.

B.I. COPPER EARTHING RODS

for
WIRELESS
APPARATUS

(U.K. Patent Nos. 438,598,
423,385, 430,040.)



100%
MORE
SURFACE
AREA

THAN A SOLID ROD
OF EQUAL WEIGHT

Designed to give a low resistance earth contact. Made from solid drawn H.C. copper. The multiple fins ensure larger surface area and better contact with the earth than any driving earth of similar diameter and weight at present on the market; giving nearly 50 per cent. more contact area than a circular rod of equal diameter, or 100 per cent. more than a solid rod of equal weight.

The rod is easily installed by driving into soft earth and the heavy centre core affords good mechanical strength and is not readily turned aside by obstructions.

About 1 1/2" of the rod is left exposed and the earth lead is simply clamped against the rod by means of the copper clamp ring and screw. No sweating or soldering is required. Supplied in two standard sizes, 18" and 24". Longer rods of similar type can be supplied, if desired, to meet special requirements.



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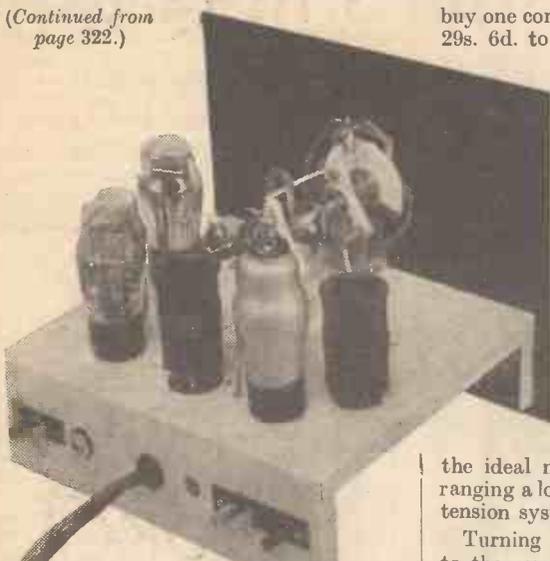
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NAME.....

ADDRESS.....

P.W.18.

(Continued from page 322.)



A four-valve short-wave set made up from one of the Peto-Scott "Pilot" Experimenter Kits, using a standard chassis and baseboard.

it is a great advantage to be able to listen in, in more than one room. For example, most people have their sets in their sitting-room, and often they desire to be able to listen in the kitchen, or perhaps in one of the bedrooms. When illness occurs—a dose of 'flu, or something like that—it is a great boon to have the radio on tap in the bedroom. Well, this can be done quite easily without the need for having more than one set. The solution is to use an extension speaker attached to a pair of extra loudspeaker terminals on the set.

Many commercial sets these days are already equipped with sockets or terminals especially for this purpose. The pioneers of the extension speaker scheme

buy one complete in cabinet at prices from 29s. 6d. to 63s. And it is interesting to note that all but the smallest speakers are fitted with a special volume control for maintaining full quality of reproduction at all volumes.

Then, of course, there is the "Long Arm" remote control also marketed by this firm, which enables a set to be switched on and off from the room in which the speaker is fitted. This, of course, is

the ideal method of arranging a loudspeaker extension system.

Turning for a moment to the experimenter and the type of present that he would like most, one should not overlook fault-finding and measuring instruments. As a matter of fact, the majority of young experimenters are very badly off from this point of view, and very many of them have no method of determining accurately the voltages and currents they are using. Or if they come across a fault in one of their hook-ups they have

no means of locating it, other than by the laborious hit-and-miss method. A combination meter is a very useful present. Naturally, such gifts cost rather more than say a component such as a condenser or transformer, but it must be remembered that the uses of an instrument of this type are legion, and that a good meter will last for many years, so if you have a son who is aspiring to service work or has already started, a first-class combination meter is an ideal gift to give him and one that he will find invaluable in his work.

In the Avo range there is the Avo-Minor, which is a D.C. model costing £2 5s., or as a universal instrument £5 10s. The universal model, of course, can be used on A.C. or D.C. mains, and enables every type of measurement met with in radio work to be made. For the young service engineer it is probably one of the most useful gifts that he could have.

Now for complete sets—the type of

gift that you would buy yourself for Christmas, plus the rest of the family, of course.

In this article we can only mention a very few of the excellent models and types which are available, and we would stress the desirability before purchase of obtaining a demonstration from the local dealer. This demonstration should be carried out under normal listening con-



An H.M.V. receiver with visual tuning. It covers the short waves in addition to the medium and long, and utilises a six-valve circuit. The price is 14½ guineas.

ditions in the actual house and room in which the set is finally to be installed. Any dealer will do this and, in fact, will prefer to adopt this method because it is more satisfactory to him in the long run.

Among the well-known manufacturers



Good value for 10 guineas—the G.E.C. "All-Wave Five."

are, of course, Messrs. Whiteley Electrical Radio Company, the well-known makers of the W.B. speakers. W.B. Stentorian speakers are wonderfully efficient instruments, and they are not expensive. They are made in different types, and you can



Drydex H.T. batteries are available in all types and sizes.

marketing sets to suit all pockets are the G.E.C., Ferranti, H.M.V. and Marconi-phone. There is, for instance, the attractive G.E.C. five-valve superhet featured in these pages. The set, which covers long, medium and short waves has A.V.C., an output of three watts, and connections for an extension speaker. It costs 10 guineas and is suitable for A.C. mains of 190-250 volts, 40-100 cycles.

In the G.E.C. range, and also, of course, in the ranges of other manufacturers,

(Please turn to page 335.)

A welcome Xmas Gift

You could not have a better gift than one of these "AVO" precision instruments. They invest you with a qualified engineer's facilities for testing your set and tracing faults. In fact, electrical engineers depend on them. And remember, too, how often you can use an accurate measuring instrument for electrical jobs around the house. Select your Xmas gift from these three suggestions.



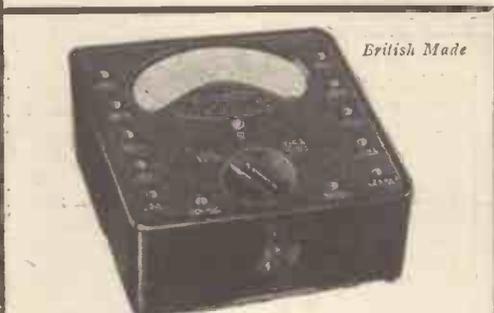
British Made

The D.C. AVOMINOR

13 precision meters in One. This accurate moving-coil instrument has 13 ranges... voltage ranges sufficient for measuring H.T., L.T., Grid Bias, Mains and Eliminator voltages; milliamp. ranges for testing all receiving valves and radio apparatus; resistance ranges for all resistance tests. In case, complete with testing prods, crocodile clips, leads and instruction booklet.

45/- Deferred Terms if desired

All good radio dealers sell "AVO" Instruments. Insist on "AVO"—no other instruments offer such a combination of accuracy and usefulness.



British Made

The UNIVERSAL AVOMINOR

This compact precision moving-coil instrument covers all A.C. and D.C. testing. It has 22 ranges for measuring A.C. voltage, D.C. voltage, current and resistance. All readings are direct. No calculations. The high total resistance of the instrument—200,000 ohms—ensures accurate readings. Complete with testing prods, crocodile clips, leads and instruction booklet.

£5 10s. Deferred Terms if desired.

LEATHER CARRYING CASE 10/-



British Made

The AVODAPTER

Simplifies valve testing. Enables all valves to be tested under actual working conditions. No groping about inside the set. No need to sever connections. Instantly adaptable for 4-pin, 5-pin and 7-pin valves

27/-

The 9-PIN AVOCOUPLER

(Not illustrated.) Instantly renders the AvoDapter suitable for 9-pin valves.

12/6

Write for leaflets giving full details of these Instruments.
THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
 Winder House, Douglas Street, London, S.W.1. Telephone: VICTORIA 3404.7.

THE SUM TOTAL OF A GOOD CIGARETTE



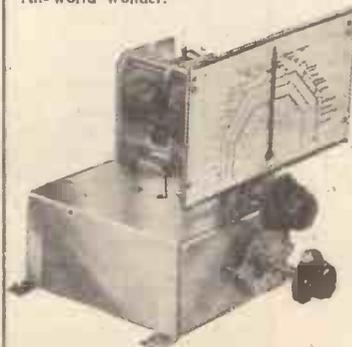
BECAUSE PLAYER'S NAVY CUT CIGARETTES 'MEDIUM' OR 'MILD' 10 FOR 6P 20 FOR 11½P



NOW READY

The BATTERY Model of the
ALL-WAVE LINACORE
 which
 revolutionises all-wave construction

★ Write J.B. for "All-Wave Vivid Radio" (Price 3d.), which describes in detail, with full-size wiring plan, a super-sensitive All-Wave 7-stage 4-valve Battery Receiver employing the new "Linacore." This amazing receiver will be the Constructors' Set of the Season. Reports already received pay glowing tribute to the wonderful quality of reception on every waveband. Performance on the Short Waves especially has created enthusiasm among the experts. 6 tuned circuits—3½ watts output—5 microvolts sensitivity—10 kc. selectivity—but write J.B. and learn ALL about this All-Wave All-World Wonder.



THE NEW J.B. LINACORE ALL-WAVE TUNER has been designed by J.B. Engineers after many months' research. Every device known to modern radio has been developed and incorporated to produce a unit of the simplest form, yet which guarantees the best possible results.

- Wave Range: 16.5-51, 200-550, 800-2,000 metres.
- Full vision two ratio drive ensures accurate tuning.
- Complete with padding condensers, gang condensers, switches, tuning controls.
- Needs no trimming adjustments, every unit being accurately aligned before leaving factory.
- Reduces background noise and whistle, minimises man-made static.
- Superhet circuit ensures efficient short-wave reception without excessively sharp tuning.
- Automatic volume control reduces fading.
- For use in 465 kc. Superhet Receiver, and designed to employ anti-noise aerial if necessary.

Battery Model Type AWB 55/-
 A.C. Mains Model Type AW 55/-

JACKSON BROS. (LONDON) LTD., 72, ST. THOMAS ST., LONDON, S.E. 1



THE TELEVISION "TOUCH"

JERRY FRANTER, poacher, farmyard snatcher, and the bane of Furzledene village, sat before the fire in his small cottage and listened patiently while his friend and crony, Bob Amblett, outlined a plan for the raiding of a nearby pheasant preserve.

Mr. Amblett was not a brilliant thinker, and his scheme, obviously foredoomed to failure, would inevitably have landed the pair of them in gaol.

Jerry pointed a dirty forefinger at Mr. Amblett. "The trouble with you Bob," he said accusingly, "is that you ain't got no imagination. That's where you're diffrunt to me! I got too much respek for ole 'obiday's brains to run them sort of risks! Ain't you realised yet that 'obiday's the suspicioneest copper wot ever 'id under an 'elmet? Likewise that partikler strip of woods is fuller of keepers than a kitten is of fleas! Wot an 'ope we should 'ave!"

Mr. Amblett grunted angrily. "Orl right then," he retorted bitterly, "you think of a better idea. Only remember we're on top of Christmas an' we got one an' a tanner between us. Ninepence an' 'ead for eating, drinking, an' making merry! Fair wore out with pleasure we're going ter be by Boxing Day!"

Jerry shook his head reprovingly. "It ain't no use you carrying on like that, Bob," he reprimanded severely. "Peevish, that's wot you are—peevish! Instead of being grateful to me for keeping you out of old 'obiday's clutches all these years! Now I've got an idea, an' it ain't nothing to do with pheasants, nor ole Gator's farmyard. In fack, it ain't nothing to do with anything ole 'obiday will expect us to try an' do—see?"

Mr. Amblett nodded. "I see," he acknowledged with heavy sarcasm. "Going to run up to London and burgle the Bank of England, I suppose? Ole 'obiday would never think of that!"

Jerry regarded his friend pityingly. "Wot you want, Bob," he said soothingly, "is a nice long sleep! Lying down with yer eyes shut, I mean. Maybe when you come round again, yer brains will wake up, too!"

Mr. Amblett revived an ancient libel. "My brains are as good as your'n!" he declared heatedly. "Anyways they don't rattle when I shakes me 'ead."

Jerry hissed impatiently. "We ain't getting nowhere, Bob, misnaming each other. Now you listen to my idea. The first thing you got to remember is that I'm a great inventor—a great skyentist!"

Mr. Amblett's bellow of laughter was not complimentary. "You a skyentist!" he gasped, when he had recovered his breath. "An inventor! I'll admit there

ain't no one within twenty mile of Furzledene wot can invent lies like you—but a skyentist!"

Mr. Franter calmly continued: "I've invented a new television cistern. Can your fat 'ead remember that? A new television cistern! Now don't interrupt me no more. Ole Squire Bellinger up at the 'all is always fooling about doing these 'ere radio experimentations. Likewise 'e's a betting man. I'm a going to see the old devil by 'ook by or crook, an' bet 'im a fiver that I got a television set wot will knock spots off anything 'e's ever 'eard of! Wot's more I'm going to prove it to 'im!"

"You ain't forgot by any chance that 'e's a magistrate, 'ave yer?" Mr. Amblett queried mildly. "E might prove that to

An Intriguing Story of Crafty Ways

By
A. DOSSETT

you if you go trying any monkey tricks on 'im!"

Jerry sighed impatiently. "I ain't forgot nothing! Will you 'old yer tongue, an' listen! First of all you've got to 'ave a black eye! 'Orl right, orl right! It ain't got to be a real 'un! Bit of burnt cork'll do!" Mr. Franter consulted a tattered calendar which he had taken from the drawer of the kitchen table. "Now the twenty-first of December is a Toosday. Toosday the twenty-first! Remember that, Bob! On that Toosday night you've got to wear that black eye—an' see that it's artistiek! Old 'obiday's got sharp eyes. But first of all we got to get round ole Biddy Weston at the Post Office. I'll tell yer wot you got to say to 'er later on. An' lastly, there's this 'ere little red book. No, not now! I'll learn you wot's in it gradual, 'cause this is the importantest part of the 'ole lot!" He stared at the bewildered Bob malevolently. "An' if you make any bloomers over your end of the business I'll skin you alive—when we come out of prison!"

It was about eight o'clock on the night of Tuesday, December 21st when a maid knocked on the door of Squire Bellinger's study and announced that Mr. Franter had called to keep his appointment. The squire knew all about Mr. Franter and his depredations on farmyards and coverts, and was curious to learn why a gentleman of Jerry's habits had wanted to see him. "Show him in, Amy," he said brusquely. "Though what the deuce that frowsy

rascal wants to see me about, I'm hanged if I can guess!"

Mr. Franter was duly shown in. On his back he carried a reasonably clean sack. The squire frowned at the sight of the sack. He found the association of ideas painful.

Jerry carefully deposited the sack on the floor, and respectfully touched his forelock. "I've brought it, sir!" he announced, mysteriously. "An' it's a fair knock-out!"

"Brought what!" demanded the squire belligerently.

Jerry eyed him in feigned surprise. "Why, my new television set, squire. When I made the discovery, I thought of you immediate, 'aving 'eard that you were interested in radio experimentations. Mind you, sir, I don't pretend to be an eddicated man. I found this 'ere invention by accident like. But it works, squire, as I'm open to prove to you. The only thing I asks is that you won't touch it! It's the only one in existence at the moment, an' if it were to go and get broke, I couldn't mend it agin!"

"Television set?" The squire glared at the obsequious Jerry, and violently scratched the closely cropped stubble on his round head. "Invented a television set? You? Humbug! You wouldn't know a television set from a suitcase! What in hades do you mean by wasting my time with your confounded cock and bull yarns about television sets! D'you take me for a lunatic?"

Jerry regarded him sorrowfully, and stooped for his precious sack. "Orl right, squire. I'll go. But you'll be sorry. I came 'ere offering to show you the most wunnerful television set in the world, an' that's 'ow you treat me. Never mind, there's plenty of others wot will give me an 'earing at least! Good-night, sir!"

"Wait a moment!" The squire paused thoughtfully. "You say you came here to give me a demonstration? All right! I don't want to be unfair. Go ahead with it. But I warn you, if you are trying to hoax me, I'll have no mercy on you, understand?"

"That's fair enough!" Jerry nodded eagerly. From the depths of his sack he produced a battered and ancient set, of approximately 1924 vintage. A portion of the front panel had been cut away, and a small pane of dull glass carefully inserted. With true artistic instinct Jerry had also mounted a few odd components on the outside of the cabinet, with wires running mysteriously into the interior.

The squire glared at the dilapidated contraption, his face slowly turning a beautiful peony shade. He opened his mouth, shut it again, gasped, and drew a deep breath.

Jerry forestalled the storm. "I know it

(Please turn to page 328.)

S.T.900

READ WHAT THESE ENTHUSIASTS SAY

"COMPLETELY JUSTIFIES CLAIMS," SAYS A CONSTRUCTOR

Dear Sir,—Having just built the S.T.900 and given it a run-out last week-end, I feel I must write and congratulate Mr. Scott-Taggart on his efforts. It completely justifies his claims that it is better than his previous designs. I have built the S.T.400, 700 and 800 and can truthfully say that it tops the list. Even the wife says so, and that is saying a lot! At the time of writing W 2 X A D is bursting the speaker with his Music Guild, and a Mr. Dennis singing "Music in the Air." At about 13.20 to-day I received W 2 X E on 13 m. at about R7, and believe me, I could put both my hands inside the set without the slightest trace of capacity, a thing that I haven't had before without the use of extension spindles.

Once again congratulating S. T. and kindest regards to yourself and staff and continued success for your journal.

WM. BLACKWOOD
(7 years' reader).

89, Willis Street, Warrington, Lancs.

A WINNER

Dear Sir,—The S.T.900 is certainly a winner. Its modest dimensions give no hint of its ability to deliver the goods. Its controls, few in number, are quite logical, and beautifully smooth and certain in action. Its sensitivity is evident as it brings in those weaker stations one reads about but seldom hears; and on the other hand its selectivity is amazing for a straight set with only one H.F. stage and no elaborate bandpassing.

In Birmingham, only some eighteen miles from the Midland transmitter at Droitwich, the said Regional's signals quite disappear in favour of closely adjacent channels; and Northern Ireland could be received without any Midland interference, a feat my S.T.700, with all its excellencies, refuses to perform—and the Extractor was not in use. On the short waves I could not test its capabilities, for my visit (to Leslie Perrins, Aston) was at a time when the 10 and 20-metre bands had gone to roost, proved by my own set's performance on preceding nights. Yet the big DX broadcasters, beloved of the buyers of well-boosted all-wave commercial sets, came romping in with ease and certainty.

As to quality of output, it is in front of the "700," and that is saying something. I have had the "400" and the "700" and have heard the "600" and the "800" and they have all put out stuff that would do more than credit to many a mains receiver. And the "900" leads all its predecessors along the path of real quality.

I am more than grateful to friend Perrins for a pleasant evening with a set which does its stuff.

JOHN C. LUCAS.

28, Rowsley Street, Leicester.

We regret that, owing to the pressure on our space this week, certain of our regular features have had to be held over.

These will appear as usual next week.

Buy Yourself a Radio Present=

AND EARN THE APPRECIATION OF ALL THE FAMILY! Now is the time to think about your Christmas Radio—to make sure of getting the best out of the wonderful Xmas Fare offered by the B.B.C. and the other Stations of the World, but be sure to order at once.

CASH OR C.O.D.
ORDERS DESPATCHED BY RETURN

S.T.900 COMPREHENSIVE 'DESIGNER' KITS

All components exactly as specified by Mr. Scott-Taggart. Carefully packed in strong carton and sent post free.

NOTE Complete kit or any part supplied separately for **CASH** or **C.O.D.** Postage and C.O.D. charges paid on orders of 15/- or over.

LRSD 'Designer' KIT 'A'

with screws, wire, etc.,

FOUR COILS covering medium and long-wave band.

NO EXTRAS EXCEPT VALVES And short-wave coils (if required).

Cash £3/10/0, or

7/-

WITH ORDER and 11 monthly payments of 6/6.

LRSD 'Designer' KIT 'B'

with all screws, wire, etc.,

TEN COILS covering medium, long, and 3 short-wave bands.

NO EXTRAS EXCEPT VALVES

Cash £4/5/0, or

8/-

WITH ORDER and 11 monthly payments of 7/6.

LRSD 'Designer' KIT 'C'

including everything as KIT "B," but WITH

ALL VALVES. NO EXTRAS WHATSOEVER

Cash £5/15/3, or

10/-

WITH ORDER and 11 monthly payments of 10/7.

S.T.800 to S.T.900 'DESIGNER' CONVERSION KITS

to enable you to bring your S.T.800 right up-to-the-minute.

ABSOLUTELY COMPLETE WITH 10 COILS

& specified H1VAC L210 VALVE **NO EXTRAS**

Cash £2/9/3, or

5/6

WITH ORDER and 10 monthly payments of 4/10.

KIT comprises: Set of all necessary extra components, condensers, resistors, panel, platform, choke, coil and valve holders

10 Coils for all specified wavebands
H1VAC L210 Valve

£ s. d.

18 6
1 7 0
3 9

Any of the above supplied separately for **CASH** or **C.O.D.**

£2 9 3

LRSD PROMPT DELIVERY

As usual, L.R.S. customers will get their S.T.900 kits first. L.R.S. has supplied all "P.W." kits quickly and on lowest terms continuously since 1925.

ANY OF THESE LINES WILL HELP TO GIVE YOU A HAPPIER RADIO XMAS

LRSD McCARTHY ALL WAVE R.F.6, A.W.



CHASSIS

Complete with B.V.A. valves, knobs, leads, etc., ready for fitting into any cabinet.

R.F.6 A.W.

17/6 WITH ORDER and 12 monthly payments of 14/9. Cash Price £3/17/6.

S. 5 A.W.

14/6 WITH ORDER and 12 monthly payments of 11/5. Cash Price £3/17/6.

Full McCarthy Range always in stock.



LRSD The W.B. SENIOR STENTORIAN

Recommended as the best out of the S.T.900 or any set. Junior Model 37S. Cash 32/6, or 2/6 with order and 11 monthly payments of 3/-.

the Speaker to **2/6** with order and 11 monthly payments of 4/- Cash price 42/-.

LRSD GARRARD A.C.6 Radiogram UNIT

Comprising silent running, enclosed economical Induction motor for A.C. 100/250 volts, 50/60 cycles. Unit plate with pick-up, needle cups, etc.



5/6 with order and 11 monthly payments of 7/-.

Cash price £3/5/0.

LRSD GARRARD A.C.6 MOTOR ONLY

Similar to above, but with fully automatic start and stop, and without pick-up, needle cups, etc. Complete with 12in. turntable.

4/- with order and 10 monthly payments of 4/3.

Cash price 42/6.

LRSD AVOMINOR TEST METER



Thirteen testing instruments in one. Measures current, voltage and resistance with ease and accuracy. In handsome case with leads, clips and testing prods. A most valuable fault tracer.

5/- with order and 10 monthly payments of 4/6.

Cash price 45/-.

LRSD ROTHERMEL PIEZO ELECTRIC PICK-UP

Unsurpassed for wide frequency response and amazingly high output. Extreme lightness reduces record wear and tear to practically nil.

4/- with order Model S.S. and 10 monthly payments of 4/3.

Cash Price £4 2 0.

Also supplied on best possible EASY TERMS: Electric Vacuum Cleaners; Sun-ray Health Lamps; Electric Clocks; Model Electric Trains; Electric Fires; Train Sets.

PHONE: NATIONAL 6828-9 3 Minutes from St. Pauls

LONDON RADIO SUPPLY EST. COMPANY 1925

11, OAT LANE, NOBLE STREET, LONDON, E.C.2

Will get a QUICKER and on BETTER TERMS from L.R.S.

THE TELEVISION "TOUCH"

(Continued from page 326.)

ain't much to look at, squire," he said humbly, "but you, as a skyentist will know better nor me that looks ain't everything in skyentific apparatuses."

Sir Lynton gradually allowed his breath to escape. To be called a scientist, even by an illiterate work-shy poacher, was soothing. Actually, he knew little more about radio than the completely ignorant Jerry, but he had laboriously built up a local reputation as a thinker and experimenter, and the recognition of his labours was sweet. He drew forth a large handkerchief and blew his nose violently. "Just so, just so," he agreed grudgingly, "but you've still to prove to me that this junk-box works!"

Jerry became more servile than ever. The fish was on the hook. "Well, sir," he answered apologetically, "I got about enough current left in my batteries to convince you that wot I say is gospel truth! Now you want a good test. Let me see—" He tapped his discoloured teeth with a long finger nail. "I got it!" He triumphantly faced the squire, his black eyes glinting. "You're a sportsman, squire! You got a pack of cards? I reckoned you would 'ave! Now this 'ere set is only a seeing set. Wot I mean is you can't speak over it. I ain't got that fur with the job. Now you get your pack of cards—a new pack if you like—seleck one an' 'old it up in front of that there mirror on my set. Then we'll ring up my friend wot as got the receiving 'alf of the set, and ask 'im wot you're 'olding in yer 'and? 'Ow's that? That'd prove my claim, wouldn't it?"

The squire snorted. "It would," he said, eyeing the outraged remains of Jerry's old receiver sceptically, "if he could! But I'll bet you five pounds to a penny he can't!"

Jerry grinned, and lowered his head to switch on the richly sulphated old accumulators. "I ain't a betting man, squire," he replied slowly, "but—you're on!"

Meanwhile Mr. Amblett proceeded to carry out the instructions instilled into his slow brain by the nimble-witted Jerry. The first part of his programme was to gain admittance to the little general shop plus post-office kept by Biddy Weston. Bob's objective was the telephone. He had to reach that 'phone and stay with it until nine p.m. if need be. Jerry had said so. Jerry had also invented for him a dying father in a London hospital. The hospital was kindly going to telephone Mr. Amblett about eight p.m. with the latest bulletin. Mr. Amblett had given the hospital the number of the Fuzledene Post Office, because he knew that Mrs. Weston had a kind heart, and would not refuse a poor man news of his dying parent.

Mrs. Weston didn't. Bob perched himself on a high stool in the closed shop, and having placed Jerry's little red book in front of him on the counter, awaited events.

At eight thirty-five the telephone rang. Mr. Amblett gulped, licked his dry lips,

and placing the receiver to his ear, mumbled a low, "Well?"

Immediately the loud tones of Squire Bellinger almost deafened him. "Hullo! Hullo! Is that Mr.—er—Mr. Stern? It is? Good. Well, I understand that you have in your possession some special radio receiving apparatus tuned to receive light waves from a transmitter invented by a fellow named Franter. That right? Good! Now I want you to tell me, sir, what I am holding in my hand in front of this alleged transmitter here! I've just bet this fellow Franter five pounds to a penny that you can't!"

Bob feverishly thumbed his little book. Then his voice, muffled but impressive, slowly went back over the wire. "I 'ave just tooned you in, sir. You are 'olding in your 'and a hordinary playing card. The seven of spades. I 'ope—"

Mr. Amblett heard the receiver crash at the other end. The squire had evidently heard enough. Without waiting to thank the obliging widow for the use of the telephone, Mr. Amblett hurriedly left the post-office. He had more work to do. He had to black his eye, and call on P.-c. Hobiday, who would be off duty, he knew. He performed both feats in record time.

P.-c. Hobiday, large, pink, and somewhat stertorous after a heavy meal, was surprised at the sight of his visitor. Mr.

at the discoloured optic, and stared himself into full wakefulness.

"Wot did 'e do that for?" he asked, with sudden curiosity.

Mr. Amblett, mindful of Jerry's coaching, fingered his eye tenderly.

"Just because I wouldn't 'elp 'im to-night. I told 'im it were too risky, an' 'e called me a coward. Well, there you are. I want you to go an' arrest 'im immediate, as is your dooty, for battery of a peaceable citizen!"

P.-c. Hobiday had climbed into his jacket and was reaching for his helmet before Bob had finished.

"Where was you supposed to be 'elping 'im to-night?" he inquired bluntly. "Poaching, I suppose!"

Bob shuffled uneasily.

"That ain't 'ardly a fair question, Mr. 'Obiday. But I reckon, if you was to be at the stile in Willowbrook Lane, just by Squirrel Wood, in, say, 'alf an hour, you might see some—"

"The squire's pheasants, eh?" interrupted Mr. Hobiday sternly. "Just what I thought! You wait while I get my boots on, and we'll go down there together."

But when P.-c. Hobiday emerged from his cottage the elusive Mr. Amblett had vanished.

Mr. Franter, emerging from Squirrel Wood with a bulging sack on his back, suddenly found his greasy coat-collar firmly gripped in the large, pink hand of the law.

Jerry wriggled convulsively.

"Wot you think you're doing?" he demanded pugnaciously. "Leave go of my collar, whoever you are!"

P.-c. Hobiday grinned broadly beneath the shelter of his luxuriant yellow moustache.

"Drop that sack, Jerry," he ordered sternly, "an' let's 'ave a look at wot's inside. Come on, now!"

He eased his grip a little, but not sufficiently for the trapped Jerry to wriggle free.

At the sound of Mr. Hobiday's voice, Jerry ceased to struggle.

"I might 'ave knowed it were you, Joe," he said resignedly. "Of all the sneakiest coppers I ever seed, you're the creepiest! An' wot you mean by assaulting me like this? Persecution, that's wot it is! First thing in the morning, I'm going up to see the squire. 'E's a magistrate, 'e is!"

P.-c. Hobiday nodded grimly.

"You never spoke a truer word nor that, Jerry Franter. You'll see squire in the morning all right, but 'e'll be on the Bench. Now let's 'ave a look at them birds. Drop that sack!"

Jerry shook his head violently.

"Not me!" he said defiantly. "If I was to drop this 'ere sack, I'd do 'undreds of pounds' worth of damage. I got some of the most valuable skyentific apparatuses in this sack wot the world has ever seen!"

"Well, you drop it just the same," ordered P.-c. Hobiday, grinning again. "You won't 'urt them apparatuses—not a feather of 'em. They're all dead, ain't they, Jerry?"

He stretched forth a beefy hand and,

(Continued on next page.)



"Drop that sack, Jerry, an' let's 'ave a look at wot's inside."

Amblett usually avoided any arm of the law like the plague. "Well?" he asked suspiciously, wiping his large golden moustache on the back of a huge red hand. "Wot's your trouble, Amblett? Committed a murder?"

Bob carefully refrained from stepping into the mellow lamplight which flooded out into the covered porch of the constable's cottage.

"You must 'ave your little joke, Mr. 'Obiday, I suppose. But I ain't done nothing 'cept collect this 'ere black eye off of Jerry Franter!"

Mr. Hobiday peered through the gloom

THE TELEVISION "TOUCH"

(Continued from previous page.)

wrenching the sack from the little man's grasp, flung it on to the hard road.

There was an appalling crash of glass and smashed woodwork, and a thin trickle of sulphuric acid oozed gently out of the pulped sack.

Jerry's voice broke the silence which followed the crash.

"Now you see wot you've done, Joe! 'Undreds an' 'undreds of pounds' worth of valuable apparatuses smashed into smithereens. Wot the squire will say when 'e hears wot you've done, I don't know. Of course, you'll be flung out of the Force in disgrace, and most likely persecuted with the full vigour of the law. I'm sorry for you, Joe. I 'ad a fortune in that there sack, and you've been an' lorst it all for me! I was a millionaire, near enough, and now I'm just a poor, honest, 'ard-working labouring man agen! All because of your 'astiness, Joe! I got a good minder sue the 'ole police force for damages! An' now you've ruined me, perhaps you'll let go of my collar, so I can go 'ome. I'm 'eartbroke, that's wot I am—'eartbroke!"

P.-c. Hobiday, still preserving a dazed silence, allowed Mr. Franter to depart.

"So you see, Bob," Mr. Franter explained later to his friend in the privacy of his locked cottage, "'ow easy it all were. The squire can't ask for no more tests. That there 'am-'anded 'obiday's busted the works. Where's that little red book of mine?"

Mr. Amblett, lost in admiration, handed it over without a word. Jerry idly thumbed the pages until he came to the one headed "Spades."

"Ace of spades, Mr. Samuel!" he said, grinning. "Dooso of spades, Mr. Salter. Ah, 'ere we are! Seven of spades, Mr. Stern. Well, it might 'ave been any of 'em. Pity we couldn't 'ave used the 'earts an' diamonds an' clubs. Took me a long time getting them fifty-two names out of Biddy Weston's telephone book, but it were worth it, Bob. I nearly larfed me 'ead off when ole Bellingier 'eld up that card solemn as a judge, an' 'eard for Mr. Stern on the telephone!"

He pitched the little red book into the heart of the fire and prodded it gently with the poker.

"Funny 'e didn't want to try agen, weren't it, Bob? But 'e couldn't 'ave done; me batteries was all run down!" Mr. Franter gave a dry chuckle and stirred the black ashes of the little book. "There goes some very clever television apparatuses, Bob," he sighed. "An' 'ere's yer two pound ten. Reckon you've earned it. An', after all, it's only a round of drinks so fur as squire's concerned!"

PLAYER'S FOR CHRISTMAS

GAILY decorated Christmas packings are again a feature which the manufacturers of the famous Player's Navy Cut Cigarettes offer to smokers for the coming Christmas season.

Printed with an appropriate greeting, these packings of Player's Navy Cut Cigarettes supply the happiest of all solutions to the

gift problem, and having address space they can be dropped straight into the post with just the addition of recipient's name and address. They contain "Medium" or "Mild" blend, plain or cork-tipped as preferred.

The famous "Medium" blends are available in tins of 150 for 7/3, 100 for 4/10, 50 for 2/6, and in card boxes of 100 for 4/8, 50 for 2/5, 200 (packed in four 50's) 9/8, and 25 for 1/3. The "Mild" blend which are so popular to-day are supplied in card boxes, 25 for 1/3, 50 for 2/5, and 100 for 4/8. Only the 50 size, however, is available in the Xmas outer carton.

For smokers who prefer the ordinary 20's packets there are postal cartons containing five packets of 20 for 4/9½.

Player's "Weights" in Christmas cartons containing four packets of 15 for 2/- are an inexpensive, yet always welcome gift. Player's "Gold Leaf" decorated tins of 50 for 2/11 are just right where a higher grade cigarette is required.

Specially blended for sensitive throats, Player's Cork Tipped "Bachelor" Cigarettes, in flat tins of 50 for 2/6, always make an acceptable gift. Then there are those generous size Player's No. 3 Virginias in flat pocket tins of 50 for 3/4, for smokers who appreciate a cigarette of extra quality.

Player's "Whiffs"—those delightful little cigars with the real Havana flavour—cost 10d. for five, while a more ample smoke is available in Player's "La Doncella" Cigars, which sell in packets of 5 for 2/6 or in boxes of 25 and 50.

Nor has the pipe smoker been forgotten. Player's "Medium" Navy Cut Tobacco in ¼-lb. tins at 4/4 is always a favourite at Christmas time. Equally popular are "Airman" Mixture in ¼-lb. tins 3/4, "No Name" in ¼-lb. tins 5/-, and the "Digger" range of all Empire Tobaccos at 2/8 per ¼-lb. tin.

Make this a Memorable Christmas!

A sense of achievement—the thrill of enjoying and giving your family a brand new comfort—what else could so positively ensure an even happier "Happy Christmas" than usual?

Think of the real pleasure which any of this up-to-date WB apparatus can bring into your home—the comfort of an extension speaker in that other room, the novelty and convenience of a Long Arm remote control, or the added zest which realistic modern reproduction can give to your radio programmes!

This Christmas, fit a new Stentorian in place of your old speaker. Or rig up a new extension, with remote control. Not only will you enjoy doing the job; you will be able to look forward to years of extra pleasure as a result of it.



Your dealer has stocks. Let him show you—to-day!

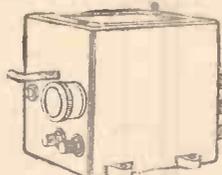
Stentorian

QUALITY REPRODUCTION APPARATUS

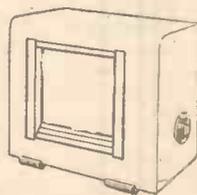
WHITELEY ELECTRICAL RADIO CO., LTD. (Information Department) MANSFIELD, NOTTS.



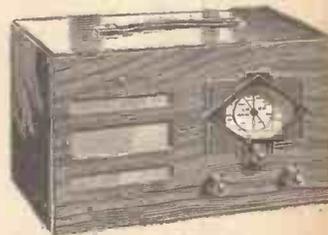
1938 Stentorian chassis, for better Christmas radio. Wider response—less colouration—greater realism. Matches to any set. Prices from 23/6 upwards.



"Long Arm" remote control for switching the set on or off from any extension point. One "Long Arm" serves any number of 1938 Stentorian extension speakers. Price 15/6.



1938 Stentorian cabinet model. All models except the "Baby" (29/6) incorporate volume control type R/C. Prices 29/6, 39/6, 49/6, 63/-.



Especially useful at Christmas is the Stentorian junior portable receiver, with self-contained aerial and full-size batteries. Price £6 : 6 : 0, or 11/- down and 12 monthly payments of 11/4.



My Radio Christmas Diary

LET me bleat a little into my beard this Christmas. Bear with me while I croak about the past years, with their radio and their Christmases. Twenty-one of 'em.

This is my twenty-first radio Christmas and I have come all over girlish in my old age. I have been delving through my radio diary, looking up December 25th's. (Say these last words quickly.)

Shall I tell you what it contains? Shall I let you into the secret of my terrible past? Turn out the lights then, save for one glimmering, green, ghostly flicker by which to read. . . . "Black clouds scurrying across the wastes of the Atlantic Ocean." That is my first entry, in 1917. Not in its exact words, perhaps. My sense of Nature's grandeur was not expressed in flowery nor polite terms in those days.

However, there I was, setting sail on an old tramp steamer for Italy with a cargo



"Sitting in front of the radio transmitter and receiver with which the vessel had been fitted."

of coal. I was bidding a sad farewell to the dreariness of Milford Haven, sitting in front of the radio transmitter and receiver with which the vessel had just been fitted.

The next Christmas was also spent on the Atlantic—with oil this time. War was over and I was on my way home from New York.

Then a radio stillness fell on me, except for a certain amount of experiment with crystals and inferior valves, till 1922. That WAS a Christmas!

Early Constructor Days

Possibly you had entered the home-constructor radio world by then—if you were not one of the early worms who listened to the *Daily Mail* station at The Hague and to Writtle long before the B.B.C. started up.

But "P.W." was shining blue and gold on the bookstalls before Christmas 1922.

And crystal sets had begun to arouse cries of joy and growls of anger in British houses. Remember how you used to curse those trams which shook the whisker off its sensitive adjustment? How you used to

THE LIGHT-HEARTED MEMORIES OF AN ENTHUSIAST WHOSE EXPERIENCES GO BACK TO THE PRE-BROADCASTING ERA. THEY WILL BRING A SMILE TO THE FACE OF MANY AN OLD-TIMER AMONG "P.W." READERS

curse auntie when she burst into the room—just as you were trying to catch what Arthur Burrows was saying from 2 L O?

I remember fitting up a loudspeaker of sorts that Christmas. I was working a two-valve set and got an old acoustic gramophone horn—it was about 4 feet long and of shining brass. With great joy I managed to get it to stay put against an ear-piece—with insulating tape binding—so that we could hear the Christmas "band" playing.

Extra cymbal effects were provided occasionally by the horn slipping every now and then and crashing on the floor.

The next two or three years marked steady progress in radio, but in 1925 I got my first superhet. Gee! What a receiver! It was a kit set made by Igranic and bore a great label saying that it was duly licensed under the Marconi Company. I believe it had five valves.

A Pancake-coil Set

Great pancake plug-in coils and plug-in intermediate transformers in bakelite holders were employed. The whole thing was built on massive proportions without any screening and with the poorest of poor (as we now would judge them) bright emitter battery valves.

It had a 2 ft. 6 in. frame aerial and I was delighted when I got 5 N O, Newcastle in those days, at full loudspeaker strength on that aerial.

And the quality! It was grand! I wouldn't listen to it for a moment to-day. But I loved it then. Plenty of high notes that made the thing sound louder than it really was. No bass at all and a middle register that peaked wonderfully at about the second "A" above middle "C." It made sopranos sound ever so powerful when they took their top notes. Wonderful days!

But that set nearly ruined me. I ran it off dry H.T. batteries for a week. They

cost me about £2. Then I got some wet ones of the leclanché type. They were better, but oh, so messy! The dog spilt one of the banks of cells on the drawing-room carpet—and out they had to go.

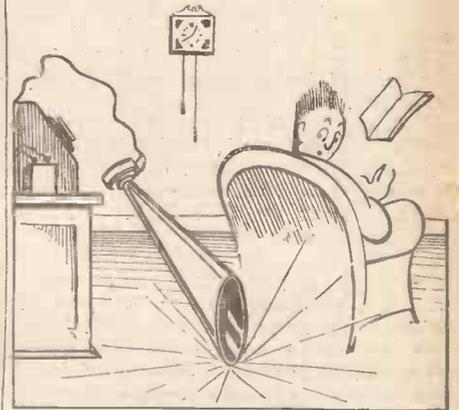
By moving the set to an attic and using H.T. accumulators I managed to get things reasonably cheap to run. But you should have seen me two days before Christmas struggling down to the charging station with those batteries—about twenty pounds weight of them, or more—piled up in an old pram borrowed for the occasion.

No, sir, I was single in those days. Do you think any wife would have put up with the contraptions I had rigged up all over the room? Besides, I have found that wives want to listen to the programmes just when you want to try the set out on some foreigner or to "just try the effect of this grid leak—if you don't mind, dear." And "dear" does mind and says so.

Unwelcome Experiments

"I can't bear those sudden squawks," she complains. "They go right through me. Why can't you leave the thing alone. It was going all right till you fiddled with it."

It is vain to point out that Marconi, Edison, and Bill Sikes made their fortunes and their names because they could not stop their fingers from fiddling and touching things.



"Extra cymbal effects were provided occasionally by the horn slipping every now and then and crashing on the floor."

I have no record in my diary as to when I first heard America. I know it was round about this period. It might have been a year or so earlier. It doesn't matter. I wish now I had never heard it.

In those days American stations at 3 a.m. gave me an almighty thrill. To-day the

(Please turn to page 332.)

SEEN ON THE AIR

News and Views on the Television Programmes by Our Special Radio-Screen Correspondent

L. MARSLAND GANDER

SIGNS are not lacking that the B.B.C. is preparing for a big television push in the New Year. Lately advertisements have been published for an unspecified number of new television producers. From this I deduce that longer hours of transmission are on the way.

But apparently the B.B.C. is in no hurry, for it seems that the newly-engaged producers will be first sent to the Staff Training College for three months. The B.B.C. is now confident that the Government means to give another television dole, and my own impression is that this means:

- Another hour of programmes in the evening;
- Sunday programmes;
- Variety from St. George's Hall;
- More and better outside broadcasts;
- More original material and better programmes from the studio.

All very impressive, but this is not to say that every prospect pleases. Serious difficulties are looming in connection with the programmes from St. George's Hall. Mr. George Black, the uncrowned King of Music Hall, told me the other day that in no circumstances will he allow his artists to televise. He adopted a most uncompromising attitude and explained that the only reason he permits broadcasting is because of its publicity value. I should have thought that the same argument would have had double force with a television appearance. Apparently Mr. Black thinks otherwise, but I am confident that one day he will be induced to change his mind. In the meantime his ban means that a great many tip-top artists are absolutely ruled out

wonderful results of the new super-Emitron camera used for the first time by the B.B.C. for the Cenotaph ceremony and the Lord Mayor's Show. The close-ups produced by the telephoto lenses are in every way as good as could be achieved photographically with the cinema camera. In other words the television eye is to all intents and purposes perfect. The camera has leaped ahead of the receiver. I prophesy that ten years hence the popular receiver will be very different in form, but the camera will be substantially the same.

These new super-Emitrons will shortly be introduced into the studio at Alexandra Palace, and they are to be used at St. George's Hall. But at the moment there is only one in existence.

A great deal of "hush-hush" progress is being made behind laboratory walls. Some matters are best kept secret, but there are others which can involve no great harm and reflect credit in the telling. For example, I hear that British laboratory tests have shown that television pictures can now be relayed over a distance of 400 miles. Germany's record of 300 miles, from Nuremberg to Berlin, could easily be beaten in this country with pictures of vastly superior quality.

The interesting point is that it paves the way to the television network of the future. When there are stations at Birmingham, Manchester, Leeds, Glasgow, etc., it is very probable that studios will be built at each or any of these centres. The expense of putting on separate programmes would be prohibitive, besides which provincial viewers may be expected to appreciate a first-class London show far better than local efforts which could be seen without much effort or expense in other ways.

In fact, biased London is probably about the worst place in the country that could have been chosen for the site of the first television station. Radio licence figures show that London, where facilities for amusement abound, is less responsive to cheap new forms of entertainment than other cities. I suggest to the Television Advisory Committee that when the question of improving transmission arises in a couple of years a brand-new station should be built in Manchester to give the provinces a chance.

In any case, I am convinced that the improvement in land-line technique means that within two years the B.B.C. studios will be shifted from Alexandra Palace to some Central London site. The advantages of a central studio site are so obvious as to need no enlargement here.

I have been browsing again among the printed programmes of the week I have under review, and find that the item which made the most impression was an altogether unusual type of programme. Mr. Robert

★
Max Miller, stage, screen and radio star, hears a good one on his Pilot U-357 receiver.

★
Gibbings, author and wood engraver, opened a series on "Artists and Their Work." He did so in an original way, by relating the true narrative of John Graham, a convict transported to Australia a century ago. Mr. Gibbings illustrated the talk with wood engravings from his own book on the subject, and also described his long and painstaking search for the details of a very human story. Perhaps this sounds little high-

brow. I can only say that the story should have been heard to be appreciated.

Marie Ney, in excerpts from "Ghosts" at the Vaudeville, once again showed that television is even at the present stage a medium for gripping drama. The Saturday night programme was much more popular than it has been, with the Western Brothers in a cabaret commèred by charming Sheila Douglas-Pennant. But on the whole I am afraid the week's programmes were a trifle disappointing.

I hear that the mobile television unit is to conduct experiments this month at Epsom in order to gauge the possibilities of televising next year's Derby. Special tests elsewhere are also to be carried out.

YOU want more money

WE can train you and help you to get well-paid employment

Read what students say:—

- ★ "I was engaged on the spot as Engineer-in-Charge of their Service Department."
- ★ "I have much pleasure in announcing an increase in salary and promotion."
- ★ "He engaged me at a big increase in salary. I couldn't have got the situation without your help."
- ★ "I have been delighted with the whole Course and am already earning more money because of it."
- ★ "My engagement was due entirely to the knowledge I gained from your training."
- ★ "I could not have obtained this job without your Course."
- ★ "I have obtained a position at double the pay."
- ★ "I am getting a lot of service work to do, and I also assist one of the local dealers. I owe it all to you."

What they have done, you can do. Without interfering with your ordinary occupation you can learn in your own home how to become a Qualified Radio Engineer, and we will help you to get employment or teach you how to earn money in your spare time. Our Home-Study Courses in Radio and Television are praised by leading radio manufacturers and are conducted by practical radio experts.

FREE To prove to you how easy it is to learn by our method, we will send you a FREE SPECIMEN LESSON as well as our booklet "Radio as a Career." Post coupon now.

TECHNICAL & COMMERCIAL RADIO COLLEGE
FAIRFAX HOUSE,
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Post in unsealed envelope: 1d. stamp.

To: **T. & C. RADIO COLLEGE**
Fairfax House, High Holborn, London, W.C.1
Please send me Free Specimen Lesson and Free Copy of "Radio as a Career."

NAME

ADDRESS

P.W.803



while under contract with Moss Empires or the General Theatres Corporation.

Considerable discussion is going on at Alexandra Palace as to the best time for the additional hour. Originally it was proposed that the extra hour should be from 6.15 to 7.15. For a number of reasons this now seems unlikely to be the choice. Many viewers, myself among them, would most likely be caught travelling between office and home. In any case, there would be difficulties about rehearsal time. Probability now seems to point to before or after the 9 to 10 period. My own preference would be a continuous transmission from 8.30 to 10.30, and I should be interested to hear the views of others.

Better outside broadcasts are promised by the

MY RADIO CHRISTMAS DIARY

(Continued from page 330.)

American transmissions give me a pain in the neck. Perhaps it is because they can be obtained so easily with the latest all-wave sets. Perhaps it is that I have become too much of a listener and too little a pioneer.

But what can you pioneer about these days? A good set and you "cover the water front." All the world is yours on the speaker. And you find that now you can get everything you don't want anything—except the locals, and Radio Normandie at breakfast-time.

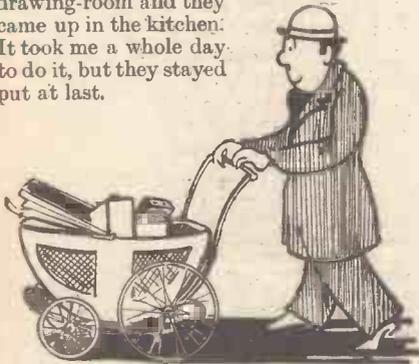
An Extension Speaker

In 1928 I ran an extension speaker (what a speaker, too!), to the kitchen for the benefit of the culinary section of the household. I always regretted that I had more trouble with that extension than anything else.

I tried it under the carpets and lino, but they got it with their brooms just where it went under the floor coverings and they hauled it forth and broke it. I tried it along the skirting boards, but they managed to get it torn from position there. Then I tried along the ceiling right in the corners of the room.

They hated the sight of it and showed it by fetching the wires down with mops and feather "dusters." It is wonderful how destructive those dusters can be when they are wielded with malice aforethought.

In the end they got their own way. I was driven below ground and actually planted the wires—thick flex this time instead of thin bell wire or D.C.C.—under the floor boards. They went down in the drawing-room and they came up in the kitchen. It took me a whole day to do it, but they stayed put at last.



"Struggling down to the charging station with those batteries piled up in an old pram."

Mains sets were going good and strong—with plenty of hum in many cases—by Christmas 1929. They had come in with the indirectly-heated valve some years before, but only gradually did they gain the favour of the home-constructor.

In 1930 I lost my amateur status and got married. I shall never forget that Christmas. I spent a great deal of the time fitting up a radiogram in a great sideboard affair I had made. It held the radio, the gramophone turntable, the speaker and goodness knows how many records. And, when it could get in, it also held the kitten! But did it push the bass out? It certainly did!

One note particularly it favoured. I believe it was the "D" below middle "C." Phew! Whenever any instrument

got on that note you could hear it above the rest all over the house. Even the floor trembled with it.

Resonance? You've said it! The whole cabinet vibrated to that "D" note. I got the speaker out. I tried it backwards, I tried it hung on rubber. I tried it with the speaker compartment filled with dusters, old sheets, sacks, cotton-wool. The house was ransacked for sound-absorbing rubbish. What a Christmas!

Every now and then I would be halted from my labours by the wife who wanted to hear some bit of pantomime or Leonard

MURDER—AND COMEDY IN B.B.C. CHRISTMAS PARTY

Listeners sitting by the fireside in their homes on Christmas night will be able to join in a comic "murder hunt." They will actually hear the "crime" committed on the darkened stage of St. George's Hall during Archie Campbell's production of the B.B.C.'s two-hour Christmas Party. Plenty of comedy will be in evidence over the way in which everyone at the festivities is questioned till the culprit is caught.

But the "crime" contains an ingenious plot as well, and listeners hearing the interrogation will be able to allocate guilt and check their verdict with that announced later in the Party. As in past years the Party will include charades, musical chairs, crackers, mottoes, riddles, and all the merriment of a Christmas family gathering—and a number of surprises, too.

Artists already booked to take part in the broadcast are: Billy Bennett ("Almost a Gentleman"), Elsie and Doris Waters (Radio's Gert and Daisy), Tommy Handley, Staines Stephen, and the Two Leslies (Holmes and Sarony). Charles Shadwell will conduct the B.B.C. Variety Orchestra, and Reginald Foort will be at the B.B.C. Theatre Organ.

Henry, and who didn't mind that "D" like I did. Then friends called—yes, in spite of my radio I have managed to keep a few friends. Not many; just those who understood and were forgiving and forgetting.

The whole business ended with the speaker compartment being ripped out and combined with the record compartments on either side of it, and with the speaker being placed at the back of the compartment on a separate baffle not attached to the cabinet at all.

Lost Its Favour

I said I married in 1930. That's true. Well, the wife "loved" the cabinet in 1930. In 1931, January, she was "not so very keen" on it. In May it began to look "too big." In September it was a "definite eyesore." At Christmas 1932 we bade it farewell.

Someone else has it now—cut in half. It looks better but not so funny, even with half its gigantic area removed.

Just before Christmas 1933 I built an all-wave six-valve mains set. It was going to be my last set. I was going to install it in the new cabinet we had, and was going to finish messing the household wireless about. Future experiments would, I said, be confined to the sets I had in my workroom.

I have made that promise ever since 1930. I made it again last week, when the fifth set this year went into the same cabinet in the living-room.

Only one thing has remained constant in that cabinet for more than a year. That is the automatic record changer unit with its home-attached piezo-electric pick-up, and the paraphase amplifier to which all radio units are attached as they are made and tested.

But to get back to 1933. That all-waver was to be the cat's pants. It was, too—for exactly three days. Then on Christmas afternoon something went wrong. It might have been a resistance—it had at least fifty of them. It might have been a condenser—there were forty-five in the set. It might have been—it does not matter. I never found out. The set was ripped to bits and another rose in its place.

Working Against Time

I had to work quickly, too. At 4 p.m. we were trying to listen to the morning broadcasts from America. ("Let's hear them greeting the Christmas we have nearly finished," said the wife, to my astonishment. She was enthusiastic for once!) and at seven o'clock we were ready for the great evening's fun—listening to the local on a three-valver.

I have never known an all-wave set to be so fond of the Empire stations and of Zeesen. That is all I could get on it that afternoon. The six valves did well on the local, however. They certainly made it audible, but as for distance—the range of that set was hardly greater than that of a good single valve Yarmouth bloater.

Now it's Christmas again. I am full of excellent resolutions. The set will not be touched (I hope). I shall have everything shipshape and tidy in that cabinet before the great day. (It is at the moment rather like the full-length carcass at the butcher's shop. Open down the back, and in the front a gaping wound through which can be seen the untidy entrails of the newly deposited receiver.)



"They got their own way. . . I was driven below ground and actually planted the wires under the floorboards."

And, as I said before, that set is going to be my last.

It's a good resolution to make every now and then. It does enable you to test the set properly and to get the full hang of it before you decide to tear it to bits and build another. . . . But, after all, surely a new set is indicated to begin a new year. Don't you agree? What shall I build?

Perhaps next Xmas I shall write again and tell you what I did build—perhaps not. In any case another fifty-two weeks are likely to find me still straying from the matrimonial path and littering the house with "those wretched bits of wireless." And that goes for you, too!

K. D. R.

A SUPER QUALITY 14-WATT RECEIVER

(Continued from page 320.)

a millimeter in the anode circuit of your output valve and a microammeter in the grid circuit, you will find to your surprise and horror how frequently temporary overloading occurs, either due to the grid voltage being swung over on to the positive side and so producing a grid current, or because of actual distortion in the anode circuit, due to excess variations of anode current beyond the straight portion of the characteristic curve.

The present receiver is capable of giving an output of 14 watts, but although this would fill a hall, it is offered quite seriously as a piece of drawing-room apparatus. Obviously you would not have this set turned full on in an ordinary house, although it is surprising what you yourself (if not the neighbours) can stand in the way of sheer overpowering volume, provided the quality of reproduction is excellent. Much of the prejudice against loud signals, apart from the possible nuisance to neighbours, is that on a smaller set large volume is always accompanied by distortion. The objection to loudness is not so much because of pressure on the ear drums, but because the distortion makes it an offence against one's musical sense. If you turned down the volume, not only does any distortion present naturally become weaker and therefore less offensive, but distortion due to overloading disappears perhaps altogether.

To some extent you have an analogy in a motor-car of high horse-power. It may not seem to possess any merits over a baby car in a built-up area, but when climbing a hill, even though hills are few and far between, it reveals its superiority.

The reserve of strength in a really powerful high-quality receiver becomes immediately and obviously advantageous when you listen to music which varies widely in loudness.

There must be very few listeners who have not experienced that fear of distress which comes over one as the music develops into a climax of volume which you know is going to produce rattle, distortion and general distress. To own a set such as the one I am describing means to be free of this anxiety and, instead, to glory in the rich overpowering volume which, while lasting for only a brief period, adds richness to the whole performance without the set being adjusted to give excessive volume.

As regards actual quality of reproduction of different parts of the musical register, the problem calls for a more detailed solution than merely providing ample volume. It is true that to reproduce the low notes fully a large output is necessary, but methods of amplification and the design of the loudspeaker are factors of the greatest importance. Straight-line amplification without discrimination or resonances in the actual amplifier is a desirable quality, and it is a quality which is possessed by this 14-watt outfit. The loudspeaker itself must not only be capable of handling this output, but must be of really first-rate design so as to avoid resonance effects and a dozen other faults which are possessed by cheaper loudspeakers of inferior quality.

You will, no doubt, have seen frequently references in advertisements to the importance of not using a high-grade loudspeaker

with an inferior set. This is because the defects of the set are shown up by the speaker. Perhaps the best known example is that where heterodyne whistles and interference mush are greatly exaggerated when a high-grade loudspeaker is used simply because the high notes are reproduced well, whereas on a poorer loudspeaker you would not hear them and the quality would be apparently better. It is therefore important to have the quality of the set and the quality of the speaker matched. Neither the one nor the other should be the better.

On the purely radio side of the set, one wants to avoid cutting off side-bands by selectivity devices. This means that for really good quality of reproduction you will have to rely on a local station, that is, one which gives a very powerful signal which is much stronger than the signals of

neighbouring stations. The present set is far from being purely a local station receiver: it will receive a large number of foreign stations with excellent results, but it is essentially a set for the music-lover, and the listener who desires something exceptionally good in the way of reproduction, and so it will naturally appeal to those who do most of their listening on B.B.C. stations.

Where the first consideration is quality of reproduction and absence of background noise, there is a great deal to be said for a straight receiver with reaction either not used at all or used only slightly if the best results are desired. When listening to a powerful B.B.C. station reaction is not required, and so the arrangement I am describing serves very well.

(To be continued next week.)

FOR ONLY 3/9

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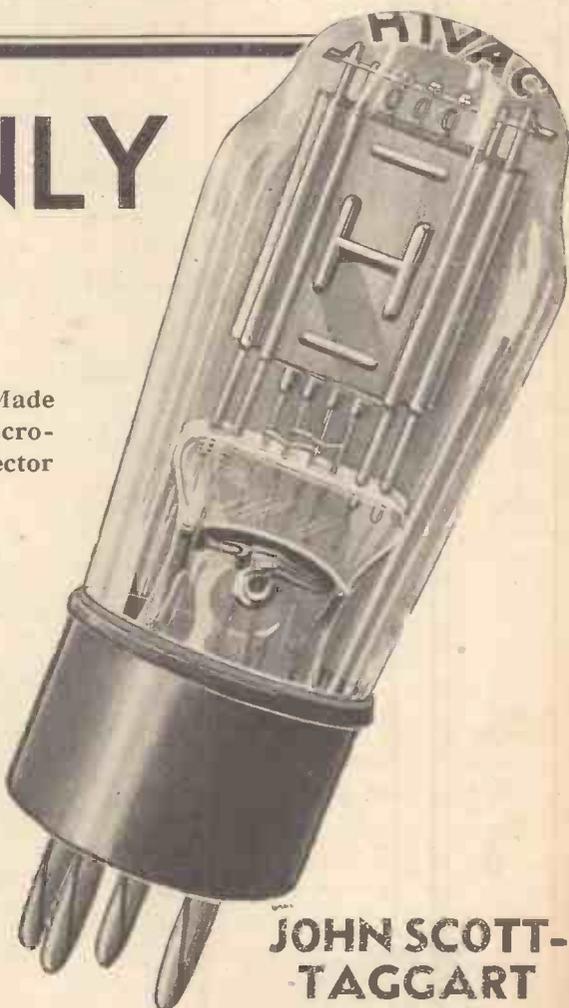
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ISSUE

The High Vacuum Valve Co., Ltd., 111-117, Farringdon Road, London, E.C.1

A SET THAT WOULD NOT "TUNE-UP"

G. S. (Golders Green).—*I have an all-wave set with plug-in coils which works perfectly from about 15 metres to 180. It consists of a screen-grid valve with detector and pentode output, and it operates on a mains unit. At about 180 metres I begin to get bad distortion even on weak stations, though the reception is crystal clear on short waves, even when the station is very loud.*

I enclose a circuit of the set. Can you tell me what is wrong?

I am not quite sure. From your circuit, I should say that you are getting a large amount of H.F. in your H.T. leads above 180 metres which is not occurring below that wavelength.

To explain that I must discuss the circuit at the H.F. end. You have a screen-grid valve choke coupled to a tuned grid for the detector. I think the 3-meg. grid leak is rather high for broadcasting purposes, but no doubt you have found that value better than the 2 meg. for short waves.

I note that there is no decoupling in the set anywhere. That may be all right as regards motor-boating, but it is not too good a scheme where an H.F. stage is used. However, we will pass that fact.

Where I think the trouble is occurring is in the anode of the S.G. valve. I notice that you label the choke "S.W. choke." The choke in the detector circuit is labelled "H.F. choke."

I am assuming, therefore, that while an ordinary H.F. choke is used for the detector only, a short-wave choke is employed for the S.G. valve.

Why? The S.G. valve will work well on short waves because its output will be shunted from the anode to the grid coil of the detector by the S.W. choke. But, what happens when you get to some wave-length that is not covered by the choke?

As I see it the choke is probably very efficient between 15 and 80 metres. It becomes less efficient after that, and at about 180 metres is useless.

At that wavelength, and increasingly so above it, the anode output of the S.G. valve does not get shunted to the tuned grid coil of the detector, but merely flows along the H.T. lead to the S.G. valve. Assuming that the lead is not decoupled from the other H.T. feeds to the detector and output valves (for your diagram does not show any decoupling), that H.F. will do untold damage in the way of upsetting the reproduction of the receiver.

In addition the reception should be weak as well as distorted, for there is no voltage build-up on the anode of the S.G. valve other than that produced by some resistance scheme in the mains unit. You have in effect therefore a resistance-coupled S.G. valve at wavelengths above 180 metres, the resistance being one in the mains unit. Or possibly in the absence of such a resistance the smoothing choke in the unit is acting as an inefficient H.F. choke.

Unfortunately, it is passing the voltages developed across it not only to the grid of the detector but also to its anode and to the output valve. No wonder, then, that you are experiencing distortion.

I think that if you insert a good ordinary H.F. choke in the S.G. anode lead between the present short-wave choke and the H.T. supply you will do away with the trouble, and at the same time increase the efficiency of the receiver on normal broadcast wavelengths.

Decoupling may also be necessary in the anode lead of the detector valve, but there is no need to add that if it is found that the inclusion of the H.F. choke as suggested acts satisfactorily.

It is also possible that the inclusion of a short-wave choke between the anode of the detector and the present H.F. choke will assist matters on the short waves, making the set even more sensitive than it is at present. The choke should be added so that the reaction lead comes off on the anode side of it, of course.

S O S

Here is one from me: Will J. Cooper, who wrote about copies of "P.W." of March 25th and April 1st, 1933, please send his full address so that I can print his S O S. So far he has sent only "7, Hardwick Avenue, W.B. Nottingham." It may be right, but it does not seem sufficient.

Also will some kind reader write to P. S. C. Hack, West Coombe, Haywards Heath, Sussex, with regard to the possible sale of the copy of "P.W." containing details of the S.T.600 and of the accompanying blue print? Thank you.

Finally, I have been asked by N. Salkin, 21, Tillotson Street, Liverpool 7, to thank all those readers who wrote to him in answer to his S O S for S.T.400 details.

He received his first letter before he himself had read his copy of "P.W." and seen his own request. That's snappy work—from a reader in Peterborough. Thank you, everyone.

ANYBODY WANT THESE?

A. Whalley, The Bungalow, Gun Street, Biddulph, S.O.T. (which, my friends, I take to mean Stoke-on-Trent), has blue prints of the S.T.300 and the S.T.400 which he is prepared to LEND provided they are taken

Really, D.G., you must not jump to conclusions. Read what others say about that 900 before you decide that any set put up against it is no good. Better still, get a kit yourself and build the set. You won't regret it.

BIAS AND A PICK-UP

I have been told by a friend to connect a bias battery to my pick-up. I am afraid to do this for surely the current from the battery will harm the windings which, I understand, are very delicate.

So writes T. R. P. (London, S.E.), and he sends a diagram of a two-valve battery set with the conventional method of connecting the pick-up between grid and filament of the detector valve.

There is no danger there, T.R.P. The bias battery is in series with the pick-up, and unless you short-circuit the grid condenser you will not pass any current through it.

Bias stops current—even the tiny grid current of the valve—and so the pick-up will have no current flowing through it. If you short-circuit the grid condenser, however, you will complete the battery circuit and current WILL flow, to the possible detriment of the pick-up.

A grid-bias battery is not used to provide current to a valve. It is used to apply a negative-voltage to the grid in respect of the filament. This voltage has the effect of preventing electrons collecting on the grid of the valve and flowing from grid to filament through some outside circuit. If you just joined the pick-up in position between grid and filament without the bias battery you would have a small current flowing through the pick-up due to the fact that electrons would collect on the grid of the valve and would leak away to filament through the pick-up.

The current formed would not be enough to harm the pick-up, however, but it might cause distortion.

With the bias battery in position the current would not exist, for the electrons would be repelled from the grid by the negative bias, and so would not flow round through the pick-up.

WHAT CAN YOU HEAR?

"Listener" writes from Southampton to ask what is the highest note that a person can hear and what is the lowest. "I have been told that 10,000 is the upper limit and 50 is the lower limit in sound frequencies. Is that right?"

It is impossible to be dogmatic about such a subject because the limit of hearing depends on the individual. I know of one man who cannot hear much above 8,000, which is a frequency common to a number of musical instruments. The harmonics of the violin, harp, brass instruments, etc., go up above that frequency. The top note of the average piano is only about 4,000 odd, but the quality of the piano is dependent on sounds with frequencies much higher.

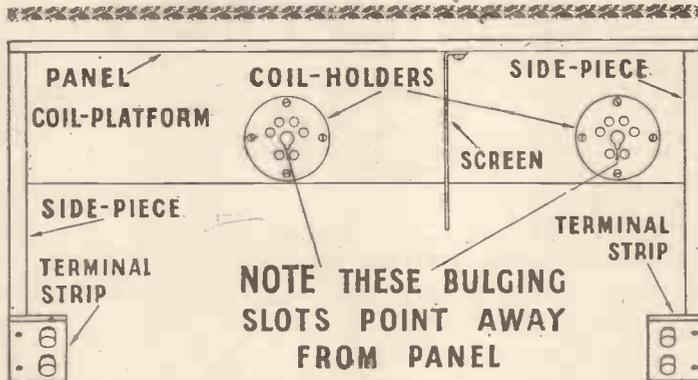
That is why a set that cuts off at 5,000 will give a very "dead" piano high note and the violin will sound rather like the flute.

Television transmissions give a much greater range of sound frequency than do the ordinary broadcast stations, and it is surmised that the average man and woman can hear up to 10,000 and many of them up to 15,000 per second.

The lower note question is more easily answered. Any normal person can certainly hear below 50 cycles. That limit is absurd. You can hear the bottom note of the piano, can't you? That is somewhere round 26 cycles. The lower organ notes go below that—down to 16, I believe, but it is certainly doubtful if you HEAR the 16-cycle note rather than FEEL it.

I think I should be inclined to put the average lower limit of audibility round about 18 to 20 cycles, with occasional instances of 16. But the whole trouble comes in the fact that the person who is listening to low notes cannot say for certain when his or her hearing is switched over to feeling, or a mixture of both.

At the top end of the scale the test is more certain, for a note is eventually reached when absolutely nothing is heard and there is also no feeling.



This diagram shows the correct position of the slots in the two S.T.900 coil holders when looked at from above.

care of. Also, he has most of the copies of the "Wireless Constructor" and of "P.W." since 1932, which he is prepared to offer to readers on the same terms. Other "S.T." designs since the S.T.400 can be borrowed if desired.

Don't all rush at once, now. Drop Mr. Whalley a line first, and if you DO borrow any of these, please take care of the copies and return them as snappily as you can.

OH, DEAR!

"Dear Sir,—You must have a rotten super. Yours, D. G. (Birmingham)."

That is the full contents of a card I have received from a reader. I can suppose it refers to one thing, and one only—my report on the performance of the S.T.900 in "P.W." November 13th.

Unkindly enough, I got the letter on Armistice Day—one day after the issue was on sale.

I am sorry my correspondent thinks so poorly of my set. I am still more sorry that he writes without trying the 900, as he obviously has done.

Luckily, I have always been brought up most strictly not to accept or to enter into any sort of bet, wager, gamble, or financial speculation resulting from an argument. And my nose does not curve at the end, either—in spite of the photo on page 242 of November 13th issue.

If I were of the "betcha" disposition I might ask D.G. to prove two things: That the super is rotten because it was beaten by the S.T.900, and that he can find any set that will beat the S.T.900 other than some umpteenth-valve contraption with a paid staff of manipulators.

THINGS THAT CAME

(Continued from page 310.)

"The whole of the human element on our side being concentrated in this one hall," added Sutor. But to industrialite Alva this was not a complete revelation, although he nodded his head with genuine appreciation of the scientifically advanced organisation.

"But isn't there one man for each of the aircraft and seacraft?" he asked.

"Oh dear no," smiled Professor Ruston, "I have recently introduced a system whereby it is possible for at least twelve units to be controlled adequately by one operator."

"By the way, where is Professor Simon?" asked Sutor, gazing at the bowed figures working at a dozen tables arranged immediately below the dais.

"He had to be retired to the Resignorium," replied the learned War Chief sadly, adding by way of explanation, "He allowed an enemy aircraft to penetrate. A careless lapse on the part of one who has rendered valuable service. He miscalculated the incidence angle of its approach."

"I didn't hear anything about an enemy aircraft getting through? Where did it happen, professor? Did it cause any damage?" asked Alva, his eyes widening with interest.

"It was brilliantly countered in the second defence zone by Professor Santon, to whom, I should mention, must also be credited an excellent piece of work in negating an enemy interlooping action by means of a new encirclement manoeuvre. I am at present preparing a little monologue on the action. It should be in the hands of the Recording Department within a month. I will send you a copy."

"Will there ever be any decisive movement on either side?" asked Alva unthinkingly. But the War Chief merely smiled tolerantly.

"Perfect offence opposed to perfect defence in both directions. No, we have not quite reached that deadlock. Twice during the past two years critical situations have arisen; on each occasion each side had to revise its systems drastically."

"Before the end of this—excuse me."

Professor Ruston turned to take a slip of paper from the delivery cup of an electric messenger and as he read it he frowned.

"Section Sixteen B Aerial reports two control relay failures," he muttered as he passed the written message to one of his colleagues.

"Out of how many, I wonder?" whispered Alva to Sutor. But he was overheard by the War Chief.

"Out of approximately two thousand of that particular type," said the scientist.

"Aircraft radio control?" asked the young man interestedly.

"Yes."

"That is bad. Why not use the new vacuum ballistic type?"

Professor Ruston glanced at Sutor and smiled significantly.

"Alva, I must make a confession," said the latter with apparent irrelevance; "did you not wonder why I had invited you to spend this day with me—I mean—?" He stumbled with his words awkwardly.

"A humble industrialite acquaintance, honoured by the great Administrator Sutor!" laughed Alva good-humouredly. "And was this ostensibly casual visit to the

War Department part of some predetermined plan?"

"Yes it was, Alva. I wanted to get you interested; in short, to endeavour to entice you away from your beloved industrialism and join the War Department. No, it was not wholly my idea. Professor Ruston mentioned to me some time ago that he considered his department would be greatly strengthened if he could acquire the services in administrative positions of one or two young, keen industrialites, and your remarks concerning control relays obviously prove that you would be a valuable acquisition."

"A link between the industrial plant and the mathematics of war," smiled the venerable scientist encouragingly.

"Thank you very much, Professor, may I think it over?" said Alva.

That evening Sutor and Alva dined at the Rivington where some excellent trans-ocean cabaret was provided for their entertainment. And it was quite late when Sutor returned to the subject.

"Well, Alva," he said, "in which direction do your inclinations go at this moment? Industrialism amid the submerged but useful many, or a seat in the War Department and access to every privilege that the country and capital can offer?"

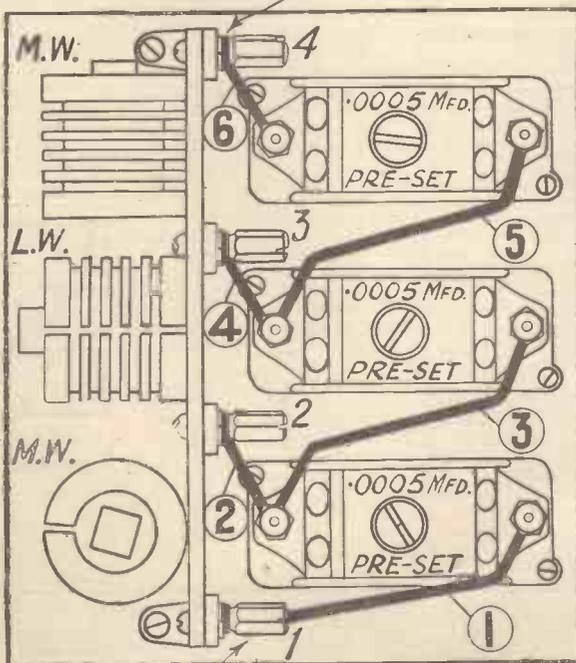
Alva grinned rather sheepishly.

"I made up my mind hours ago," he confessed. "War! Interesting, yes. But how terribly dull! Years and years of standing still and getting nowhere. Just waiting for the other side to make the big mistake which they never do make! How hopelessly useless. Give me industrialism every time where one can work constructively and progress, even if slowly, towards definite conclusions. No, Sutor, I am afraid for all the social prestige and privileges which it may offer, a war department position is not my desire. History proves that war has always been wastage. There is no longer any wastage of human life apparently, but it appears to me to be just as much a misapplication of human endeavour as ever it was. And one day, after years of complete deadlock, this will be realised and there will be no more war."

Sutor clapped him on the shoulder and laughed.

"And to that, Alva, if I were an old-time American, I'd say 'Oh yeah!'"

TO AERIAL TERMINAL OF SET



TO AERIAL

TRIPLE EXTRACTOR UNIT

How the S.T.900 Triple Extractor is wired-up. Details of the operation appear on page 317.

GIVE RADIO THIS XMAS

(Continued from page 324.)

there are sets for the battery user and for those who need a universal instrument so that they can be ready for the change-over from D.C. to A.C. mains. And when this comes they will not have to scrap their sets and buy new ones.

The Marconiphone model 557, a photograph of which you will see in these pages, is a six-valve all-wave superhet for A.C. mains, and on the short waves covers from 16.5 to 52 metres. It costs 12½ guineas and has a very sensitive circuit and an output of three watts.

The H.M.V. receiver, which photograph you see, is the well-known model 499, costing 14½ guineas, and it is fitted with fluid light tuning, a scheme which renders it a very simple matter to tune-in accurately to a station. It is an all-wave set, having a superhet circuit and a wavelength on the short waves from 16.5 to 52 metres.

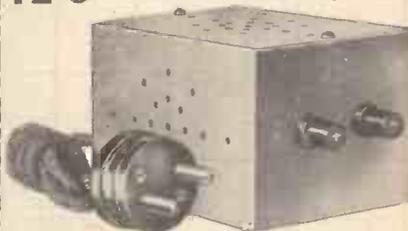
Ferranti's do a remarkable value-for-money set at 9 guineas. Known as the model 837, it has a new multiple valve circuit giving 9-kilocycle selectivity, and is an all-waver, tuning from 16.7-52 metres on the short waves. The output valve is a compensated double-diode pentode giving a maximum of 3½ watts.

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

TO-DAY the majority of receivers are fitted with pick-up sockets so that the L.F. side of the set can be used for the electrical reproduction of gramophone records. Most home constructed receivers can be easily adapted by the insertion of the necessary pick-up terminals into the grid circuit of the detector or first L.F. stage.

The problem in many instances is that of arranging the necessary record-playing unit. Not only is a pick-up required, but in addition a suitable motor, the whole having to be built into the form of a unit in some sort of cabinet. Given this desirable unit, there is no need to feel envious of one's friends' radiograms, because a table model receiver, plus a record-playing unit, will do everything that a radiogram can do. And in some respects more because the record-

A VISIT TO THE G.E.C.'s WITTON WORKS

RECENTLY we had the opportunity of paying a visit to the G.E.C. works at Witton, to look over the more modern additions to this huge factory which was started in 1902. The parts visited included the first self-contained Steelclad Mercury Arc Rectifier Works in the world, laboratories dealing with the testing of high-power alternating-current circuit breakers, a mechanised foundry and the new dry battery works. It is the latter, in its association with the production of high-tension batteries for radio purposes, that will interest readers of POPULAR WIRELESS most.

This factory can produce millions of battery cells a week, and deals with the whole process from the raw materials, which go in at one end of the factory, and the cartoned batteries which come out the other, all ready for despatch.

If you pull an old high-tension battery to pieces, you will gather some idea of the number of processes involved in its manufacture; and remembering that the present H.T. battery has a life about three times that of the H.T. batteries of fifteen years ago, you will appreciate that work and materials must be pretty efficient.

First there are the electrolyte and depolariser materials to be mixed. Then the dollies have to be prepared by wrapping depolariser around carbon rods. Next, these prepared dollies are inserted in the zinc containers and filled with electrolyte. Finally the cells have to be sealed off, connections attached and packed in the boxes which make up the complete battery.

Much clever mechanical machinery is used in these stages, a particularly interesting one being a machine that solders a wire on to

playing unit can be connected to the set by a flexible lead and operated from some convenient position in the room such as alongside an armchair.

A particularly neat and efficient unit is the one which has been recently placed on the market by H.M.V. Costing only £3 19s. 6d., it consists of an attractively finished cabinet containing the pick-up, turntable, and electric motor, needle cups, etc. Moreover, it has its own volume control so that it can be adjusted to a nicety from the armchair.

Designed for A.C. mains this unit will transform your set into a highly efficient radiogram. Those who wish to purchase on the deferred payment scheme may do so by depositing 7s. 6d. and paying up the balance in twelve monthly instalments of 7s. 6d.

NEW MURPHY RECEIVER

Murphy Radio have added a luxury receiver to their range, known as the A40RG. The set is an A.C. mains superhet with automatic record changer, and operates on mains voltages of 100-125 and 200-250 volts 50 cycles. It is essentially a set for those who require super quality of reproduction and are prepared to pay for it. The price is £85.

the zinc containers. The cells pass a pulley dipping into solder which pushes a continuous piece of wire against them as they pass, soldering wire and container where they touch. Then an automatic cutter separates each cell by cutting the wire between cells and leaving a short connection attached to each.

The electrolyte is in liquid form when it is put into the cells, but a cooking process which warms it up for a minute or so turns it into a jelly. As soon as the cells are filled with electrolyte they are capable of giving current, and so from this point onwards continual meter checks are made to ensure that everything is going on properly.

The high standard of uniformity set for the production of G.E.C. batteries is shown by the fact that only one cell in 100,000 is found to be below average.

The inert cells intended for export to hot climates, and which have a dry electrolyte until water is inserted, are interesting in the precautions taken to see that not one drop of moisture gets into the cells accidentally. After completion each cell is tested on a most sensitive galvanometer, and there must not be the slightest kick from the needle.

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NEW and NOVEL SIMPLE

'BELISHA'

The SAFETY FIRST Card Game

A GAME OF THRILLS

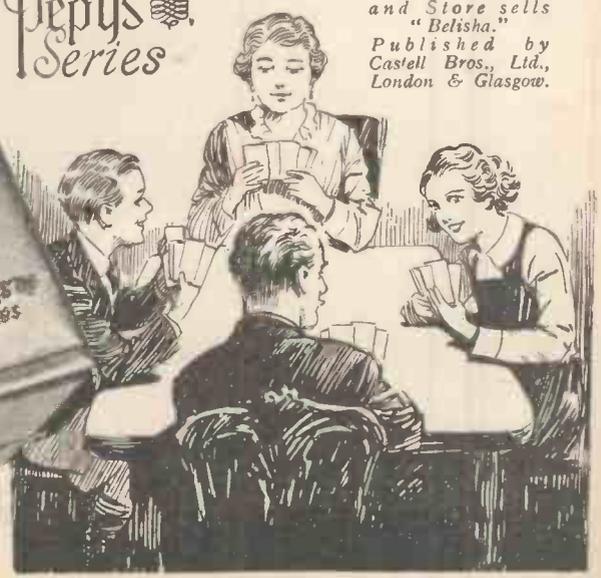
All the family can play this new and entertaining game ; young and old alike will find in it many a new thrill and many a valuable lesson, for " Belisha " teaches the ever-valuable and all-important doctrine of " Safety First." Played on the same familiar lines as " Rummy," with new and ingenious variations, " Belisha " is a game of many interests. As the game proceeds the players are taken on a tour of England and Scotland from London to Oban, many of the cards bearing beautifully drawn pictures in colour of famous beauty spots.

Each card bears in the top left-hand corner a familiar safety-first symbol ; some cards illustrate the dangers of the road, some show how accidents may be avoided. There's a touch of humour, a smattering of geography, a new method of teaching " Safety First," and a heap of fun. " Belisha " is a game that should be played in every home, for it has all the merits of a family or party game with the added attraction of demonstrating again and again the way to ensure road safety for all.



Pepys Series

Every good Stationer and Store sells " Belisha." Published by Castell Bros., Ltd., London & Glasgow.



2/6 PER PACK

8



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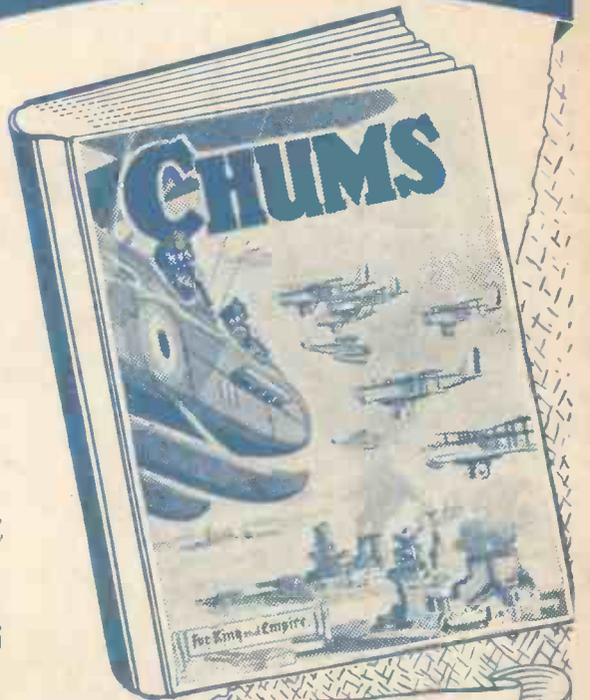
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STEERING BY WIRELESS (SEE PAGE 348)

Popular Wireless & TELEVISION TIMES

YOU MAY BE A B.B.C. SAMPLE SOON!

By ALAN HUNTER

EVERY WEDNESDAY PRICE

3^D

No. 810.
Vol. XXXI.
Dec. 11th, 1937.

"Calling all Cars!"



To hear the thrilling signal "CALLING ALL CARS" is the ambition of all short-wave enthusiasts. This week Lionel Chester, whose "Short-Wave Adventures" are such a popular "P.W." feature, gives details of the Ultra-Short-Wave Set with which he recently tuned-in one of these American Police Transmissions.

Also In This Issue:—

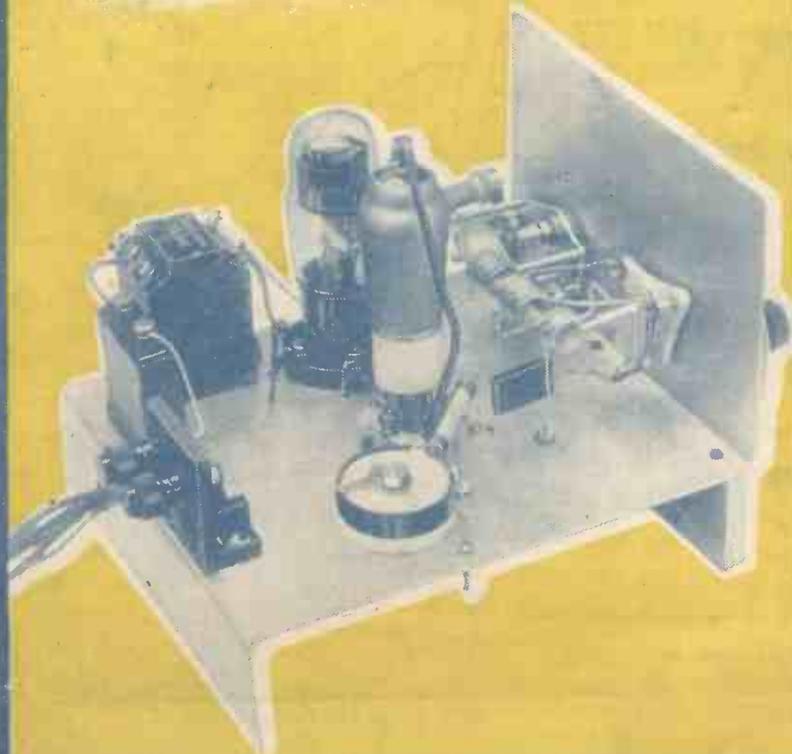
MORE ABOUT THE SUPER QUALITY 14-WATT RECEIVER

By JOHN SCOTT-TAGGART

★ ★

"NEGATIVE" REACTION

By CARDEN SHEILS





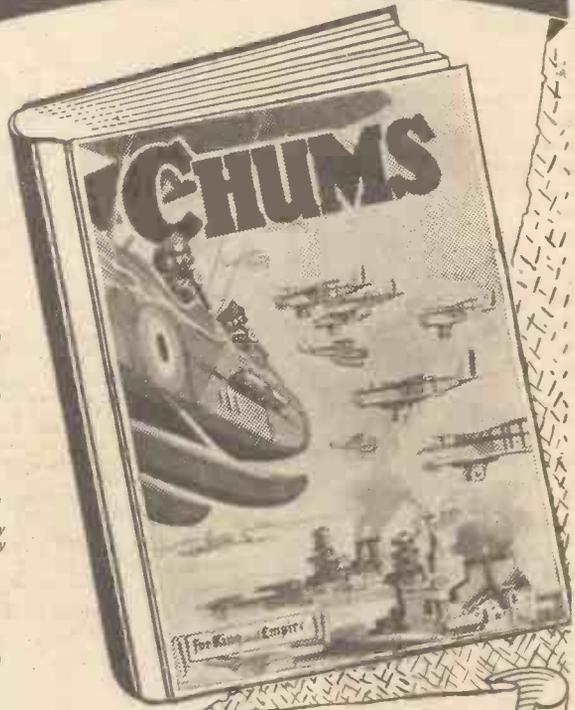
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Editor: G. V. Dowding

Asst. Editors: A. Johnson-Randall, A. S. Clark

AT POLDHU
INTERFERENCE
RADIO DOCTORING

RADIO NOTES & NEWS

WEATHER—OR NOT?
WELCOME, STRANGER
DREAM SCHOOL

Lifeboat's New Record

I AM reported to D. N. of Boston, Lincs, for some interesting details of radio equipment on motor lifeboat City of Bradford which recently made lifeboat history in the matter of communications.

Linked by her radio telephone and the land lines, she was able, for the first time, to let the Royal National Lifeboat Institution in London talk directly with one of their vessels at sea.

Conversation was easy and clear, which is saying a lot when it is remembered that the twin engines of the lifeboat run at some 800 revolutions a minute. There is none too much space in a lifeboat, and as a matter of fact the two 40-h.p. engines of the City of Bradford II were only about three yards away from the radio. Good screening, what?

Pioneers of Poldhu

IT is good to be able to record that the Marconi Company has erected, at Poldhu, a monument commemorating the great radio achievements that took place in the little Cornish village.

A granite column was unveiled by Mr. R. N. Vyvyan, former Chief Engineer of the Company, and plaques on the monument recall Poldhu's radio history. From this spot went out the historic letter S (three dots in the Morse code) which Marconi picked up in Newfoundland "while all the world wondered." The first trans-ocean wireless service was based on the Poldhu station, designed by Sir Ambrose Fleming. And it was from Poldhu that in 1923-4 Mr. C. S. Franklin, the inventor of the Franklin beam aerial, directed his historic beam transmission to the Elettra, cruising in the South Atlantic.

Six Months' Hard Labour

THE four Soviet scientists who, back in May, were landed by aeroplanes on the ice near the North Pole, and who have since been drifting on an ice floe, have now reached the tip of Greenland, more than five hundred miles from their starting-point. And their tiny, frozen, floating world has been cheerfully chatting to the rest of civilisation by radio all the way.

Their feat is a remarkable one, and shows that the ice drift of the Polar basin, by covering about two and a half miles a day, far exceeds all the scientific estimates.

A mass of meteorological and astronomical data has been collected, and when co-ordinated will throw new light on many Polar problems.

Among other activities, the scientists sounded the ocean at various points, and took samples of deep-sea water. Forms of

400 metres. When the matter was mentioned at one trade meeting, an Essex dealer said that the culprit had been found—under the Thames.

He attributed the noise to the drilling machines which are being employed in connection with the new tunnel between Purfleet and Dartford; and he said that although the Post Office engineers had located the offender, nothing appeared to have been done to effect a cure.

Complaints have been received from towns as far apart as Gravesend, Brentwood, Southend and Loughton.

Radio Doctoring Among Ice Floes

HAVING signed off from the Canadian Government icebreaker N. B. McLean, at Quebec, Dr. F. Lizotto has transferred to a passenger ship running from Canada to the West Indies. The West Indian run is a delightful one; and the doctor has earned a rest, for life on an icebreaker is strenuous for twenty-four hours of a day.

One operation—the first ever performed in Hudson Straits—had a radio prelude, for the patient was hundreds of miles away when the doctor diagnosed appendicitis from an account of the symptoms. All preparations and the rendezvous were fixed by radio, and when the ships met the patient was quickly transferred, and had his appendix successfully removed.

On another occasion the cook of one of the Far North wireless stations poisoned his foot—and would have lost it but for instructions from the icebreaker's doctor, fortunately only a few hundred miles away.

Isn't That Like Life?

AS an admirer of Professor John Hilton's radio talks, I should have liked to have been among his audience at Blackpool recently, when he revisited the town.

He recalled how his parents took him to Blackpool as a child for holidays, and how keenly he yearned for a really posh spade with which to dig on those famous sands. He was always hopeful, but family funds never soared sufficiently to find the necessary sixpence.

"And now," said the Professor, "when
(Continued overleaf.)

THE BASE OF KDKA'S NEW MAST



Though weighing 60 tons, the new aerial mast at KDKA, the well-known American station, rests on a porcelain insulator base about 3 feet high and 18 inches in diameter. Mr. H. W. Irving, of the Westinghouse Company, is seen here looking up the mast, which is 718 feet high.

life found in this suggest that the Gulf Stream flows right to the North Pole.

Underground Influence at Work?

COMPLAINTS that wireless programmes were being seriously interfered with over a wide area in south Essex and north Kent have recently been frequent, and fervent. The interference is especially strident on the wavelengths round about

RUMANIA TO BUILD ANTI-PROPAGANDA STATION

I return to Blackpool and really could afford to buy myself that sixpenny spade, I find I don't want it. Isn't that life, all over?"

Weather—or Not?

TO test the possibilities of television as an aid to meteorology the U.S. weather forecasters have equipped a ship with a television receiver, and have been transmitting complete weather charts to it, isobars and all. Tests are still going on, for it is believed that such methods will prove better than any at present in use.



There is rumour, however, that on one occasion the

wireless operator, by some mistake, tuned in not only the weather-chart intended for him, but also an experimental television programme on the same wavelength, in which some high-kicking young ladies were prominently featured.

The combined transmissions resulted in such a fierce-looking weather chart that on first beholding it the skipper instinctively ordered Half Speed Ahead, Batten Down, Heave the Lead and All Hands on Deck!

Welcome, Stranger

RUMANIA has decided to add from the capital of Bessarabia another voice to the concert of Europe. The station will announce itself as "Radio Bessarabia" on 201.2 metres.

Tickled to death at having the site of the new station right at their own doorsteps, the town council of Chisinau offered to the broadcasting authorities a former theatre, which it is hoped will make a good home for the necessary studios.

It has been frankly stated that the object of the new station is to help to counteract the effect of foreign radio propaganda. How heartily the station-erecting firms must bless the spirit of emulation!

Verbal Come-Back

ONE of the West Indian stations has lately had the unpleasant experience of being turned out of house and home. It's a sad story. Apparently this station was comfortably settling down to its morning transmission one day when the postman called with a letter from the landlord. Shorn of finer sentiments the gist of the letter was Pay More Rent or Get Out!



Stung by this unexpected demand the station moved to more accommodating premises across the road, and then started to tell its audience of what it thought of the landlord, in the plainest possible terms. Some listeners say that these tirades, with their vehement denunciations and vivid

descriptions, are the best programmes which the station has ever put over.

Radio Training for Pilots

THE special training which is being undertaken by a number of British Airways pilots in preparation for the forthcoming British South Atlantic air service includes a goodly ration of radio.

The training is going forward at Gatwick Aerodrome, Surrey, where two air-liners are used as flying schools in which aeronautical manoeuvres, including blind flying and blind landing, can be practised. Much of the preliminary work can be done in an ingenious device called the Link Trainer, evolved in the U.S.A. To a full-sized cockpit is attached a miniature aeroplane,

BROADCASTING BREVITIES

The Northern microphone has by no means deserted the great entertainment field of Blackpool now that summer has passed, and a Northern Music Hall programme from the famous resort will be included in the evening programmes of December 15th, when listeners to the main Regional and the Northern programmes may hear some of the variety fare from the Palace Theatre.

Western Cabaret from the Royal Bath Hotel, Bournemouth (West of England programme), on December 15th, will include: Murray and Mooney "In More Funny Business"; Ann Penn—the Popular Impressionist; Mario de Pietro and his Mandolin; and dancing to Billy Bissett and his Canadians, with the Canadian Capers and Alice Mann.

"Round London at Night" is the intriguing title of a new feature to be introduced from the Empire station to the Home programmes on December 22nd (National network). Designed originally to supply entertainment news to the outposts of the Empire, it was thought to be of equal interest to home listeners.

The idea underlying the programme is to visit, with the microphone, six places of entertainment towards the end of the programmes. Each place visited will be of a different character; each flash will be brief, but will seek to convey to listeners the differing characteristics. Various points of interest in the metropolis will be covered by this feature, a kaleidoscopic news bulletin of London's entertainment thus being available to radio listeners.

The conception and planning of this feature is in the hands of Pascoe Thornton of the Empire Department. The staff work, both of negotiating permission and arranging for technical equipment and engineers, is a formidable task; but it is hoped the idea will yield programmes of considerable entertainment and of novelty value.

which can climb, turn, stall, spin and roll in realistic manner without leaving the ground. A control officer instructs the pilot, and recording devices show his "course" and reveal any mistakes he has made. Leisure to study his mistakes is something that the old-time pilot never lived to enjoy.

Other People's Licences

THE French Minister of Posts, Telegraphs and Telephones has been in the counting-house doing a bit of *un, deux, trois*-ing, and he finds that up to the end of September, 1937, 4,108,992 radio receiving sets had been declared in France, for fiscal purposes. This is an increase, in twelve months, of just about 1,000,000.

Japan, too, has recently published her licensed receiving set total for the first quarter of this year. Including over 40,000 sets for which no fees were payable

the overall total comes out at 2,904,823. This means that, by the time these lines appear in print, Japan will probably have reached the 3,000,000 mark.

I-Horse-power Receivers

ALTHOUGH the folks who live on the shores of the Caspian Sea have a certain fondness for their native soil, they do not claim that it is of the type that causes the land to flow with milk and honey. To call it a rich compost would be an exaggeration, and the workers who till it from dawn till dusk have little cash to spare for buying radio sets.



Realising this the Station Director of the "local" has ingeniously enabled villagers to listen-in by calling to his aid that noble animal the horse. Powerful receiving sets with loud-speakers are strapped to the backs of selected steeds, and technicians are trained to boot and saddle.

Servicemen in this country generally consider their jobs are no beds of roses, but at least they are spared the anxieties attendant upon the uncertain behaviour of a mettlesome Caspian Derby aspirant.

That's a Point!

THE B.B.C. has announced that the fat stock prices will no longer be included in the news bulletin. How shall we know when it is Sunday?—*Glasgow Herald*.

School of His Dreams

THE Australian idea of broadcasting special lessons to children prevented from attending schools by outbreaks of infantile paralysis has been copied in several countries.

One of the biggest experiments was in Chicago, where over a quarter of a million children were involved. Broadcast announcements and newspaper publicity ensured that all parents were aware of the scheme, and investigations showed that it achieved a very considerable success.



Some of the enterprising newspapers interviewed representative scholars, to find out what they thought of the innovation. One young hopeful said that he had not missed a single lesson by wireless because he so enjoyed listening to them in his way—lying down on his "tum" with his notebook on the floor, chewing gum, and interpolating remarks such as, "You don't say, teacher," "Is that so?" and "You didn't think I'd know that, did you, Smarty?"

ARIEL

A SUPER QUALITY 14-WATT RECEIVER

By
JOHN SCOTT-TAGGART,
M.I.E.E., F.Inst.P., Fel.I.R.E.

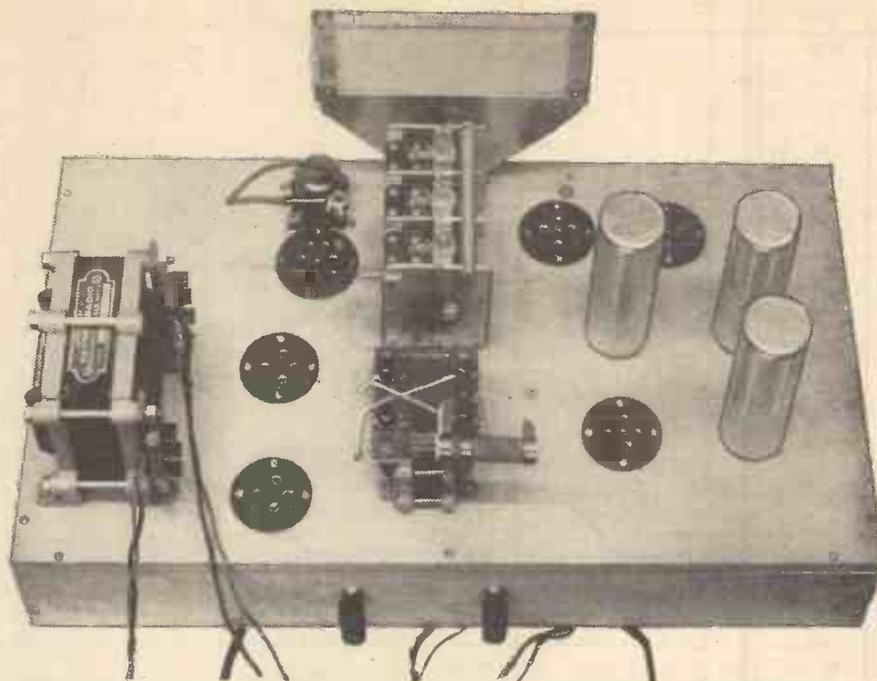
FURTHER DETAILS OF THE MUSIC-LOVER'S SET INTRODUCED IN LAST WEEK'S "P.W."

THE radio side of the set may be considered separately from the amplifier side. It consists of a bandpass input circuit followed by a stage of radio-frequency amplification which can be controlled by means of a potentiometer adjusting the bias on the grid of the H.F. variable-mu pentode. The output circuit of this H.F. pentode includes a tuned circuit connected to a power grid detector which is resistance coupled to an L.F. valve. This L.F. valve is coupled by a Duophase unit (made by Haynes Radio) to two large output valves in push-pull.

Three Tuned Circuits

The coils are of Ferrocart pattern (Colvern), and this combination of circuits when used with reaction on the third tuned circuit is admirable for the reception of distant stations, while without reaction the local stations may be received excellently without clipping their sidebands. As there are three tuned circuits, separate tuning condensers are rather out of the question and moreover, on a set of this ambitious type, entirely different considerations apply when one compares it with a battery set such as the S.T.900.

The loudspeaker and audio-frequency components are due to Haynes and may justifiably be said to match.



A clean and simple layout is a feature of the Super Quality Receiver. The power pack is a separate unit.

A point which I had to decide was whether the loudspeaker should be incorporated in the same cabinet as the receiver. I definitely came to the conclusion that this is undesirable on several grounds. From the point of view of convenience you can have your set with its controls at your side, when sitting in an armchair by the fire; but you certainly do not wish to have a loudspeaker even occasionally putting out 14 watts within a foot or so of your ear. On the other

hand, if you put the complete outfit at a distance it means having to get up to switch it on and off or alter volume or tuning whenever required. This is an obvious inconvenience, and the idea of separating the loudspeaker from the receiver is to be commended on the score of convenience alone.

If you have the speaker quite separate from the mains set, you can place it where you wish, whereas a complete set with
(Continued overleaf.)

THE PARTS YOU WILL REQUIRE TO BUILD THE SUPER QUALITY SET

- 1 Polar bar-type 3-gang tuning condenser, each section .0005 mfd.
- 1 Polar V.P. Horizontal drive for above.
- 1 Colvern Ferrocart coil-unit, types G1, G2, G3.
- 3 T.C.C. 1-mfd. fixed condensers, type 50.
- 2 T.C.C. .0002-mfd. fixed condensers, type 34.
- 2 T.C.C. .0001-mfd. fixed condensers, type 34.
- 1 Dubilier 1-mfd. mica fixed condensers, type B.775.
- 3 T.C.C. 50-mfd. electrolytic condensers, 12-volt working, type F.W.
- 3 T.C.C. 8-mfd. wet electrolytic condensers, type 805.
- 1 Wearite H.F. choke, type H.F.J.
- 1 Wearite H.F. choke, type H.F.J.A., with thimble.
- 1 B.T.S. H.F. choke, S.T.800 type.
- 1 Dubilier "Spirohm" resistance, 20,000-ohm, tapped at 15,000 ohms.
- 1 Dubilier "Spirohm" resistance, 5,000 ohms, tapped at 3,500 ohms.
- 3 Polar-N.S.F. .25-meg. 1-watt resistors.
- 2 Polar-N.S.F. 20,000-ohm 1-watt resistors.
- 1 Polar-N.S.F. 15,000-ohm 1-watt resistor.
- 3 Polar-N.S.F. 10,000-ohm 1-watt resistors.
- 1 Polar-N.S.F. 5,000-ohm 1-watt resistor.
- 1 Polar-N.S.F. 1,000-ohm 1-watt resistor.
- 1 Polar-N.S.F. 500-ohm 1-watt resistor.
- 1 Polar-N.S.F. 250-ohm 1-watt resistor.
- 1 Erie .25-meg. 1-watt resistor.
- 1 Erie 30,000-ohm 1-watt resistor.
- 1 Erie 400-ohm 1-watt resistor.
- 1 Erie 300-ohm 1-watt resistor.
- 1 Erie 100-ohm 1-watt resistor.
- 1 Erie .25-meg. volume control.
- 1 Colvern 10,000-ohm volume control, type S.T.5.C.
- 1 Graham-Farish .0005-mfd. log-mid-line "Litlos" reaction condenser, with insulated piston.
- 1 Polar .00075-mfd. "Compax" condenser.
- 1 Bulgin toggle switch, type S80.
- 1 Haynes Duophase Balanced Coupler.
- 1 Haynes Output Transformer, type OPP-15.
- 1 Clix 7-pin chassis-mounting valve holder, with terminals.
- 3 Clix 5-pin chassis-mounting valve holders, with terminals.
- 2 Clix 4-pin chassis-mounting valve holders, with terminals.
- 4 Clix terminals, type B (marked A, E, Pick-up, Pick-up).

- 1 "Metaplex" (both sides) baseboard, 18 in. x 10 in. x 1/8 in. (Peto-Scott).
- 1 Baseboard support, 18 in. x 3 in. x 1/8 in. plywood (Peto-Scott).
- 2 Baseboard supports, 9 1/2 in. x 3 in. x 1/8 in. plywood (Peto-Scott).
- 2 Pieces 18-gauge aluminium 4 in. x 2 1/2 in. for brackets (Peto-Scott).
- 1 Piece 18-gauge aluminium 3 1/2 in. x 2 in. for bracket (Peto-Scott).
- 20 ft. 18-gauge T.C. wire (Peto-Scott).
- 5 Lengths 1 1/2-mm. insulating sleeving (Peto-Scott).
- 4 ft. 23-36 round twin-flex (Peto-Scott).
- 14-36 red and black, and maroon twin-flex for loudspeaker and mains connections. Lengths to suit. (Peto-Scott).
- Screws, washers, etc. (Peto-Scott).

POWER PACK

- 1 Haynes main transformer, type T-159.
- 1 Haynes smoothing choke, type L-15.
- 2 Dubilier 4-mfd. fixed condensers, type L.E.G.
- 1 T.C.C. 50-mfd. 50-v. wkg. electrolytic condenser, type 521.
- 2 T.C.C. 1-mfd. tubular fixed condensers, type 341.
- 1 Bulgin mains plug and fuses, type F.15.
- 2 Clix 4-pin chassis-mounting valve holders, with terminals.
- 6 Clix terminals, type B, marked L.T. (four), H.T., H.T. +.
- 1 "Metaplex" (both sides) baseboard, 18 in. x 10 in. x 1/8 in. (Peto-Scott).
- 2 Baseboard supports, 18 in. x 1 in. x 1/8 in. plywood (Peto-Scott).
- 2 Baseboard supports, 9 1/2 in. x 1 in. x 1/8 in. plywood (Peto-Scott).
- 8 ft. 18-gauge T.C. wire (Peto-Scott).
- 2 lengths 1 1/2-mm. insulating sleeving (Peto-Scott).
- Screws, washers, etc. (Peto-Scott).

VALVES

- | | | | |
|--------------------|------------------|------------------|------------------|
| V1 | V2 | Vx and V3 | V4 and V5 |
| Marconi or Osram | Marconi or Osram | Marconi or Osram | Marconi or Osram |
| V.M.P. 4.G. (met.) | M.H. 41. (met.) | M.L.4. (two) | PX 25. |
| | | | (matched pair) |

RECTIFIERS

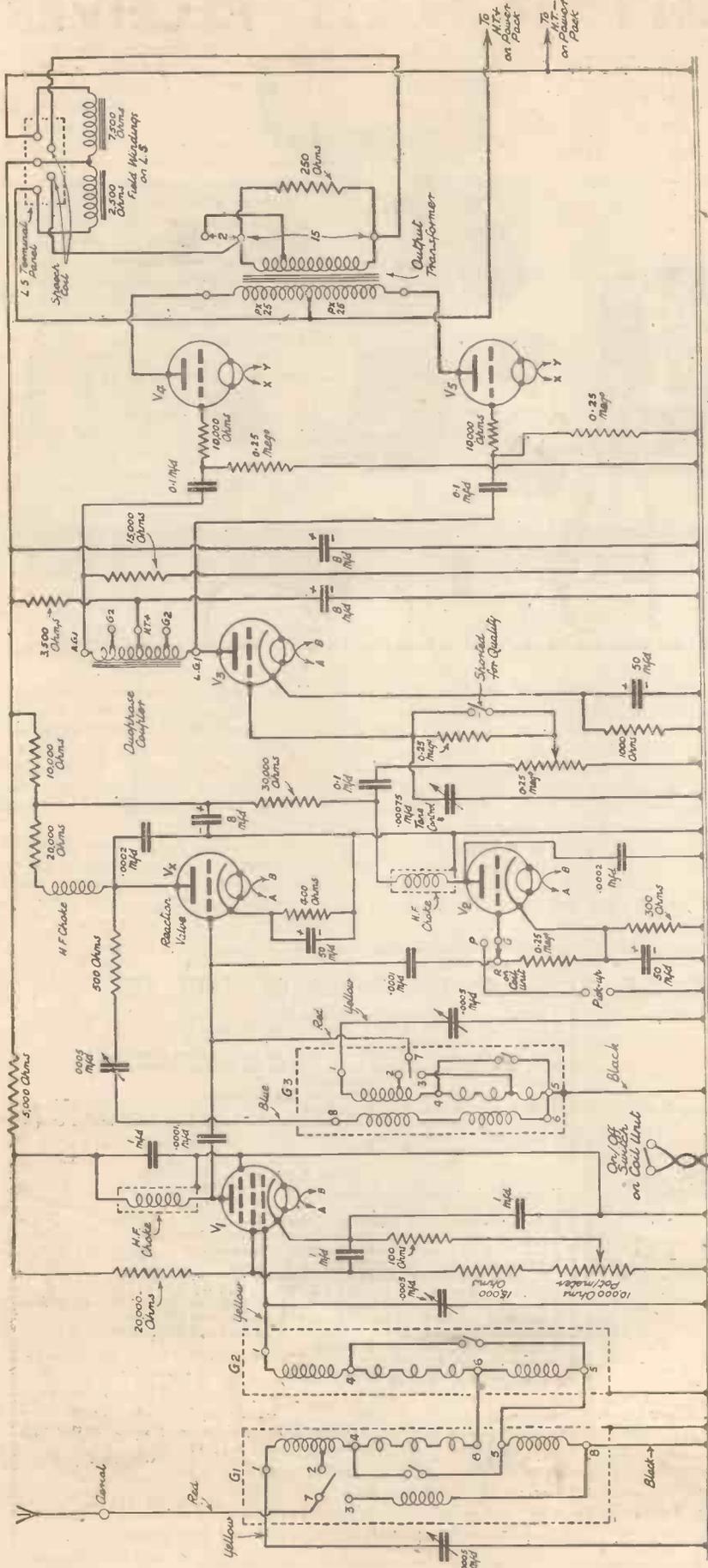
- 2 Marconi or Osram, type U.14.

LOUDSPEAKER

- Haynes—Senior Standard Model, Fields 2,500 and 7,500 ohms.

A SUPER QUALITY 14-WATT RECEIVER

(Continued from previous page.)



How the circuit of Mr. Scott-Tangart's 14-watt receiver is arranged. Note the two output triodes in push-pull and the separate reaction valve.



A Separate Speaker Simplifies Matters

When there is some sort of rattle, or similar defect, on certain notes, or when the volume gets beyond a certain strength, you are nearly always left in some doubt at first, at any rate, as to what the cause of it may be, and the separation of the loudspeaker simplifies things enormously. The problems of obtaining really high-grade quality are sufficiently difficult to solve in themselves without our being confronted by a score of peculiar mechanical vibration effects which may arise when the speaker itself shakes the whole cabinet, which it certainly will do inevitably if everything is contained "under one roof."

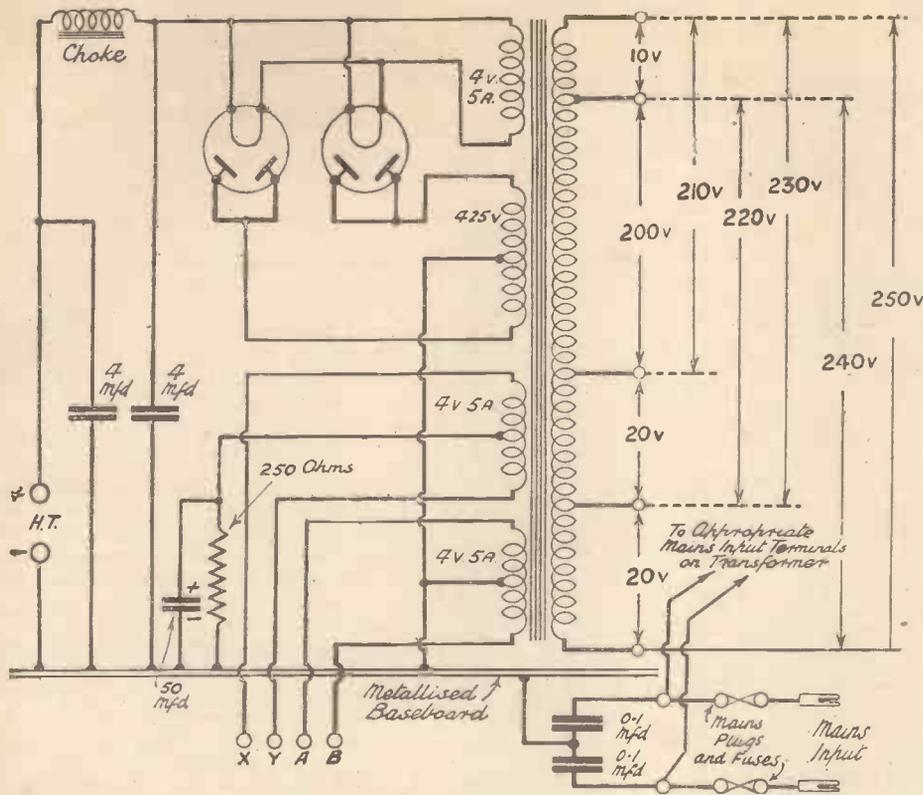
The common practice of having the

speaker combined will only fit into certain parts of the room as a rule. Such a combined arrangement will necessarily be of large dimensions, so the problem of fitting it in becomes much greater than when dealing with a small set which can be conveniently placed almost anywhere. There are, however, technical reasons of great importance why it is desirable to keep the loudspeaker separate from the set itself. In the first place, you can provide the speaker with an adequate baffle. You can have a baffle-board of as large a size as possible fitting into, say, a corner of the room, or you may fix the loudspeaker into the wall, especially if the other side of the wall forms part of a passage or corridor where the sound of radio does not matter.

One of the best methods is undoubtedly to fit the speaker into a special cabinet with padding to prevent box resonance. A Howe Box Baffle may be recommended.

When you put a loudspeaker in a cabinet intended to take the radio receiver, you are always faced with the difficulty of "cabinet resonance," the air in the cabinet at the back tending to produce "boom." The actual cabinet itself will also vibrate, and this will be communicated to the receiver and very likely produce microphony. This may arise only on certain notes, or when the full volume of the set is being given. The valves themselves may vibrate, and the microphony effect will vary with the mechanical structure of the valve and the natural frequency of vibration of the mechanical structure of the valve. Components and cans may rattle. This sometimes produces an electrical effect, and a microphonic howl or distortion may arise by the vibration altering the frequency of local oscillations generated in a superheterodyne receiver.

There is no doubt that the best thing to do is to remove the speaker from the receiver and then these troubles vanish, or are made so improbable as to remove any anxiety.



of the H.F. pentode, you will obviously be altering the reception conditions. The set may even oscillate, and even if it does not do this the amount of reaction will vary for several reasons. The logical use of the variable-mu grid-bias potentiometer is to prevent overloading of the radio portion of the receiver, and for improving selectivity. Having once tuned-in the signal to give good results, it is best to vary volume by altering the input to the audio-frequency amplifier. A convenient way of doing this is to set a potentiometer at the beginning of this audio amplifier and so control the input voltages. The conditions for best reception will remain constant on a given occasion, but you may be desiring to turn the volume up or down according to the nature of the programme being received or because you wish to speak to someone in the room, or because of some other reason. The alterations in volume by adjusting the input to the audio-frequency amplifier does not, of course, interfere with the radio receiver at all.

Controlling The Tone

A tone control is a highly desirable feature of any receiver, and naturally it is fitted to this particular outfit. A tone control is useful both for cutting down needle scratch if the amplifier is used for electrical reproduction of gramophone records, and also for reducing miscellaneous high-note interference when receiving a distant broadcast station.

The operation of this high-power receiver calls for very little comment, and there is no aerial coupler and ganging employed. An aerial coupler is not used because it would alter slightly the capacity across the first tuned circuit and would therefore put the set out of gang. The high-frequency input to the set is controlled by the variable-mu grid-bias potentiometer, and when you desire maximum selectivity you increase this bias, thereby reducing signal strength, and bring up the signals by the application of reaction. This process should be carried out with the audio-frequency volume control kept sufficiently low to permit you to notice the volume variations. Excessive high-frequency input will cause over-

(Please turn to page 360.)

The circuit of the power-pack is perfectly straightforward. It will be seen that two full-wave rectifiers are used.

loudspeaker in with the set is due no doubt to the objection of the average member of the public to wires "trailing all over the place." The completely self-contained set is so obviously the ideal from the point of view of different members of the public, that manufacturers have catered exclusively, or almost exclusively, for this type of person, although from a technical and convenience standpoint the separated loudspeaker has nearly all the advantages. The disadvantage in the present set is that a group of well-insulated wires must go to the loudspeaker, including the wires going to the field of the speaker.

The complete outfit consists of two chassis, one containing the receiver and amplifier, the other the "power pack," which supplies the current at the right voltages for the various parts of the outfit. Many constructors will already have cabinets which they wish to use, and provided they arrange the two packs so that there is no hum produced through their incorrect juxtaposition, little harm can come from the constructor using his own cabinet. If the loudspeaker is put into the same cabinet the constructor is faced with the various problems which I have just been discussing. It may be perfectly successful, but on the other hand, there may be trouble.

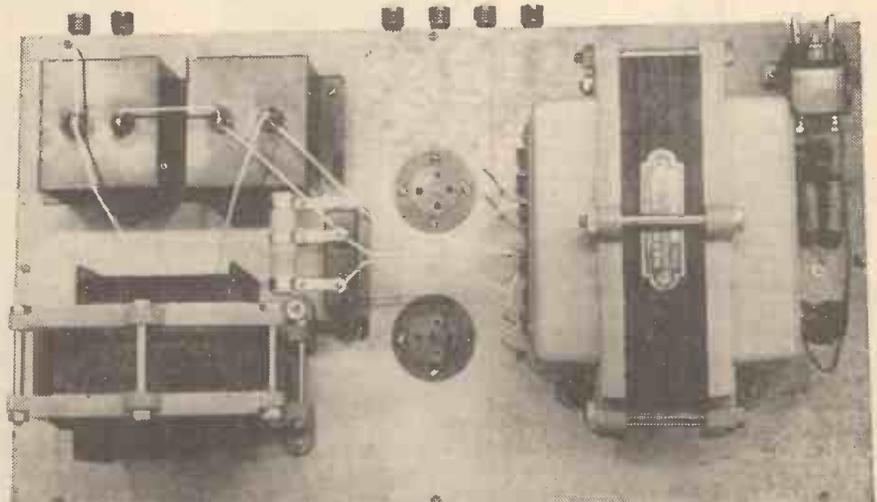
Provision For a Pick-Up

Naturally having such an excellent amplifier, the average constructor who decides to build this set will probably also want to play records, so provision is made for pick-up terminals. An automatic or even plain electrical gramophone may be mounted above the receiver in a cabinet with the power pack on the bottom shelf. The speaker, of course, is separate.

There are two ways of varying volume for radio. One is the variable-mu bias

control potentiometer and the other is the audio-frequency volume control. This latter would be used for pick-up control purposes, but there is a reason why it is also very useful for controlling signal strength when receiving radio signals. When you vary bias on an H.F. pentode, in a straight receiver particularly, you are varying the operating conditions of the set and affecting what may have been the best adjustment for quality or selectivity. Take, for example, the case of the reception of a distant station with reaction. You will have set the variable-mu bias control potentiometer to a certain value and applied anode reaction to give you the required selectivity. If now you desire to vary volume and you alter the grid bias

THE POWER-PACK IN PLAN VIEW



The power-pack unit has been designed to give an abundant supply of hum-free current. The simplicity of its construction can be well gauged from this photograph.

THE DIAL REVOLVES

By LESLIE W. ORTON

A STATION WORTH CHASING

Thrills on Broadcast Bands :: Amateurs On Twenty Metres
North Pole's Schedule

BY the way, I heard a "wow" of a broadcast the other evening. It was emanating from somewhere in North America. Unfortunately the call was indistinct, and though it sounded like 2Z (may have been VO2Z), nothing short of a lynx could have told for sure! When tuned in the station was calling "Tom." "I'm also running an 80-metre transmitter," the operator informed us, "to enable the wives of trappers to talk to their husbands. Sometimes they are parted for five or six, or even eight, months, and this link is appreciated."

At this moment Drama, with a capital "D," stepped in: "Hold on for ten minutes—motor running down!" excitedly announced someone, then the station faded as completely as a "quid" in a fair-ground!

Ten minutes elapsed and then, like a lark, 2Z (?) took the air again and continued the programme.

Now then, all you sons of the Dials, don't envy my reception, go and do likewise. For here's great news, 2Z (?) takes the air on 20 metres around 7 to 7.30 p.m. every Sunday, calling trappers of the North, and maybe Rin-tin-tin!

VK2ME Disappoints

The broadcast bands have provided plenty of thrills for those searching for them. Radio Nacional de Espana on 28.2 metres was heard at wonderful strength the other day when some sort of speech-making was in progress. One fellow was extremely amusing, and did I laugh? I should say so! And why not?

Baritone songs greeted me from VK2ME, Sydney around mid-day the other Sunday. Volume, however, was disappointing. More thrilling was a station calling Paris on about 24 metres. Its call sounded like Hankow.

Oh, by the way, don't forget to, pay a visit to the 40-metre band. Many mysterious Spanish stations, as well as batches of British and Continental amateurs, are there to greet you. A trip to the 49-metre band is also well worth while these days; W8XK, W3XAL, and scores of Latin-American stations make one feel as if on a world tour!

They're Tough!

They're tough, mighty tough, in the North—at least they were the other morning when the majority of stations tuned-in on the 20-metre band emanated from the land of rolled oats and "R's"!

GM5ST was calling VE2CA; GM8CM, W4BQE, and GM6JH near Edinburgh, GM8AG and GM2JS (North Scotland) were chin-wagging with "hams" nearer at home.

But though our Scotch friends had things their own way, they by no means had the band to themselves. GI2CC at Ballygally was a particularly powerful signal. Gee, how I envied the operator his way of pronouncing "Ballygally"—he rolled it off his tongue with the same ease that my cat swallows a lump of meat! G8NK,

G8FM, G5JN, G5MI, and, for variety, LA6N, also romped in like so many two year-olds.

Between 7 and 9.30 p.m. appears to be the best times to search for the "Yanks." Though my log is nothing to write home about it isn't too bad, including W1TW, W1GLW, W2VAU, W3PJU, W8OG, W8TRV and many others.

At this stage I should like to introduce DX'er Bill Coleclough of Ealing to you. With a roll of drums he has come into action after seeing some of the spectacular logs sent me by readers. His first barrage scores many hits including VP6YB, K4BDS, CO8MA, HK1EP, VK2XU, VK2HS, VK3GU, VK3ZZ, VK3PL, VK4JU, VK4AW, W5ZA, W5AXA, W6AM, W6JJU, W8OUG, W8CKC, W9QI, W9SAA, NY2AE, VO6L, VO6D, ES5D, TS3P, CN8MB, YV5AA and YV5AB.

Latest News

From America we learn that several new stations have taken the air. First we



Colombian broadcasters offer good entertainment from 11 p.m. onwards.

have H11L at Santiago de los Caballeros, Dominican Republic, on 46.2 metres, then ZPI4 at Villarica, Paraguay, on 51.4 metres, and TI2H, San Jose, Costa Rica, on 51.6 metres—all well worth searching for.

XGOA, Nanking, is reported to be relaying XGOA from 12 p.m. to 3 a.m. daily on 30.6 metres. I've listened and listened, but to no avail! By the way, UPOL's (North Pole station) latest schedule is given as from 7 to 9 p.m. daily on 21 metres, whilst PRF5, Rio de Janeiro, has been heard on 19.9 metres—so don't blame me if you don't pull in something worth while, there's plenty going!

Short-Wave Station Identification

By F. A. Beane

MORE NEWS FROM LATIN-AMERICA

ALTHOUGH I have "combed" the noisy 40-metre amateur band methodically, night by night, I have failed to reveal any additional Spanish War stations other than those already "introduced." EA1DD, of the 26th Division, Aragon Front, which made a powerful debut on 40.4 m., has "owing to special circumstances" had a break in its programmes, but will shortly resume its activities of etheric warfare and, in a letter, promised to call me during the course of their English broadcast at 21.30 G.M.T. However, up to the time of writing there has been no sign of the station, undoubtedly due to the fact that it is actually operating in a war zone!

The Dominican Republic

This diminutive Republic has taken up the challenge of Cuba and Dominicans are popping up on all wavelengths, or moving from one situation to another, or altering their slogans. At the moment there is an unidentified newcomer in the vicinity of 32.5 m., HI4V on 46.27 m., HI9B on 49.59 m., H11L on about 46.2 m. and finally HI5N on 48.8 m., all being well heard practically any night. HI9B may be heard at about midnight favouring its English audience with numerous English announcements, and is in Santiago.

H11L is the Republic's latest addition to the ether, and as its call is very similar to that of a station which used to operate on approximately 46.15 m.—H11L—I am wondering whether it is really the latter with a new call and location. To hear H11L one should listen on a wavelength slightly above that of YV4RB, Valencia, from about 22.30 when it frequently presents a strong transmission. As Dominican Time is 4 hours 40 minutes behind G.M.T., the full call is generally given

at the hour by their time, i.e. at 22.40, 23.40, 00.40 G.M.T., and so on. H11L generally announces in both Spanish and English each quarter hour, or in other words at 22.40, 22.55, 23.10, 23.25, and so on. Four chimes herald the announcement "H11L, Emisora Nacional el Diario, Santiago de los Caballeros, Republica Dominicana," which is followed by the abbreviated equivalent in English, "Short-wave station H11L at Santiago City, Dominican Republic, West Indies." Another feature is its frequent mention of "Casablanca," but why I cannot say.

Just below the mighty W8XK (48.86 m.), now heard from about 21.30, on 48.8 m., will be found a Dominican in new guise, viz. HI5N. Like Columbus, I claim to have taken part in the discovery of Dominicana, or at least in solving the HI5N mystery and controversy a year or two ago! At that time HI5N came on the air regularly at 23.40 with the "Merry Widow" waltz, and I well remember sitting up night after night in an effort to determine whether it was HI5N or 5M. I sent in my report to Santiago, and a brilliant QSL, sent as verification, settled the matter—it was HI5N! But now, however, it has altered, even to the extent of moving to a different city! The other night I picked it up at 23.27 and observed that it now employs 5 chimes and announces at the hour (23.40) in English as "Short Wave station HI5N, in Moca City, Dominican Republic" and in Spanish gives its slogan as "La Voz de Moca," while subsequent announcements are generally interspersed with 4 or 5 chimes. At 00.47 HI5N left the air after playing the Republic's dignified national anthem and bidding its etheric audience "Buenos Noches."

ON THE SHORT WAVES

THE ONE-VALVER IN DETAIL

By W. L. S.



If you want to see how two sets of (apparently) identical design can vary in performance, put a couple of single-valvers side by side. They have nothing in reserve; slight losses in the detector circuit can't be hidden or compensated for by turning up a volume control. If a single-valver is good, it can be very, very good; if it's ordinary, it's just passable; but if it's bad it's absolutely useless.

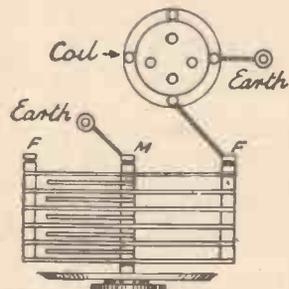


Fig. 1. This method of connecting the moving vanes of the condenser and the earth side of the coil is not to be recommended.

BAD

Some years have elapsed since I started boosting the single-valver as the ideal set for a novice. I had misgivings at the time, but everything turned out all right, and I proved that it was possible to make a "one-lunger" so good that you didn't need anything else to receive all that was going. What did I get? Hoots of derisive laughter! But as that came mostly from people who had built single-valvers and couldn't hear anything at all on them, I didn't worry unduly.

I had three sets of my own on the bench at that time, I remember, but the finally hotted-up single-valver turned out so well that I gave them all the sack and stuck to one valve for all my own work for over a year. I even used it in conjunction with my transmitter, and found that I wasn't missing any calls. If anyone could hear me, I could hear them—even on my "childish toy" of a set.

Since then I have used single-signal supers with twelve valves and almost every conceivable type of set, but I still have a single-valver handy, all ready wired up, and if there's an extra noise on the air any time I invariably go over to this quiet little set and make the best of a bad job.

Now, what makes a one-valver good or bad? There's so little in the circuit that it can all be narrowed down to one thing. And that one thing is the life and breath of the receiver—its tuned circuit. Between the grid condenser and the filament of the valve you have a coil and condenser. The

goodness or badness of the tuned circuit which they comprise determines the performance of the whole set.

In how many ways can this circuit be made bad? Let us consider them one by one: It has to tune sharply—which means that its losses must be low. The D.C. resistance of the coil must be low; it must be free from dielectric losses, and so must the condenser; the circuit must be free from damping.

If you go out of your way to get an efficient coil and an efficient condenser, you must obviously connect them together in the most efficient way, and not by means of wires which run all over the baseboard, "calling in" at other components on their journey.

Figs. 1 and 2 show you how to go wrong over this. In Fig. 1 you rely on the conductivity of the baseboard and on two unnecessary joints. In Fig. 2 you are still worse off, through making one connection on the baseboard and the other on the

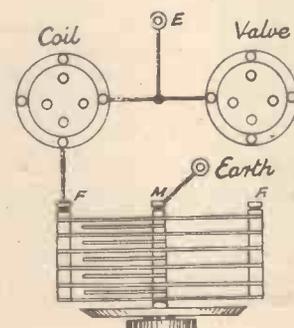


Fig. 2. Here is another bad method, the conductivity of the baseboard again being relied upon.

BAD

"earth" terminal. Fig. 3 is the only sensible way of doing the job, by having direct connections and by earthing the bottom end of the coil by the shortest possible route. If the condenser is also earthed by way of a metal panel, so much the better.

The main thing is that the leads should be short, of heavy wire, and linked to the components with good connections. The next most important thing is that they should be as short as possible. Put in a couple of long leads there, and you have to subtract that much wire, so to speak, from the coil, to make it tune to the desired wavelength. You want as much wire in the coil as possible, for efficiency's sake, so don't waste it round and about the baseboard.

We all use good coils and condensers nowadays, so I can take that point as read. This damping business, though, needs a

few words. How can you introduce damping into a tuned circuit? One excellent way is to put it too near a metal panel or screen—so don't. Another way is to clip a long aerial directly on to it, thereby killing the tuned circuit off to such an extent that you can't even make it oscillate. Couple your aerial as loosely as you possibly can; preferably by using a six-pin coil with a separate aerial winding, but, as a substitute, using a four-pin coil and putting a very small capacity between the aerial and the top of the coil. If you use a neutralising condenser, don't imagine that it should be screwed in to maximum capacity; use as little capacity as is consistent with reasonable signal strength.

Even if you use a three-winding coil, don't imagine that you have taken the necessary precautions. Use a small condenser in series with the aerial winding, or its coupling may be such that the damping effect on the grid circuit is too high.

So much for the tuned circuit. What of the other points in the detector circuit? Don't forget the grid leak. It is customary to stick to the good old conventional value of 2 megohms, but if you find that a 5-megohm leak gives you smoother reaction then use it by all means. Smooth reaction is desirable above everything else, once you have a tuned circuit that really works. Once you have got the grid leak right, you can improve your reaction by getting the H.T. just right, and by finding the right kind of H.F. choke or resistance to go in the anode circuit of the detector.

Most short-wave chokes sold to-day seem to work well on all the wavebands you

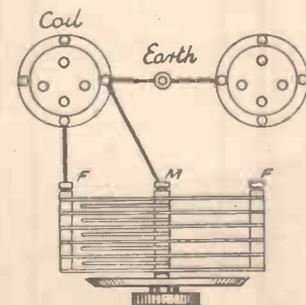


Fig. 3. The best way of arranging the earth leads, viz., by direct wires

GOOD

will want. If reaction becomes smoother when you substitute a 5,000 or 10,000-ohm resistance for the choke, use it.

The reaction condenser should be as small as possible. If, when using the usual .00015, you find that you need not have it set above about a quarter-in to produce oscillation, then go in for a smaller one.

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Reviews his Correspondence

NOTHING seems to stop readers from pouring out their troubles to me; and because of the kindness of my heart, nothing will stop me from trying to help them. Sometimes I hit the nail on the head, as proved by the nice letters of gratitude that come back. Sometimes I drive a despairing reader into a slough of despondence by telling him that he *must* have done something careless in his set, and that I can't possibly help him till he finds out what it is. Always, however, I have the feeling that readers are nice, friendly people.

This being so, I hope that those who have written to me recently will not mind if I shelve their questions for a little while and get something off my chest. I make the apology that it is getting near Christmas, and one is allowed to do all sorts of unusual things at Christmas. (Think of the mistletoe, for instance!)

Things that Readers Write About

So this is by way of being a large-scale review of the kind of things that readers worry me over. You, Mr. Pillworthy of Wigan, and you, Mr. Radiobasket of Little Wallowing (I hope there aren't two such people!) may recognise yourself, but don't worry over that.

Well, strange though it may seem, the vast majority of my letters are just from enthusiasts who are bubbling over with the excitement of short-wave reception, and are longing to tell someone about it. I don't always reply to them individually, because their letters don't need replies.

Next in order come readers who have made some set or other, and have got it working. They don't think, however, that it can be going properly, because they have never yet heard So-and-So on it, and they see in "P.W." that he comes in well every night. In most of these cases I imagine that their sets are working perfectly well and that they are expecting too much from them. The only reason why they don't hear So-and-So is that they are not looking at the right degree on their condenser dial at the right time!

Also, you'd be surprised at the number of readers who, I am convinced, never bother to stop and listen to anything that is weaker than about R 5. All the super-DX signals are liable to be very weak—at any rate for the first time you pick them up. When you get used to them and start tickling the old set up a bit, then they will start to become stronger, and you'll tune them in with the familiarity that you formerly reserved for W 2 X A D and Co.

The Unlucky Ones

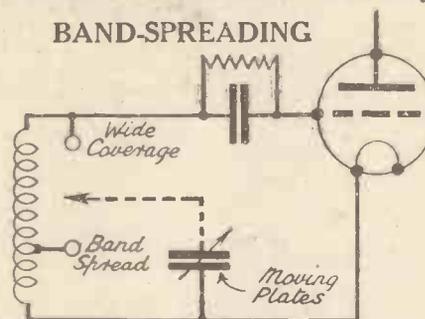
What of the third class of readers? Well, I'm afraid they're the unlucky ones. They have built a set, and (a) they can't get a sausage; or (b) they have only succeeded in hearing Zeesen; or (c) it plays all sorts of fiendish tricks, such as oscillating like a steam-engine on some wavelengths and packing up on others.

It is my regretful duty to inform the world that these readers are nearly *always*

the victims of their own carelessness. They do something silly in their wiring; they use a valve that dates from the year dot, assuming that because it's all right in a broadcast receiver it's going to be all right on short waves; they whizz round the dial like one of those fortune-telling slot machines, and grumble because they *say* they don't hear anything. Actually, of course, they hear everything that's going, but they can't spare a second to stop and listen to any of it. Fantastic, I know, but too true! I've seen (and heard) them at it.

Never yet have I had a letter from a reader in a difficulty which has eventually been tied down to an error in design or to a mistake in any way. (And that isn't blowing my own trumpet. If I *did* make a mistake anywhere it wouldn't get past the eagle-eyed staff of "P.W.")

Then, lastly, come shoals of letters asking for information of all kinds—sometimes not even on subjects remotely connected with short waves. When they



How to get the advantages of band-spreading without going in for two separate tuning condensers. Further details are given in the text.

concern points of design, new stations on the air, amateur procedure or subjects like that, I can generally answer them on this page, and the answers often prove of interest to other readers as well. Sometimes, as you will have noticed, I have to hand on the baby to those other readers and see whether *they* know the answer.

Taking them all in all, I find that readers are a wonderful crowd, and that they help each other in the long run. One puts up a query to me, another tells me of some experience of his which helps me to answer the other man's query—and so it goes on.

Don't be afraid of writing in if you're in any difficulty at all; but please remember the golden maxim and keep your letters *short*. And if you ask queries, please *ask* them—right away—without making me read through an eight-page letter to find out what your trouble is. Do this, and I shall love you all the more!

This week's sketch is in response to a reader who wanted to know how to get the advantages of band-spreading without going in for two separate tuning condensers. It shows one of the best known and least used methods—that of connecting the condenser to a tapping on the coil instead of across the whole coil. The standard Eddystone coils, used this way, give a nice wide spread on the amateur bands. The 22-47-metre coil covers "20"; the 41-94-metre coil covers "40," and so on. If you want to cover other particular bands, you will have to wind the coils accordingly, by hit-and-miss methods, until you have got them just right. You can choose your tapping point to give as much, or as little spread as you like.

The normal position for general use is a point about a quarter of the way up the coil.

Short-Wave News

CONDITIONS are still what I call "embarrassingly good." There are so many stations coming over at all times of day, on all bands, that one just doesn't know what to do about it. The 10-metre Yanks have now become so numerous that on a good Sunday afternoon it is a sheer impossibility to tune-in one of them who isn't almost heterodyned out of existence by at least two more!

These spells of good conditions have a two-fold effect. Not only do the regular stations come in more strongly than usual, but also hundreds of others, who have heard how good things are, brush up their gear and decide to get on the air and share in the fun. And *what* fun they make of it!

I, personally, shall be heartily glad when conditions tail off a little; not that I want them to be bad. But when they're as good as they are at present, you can almost hear a man twiddling an automatic cigarette-lighter in New York, and it becomes perfectly obvious that there are far, far too many stations on the air to-day.

Difficult States to Get Hold Of

How's the "Heard All States" effort going? I heard thirty-four of the forty-eight States during a Sunday afternoon's listening, on 10 metres *only*. Difficult ones to get hold of are Idaho and Montana (7th District); Nevada and Arizona (6th District); New Mexico, Texas and Oklahoma (5th District). Most of the 9th District stations seem to be in Iowa, Indiana and Illinois, leaving North and South Dakota, Nebraska and Colorado somewhat scarce.

Nevada *can* be heard, if you're lucky enough to spot W 6 B I C. Arizona I have heard in the person of W 6 G Z U. Oklahoma is pretty easy, with W 5 A F X and W 5 E H M. It's easy enough to get 34 or 35 of the States, but the odd dozen means spending an awful lot of time on the job.

Readers, at last, seem to be getting interested in the 80-metre band. Some of them find it at least as interesting to listen to British stations working up there as to bag innumerable Yanks on the DX bands. I have been working on "eighty" for several weeks now, and I find that it is a really interesting band, with a set of conditions of its very own. "Flutter fading" is not unknown up there, even over short distances. Selective fading and phase distortion sometimes play havoc with stations that are modulating very fully.

Less Interference on 80 Metres

It is possible, however, to do anything on 80 metres which can be done on 40 metres (I mean at the present state of 40 metres) and there's far less interference. Half-a-dozen readers have spotted my carefully veiled identity because of a chance remark I happened to make on 80 metres, which proves that there must be quite a lot of listeners up there. If you can't cover that band, wind yourself—or buy yourself—some coils and get up there right now.

W. L. S.

YOU MAY BE A B.B.C. SAMPLE SOON!

One of the big difficulties with which the B.B.C. is faced is that of finding out what listeners really want in the way of programmes—the kind of plays they like best, and so on. This is what Mr. Silvey of the B.B.C. is trying to do; and most of you will agree that it is some job!

By ALAN HUNTER

LET us suppose, for a nightmare moment, the B.B.C. really wants to discover what you, as a listener, really wants. How could they find out? Take an eight-million census, maybe, or make a house-to-house canvass so as not to miss *you*?

It couldn't be done, of course. The expense would be even more than that of a series of Toscanini-conducted Queen's Hall concerts—colossal, in other words.

It *wouldn't* be done, either. Being an Average Man you just hate filling in forms even when you have to. And as for the canvasser, well, being from the B.B.C., he would be much too much of a gentleman to put his foot in the door, which would probably be slammed in his face.

So, you see, it is one thing to dream of the B.B.C. asking you what you want—but quite another to find a way of contacting you direct, in person, *en masse* and as the crow flies.

About Letter-Writing

Of course, you could write to the B.B.C. Perhaps, in a moment of unendurable spleen, you have already done so. With what result? A polite acknowledgment—probably much more polite than your letter, what?—and that's all.

Or if the B.B.C. feels particularly waggish that week, your letter may appear in the "Radio Times" above or below another listener's letter saying just the opposite. For in this subtle way the B.B.C. has often in the past sought to prove public tastes cancel out.

Much more likely—again assuming you are that non-existent but convenient entity the Average Man—you just haven't done any letter-writing but have malevolently tuned-out the B.B.C. and tuned-in Luxembourg, just to show 'em.

No doubt, with the passing of years, you have come to the conclusion the B.B.C. is as inscrutable as the Sphinx—but not nearly as excitingly mysterious. It has been rather high-hattish, but *all that is now changed*.

Listener Research has come into being. Has, in fact, been in existence for a year. The B.B.C. has taken on the services of a high-powered statistician, by name Mr. R. J. E. Silvey. He's researching on you—and me—to find out what we like, and don't.

Now this young man—he looked very young when I met him, anyway—is well primed in the elements of his somewhat mystical calling. At the same time he is on guard against coming to conclusions that are statistically absurd.

He tells the story of the American statistician who, wanting to find out the nature of the Average American Citizen, did a lot of research work and came to this conclusion: age, 27 years; height,

5 ft. 7 in.; fair hair; blue eyes; married; three children—two white and one black.

But he does not agree with Mr. Shaw, who is alleged to have coined this epigram: "There are lies, damned lies—and statistics." Nor does he believe, as many unversed in the science do, that statistics can be made to prove anything, meaning nothing.

No, Mr. Silvey, of B.B.C. Listener Research, sincerely believes that, if statistical research is properly carried out, it is possible to find out what listeners like and dislike. And that, in brief, seems to be his job at the moment.

As he explained, a nation-wide census would be out of the question. But he suggests it is unnecessary, in any case. Just as accurate an idea of what the public wants can be found, he says, by applying the technique of Sampling.

A Representative Sample

Now sampling is no new thing in market research work. It is a method of discovering the characteristics of masses by taking a representative sample. With, of course, the accent on the highly operative word "representative."

He goes on to suggest that the tastes of eight millions can perfectly well be judged from as few as 2,000. First, the statistician decides what degree of accuracy he desires—and then he takes a number big enough to give it.

This is known as the quantitative side of sampling. But the qualitative side must also be carefully dealt with, otherwise it would be quite possible for as many as half a million to give an entirely wrong idea.

Obviously, only one aspect of the programmes can be "researched" at a time. And that is why various Panels have been formed. Over 9,000 listeners have co-operated, for example, in the Drama Panel, the first of a series of such voluntary advisory bodies.

Each member has to fill in B.B.C. questionnaire forms and the answers are



John Watt and R. J. E. Silvey (standing) have certainly got a big batch of post to tackle here. It is the result of John Watt's invitation to listeners to help him by keeping Variety Logs.

carefully sifted by Listener Research to find what changes are desirable in the presentation of radio plays, in the type of plays, and so on.

A Cinema Panel has likewise been co-opted—and here the results will prove, so Mr. Silvey says, what sort of talks we want on films, and who are the most popular talkers.

So much for the Panel system, which is likely to be extended to other departments. Meanwhile, the Barometer Method has been introduced as yet another way of gauging listener tastes. This idea is being tried on Variety.

Mr. John Watt, you may remember, appealed for 1,000 listeners to keep Variety Logs. Over 47,000 responded to the glad hand Mr. Watt extended. No doubt which type of programme most people like—or which is most in need of improvement!

But did Mr. Silvey use all 47,000 as a useful cross-section of public taste? Not a bit of it. That wouldn't have been a bit statistical! Instead, he selected only 2,000 from the total number and—being a statistician—is quite sure that is enough for the job.

Well, this is all very fine in its way. But it obviously has one glaring weakness, apart from any difficulty you and I may have in believing in the sheer statistical truths of the matter. And the weakness is that, as the B.B.C. asks you impersonally, you have to take the initiative, and—small point, perhaps—sit down and write a postcard, paying for the penny stamp.

Scope Limitation

Now many believe—I myself don't, let me hasten to add—that only cranks ever write to the newspapers, and only real lunatics to the B.B.C. Mr. Silvey dismisses this taunt as quite absurd, regarding an inclination to write to the B.B.C., at least, as a sure sign of normality.

Still, to use his phrase, the present methods do limit the scope of the research (Please turn to cover iii.)

S.T.900: THE RECORD BREAKER

BIRMINGHAM AMATEUR RECEIVES AND IDENTIFIES 410 STATIONS

Further Weekly Reports from Mr. Leslie Perrins

Week ending Nov. 13.

Dear Sir,—Although conditions during the week under review have been extremely poor on the short waves, the S.T.900 has pulled through with flying colours.

As you will see by the following detailed programme report the Americans have been received amazingly well under adverse conditions. On Mon., 8th, I gave a demonstration to a "P.W." reader, and an S.T.800 owner (C. Ward, 1/54, Gerrard St., Aston), who had come through the pouring rain to hear the wonderful 900. Before leaving home he tried his 800, only to find the conditions very bad. He was therefore amazed when I pulled in the following: 8.30 p.m., 40 m., Bilbao at full loudspeaker strength. Talking in English about the methods of the Spanish Government killing their own suspected soldiers to prevent desertion. At the conclusion the announcer fairly shouted "Vivo la Franco!" and then followed the Nazi anthem with news in German.

8.55 p.m., San Sebastian, also at full loudspeaker strength, giving Franco war news in English. 9 p.m., 49 m., O E R 2 Vienna; L K J Jeloy, and O L R 2 A Podebrady, all at full loudspeaker strength. 9.10 p.m., received 25 med. wave stations between 300 and 550 metres at full loudspeaker. As my demonstratee remarked, one could follow the "World Radio" list of stations down and hear each one clear of one another on the 900, and with amazing ease of tuning. Among those received were Budapest, Athlone, Vienna, Brussels 1, Rabat, Sottens, Marseilles, Lwow and Poznan. I also separated Toulouse from Hamburg—a great feat here in Birmingham—and got Poste Parisien and Bordeaux Lafayette clear of Midland Reg., and Luxembourg and Hilversum 1 clear of Droitwich without the use of the Triple Extractor. He, as all other "P.W." readers who have visited me, does not consider the coil changing a bugbear, especially as he has had several unfortunate experiences with all-wave coil units due to switching.

9.30 p.m., 31 m., W 2 X A F Schenectady, at good loudspeaker. O Z F Skamlebaek, at good loudspeaker, and E A R Madrid, at full loudspeaker. On Tuesday, Nov. 9th, the musically-minded members of the family were insistent on hearing the Symphony Concert at Strasbourg if the 900 could get it? So at 8.30 p.m. I set the main tuner to the original marking of this station on my dial and brought into tune the aerial balancer, and in came Strasbourg (weak) making the opening announcement. I then applied a little reaction, and could the 900 get Strasbourg! By a slight amount of anode reaction and adjustment of tuners, we enjoyed the Strasbourg Symphony Orchestra and Choir giving "Rosamunde" Overture and Prelude, "The Mastersingers" till 10.30 p.m., with hardly any fading at full loudspeaker and no interference. Wed., Nov. 10th, listened to 31 m., D J A Zeesen, at full loudspeaker at 7.30 a.m. Station orchestra and a talk in English on "Hitler Youth Movement" till 8.15 a.m., when I have to go to business.

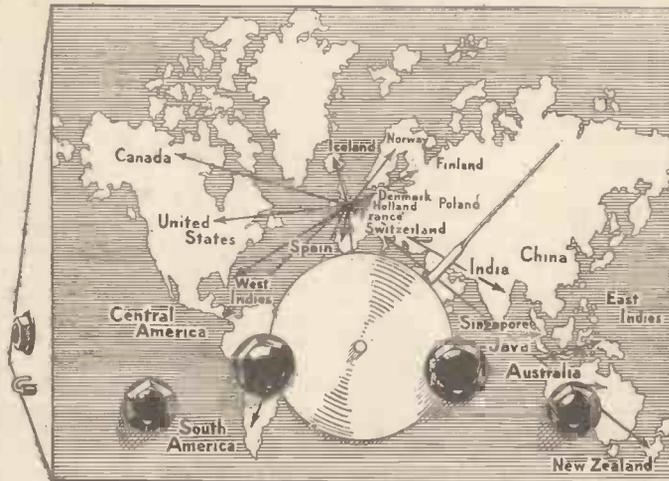
At 10.15 p.m., W 2 X A D Schenectady, at good loudspeaker on 19 m. A talk, "Instruction on Football." 10.30 p.m., Jack Armstrong "Wheaties" programme. W 3 X A L Bound Book, at full loudspeaker on 16 m., giving vocal trio "With a Banjo on My Knee," "Roll Along, Covered Wagon." 11 p.m., W 1 X A L Boston, at full loudspeaker, 25 m. Christian Monitor News by C. Morris, announcer, 11.30, W 2 X A F, 31 m., News from Press Radio Bureau. Thurs., 11th, listened to the Home Programmes Remembrance Day.

Fri., 12th, gave a short half-hour demonstration to another S.T.800 owner. He was amazed at the ease of operation of the 900 and the results obtained. W 1 X K Millis, on 31 m., at loud loudspeaker. Music Box

G M 6 R V, G I 5 W D Portrush, F 2 C M France, G 2 U T, G 6 S W, G 8 F V, E I 4 S Ireland, G 6 V Q, O N 4 L O Belgium, G 5 N A London, G 5 L L, G 8 M D, G 8 O K, O L 4 I W, G 2 I L Southampton, G 2 T U, G 5 I F Torquay, G 8 W P, G I 2 C C (Mills Bros. record of "Tiger Rag"), G 5 X G, G 2 Y H, G M 6 S R Edinburgh, and G 8 F P; all at loud loudspeaker—some extremely loud. Most of these fellows complained of the bad conditions of the week and none claimed any long-distance contacts.

Thus the S.T.900 has won through with flying colours, bringing in stations under decidedly adverse conditions from the other side of the earth at good loudspeaker strength and separating them from the powerful "local" short-wavers.

JUST PICK YOUR COUNTRY



With its "X"-reaction and no-gap waverange there is no country in the world that does not come within the scope of the S.T.900. Never was the term "world-wide" reception more truly upheld in either commercial or home-constructor design.

410 STATIONS IDENTIFIED

Week ending Nov. 20.

So far, within a period of five weeks, I have heard and identified 410 stations, consisting of 15 long wave, 98 medium wave, 85 broadcasting short wave, and 212 amateur short wave. I have heard the nine districts of U.S.A. on the 20-metre band alone, and I am very proud to think that this has been done on an "all-wave" set. I am confident that no other "all-wave" set is capable of such results, and although I have recently handled some dozens of up-to-date, well-known makes, none has given the results obtainable on the S.T.900.

The "X"-reaction works perfectly, and all who have called on me to hear this set agree that the results obtained by the use of this simple control are miraculous. A fellow-"P.W." reader from Wolverhampton (an owner of an S.T.800) was simply astounded at the way in which the S.T.900 brought in stations on all wavebands. He remarked that the set is alive all over the dial on any coil, and yet all the stations are received clear of one another. He was particularly impressed by the fact that Poste Parisien and Bordeaux Lafayette are receivable without a trace of Midland Regional, and without the extractor. Also Luxembourg and Huizen clear of National, although these B B C. stations are only 18 miles away.

I started the week (14th-20th Nov.) by listening at 12.55 midday, 13 m., W 2 X E Wayne at full loudspeaker, just opening call in English, French, German and Italian. We then listened while having lunch to Lev White at the organ. His programme included Prelude to Act 3 of Lohengrin, Blue Danube Waltz, Woodland Sketches, The Sweetest Story Ever Told, and A Tone Poem, Hunting Scenes (this was perfectly played, the effects of the dogs barking and galloping hoofs being done to perfection). 1.30 p.m., Lyric Serenade, a programme given by the Columbia Ensemble. 1.45 p.m. Radio Spotlighter, who gives information on radio and film stars. 2 p.m. Variety, which included a song called "Capt. John McPherson" (I had to leave home at 2.20 p.m. and so I left the family listening to this programme still at full loudspeaker. Upon returning at 3.40 it was still going strong (Please turn to page 355.)

Programme, "March of the Little Red Soldiers" and "Nutteracker Suite" were heard at 7 p.m.

Sat., Nov. 13th. I could not get to the set until 5 p.m. (perhaps due to the date being unlucky), when I got 19 m. W 2 X A D Schenectady at loud loudspeaker. Dance music. I then followed programme through till 7.30 p.m. without a break. 5.45 p.m., Dr. Hart: talk; 6 p.m., N.B.C. presents Music Style, by Lyre Ram Wild and his orchestra, with Jimmy Glynn and Joe Lewis, from the Restaurant Continental in Cincinnati, at 6.15 p.m. Bill Stearn at the Yankee Stadium giving a commentary on the Army v. Notre Dame match.

At 8.15 p.m. I had a "P.W." reader and S.T.700 owner (Mr. Lucas, of Leicester) who had come from Leicester and had been delayed by disorganised traffic due to a local timber yard being on fire. He was very impressed, and has promised a letter about the 900. Amongst about 80 stations received we heard W 1 X A L, Boston, loud loudspeaker, on 25 m. Football commentary and W 2 X A D Schenectady, 19 m. Electric organ recital also at good loudspeaker.

At the end of the week the conditions were much improved on 40 m. phone. G I 5 O Y,

STEERING BY WIRELESS

By J. C. JEVONS

Fog is the greatest enemy of both the mariner and airman, but fortunately its dangers are now largely reduced, thanks to recent developments in radio direction-finding

BBROADCASTING is now so much "upstage" that we are inclined to overlook the fact that there are still some wireless services which do not cater for entertainment. For instance, the one "voice" on the ether for which most listeners have no use is that of Morse. Yet, on occasion, a few "dots and dashes" may mean far more to those in peril at sea than the most dulcet tones of any broadcast crooner.

Overcoming Fog Difficulties

Direction-finding is another wireless "side-line" which, although not basking in the limelight of popular favour, is winning laurels as an aid to navigation both at sea and in the air. Fog is the biggest enemy both of the mariner and the airman, but more particularly the latter. Unlike the navigator of a ship, the air pilot cannot decide to "stay put" until conditions improve. If he strikes into fog, he must make up his mind promptly either to "chance his arm" at a risky landing, or else to fly on until he gets out of the fog-bound area.

Thanks to recent developments, an aeroplane can now keep on a scheduled course, from beginning to end, along a "guide-line" invisibly marked out by two overlapping radio-beams. As the pilot comes near his destination, he picks up a warning "marker" signal which leads him into a short-wave "landing-beam," down which he can glide safely to earth.

"Blind" Flying

During the whole of this time the pilot is "flying blind," in the sense that he does not need to look outside the machine. He trusts solely to the radio instruments fitted to his dashboard, and so long as he keeps each indicator needle steady at zero, he is bound to land safely at his destination. From this system of radio navigation it is only a short step to the wireless-controlled "Queen Bee" type of plane which flies automatically along its appointed course without the aid of any pilot.

Harbour Radio Beacons

There are various other systems designed, for instance, to guide a ship safely through the tortuous approach to a harbour in the thickest fog, simply and solely by using the indications given by radio beacons located at selected points on the land. The mariner, in this case, requires no lighthouses, buoys, foghorns or other warning signals. He steers by radio alone, and with the help of a single set of instruments.

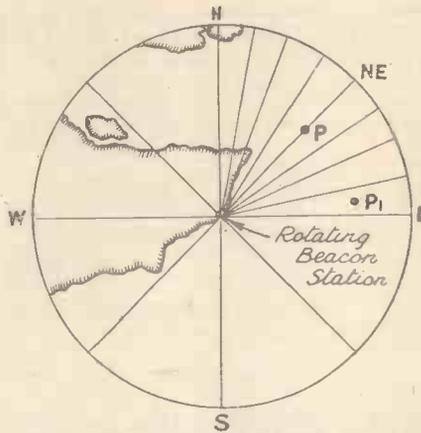


Fig. 1. A ship at point P hears the north-east signal at maximum strength. Another ship at point P1 will hear the east signal at equal strength with a signal indicating one point north of east.

32 main divisions of the compass, it is modulated with a special signal which identifies that point. Any fog-bound ship within range then simply listens for the beam to sweep past, and the signal heard gives the navigator his bearings relatively to the beacon. For instance, a ship at the point P in Fig. 1 hears the north-east signal at maximum strength. Another ship at the point P1 will hear the east signal at equal strength with a signal indicating one point north of east, so that the navigating officer knows he is located midway between these two compass readings.

A Stop-Watch System

The navigator must, of course, be able to read simple Morse, in order to identify the different compass points, and this may possibly create difficulties. To avoid them, a second method is available in which the navigator uses a special "stop-watch" indicator. He sets this going when he hears the "north" signal (which is broadcast in every direction) and stops down when the rotating beam sweeps past him. The ship's bearing, relative to true north, can then be read off from the angle through which the indicator needle has moved during this interval.

More recently it has been sought to make use of television as an aid to navigation. For instance, the rotating beacon transmits a picture of the compass scale—or, at least, that part

of it through which the beam is passing at any given moment—together with a series of synchronising impulses. The latter are "broadcast" in every direction, so that they serve to synchronise the receiving sets of all ships within range.

Use of Television

Only a simple and robust form of television receiver need be used, since the degree of detail required is not high.

The second class of direction-finder, which involves the use of a directive aerial at the receiving end, usually gives more accurate results than the rotating-beam type. For instance, in the well-known Bellini-Tosi aerial, shown in Fig. 2, the incoming signals are received on a pair of directive aerials N, S and E, W, which are coupled to the crossed coils B, B1 of a so-called radio-compass, shown separately at the right-hand side. The ship's wireless operator has simply to rotate a movable "search-coil" S until the signal heard in his headphones sinks to a minimum, when he knows that the distant transmitter is located in the direction towards which the search-coil indicator I is then pointing. By taking a cross bearing on a second transmitter, he is able to spot his position at sea with great accuracy.

THE BELLINI-TOSI SYSTEM

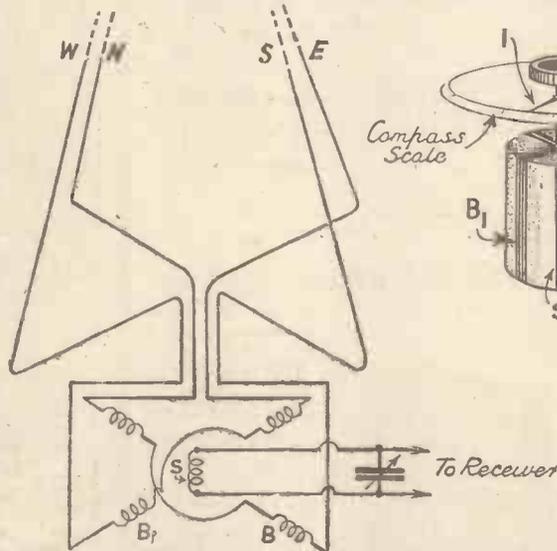


Fig. 2. With the Bellini-Tosi system the incoming signals are received on a pair of directive aerials N, S, and E, W, which are coupled to the crossed coils B and B1 of a radio compass (shown separately in the small sketch on the right).

Broadly speaking, the art of radio navigation has been developed along two different lines. In the first, a rotating beam of energy is radiated from a transmitting aerial, and the moving craft is fitted with an ordinary non-directional aerial. In the second, a directive aerial is installed on the moving craft, and is manipulated so as to indicate the point from which non-directional signals are being received.

The rotating-beacon transmitter is usually located at some fixed point on land, such as the South Foreland, and sends out a short-wave "beam" which makes a complete revolution once every two minutes. As it passes through each of the

I HEAR THEM "CALLING ALL CARS"

Our contributor describes the ultra-short-wave set with which he tuned-in an American police transmission

AS I write this adventure, the sun is going down after one of those golden afternoons only we who live in the country seem to be able to enjoy at this time of the year. Forgive the nature note—but it has a technical bearing, I imagine.

For, you see, I have just switched off my new "two"—which is designed [sic] for ultra-short waves. And, believe it or not, as Mr. Ripley might say, I have just heard a decidedly Yankee police officer tracking down a lost Ford sedan.

Or, maybe, it was stolen. Anyway, between the two policemen I heard talking to one another as plainly as if on the telephone, there flew staccato instructions, "Okays," "I call you backs," and the rest of the G-Man's jargon you know so well if you are, like me, a film fan.

As usual, I have started at the end, so let's retrace my steps to the point where

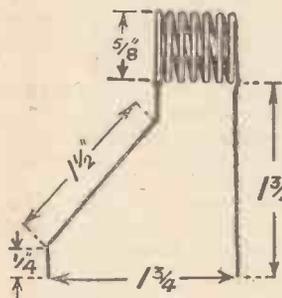


Fig. 1. This 7-turn coil tuned-in the Alexandra Palace sound transmission at 43 degrees on the '000025 condenser.

we left off—somewhat up the gum-tree—my last adventure.

I seem to remember moaning about horrible shrieks with reaction. My life is, indeed, beset with shrieks from apparatus that will not behave itself. It's not that I ill-treat 'em—but maybe I ought to chloroform the little brutes before I attempt any "vivisection."

Anyhow, let's get on. (Yes, let's.—ED.) Judging from letters you kindly send me, howling is far less of a nuisance than I had supposed—threshold howling, especially. I can only suppose that, living in a hundreds of years' old cottage, a former tenant who is dead but won't lie down casts an evil spell over my apparatus.

Wound On a Screwdriver

I began again by making some more ultra-short-wave coils. "Professor"—"W. L. S." to you!—suggests my inability to make the coil spring out from the pencil former may be due to the fact that I do not stretch the wire enough. As it was, I simply used the handle end of a screwdriver as a former, and from this I have made a series of coils 5/8 in. in diameter.

If you look at Fig. 1 you will see the sort of shape the tuning coils have taken. The coil shown is my No. 2, having 7 turns. The

shape is designed just exactly to solder direct on to the tag of a '000025 B.T.S. tuning condenser.

I have made two other tuning coils, No. 1 having 5 turns and No. 3 having 9 turns. By slight bending here and there, they are all interchangeable—but, of course, to change from one coil to another means a couple of dabs with the hot

Fig. 2. The circuit consists of a detector followed by a stage of R.C.C. L.F. with a choke output.

soldering bit. So one does not change coils too often!

The reaction coil, which I am not going to draw, is an 8-turn coil on similar lines, with its ends so bent that one goes to the anode terminal of the detector valve holder, the other to the fixed plate terminal of the reaction condenser. I find the same reaction coil does for all three tuning coils.

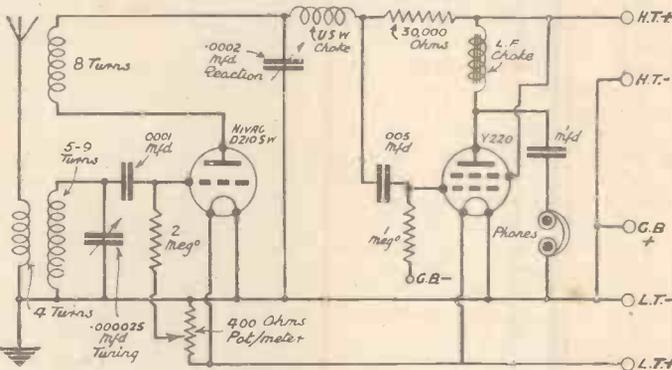
But there's yet another little coil—also common to all three tuning coils. This is the aperiodic aerial coupling coil—a 4-turn winding with one end sticking up in the air, to be clipped by the "crocodile" of the aerial lead, the other end being a 2-in. vertical bolted to the metal chassis so that the aerial coil is about 1/2 in. away from the tuning coil soldered to the tuning condenser.

Perhaps you will understand better what I am driving at if you glance at the Fig. 2 circuit diagram of the whole outfit. Nothing original about it, of course, but every point has received loving care and attention.

Seems to me it's the values that count down on the ultra-shorts more than the actual circuit. And the layout, naturally. The detector and resistance-capacity output

combination is my "pet," as you know—and I see no reason to abandon it for 5 or 10-metre work.

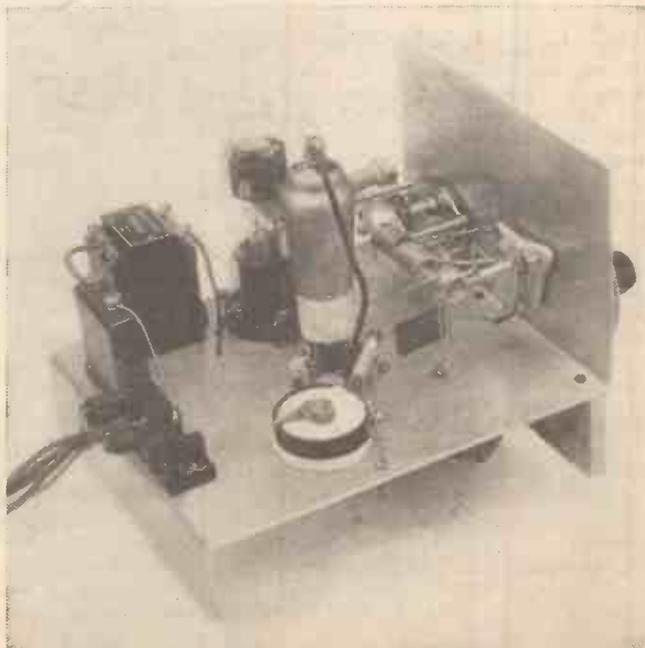
But you need a reasonably suitable detector valve. I can't claim to have tested many—all I can say is the Hivac D210SW is a valve that, as detector, oscillates easily



right down to the lowest settings. I tried using a 5,000 or 10,000-ohms resistance for the anode circuit—instead of a high-frequency choke, that is, same as W. L. S. has suggested. But I find my little ultra-short-wave choke does just as well, and saves a few volts for the anode.

The present arrangement will oscillate (Continued overleaf.)

A VIEW OF THE RECEIVER



In this photograph of Mr. Chester's ten-metre receiver the miniature coils can be seen fixed directly to the condensers.

THE GRIP OF THE "GETTER"

An Interesting Sidelight on the Art of Modern Valve-Making

By J. F. STIRLING

GETTER! The word is a sophisticated and strange-sounding one, yet, when once its real meaning is grasped, it becomes difficult to think of a more satisfactorily expressive term which might be substituted for it.

The radio valve, as is well known, contains a vacuum of a very high order. Long experience seems to teach that it is quite impossible to obtain an absolutely perfect vacuum here on earth, a condition of complete and utter emptiness in which not even a single gas molecule is present to take away from the state of ideal nothingness. Yet the radio valve, if it is to have any lasting life at all and if it is to function with a minimum of current consumption, must possess a degree of vacuum which is exceedingly high.

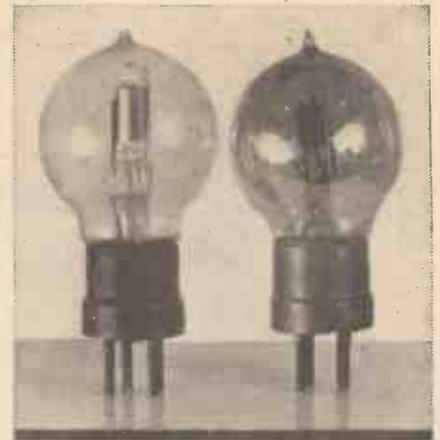
What the "Getter" Does

Thanks to the modern methods of valve making, the distances apart of the residual and unabstractable gas atoms in a present-day radio valve are equal to 100,000 times the diameter of the atoms. And since the earth itself is separated from the sun by a space equal to merely one hundred times the earth's diameter, it will be realised that the degree of emptiness existing within a

valve is really something very great, something which, relatively speaking, is greater than the space-magnitudes which characterise the planetary system to which our earth belongs.

It would be impossible to reach or to maintain this degree of vacuum within the modern valve if it were not for the use of the "getter." The getter is a material incorporated with the valve which comes into action after the powerful vacuum pumps have abstracted as many atoms of air from the valve as they possibly can. The getter, as its name implies, gets or reaches out after the few remaining atoms of gas within the valve and, capturing the majority of them, holds them in its powerful grip indefinitely.

The outward appearance of the valve getter is well known to all of us. It is the silvery layer of metal which covers the greater portion of the inner side of the valve bulb. Many are the radio-minded individuals who have inquired as to the nature and meaning of this mirror-like surface. One inquirer, I recollect, held firmly the opinion that the mirror layer on the inner surface of the valve bulb was placed purposely there by the valve maker in order to obscure from prying eyes the inner construction of the valve!



Two early valves. The one on the left is un-gettered. The right-hand valve contains a getter of phosphorus condensed upon the upper interior sides of its bulb.

The earliest radio valves were constructed without getters. The consequence was that their efficiency was of an erratic order and that they could not be depended upon to maintain constant characteristics.

The first getter used was phosphorus, a powerful air-abstracting material. A quantity of the phosphorus was placed around the plate of the valve and, just before the valve was finally sealed off, a sort of miniature high-frequency electric furnace was placed near to the valve. This had the effect of strongly heating the internal metal work of the valve. The phosphorus was immediately vapourised and it condensed

(Please turn to page 358.)

MY SHORT-WAVE ADVENTURES

(Continued from previous page.)

with 120 volts on the H.T. plus terminal (heaven only knows how many volts get through to the anode itself after passing through the 30,000-ohms resistance!), but the extra 36 volts makes a lot of difference in my set, especially to the smoothness of the oscillation.

The D210SW valve has the grid brought out to the top of the bulb, so as to reduce the losses, presumably. I tried taking the grid side of the grid condenser direct to this top terminal—but it makes no difference when it is much more conveniently taken to the grid terminal of the valve holder—and a short thick rubber flex connecting this terminal with the grid connection of the valve on top.

Effect of the Potentiometer

I can't quite make up my mind about the grid-leak potentiometer I subsequently incorporated. The snag is that, with full plus volts on the detector grid, reaction is inclined to be a wee bit "sticky." But when the slider of the "pot" is moved half way round the winding to apply only half the filament battery voltage to the grid, the oscillation is as smooth as silk.

Prolonged listening tests show that this smoothness is gained only at the expense of signal strength. So I simply use the "pot" when searching—to avoid that "plonk" in the ear every time I oscillate the valve, and then when a few exciting "chirps" come through I back the slider right over to positive.

Fig. 3 gives a hint as to the layout. I have done this simply to show how my home-made coils fit into the general scheme of the chassis layout. Please don't take it too literally—compare with the picture of the finished job, if you like.

Marginal note: I simply cannot give full wiring plans for this or any other set, you know. Once I make an exception I must in honour bound do it for everyone who asks—and that is just too much for me. I mean, of course, when you write in to me. What the Editor allows me to do in print is another matter.

THE COIL ARRANGEMENT

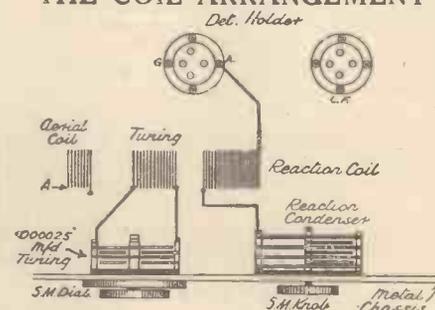


Fig. 3. This sketch gives a good idea of the arrangement of the coils in Lionel Chester's ultra-short-wave set.

You will see, anyway, how the aperiodic aerial coil, tuning coil and reaction are wired—and the rest you can no doubt follow from the theoretical. Always assuming, of course, anyone is foolhardy enough to follow my amateurish plans!

Still, it does work—and now I'll give you a few facts and figures. And first, Alexandra Palace—a good enough alibi for making an

ultra-short-wave outfit if you live within say 30 or 40 miles of the station, and you can put up a reasonably high aerial.

I live some 25 miles south-east of "Ally Pally." The aerial is about 35 ft. high, the site about 550 ft. above sea-level. A few cars pass by to cause interference—but there is open country for miles to the north.

Tuning Positions for "A.P."

Coil No. 1, with 5 turns. Ally Pally sound at 119 degrees on a 180-degree condenser. Vision (what a nasty sound!) at 70 degrees. So that looks as though this coil goes down to 5 metres.

Coil No. 2, with 7 turns. Sound at 43 degrees—but vision not tunable, so this coil is too big for 5 metres.

Coil No. 3, with 9 turns. Sound at 27 degrees—and naturally no sign of vision signals. I am certain this coil is best for Ally Pally, because signals are much louder. Not surprising, when one remembers how the ratio of inductance to capacity controls sensitivity down here.

The No. 2 coil embraces the American police band, which I believe is on 9 metres—or isn't it? For with this coil at 128 degrees I struck the Ford car spot of bother.

That is why, actually, I made up the No. 3 coil with two more turns, so as to get a good L to C ratio for 10-metre reception. And it works like a charm. "Yammer-teurs," as some unkind friend refers to the noble band of amateurs, plonk in around 110 degrees with No 3 coil.

I enjoy their "yammering," any old how. My best time is at week-ends, around tea-time. By the way, Ally Pally on the No. 3 coil just works the W.B. Cadet speaker. The quality is simply wonderful, the programmes often most interesting.

"NEGATIVE" REACTION

Few people appreciate the benefits of reverse reaction, yet used in a properly controlled fashion it has certain definite advantages in connection with quality and with interference elimination

By **CARDEN SHEILS**

THE use of ordinary or "positive" reaction, with its great advantages in increasing sensitivity and volume are well known to all.

But not many people have paid much attention to the use of a "reverse" or "negative" form of back-coupling which serves to reduce rather than increase the overall amplification. In other words, energy is returned from the plate to the grid of the valves, in phase-opposition to the incoming signals, and so tends to reduce their amplitude.

At first sight it seems against common sense to deliberately throw away signal strength, but on the other hand "negative" reaction offers certain advantages, particularly in improving quality, which more than outweigh a little loss in volume. It all boils down to a question of "gaining on the swings what one loses on the roundabouts."

Off the "Straight"

The relation between the input and output of a valve is usually expressed in the form of a characteristic curve. It is necessary to lay some emphasis on the fact that it is a "curve," because in theory a valve should always work along a straight line. Otherwise the output does not remain strictly proportional to input.

As soon as one starts to overload the grid, the valve is driven around the "corners" of the curve, and distortion sets in. Negative feed-back provides a useful way of "curbing" the grid voltage in order to keep a valve within the permissible limits of straight-line working. It can be applied both to high-frequency and low-frequency amplifiers, and has other advantages besides preventing non-linear distortion.

A low-frequency amplifier, for instance, can be regarded as an alternator working into a "load" which consists of the loud-speaker windings. Now the load does not remain constant because the inductance of the windings must vary with the frequency they are handling, and the result is a lack of proper "balance" between the high notes and the low.

Negative reaction can be used to keep the effective inductance of the loudspeaker windings constant at all times, thus getting rid of what is known as "frequency distortion."

Again, in these days of ether congestion, one is often troubled with the kind of interference caused by cross-modulation. This occurs when a strong signal and a weak one both reach the grid of the same valve together. Once two signals get "welded together" in this way, it is impossible to

separate them by subsequent tuning, no matter how selective the circuits may be.

Cross-modulation can only take place when the amplitude of the grid-swing produced by the stronger of the two signals is sufficient to throw the valve off the straight-line part of its curve, so that the best way to avoid it is to reduce the signal voltage applied to the grid of the first amplifier, even though this means some initial loss in amplification.

The obvious remedy of tapping-off a fraction of the pick-up voltage from an input potentiometer is not satisfactory

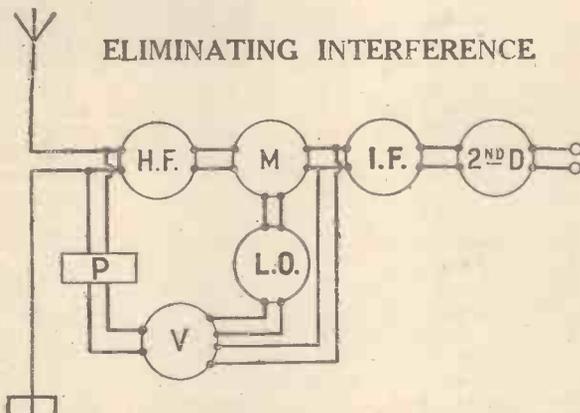


Fig. 2. How reaction is used to get rid of an unwanted station. Signals are fed back through a phase-adjusting circuit P which brings the feed-back signals corresponding to the unwanted station into phase opposition with the same signals reaching the grid from the aerial, thus wiping out the interference.

because, although it reduces the grid voltage, it does not reduce valve "noise," and this becomes a serious nuisance during the subsequent stages of amplification.

By using a certain amount of negative reaction, the signal voltage is automatically kept within the limits of straight-line working, where no cross-modulation can occur. Any interfering signal can then be subsequently tuned out, and the initial loss in amplification made good, without the production of excessive valve "noise."

Negative reaction has also been put to good use in eliminating what is known as "second-channel interference." In a super-het set, a station is tuned-in when the difference between its carrier wave and the local oscillator frequency coincides with the fixed frequency of the I.F. stages. When the control knob is set to bring in a given programme, it often happens that there is a second station working on a carrier-wave which lies as far below the local oscillator frequency as the first station lies above it. In this case, both stations produce the same "beat note" with the local oscillator, and so both get through and overlap in the loud-speaker.

This state of affairs is illustrated in Fig. 1, where the line OO represents the frequency of the local oscillator; AA the frequency of

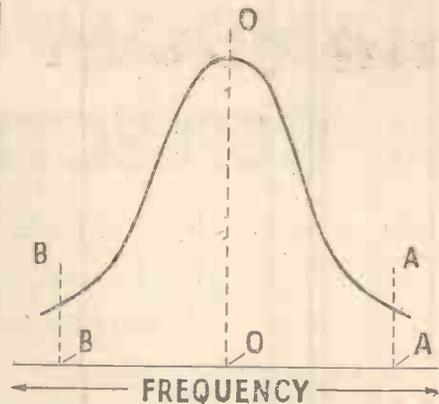


Fig. 1. The line "OO" represents the frequency of the local oscillator; "AA" the frequency of the desired station; and "BB" that of the interfering station.

the desired station; and BB that of the interfering station. Since AA is as far above OO on one side, as BB is below it on the opposite side, one set of signals will be advanced in phase by about 90°, whilst the other will be retarded in phase by the same amount.

Fig. 2 shows schematically how reaction is used to get rid of the unwanted programme. Broadly speaking, the idea is to apply "reverse" reaction to wipe out the intruder, and at the same time to use "positive" reaction to strengthen the desired signals.

Both signals get through the H.F. amplifier and mixer valve M in the ordinary way, though keeping the initial phase-difference shown in Fig. 1. A part of the output from the mixer valve is fed back to a separate valve V, which is also coupled to the local oscillator LO, so that the output from V contains components of both signals restored to their original form.

Reversing the Phase

They can therefore be fed back to the input of the first valve, but, on the way, they are passed through a phase-adjusting circuit P, which introduces a further 90° phase difference. This brings the feed-back signals corresponding to the unwanted station into phase opposition with the same signals reaching the grid from the aerial, so that the interference is completely wiped out. At the same time the feed-back components of the desired programme are now in phase with the corresponding signals arriving via the aerial, and therefore serve to strengthen them.

"THE MELODY MAN"

BRYAN MICHIE will produce on December 17th, a short play for the Regional programme, with music by Norman Hackforth, who has done several shows for John Watt, to the words of Francis Durbridge. The idea of this production is to create a vehicle for Leslie Hutchinson ("Hutch") to give listeners a chance of hearing this clever and versatile artist in a feature suited to his characteristic style.

The story revolves around a waiter who is urged by his customers to seek fame as a singer on radio. After many vicissitudes, the singing waiter becomes a radio star.

"Hutch" will have a cast of some half-dozen artists to support him in the restaurant called "The Golden Slipper." The restaurant has Charles Shadwell and the B.B.C. Variety Orchestra as its purveyor of light music.

RANDOM RADIO REFLECTIONS

By VICTOR KING

THAT EGG PROBLEM :: PICTURE TRANSMISSIONS :: ELECTRICAL TRANSCRIPTIONS

QUESTION OF PRESSURE

I HAVE had a letter from a Frimley reader about that egg matter. Remember it? In case you don't, I'll remind you: An engineer friend of mine made the statement to me that there is sufficient pressure in an ordinary hen's egg to blow up a motor-car tyre.

I very much doubted this and said so. "Why," I observed, "if that were the case, didn't an egg go off with one great big bang when you cracked it. I further remarked that I thought it possible that the engineer laddie was thinking in terms of energy.

And now here is the Frimley letter.

"With reference to your remarks in this week's issue of 'P.W.', re the pressure in an egg. (By the way, which came first, the egg or the chicken?)

"I do not profess to be an expert in these matters but this is how it strikes me. (The problem, not the egg.)

A pressure of 12 volts will turn the starter and start a car if this pressure is obtained from the recognised source, i.e. a large capacity accumulator, but just try starting the car with a pressure of 12 volts tapped off from an H.T. battery, or even 10 times the pressure—120 volts—you will find it doesn't work. Why? For eggsactly the same reason that an egg will not inflate a car tyre. It hasn't got the capacity or quantity as apart from pressure.

"Now let us consider why the egg—presumed to have an internal pressure of, say, 30 lbs./sq.in.—does not pop! when cracked.

"First of all, what is a 'pop'? We will assume that it is the noise made by a sudden displacement of a volume of air—I think you will agree with that definition. Therefore, if there is no displacement of air there will be no pop! You agree? Very well.

"I have to assume that the contents of the egg are practically incompressible and that a pressure of about 30 lbs. is exerted by the contents on the shell. When the shell is broken the pressure will be released, but on the assumption that the contents are incompressible there will be no expansion of the contents, consequently no displacement of the surrounding air and consequently no POP!

"That, I think, is one answer to your query—whether it is correct I leave you to decide. No doubt there are other solutions.

"Maybe your engineering friend was confusing pressure and energy when talking about the egg; if so, does he refer to potential or kinetic energy? A lot will depend on the arm behind the egg.

"Until I hear more about this I shall still continue to use the ordinary air pump to inflate tyres."

With thanks and all due respects to the writer (whose name might be Chaub—his signature isn't very clear) I don't think we are any nearer to solving the mystery.

Surely, if the contents of the egg are incompressible they are not being retained in the egg under pressure. The term itself defeats the arguments. Incompressible! It means you can't "press them in." Strictly speaking, though, is anything incompressible?

Hi! What a tangle I'm getting into. Help me out, somebody.

FACSIMILE RADIO

WHILE we in this country are forging ahead with television, more or less, the United States are still toying with facsimile radio.

I wonder how many of you remember the

B.B.C.'s short-lived adventures in this direction? Goodness, it must be seven or eight years ago now that they used to send out special "picture transmissions" from the Daventry station.

You paid about twenty pounds for a receiving outfit, a bottle of chemicals and some special paper. Then if you were lucky you received pictures. Quite good pictures, too, but each picture would take some minutes to build up, though once you'd got it you'd got it for keeps, just like a photo cut out of a not-too-well printed newspaper.

I don't remember that there was any real enthusiasm behind the scheme in so far as the B.B.C. was concerned. I rather feel that they fell for the idea rather against their own better judgment and somewhat regretted it soon after. Anyway, it didn't last long, and you could very soon afterwards pick up the special apparatus at knock-down prices. One or two stations on the continent, notably the Eiffel Tower and Vienna, continued sending out pictures for a few months longer.

Eventually, the whole scheme fizzled right out as a public service, though the Air Ministry used it for weather maps and what not. They may still do so for all I know—or care.

But in view of the fact that traditionally the good old U.S. is supposed to be ahead of this "sleepy" country, it makes strange reading to find the following in the "New York Times."

SACRAMENTO, October 20th.—The McClatchy Broadcasting Company, operating four radio stations in California, announced plans to-day to start the first facsimile broadcasting on the Pacific Coast.

G. C. Hamilton, manager of the McClatchy newspapers, announced that an application had been filed with the Federal Communications Commission for a permit to start this form of "radio newspaper" in Sacramento and Fresno. The "radio newspapers" will be two columns wide.

The system is understood to be a modification of stylus radio receiving, which has been in development for many years.

The company intends to broadcast from midnight until 6 a.m., supplementing the regular schedules.

Because the radio facsimile recorder for home use is not yet manufactured in mass quantity, it is planned to acquire 100 of the devices and install them in the homes of fifty Sacramento residents and in the homes of as many Fresno residents to determine the value of the service.

The broadcasts will be made on the regular power of K F B K and K M J.

Experiments in facsimile broadcasting and receiving have been conducted for several years. In the New York area stations W O R and W Q X R have been broadcasting facsimiles for reception, with modifications, through ordinary receiving sets.

John Poppele, chief engineer of Station W O R, stated last night that application was made nearly a year ago to the Federal Communications Commission for permission to continue experimental broadcasts



The Telefunken Company has recently fitted Germany's coastal patrol boats with radio telephony apparatus. The transmitters are of the 15-watt 2-way type designed to work on short waves, and have a range of about 18 miles over water and 5 miles in built-up areas. Six-valve receivers are used. One of the transmitters may be seen above. It is automatically switched on when the combined telephone receiver and mike is lifted.

and allow expansion to the extent that facsimile receiving attachments might be connected to radio sets of fifty persons in the New York area.

Experimenters have dealt with a "newspaper" about the width of three columns of an average newspaper, Mr. Poppele said. He pictured a time when it might be possible for the home radio owner to throw a switch at night and wake to find a complete magazine or newspaper, with news, advertising and pictures completely printed, or "facsimiled," on a neat roll ready to be read at breakfast.

He added that facsimile radio was still experimental, but he ventured an opinion that it would precede television. At present, he said, facsimile attachments would probably cost about \$100.

Mr. Poppele explained that the photoelectric cell was used in facsimile broadcast, impulses similar to those that make possible the sending of the dots and dashes of the Morse code being the basis of the system.

In the home the apparatus consists of a device that connects with the set through the wires of the loud-speaker. The attachment is set in operation by the electrical energy supplied by the receiving set, and translates that energy into mechanical energy which prints the reproduction of the picture or reading matter broadcast.

Of course, it might reasonably be said that even if we did try the stunt in this country first, we didn't give it sufficient of a push to be a real success.

DID I LAUGH?

WHEN the announcer said that—"Mr. So-and-So will squeak on the—sorry, speak on the subject of—"

When the advertising stations get their needles jumping gramophone-record grooves.

Which reminds me. I note that the American phrase "electrical transcription" is being used these days by the buyers of time on the air.

Does it go over better? Let's have a look at it in print.

First, the new method:

"The programme you have just heard came to you by means of electrical transcription."

Now, the plain statement of fact:

"The programme you have just heard was recorded."

M'yes! I suppose the idea is that they
(Please turn to page 359.)



SHERLOCK HOLMES SAYS...
*It isn't just for Radio — but
 for testing everything electrical*

A fuse may have gone in the lighting circuit; the door-bell may have ceased to function; the radio, perhaps, is not up to standard; the vacuum cleaner, usually so reliable, has definitely "given up the ghost." faults faults faults all equally perplexing but they're all the same to the Pifco Rotameter just another job, in fact. This precision-built instrument reduces electrical fault-finding to a mere bagatelle; saves hours of wasted time, money too; yet its price is only a modest 42/-.



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A MAINS SET THAT "PURRS"

L. T. (Manchester).—*I have a mains set and it has started to "purr." Or, perhaps I should say that it makes a noise that sounds like a motor bike. What is likely to be wrong?*

I should say that the trouble was due to some break-down in a decoupling circuit. Perhaps one of the condensers has developed a disconnection or one of the resistances associated with the decoupling has broken down and developed a short.

It might be due to grid choking somewhere, if the detector, for instance, has a faulty grid leak and is choking momentarily and then clearing itself.

Again, if the set is not well decoupled it might be that the rectifier valve is developing high resistance owing to its losing emission. In that case the voltages on the anodes of the valves in the set will probably be down and the signal strength will be weak (if you can judge it above the noise of the motor-boating).

There are other things, of course. The noise may be more of a purr than a motor bike after all, in which case the faults that I have mentioned might be present or you might have a leaky cathode in one of the valves giving rise to mains hum superimposed on the signal. I have heard a purr from a set with faulty cathode insulation in an H.F. valve, but I would not like to say that such a cause is likely to be the probable one in your case.

The only way to trace the trouble is to go systematically through the set. Test voltages first. If they are wrong everywhere, you can usually suspect either the mains unit or some condenser that is partly broken down. If they are wrong on one circuit only you have obviously limited the search considerably.

Test resistances in the decoupling circuits by the simple expedient of shorting them with a piece of wire. Watch the voltage on the anode of the valve concerned at the same time. It should increase considerably if the resistance which you are shorting was in good condition. If it is faulty—and shorting—you will find that the voltage does not increase to any extent.

Test the condensers in the usual way by removing them from the wiring and charging them up, leaving for a few minutes and seeing if you can get a decent spark from them.

A change of valves may do the trick if the valves are at fault, but more likely than not it is a circuit trouble and not due to valves in any way.

"UP A GUM TREE"

"I'm up a gum tree," writes P. S. (Peterborough). "My short-wave set has been giving trouble, so I rewired it. Then I found that instead of the tuning coil tuning from 19 to 40 metres it went from 15 to 50 metres.

"Thinking that was peculiar I rewired it again and the tuning then went back to normal. Why was it?"

I wish I knew. Your query has given me nightmare and I am still without a definite solution. I dreamed of great big condensers tuning a tiny coil on which turns slipped about in a most aggravating manner. A condenser drive as big as a clock turned slowly back and forth and the pointer slipped about in an uncanny manner between 15 and 50 degrees. On waking I considered the dream, and thought it cannot be held to be definite in any way I think that perhaps there is a grain of truth in it. It's possible, at any rate.

Are you sure that when the coil was tuning from 15 to 50 that you actually logged stations on those wavelengths? Or are you assuming that the range was roughly 15 to 50 because the tuning went so far past the normal 19 and 40 at either end?

Forgive me the apparently rude question, but I am frankly puzzled by the phenomenon. You see, if the coil had suddenly begun to tune down to 15 metres, but had not gone above 40, I should have said that you had removed some inherent capacity

in the tuning circuit due to wiring and that with the capacity removed the coil was tuning lower. That is logical.

So would be the effect of going up to 50 metres if the coil had not started below 19. That additional range, or rather maximum wavelength, could be achieved by some added capacity due to the new wiring. In that case one would not expect the coil to tune down as far as the original 19 metres.

Your coil seems to be bewitched, or is it that the condenser drive has been slipping and has given you the impression that the tuning has been covering a greater range?

You may roar like little Audrey at that, but really it is all I can suggest with the small data you have given me. It does not seem easily possible for any coil to increase its range at both ends of the scale unless something peculiar has happened which is misleading you to thinking that the range has been increased at one end or the other.

What I should imagine is happening is that the coil has actually been tuning lower than normal owing to the reduction of capacity in the wiring,

and that the condenser has been slipping at the upper end and has given you the impression that you are tuning higher.

Now write back and call me a I shall not mind. There must be a reason and I, for one, should be glad to know what it is. Perhaps other readers may have had some sort of similar experiences and will write and tell me about them.

CHARGING AN ACCUMULATOR

How can I charge an accumulator from a dynamo giving 8 amps at 6 volts? I want to connect it to a two-volt battery which should be charged at 2 amps. So writes D. S. (Royston).

When the accumulator is fully charged, or thereabouts you will have a back pressure on your dynamo of 2 volts. So the dynamo will be giving 6 volts minus 2 as far as charging voltage is concerned. That is a rough calculation and assumes that the dynamo will give constant voltage between 2 amps and 8 amps. So you want a resistance that will cut down the current at 4 volts (6 minus 2) to 2 amps.

That will be a matter of 2 ohms. With 2 ohms in series with your dynamo you should get somewhere near the right current.

To get it actually right I should arrange a bit of latitude and have a variable resistance of about 4 ohms in series with the dynamo and the battery and also an ammeter. Then you can vary the resistance until you get the desired 2 amps.

Another scheme is to arrange a potentiometer system so that part of the power from the dynamo goes through a by-pass path instead of the battery but I prefer the other scheme.

CRYPTIC

Dear Sir,—Can you tell me exactly what power those R signs mean? I see R1 and R21, and so forth, on diagrams. What do they mean?—J. M. S. (Markspool).

They are merely numbers placed against the letter R, meaning resistance, to denote which resistance is referred to in the diagrams and text.

For instance, if you have ten resistances in a set and you want to refer to any particular one, it is much easier to label the resistance R5 or R6, for instance, than to have to refer to it every time as the resistance connecting the choke in the anode circuit of V2 to the resistance used for decoupling, or something like that.

If that particular resistance is marked, say, R5 and the decoupling resistance in the same anode circuit is marked R6, all you have to do is to refer to R5 when you want to mention it and to R6 when that resistance is to be mentioned.

The figures do not refer to the value nor the power or wattage of the resistance.

FLOATING CONES

A. R. T. (London, S.W.4).—*I have been told that if I paint my moving-coil cone round*

the edge with dope I shall get the effect of a floating cone. What dope shall I use?

Without knowing more about the speaker diaphragm I cannot advise you.

There is a method of freeing the edge of the moving-coil speaker diaphragm when it is of the rather stiff woven material, but I should not like to guarantee its success.

I tried it myself some time ago on a speaker now out of date which had a ridged diaphragm held rather stiffly to the mount by its ridged edge. I doped that one with castor oil and it certainly worked very well. But you have to be careful about that sort of thing, doing the job gently and gradually. It does not do to make the diaphragm too limp.

Further, some diaphragms are held in position by a definite pull forwards, and if these are softened at the edges they sag back into the gap in rather a disconcerting manner. The centring spider does not always suffice to hold them in the correct position, and the result is that they "bottom" on loud notes, with consequent distortion.

I should hate that to happen to your speaker. So, though it is possible to dope diaphragms successfully and to get what you call a "floating" diaphragm, I should not like to tell you to go ahead without knowing the type of speaker you are using.

Such doping is apt to reduce the brilliance of many speakers, because it reduces their rigidity, and some makes and types rely on rigidity for the high-note reproduction. They also rely on it to some extent for sensitivity, and I have certainly found doping to reduce the sensitivity sometimes.

On the other hand, it allows greater freedom for bass reproduction, with the result that bass notes are handled better, and it is possible to gain about an octave in some cases. This is done with a reduction in artificial brilliance, though in a good speaker the "top"—true top—is still there.

The net effect is to change the "tone" of the speaker somewhat, and you might not like the effect. You see, you will have added bass—for the speaker will not only "go lower," but will be more sensitive to bass notes. And you will have a top that has been cleaned of some of its artificiality, with the result that it will sound less sensitive on the higher notes.

One more thing. Once a speaker has been treated in this way it is impossible to undo it. I mean you cannot remove the effect of the oil, and the diaphragm will for ever be "soggy" round the edges.

THOUGHT WHILE THINKING

Here is a Christmas conundrum which has been asked me by a reader. I pass it on gratis for your perusal.

I switched off my battery set the other day. When I switched it on again it didn't. Why?

There you are, my friends. And until we meet again, "Hullo!"

BOOKS FOR THE BOYS

Two Ideal X-mas Gifts

EVERY boy to-day is interested in and often puzzled by the marvels of modern science and engineering. The BOY'S BOOK OF MECHANICS AND EXPERIMENT (6/-) is an ideal gift book because it explains simply how and why things work, from the Boulder Dam to traffic signals and refrigerators. Further, there are directions for conducting safe and easy experiments in the home. The book is profusely illustrated with photos, drawings and diagrams that are as fascinating as they are informative.

CHUMS ANNUAL (8/6) is too famous to need any introduction. The 412-page 1938 issue maintains the traditional standard of excellence associated with this magnificent gift book. It contains four book-length stories of adventure and mystery, over forty short stories, and pictorial articles. The numerous illustrations include four fine three-colour plates. There are literally weeks of gripping, healthy entertainment in CHUMS ANNUAL. No better gift book could be desired.

S.T.900: THE RECORD-BREAKER

(Continued from page 346.)

and had been doing so without any attention whatsoever.) 3.45. Children's Concert, with some surprisingly good talent, included a song "Broadside Kelly," a drum solo, saxophone solo "Betty Coed." Child comedians and Norman Sisters, duettists. The announcer said one little girl was only four and they had to use a special mike for her. 4.30. Orchestra, "We'll All Go Riding on a Rainbow," "Harbour Lights," and several rumbas.

4.45, 10 m., W 4 FT North Carolina, R 8, W 5 E V I, R 7. 5. W 2 X E Wayne, 13 m., returned to this station to hear Major Bowes' Amateur Hour at full loudspeaker. 5.30, 10 m., G 5 V M, full loudspeaker. W 8 O T T, good loudspeaker. 49 m., L K J Jeloy, full loudspeaker. Talk. D J C, full loudspeaker. Orchestra. 40 m., G M 8 R U and G W 5 X M and O N 4 L O, very loud loudspeaker, G 2 M F, G W 5 F U, G M 6 R V, G 8 H F, full loudspeaker.

14.5 m. (approx.) Lawrenceville was talking to London, and I heard some very interesting remarks from this station at very loud loudspeaker.

7 p.m., 16 m., W 3 X A L Bound Brook, at very loud loudspeaker (when I started to listen here GSG was interfering very badly, so I applied the bias to the H.F. Pen, and increased the "X"-reaction, and up came W 3 X A L loud and clear of GSG). Announcements in English, French, German and Italian. "The Magic Key" turns for (as the announcer said) Frank Black and the N.B.C. "Magic Key" Orchestra playing "Perpetuum Mobile"; a famous Peruvian soprano. A Tipica Orchestra relayed from Buenos Aires. N.B.C. Orchestra, "When Day is Done." Tenor singing aria from "Figaro" and "Just a Memory." A town crier and tenor and soprano duet from "Don Giovanni." At 7.55 we listened to the local service, but our entertainment from 1 p.m. had, for practically seven hours, come from two American stations, and had been received without a break at full loudspeaker.

Mon., 15th., was occupied with the Royal Command Performance.

Tuesday, 16th. Athlone full loudspeaker, with very slight fading. 7.30 p.m. poem, "In an Irish Theatre," Michael O'Higgins, baritone, "Piper," and "Shadows." 7.50 p.m. Cologne full loudspeaker, no fading. Band music, 8 p.m. Hilversum (415 m.) full loudspeaker. Records. 8.20 p.m. Marseilles, full loudspeaker; records, including one by New York Philharmonic Orchestra and French dance numbers with vocal refrains. This proved a good programme, the piano solos being particularly outstanding. 10.30 p.m. 20 m., G 8 I K, G 8 M C, G 5 B J and G 8 J L, all at good loudspeaker, and complaining of no DX possible. 10.50 p.m., 31 m., W 2 X A F Schenectady, very loud loudspeaker (cleared of Zeesen and G S B by use of G.B. on H.F. Pen. and full application of "X"-reaction). Orphan Annie Ovaltine advert. 11 p.m. From Chicago University, "Science in the Making." 11.30. News and short-wave news stated that W G Y and W 2 X A D and W 2 X A F were removing to new sites. This is very interesting for one who is interested in wireless, as all the latest information is given.

Thurs., 18th. 29 m. O R K Ruyssede, at full loudspeaker, relayed Brussels 2. programme. 41 m. San Sebastian, full loudspeaker. An appreciation of Gen. Orlando, followed by an impression of the Spanish war by an Englishman who had been on both Valencia and Salamanca fronts.

Friday, 19th. Midnight, 49 m., W 8 X K Pittsburgh, good loudspeaker. Trio singing "That Old Feeling." 12.15 a.m. H J 4 A B B, good loudspeaker. Manzales Dance Music, including "Yesterday's Cup of Kisses."

Sat., 20th. From 3 p.m. Demonstrated to a fellow from Wolverhampton. Among the stations heard were 13 m. W 2 X E Wayne, G 8 J Davenport, 16 m. W 3 X A L Bound Brook, playing "Hymn to the Sun." GSG and D J E Zeesen. 19 m. W 2 X A D Schenectady, W 8 X K Pittsburgh, 25 m. G S D, I 2 R O 4 Rome, T P A 3 Radio Colonial. 31 m. G S B Zeesen, W 2 X A F Schenectady. 10 m. W 6 C N E. 20 m. F 3 G L.

Medium Waves: Budapest, Beromunster, Athlone, Stuttgart, Vienna, Rabat, Florence, Brussels, Prague, Lyons P T T, Cologne, North Reg., Sottens and so on, down the dial. He was delighted to think that he was tuning these stations in himself and was particularly impressed by the knife-edge selectivity. He was so convinced of the set's capabilities on the medium waves alone that he has straight-way ordered the parts for converting his 800. I think the stability of the set is proved by the long-period listening sessions from U.S.A. stations.

LESLIE A. FERRINS,
101, Sycamore Road, Aston, Birmingham 6.

Judging from letters we have received, Mr. Scott-Taggart's statement in a recent S.T.900 article that he is "not a London designer" has in cases been misunderstood. He was referring to the fact that he designed his set on a national and not a metropolitan basis. The S.T.900 gives as sterling a performance in the London area as in any other place in the country.

"NIGHT SHIFT"

THE opening of Christmas week finds the B.B.C.'s outside broadcast engineers visiting King's Cross Station for a broadcast of "Night Shift" on December 20th, in the National programme. On this occasion the night shift is that of the turning round of a great locomotive in a London terminus.

The B.B.C. commentators and engineers will ride on the Coronation engine as she makes her way back from King's Cross platforms to the railway shed. Listeners will hear this famous engine being turned round, taken to the mechanical coaling chute, and back to her sheds. The microphone will then transfer to an outgoing engine of the Pacific type, ready to haul the 1.5 a.m. express to Scotland.

Driver Taylor, of the Coronation Scot, who recently created a record for railway engines of 113 miles per hour, will be heard talking with B.B.C. commentators and engineers.

You can get it at
once from L.R.S.

CASH OR C.O.D.
ORDERS DESPATCHED BY RETURN

S.T.900 COMPREHENSIVE 'DESIGNER' KITS

All components exactly as specified by Mr. Scott-Taggart. Carefully packed in strong carton and sent post free.

NOTE Complete kit or any part supplied separately for CASH or C.O.D. Postage and C.O.D. charges paid on orders of 15/- or over.

IRS 'Designer' KIT 'A'

Complete kit with
FOUR COILS

covering medium and long wave band. All screws, wire, etc.
NO EXTRAS EXCEPT VALVES
And short-wave coils (if required).

Cash £3/10/0, or

7/-

WITH ORDER and 11 monthly payments of 6/6.

IRS 'Designer' KIT 'B'

Complete kit with
TEN COILS

covering medium, long, and 3 short-wave bands. All screws, wire, etc.
NO EXTRAS EXCEPT VALVES

Cash £4/5/0, or

8/-

WITH ORDER and 11 monthly payments of 7/10.

IRS 'Designer' KIT 'C'

ABSOLUTELY COMPLETE

including everything as KIT "B," but WITH ALL VALVES.

NO EXTRAS WHATSOEVER

Cash £5/15/3, or

10/-

WITH ORDER and 11 monthly payments of 10/7.

S.T.800 to S.T.900

'DESIGNER' CONVERSION KITS

to enable you to bring your S.T.800 right up-to-the-minute.

ABSOLUTELY COMPLETE

WITH 10 COILS

& specified H1VAG L210 VALVE

NO EXTRAS

Cash £2/9/3, or

5/6

WITH ORDER and 10 monthly payments of 4/10.

KIT comprises:

Set of all necessary extra components, condensers, resistors, panel, platform, choke, coil and valve holders 18 6

10 Coils for all specified wavebands 1 7 0

H1VAG L210 Valve 3 9

Any of the above supplied separately for CASH or C.O.D. £2 9 3

IRS McCARTHY ALL WAVE CHASSIS

Complete with B.V.A. valves, knobs, leads, etc., ready for fitting into any cabinet. Call for Free Demonstration.

R.F. 6 A.W.

17/6 WITH ORDER and 12 monthly payments of 14/9. Cash Price £8/17/6.

S. 5 A.W.

14/6 WITH ORDER and 12 monthly payments of 11/5. Cash Price £6/17/6.

Full McCarthy Range always in stock.

IRS AVOMINOR TEST METER

5/-

Thirteen testing instruments in one. Measures current, voltage, and resistance with ease and accuracy. In handsome case with leads, clips and testing prods. A most valuable fault tracer.

with order and 10 monthly payments of 4/5. Cash price 45/-.

IRS GARRARD A.C.6 Radiogram Unit

Comprising silent running, enclosed economical induction motor for A.C. 100/250 volts, 50/60 cycles. Unit plate with pick-up, needle cups, etc.

5/6

with order and 11 monthly payments of 7/-.
Cash Price £3:15:0

IRS GARRARD A.C.6 MOTOR ONLY

Similar to above, but with fully automatic start and stop, and without pick-up, needle cups, etc. Complete with 12in. turntable.

4/-

with order and 10 monthly payments of 4/3. Cash price 42/6.

IRS ROTHERMEL PIEZO PICK-UP

MODEL 88. Unsurpassed for wide frequency response and amazingly high output. Extreme lightness reduces record wear and tear to practically nil.

4/-

with order and 10 monthly payments of 4/3. Cash Price £2:2:0.

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Electric Clocks;
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You get it QUICKER and on BETTER TERMS from LRS

TECHNICAL JOTTINGS

Items from an expert's notebook

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

THE earliest forms of moving-coil speaker comprised electrically energised field magnets and, of course, to this day a large proportion of M.C. speakers are of similar type. But for still greater convenience a type of moving-coil speaker with permanent magnet was introduced a few years ago, and this has proved very popular, particularly in small, compact sets such as portable and semi-portable ones. It goes without saying that in battery sets it is a very important advantage to be free of the need for supplying any more current than is actually essential to the valves.

As the two types of moving-coil speaker—that is, the energised type and the permanent-magnet type—are used in large numbers, people often wonder whether there is some particular advantage in the one type or the other, and which type they should choose.

Permanent Magnet

This depends very largely, as I have already indicated, upon the particular conditions under which the speaker is to be used. You need have no fear, however, that a good-class permanent-magnet speaker will be in any way an inferior article. The manufacture of permanent magnets has now been brought up to a high state of excellence, and you can get speakers in which the magnetic flux due to the permanent magnet is actually better than that which prevailed in energised speakers of a few years ago. Moreover, the permanency of magnetisation of these magnets is enormously better than it was a few years back, due to the use of better types of magnetic alloy and improved methods of magnetising the same.

Domestic Requirements

For all ordinary domestic purposes a good type of permanent-magnet moving-coil speaker will be quite adequate, and you need only think about an energised speaker if you require larger outputs, or, on the other hand, if the exciting current for the field coil is no object (as in an all-mains set) and you think that you may get a more "generous" tone.

When it comes to much larger outputs, of course, you have to use a more powerful speaker, and here you definitely run into the category of energised field-magnets. But I do not need to say much about this, because the vast majority of my readers are those who only require a speaker giving good reproduction on what might be called the "domestic" scale of loudness. For these there is really little to choose, except on the ground of convenience, between a good permanent-magnet moving-coil speaker and an energised speaker of corresponding output capabilities.

I forgot to say that the power consumed by the field coil of an energised speaker is not really much—not nearly so much as some people imagine. If the coil is a low-voltage one, operating from a 6-volt

battery, it will probably consume $\frac{1}{2}$ amp. of current, or perhaps a little more, thus using 3 watts upwards. If it is a high-voltage winding, designed to operate on, say, 200 to 250 volts from the mains or a supply unit, it will probably consume 15 to 25 milliamps, which works out, as you

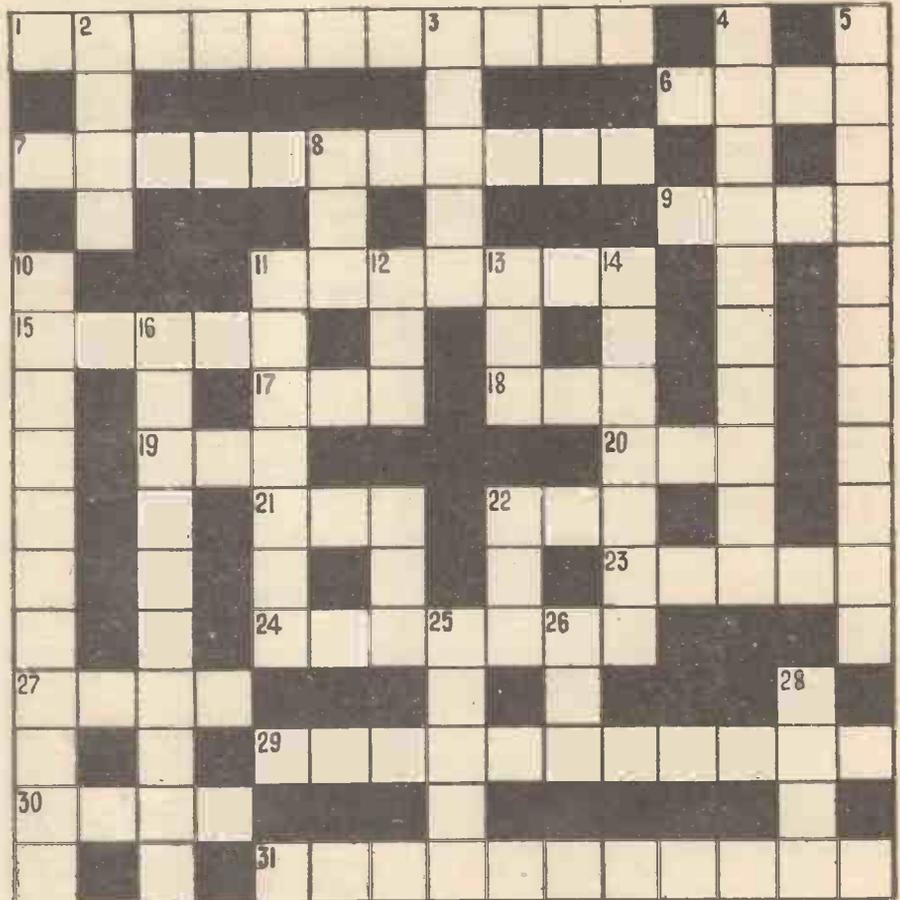
will see, at a similar kind of wattage consumption to the other. There is nothing particularly critical about the voltage to be applied to the energising coil, and if you cannot apply the full specified voltage, you will probably not notice a great deal of difference. If the supply is A.C. and a rectifier has to be used, you may sometimes find that the impedance of the field coil of the speaker will itself be sufficient to smooth the rectified A.C.; but, if not, extra chokes and condensers should be included.

Screen Grid and H.F. Pentode

Newcomers to radio sometimes wonder what is the difference between the screen-

(Continued on next page.)

"POPULAR WIRELESS" RADIO CROSSWORD PUZZLE



CLUES

ACROSS

1. Without this your set will probably receive several stations at once.
6. You may do this to your set, or you may hear it on the air.
7. Most popular type of short waver for the home constructor, according to a recent ballot.
9. Is this what a meter does?
11. Aerial in America.
15. Kingdom.
17. Shortened current.
18. Part of the body.
19. They're in Town on this abbreviated night.
20. An age of the universe.
21. Special, along, and round the corner.
22. Keep this tight for a good connection.
23. Ink from Radio Paris?
24. A separate this may improve your detector.
27. Lots of this is heard from the B.B.C.
29. "Ham-Handed Henries" in the old days, but now parts of a transmitters or receivers.
30. Every "ham" has to go through this in the Morse code.
31. The science that gives us our weather reports.

DOWN

2. Often heard on distant stations.
3. The invention that made radio what it is to-day.
- 4 and 5 (two words). The full names of some of the most popular receivers of to-day, nowadays condensed into one word.
8. The G.P.O. this often calls on amateur transmitters.
10. Without this your receiver wouldn't be much good to you.
11. This in front of 10 is what most short-wave enthusiasts want to be.
12. This on a coil may give increased I across.
13. Call sign famous for American time signals.
14. Current measurer.
16. To hear a this 11 10 is good DX reception.
22. Abbreviation for one of the B.B.C. transmissions.
25. To interfere with your neighbour's reception, one day, will be treated as a this.
26. This will stop squeaks but not oscillations.
28. Short-wavers often do this about their DX records.

The Solution to this Crossword Puzzle will be given next week.

TECHNICAL JOTTINGS

(Continued from previous page.)

grid valve and the H.F. pentode, and what are the particular advantages of the latter. In order to understand this, you want to consider the question of selectivity and stability. The screen-grid valve enabled us to do away, to a large extent, with reaction, because the "stage gain" of the screen-grid valve was such a great improvement on that of previous valves. But reaction, whilst increasing both sensitivity and selectivity, is very apt to introduce distortion. The screen-grid valve, enabling us to dispense with reaction to a large extent, gets rid of the difficulty just mentioned; but on the other hand it is apt to bring in certain kinds of distortion of its own and, as most people know, the circuit has to be adjusted very carefully if it is to be kept free of oscillation.

Improved Coil Efficiency

A further important point is that great improvements have been made in the efficiency of coils since the screen-grid valve was introduced, and the coils, so to speak, had outpaced the valve. Some further improvement in valves was necessary in order to be able to take full advantage of the new improvement in coils.

It was here that the H.F. pentode came into the picture. This valve not only gives greater amplification than the S.G. valve, but the more efficient coils can be made use of and the circuit designed without trouble.

Communal Experiments

Some interesting and important experiments have been made recently at Baden Baden, in Germany, in connection with the suppression of radio interference on what might be called a friendly basis. Special facilities were provided so as to encourage owners of interfering electrical apparatus to have the cause investigated and to have suitable devices installed for correcting the trouble. A great deal of very useful information was obtained from these efforts, one point of particular interest being the fact that for suppression purposes close upon 8,000 condensers were used, whilst only 300 other devices such as chokes, or combinations of chokes and condensers, were found necessary. In other words, by far the greater number of cases of interference with radio reception of the usual kinds can be cured by condensers alone.

Interference

Interference with radio reception, which is heard as a series of crackles, clicks, sizzling and other noises, either continuous or intermittent, coming from the loud-speaker, arises from sudden changes of current in various types of electrical apparatus such as motors, fans, vacuum cleaners, refrigerators, flashing signs, and so on. It is usually most severe when sparking occurs, as, for example, at commutators or motors or contacts of flashing signs. The sparks cause ether waves to be radiated in all directions, and if these should reach the receiving aerial, at a strength comparable with that of the waves from the broadcasting station to which the set is tuned, then appreciable interference will be caused.

BARGAINS FOR XMAS

ORDER NOW FOR IMMEDIATE DELIVERY

S.T.900 SPECIAL OFFER 5/- ALLOWED FOR YOUR S.T.800 QUADWAVE TUNER

Simply send full cash or usual deposit for Pilot Author or N.T.S. S.T.900 kit required. On receipt of goods forward your tuner to address below, quoting contents and your new order No. on outside of parcel, on receipt of which we will enter a credit in your favour for 5/-.

KIT "1" with FREE Full-size Station Name Dial Card Cash or C.O.D., Carr. Pd. 45/-

Comprising all parts for S.T.900 battery version, including EXCLUSIVELY SPECIFIED Peto-Scott polished and drilled panel, side pieces, platform, terminal strips and screen, Varley Nicol L.F. transformer, B.T.S. H.F. chokes, and T.M.C. block condenser, less valves and coils, but including ALL WIRE, FLEX, SCREWS, card. Yours for 4/- down and 12 monthly payments of 4/-.



N.T.S. BATTERY S.G.3

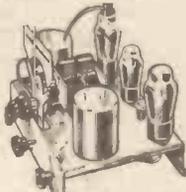


Reviewed on Page 359

LIST VALUE £6:6:0

BARGAIN

Cash or C.O.D. 52/6 or 5/- down and 12 monthly payments of 5/-



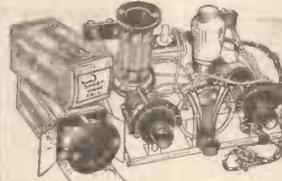
Waverange 200-2,100 metres. Concert-Grand Moving-coil Speaker. New-type No-trouble Switch. Complete with Valves, less Battery and Accumulator, READY TO PLAY. Will bring you British and Foreign programmes with remarkable fidelity and volume. 3 British Valves of guaranteed life: new screened-grid high-frequency, high-efficiency detector, and Pentode output. Latest improved components. Steel Chassis. Slow-motion tuning. Illuminated wavelength scale. Beautiful walnut-veneered cabinet, 19 1/2" high, 14" wide, 10" deep.

CHASSIS ONLY with knobs & escutcheon, less valves LIST VALUE 60/- BARGAIN 19/6

An excellent opportunity which must not be missed. Chassis only as employed in the above receiver. Ready for fixing in your own cabinet. Dimensions: 10" wide, 7 1/2" deep, 8" high to top of scale. OR COMPLETE WITH 3 matched valves. CASH OR C.O.D., £22/2/0, or 2/6 down and 12 monthly payments of 4/-.

DX SHORT WAVE KITS

THE IDEAL XMAS GIFT for YOUNG and OLD "3-in-1" SHORT-WAVE KIT RECEIVER - ADAPTOR - CONVERTER List Value 37/6 BARGAIN 25/- 12-94 metres.



ADAPTS or converts your battery set for short-wave reception, or may be used as one-valve Short-wave Receiver. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Air-spaced

bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 scales calibrated in degrees.

KIT "1" comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions, less valve only. Cash or C.O.D. Carr. Pd., 25/-, or 2/6 down and 10 monthly payments of 2/6. Kit "2," with 2-valve valve, £18/9, or 2/6 down and 11 monthly payments of 2/9.

3-VALVE BANDSPREAD SW KIT 12-94 metres. Will bring a lifetime of fascinating short-wave entertainment. Kit "1," including all coils, but less valves. List value £30/0. BARGAIN CASH OR C.O.D., 37/6, or 2/6 down and 11 monthly payments of 3/6. Kit "2," with 3 matched valves, £21/5/0, or 5/- down and 11 monthly payments of 5/-.

4-VALVE A.C. BANDSPREAD KIT 12-94 metres. Entirely new design. Guaranteed world-wide reception. Kit "1," complete with all coils. List value, £51/0/0. BARGAIN, £33/15/0, or 5/- down and 11 monthly payments of 7/-, if 4 matched valves required, add 2/6 to deposit and 3/6 to each monthly payment.

KIT "2" Cash Price £3:5:0 Carr. Paid

or 5/- down, balance in 12 monthly payments of 5/9. Comprising all parts as in Kit "1," but including set of 5 matched and guaranteed valves, less coils, cabinet and speaker.

N.T.S. S.T.900 6-PIN COILS

MEDIUM WAVE (190-550 metres) per pair 4 6 LONG WAVE (900-2,000 metres) per pair 5 6 SHORT WAVE, three wave ranges (15-43, 24-70, 9.5-27 metres) per pair 4 0 If complete set of 10 coils required, add 22/- to Kit cash prices, or 2/- to deposit and to each monthly payment. If 10 coils required separately, send 2/6 only and 9 monthly payments of 2/6. 5 British matched, guaranteed and tested valves, £1.

N.T.S. S.T.900 FINISHED INSTRUMENT

Housed in PETO-SCOTT walnut table cabinet with extended aerial coupler, station name dial and 5 valves fitted. Complete with 5 pairs of N.T.S. 6-pin coils covering long, medium, and 3 short-wave bands. Aerial tested on all wavebands. CASH, C.O.D. £6:6:0 Or 10/6 and 12 monthly payments of 11/3. Less Cabinet, £25/5/0, or 9/6 and 12 monthly payments of 9/3.

PETO-SCOTT S.T.900 PILOT AUTHOR KITS

KIT "A" Cash Price 55/6 Carrlage Paid

Or 5/- down and 11 monthly payments of 5/3. Comprising all components exactly as FIRST specified by Mr. John Scott-Taggart, with S.T.900 auto-dial card, less coils, Konectakit, wandler plugs, accumulator connectors, valves, extractor kit, cabinet, and speaker.

KIT "A4" As Kit "A" but with Konectakit and 4 B.T.S. medium and long-wave One-Shot Inductors. Cash Price, Carr. Paid, £31/0/0, or 7/- down and 11 monthly payments of 6/7.

KIT "A10" As Kit "A," but with Konectakit 10 B.T.S. One-Shot Inductors, covering long, medium, and 3 short wavebands. Cash Price, Carr. Paid, £45/0, or 8/6 down and 11 monthly payments of 8/-.

S.T.900 SPECIFIED VALVES. If set of 5 first specified valves is required with any of the above kits, add £1/10/3 to cash price, or 3/6 to deposit and 2/9 to each of the 11 monthly payments. Any Peto-Scott S.T.900 Pilot Author Kits, Cabinets, or Finished Instruments available for Cash or on Easiest of Easy Terms.

SPECIAL CASH OFFER N.T.S. MAINS UNITS



You will need a mains unit at some time or other. You MUST buy NOW, however, to obtain these efficient units, as we cannot repeat at the price.

A.C. MODEL. Output 120-v. at 25 m/a. 4 tappings: 60-v., 75-v., 90-v., 120-v. For A.C. mains 200/250-v. 40/80 cycles. Cash or C.O.D., 32/6.
D.C. MODEL. Tapped for screen, det. and power. Output 25 m/a. at 150-v., for D.C. mains 200/250-v. Cash or C.O.D., 19/6.

FREE! SHORT-WAVE BOOK-LET, describing in detail, with actual photographs, 5 entirely new N.T.S. Bargain Bandsread Short-Wave Kits, together with Complete General Bargain Lists—Receivers, Accessories, Components, etc., etc. N.T.S. supply all leading makes Radio and Television. Send us a list of all your Radio requirements for quotation by return.

NEW TIMES SALES Co. (P.W.49), 56, LUDGATE HILL, LONDON, E.C.4

THE GRIP OF THE "GETTER"

(Continued from page 350.)

as a thin film on the upper surface of the valve bulb, imparting to the latter the characteristic reddish-brown appearance of the valve which many of the earlier "hands" at radio will so well remember.

Magnesium, nowadays, constitutes the almost universal valve getter. This is the metal whose presence in the form of a thin layer on the inner sides of modern valve bulbs gives rise to the silvery mirror-like appearance of the valve glass. The magnesium is either welded to the plate or to a convenient electrode of the valve when it is being assembled, or else it is attached to a small mount placed at the base of the valve. Just before the final closure of the valve the electrical high-frequency furnace is brought into operation with the result that the magnesium volatilises and condenses in its characteristic mirror-like condition on the inner sides of the valve.

Practical Difficulties

More powerful getters than magnesium are the metals barium and strontium and, also, sodium, potassium and caesium. Practical difficulties, however, in most cases preclude the employment of these metals as getters, and it is mainly for such reasons that the metal magnesium is so universally popular for this purpose.

Let us now go into the matter of the getter's precise function a little more closely.

In a sense, the getter resembles a sticky fly-paper spread over the inner surface of the valve bulb. We remember, of course, that even the most prolonged pumping cannot accomplish the complete removal of all the atoms of air from the valve's interior. Hence, after pumping has been pushed to its most efficient degree, there still remain in the valve many atoms of air which refuse to be removed from the valve enclosure by such mechanical means.

We must picture these residual atoms as flying about inside the valve in all directions, here, there and everywhere. From time to time, one or more of these atoms comes into collision with the inner side of the valve bulb. Immediately it does so, it is trapped and retained by the getter, and although we cannot picture such an atom held fast in the grip of the getter and waving its hypothetical legs wildly in an effort to free itself like a poor fly on a treacherous fly-paper, we can, at least, visualise the process by which the unwanted atom is secured by the active getter in a state of chemical combination. In this manner, therefore, large numbers of the residual air atoms in the valve come in contact with the getter surface of the valve bulb and are firmly retained by it.

An Important Point

Even if it were possible to obtain an absolutely perfect vacuum by mechanical pumping, the use of the getter would probably still be necessary.

Here is the reason: All substances, and glass in particular, absorb air and other gases very much in the same manner as a sponge absorbs water. Now, when the greater part of the air has been abstracted from the interior of the valve, atoms of air and other absorbed gases begin gradually to ooze out of the valve glass and, also, out of the very metalwork of which the valve

S.T.900

READ WHAT THESE CONSTRUCTORS SAY

"INCREDIBLE"

Dear Sir,—Further to my letter of November 1st, I would just like to add that only last week-end was I able to complete the set, and I gave it a run-out the other evening.

I have only one adjective for it, and that is "incredible." Naturally I cannot give a full report yet, but during the course of the evening I was able, without the slightest difficulty, to log eight different American stations and hold them at full programme strength on the loudspeaker on the 16, 19, 25 and 31-metre points.

I have not yet come across any other set that is capable of doing this. Once again my heartiest congratulations.

M. G. Ferguson.

Grosvenor House School, Harrogate.

(The stations were W 3 X A L, W 2 X E, W 2 X A D, W 1 X X, W 2 X A F, W 1 X A L, W 3 X A U, W 2 X E, also quite a number of American amateurs on 20 metres.)

"AN EXCELLENT SET"

Dear Sir,—I have just constructed the S.T.900, an excellent set to say the very least. The set certainly has got what it needs to get a list of stations which make the most expensive commercial receiver turn green with envy.

Congratulations to its designer, Mr. Scott-Taggart—may his valves never go soft on him.

Austin S. Reed.

No. 3 Hut, No. 2 Wing, R.A.F., Halton Camp, Wendover, Bucks.

electrodes are made. All sorts of elaborate precautions are nowadays taken by valve makers to ensure that this slow leakage of

unwanted air atoms is made as small as possible, but it is impossible to prevent it entirely. Thus, without the presence of the getter, the air-atom population of the valve interior would gradually increase and so ruin the performance of the valve.

The protecting getter, however, ever on the alert, remains in readiness on the inner sides of the valve bulb to seize and to hold any of these intruding atoms which may come in contact with it. The getter, indeed, is the ferocious spider of the valve which waits patiently in its corner and eventually secures the majority of the flies.

Care is Necessary

The "gettering" of valves has now reached a high art. Care must be taken in the case of pentodes and other valves to see that the getter does not condense on the inner walls of the valve so that it forms an electrical leakage path between two electrodes. In a screen-grid valve the getter must not surround the grid terminal, otherwise leakage would occur at this part.

Perhaps some day a super-efficient getter will be forthcoming, a getter which will automatically abstract all the air from within the valve and without pumping having to be resorted to. Such a getter, were it easily obtainable, would cheapen valve production considerably. It is, however, difficult to conceive any practical means of obtaining a higher vacuum than that which exists within the average high-grade valve of the present day. Few manufactured articles and particularly those manufactured on the mass scale, approach so closely a theoretical ideal as does even the humblest of our modern radio valves.

Indeed, the present-day valve has reached an amazing degree of perfection, thanks to British research and engineering skill. Modern valves are extraordinarily consistent in performance and a very high standard of reliability has been attained.

DO YOU REMEMBER ?

ALMOST everyone must have listened to the broadcast of the Scrapbooks which from time to time appear in the B.B.C. programmes. Almost everyone must have shed a tear at the poignant scenes that they have conjured up; laughed at the amusing incidents that have been recorded in them; and joined in the choruses of those lilting melodies. Memories of yesterday.

Leslie Baily and Charles Brewer, of the B.B.C., who are responsible for these programmes, have written a most interesting book entitled "The B.B.C. Scrapbooks." This book besides being a record of the "Scrapbook" broadcasts, which are a collection of reminiscences of twentieth-century personalities and events, tells us of some of the stories behind these performances, with incidents concerning the various characters who have taken part. It gives countless anecdotes, and pictures of backstage happenings at Broadcasting House during their preparation.

A new and intimate light is thrown upon some of the events in the history recorded by those who have taken part in the "Scrapbook" programmes, including such famous personalities as the Marchese

Marconi, the Countess of Oxford and Asquith, Lord Rosebery, Monsieur Bleriot, George Robey, Dorothy Dickson, Leslie Henson, Madeleine Carroll and Vera Brittain.

The book gives a comprehensive range of events, such as records broken in aviation, political disturbances, the acceptance of votes for women, weird crimes committed, famous operas which have been produced, etc.

Sir Philip Gibbs, in his delightful introduction to this book, says of it: "This may be truly called an extraordinary book. Nothing quite like it has ever been written before, because it is the record of an adventure in a new form of drama."

Remember that memorable year of 1918 when the thunder of guns and explosion of shells was suddenly silenced? Remember the church bells pealing in that so-much-yearned-for Armistice? Peace! After four years of perfidy among nations. In "The B.B.C. Scrapbooks" the entire script of "Scrapbook for 1918" is reproduced.

This is not a formal history book but a miscellany of human and national incidents, many of which are revealed for the first time.

The book itself is beautifully illustrated and bound, and is published by Hutchinson at 8s. 6d. It cannot fail to provide first-class entertainment for many thousands of readers and listeners.

F. C.

AN INEXPENSIVE "S.G.3"

A consolette set which represents excellent value for money

OF the various types of circuits available to the battery user there is a lot to be said for the good old straightforward three. The modern three usually consists of an S.G. stage followed by a detector and one L.F. valve. It is good practice to have two tuned circuits, the two tuning condensers being ganged so that both are adjusted simultaneously by one tuning knob.

With a set incorporating a circuit of this type the listener has a wide selection of programmes from which to choose. The S.G. H.F. stage provides the necessary high sensitivity, and the two tuned circuits adequate selectivity, assuming the set to have coils of low-loss design. And the great advantage of a straightforward three of this type is that it need not be expensive. Therefore, it is the ideal receiver for the listener with a pocket of strictly limited depth.

Attractive Table Model

We are reminded of these advantages by our recent test of the New Times Sales Company's "S.G. Three." This is an attractive table model set built into a distinctive walnut veneered cabinet with macassar and sycamore contrasted inlays.

The set itself is built up on a chassis of enamelled, pressed steel and is in the lower portion of the cabinet. On the back of the chassis there are sockets giving alternative aerial taps for selectivity. The loudspeaker, which is of the moving coil type, is in the top section of the cabinet. The circuit utilises an S.G. H.F. valve followed by a detector and pentode output stage. It is designed for reception on the medium- and long-wave broadcast bands covering wavelengths of 200-550 and 900-2,100 metres. The two tuning circuits are equipped with

(Continued in next column.)

RANDOM RADIO REFLECTIONS

(Continued from page 352.)

hope lots of listeners won't understand that new term. They believe that they might think it is merely some special process of transmission and that the artists are actually there all the time and not that gramophone records have been used.

However, they don't now try to get away with it like they used to in the early days.

"Mr. Smith will now speak to you—come on, Smithy, tell the listeners all about it"—at which point the announcer switches on the radiogram. Once or twice they dropped bad bricks. Remember that classical occasion when a very popular broadcaster was supposed to be broadcasting from the continent and the needle kept in the same groove and he sounded most parrot-like?

Though their handling of them has improved mightily the advertising stations still largely run on recorded programmes. The whole programmes are in most cases recorded in this country and sent over to the continent on records. Very small stations staffs are retained. Just an announcer or two in the majority of instances.

the latest screened wave-wound air-cored coils. Also, these two tuned circuits are ganged together and thus adjusted with the one tuning control. There is also provision for an external speaker.

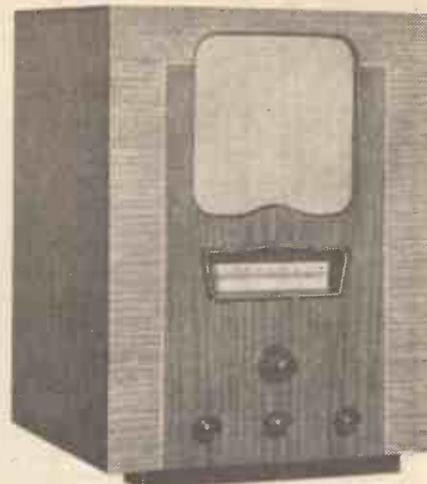
The L.T. and H.T. batteries fit snugly into the cabinet so that the set is self-contained in this respect. The makers have thoughtfully provided a fuse bulb so as to remove any possibility of damage due to accidental short circuits when connecting up. The H.T. consumption is 9 m/as.

We tested the receiver on a rather poor aerial of high capacity and we were surprised at the excellent degree of selectivity obtainable. A wide selection of British and Continental stations on both wavebands were tuned in with ease.

This is a type of set which should give good, trouble-free service and with a reasonably effective aerial and normal earth a sufficient choice of programmes to suit the most fastidious listener.

The price is only £2 12s. 6d., and we think that it will be agreed that at this figure it is remarkable value for money.

While on the subject of bargains, we should like to mention the splendid value-for-money short-wave kits described in the New Times Sales Company's list of short-wave bargains, copies of which are obtainable on request. These kits comprise a combined adaptor-converter and single-



This attractive "S.G.3" has two fully tuned circuits and a moving-coil speaker.

valve set which, complete with three plug-in coils sells for 25/-. Then there is a two valve Bandsread short-wave kit at 32/6 a three valve Bandsread kit at 37/6 and a four-valve kit at 42/-, and an A.C. mains kit known as the "A.C. Four" at 75/-.

These kits are sold complete with all the necessary drawings and easy-to-follow building and operating instructions, so that all the constructor has to do is to assemble them.

The short-wave fan will find much to interest him in this little booklet which is obtainable from the New Times Sales Company, 56, Ludgate Hill, London, E.C.4. All the kits are available on deferred terms.

ENJOY SHORTWAVES at CHRISTMAS



You can get first-class headphones reception of World-wide shortwave broadcast and experimental amateur transmissions with this Eddystone battery operated "All-World Two." It will consistently receive many American, European, Australian and other long-distance shortwave broadcast and amateur stations at good volume and quality. It is fitted with special "Eddystone" bandsread tuning. Wave range 15 to 52 metres. Price, with valves and coils, guaranteed aerial tested and ready for immediate use.

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A VISIT TO THE EXIDE WORKS

FEW people outside the actual manufacture of accumulators realise the skill and knowledge which are essential in the making of what is to the uninitiated an apparently simple device. To the layman the sight of the familiar plates immersed in acid and contained in a glass, celluloid, or other type of case conveys nothing of the ceaseless research and experiment behind it.

It takes a visit to the factory to appreciate this, as we quickly realised on our recent tour of the Exide works at Clifton Junction, near Manchester.

Let us for a moment consider some of the varied uses of accumulator batteries. They are employed extensively in radio for L.T. and H.T. That we all know. But what of their other uses.

Uses of Accumulators

Motor-cars need them for starting and lighting purposes. They are used on motor-cycles; for bus and coach lighting and starting; in cinemas; miners' hand lamps; on trains and in submarines.

There are also stationary batteries for generating stations, domestic lighting plants, load regulating purposes, marine and emergency lighting, etc.

Extremes in the range of batteries are indicated by the small police lamps weighing but a few ounces to the large cells for central electricity stations weighing as much as three tons. Between these two limits cells of several hundred different designs are produced by the Chloride Electrical Storage Company—to give the Exide firm its full name. This great firm came into existence in 1891 when the founders of the syndicate purchased certain French and American patents for the manufacture of storage batteries with chloride of lead as an active material. Since then steady progress has been made, culminating in the present enviable position of the company. One of the things that strike one forcibly in going round the works is the great care taken in the welfare of the 2,000 workers. As the employees in the course of their work are called upon to handle considerable quantities of lead or lead oxide, elaborate precautions have been instituted and special plant installed to protect them from the dangers involved in this class of work.

Watching Employees' Health

There is, for example, a resident medical officer who examines the employees at regular intervals. There are also a dental clinic and first-aid department. The result of this is that there has been no known instances of lead poisoning since 1929.

All handling of oxide and plates is carried out under an exhaust system, the men having a glass screen between their face and their work, any dust that is created being carried away by suction. Where it is not practicable for work to be done under an exhaust, specially designed respirators are worn.

In certain processes a complete change of clothing is provided for the workers, who

take a bath at the end of each shift before dressing in their own clothes.

It was extremely interesting to see the multitudinous types of batteries going through the various processes and to study the many different kinds of plates used.

Those familiar to radio enthusiasts are the "Hycap" and "Mass" cells. The "Mass" type are specially suitable for receivers with small current outputs, the "Hycap" cells being more suitable for the higher-powered models and therefore supplements the "Mass" cells.

To the layman the Exide submarine battery has a fascination of its own.

The Exide works have kept pace with the development of these special cells since 1901, and thus occupy a unique position in the manufacture of cells of this type. When it is remembered that the submarine, when submerged, has to rely solely upon the current from a battery of cells for its propulsion the importance of extreme reliability will be readily understood. Altogether a most interesting visit.

A SUPER QUALITY 14-WATT RECEIVER

(Continued from page 341.)

loading of the detector valve, and an extreme case of this will result in a weakening of signal strength when accurately in tune and an increase in signal strength as the tuning is altered to either side of this middle position. The reason for this is that when the input to a grid detector is greater than a certain amount, signal strength falls off. When you detune to either side, the input decreases and the output from the detector consequently increases. As you detune still further signal strength will fall off in the normal manner. In a clear case of overloading of the detector, a reduction of the variable-mu grid-bias potentiometer will result in an increase in signal strength, but, of course, as the potentiometer is turned still farther round, the normal decrease in signal strength will always be obtained.

Note the method I have adopted for tone control. A "grid stopper" of 250,000 ohms in combination with a .00075-mfd. solid dielectric is used. Where no tone control is desired the switch under the tuning knob short-circuits the 250,000-ohms resistor.

J. S.-T.

Mr. Scott-Taggart will describe the construction of the Super Quality receiver in next week's issue.

ALL-STAR VARIETY

AN all-star variety bill will be broadcast in the Regional programme from the Gaumont State Cinema, Kilburn, when London's newest giant cinema opens on December 20. Gracie Fields, Henry Hall and his Orchestra, George Formby, Larry Adler, Carroll Levis, Vic Oliver, Stone and Lee, and Alfred Van Dam and his State Orchestra will all be included in the broadcast, lasting three-quarters of an hour. Sidney Torch will be at the organ. The B.B.C. has arranged to place microphones throughout the cinema to pick up both the stage performance and the atmosphere of the house.



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

ONE of the most remarkable experiments ever undertaken in short-wave transmission is now nearing completion at P.C.J., the Philips short-wave transmitter known to thousands of listeners throughout the world.

Recently it raised its power to 60 kw., and its next step is to overcome in a novel manner the one big disadvantage of the "Beam" system—that of requiring a separate set of masts and aerials for each direction of the beam.

The scheme which has been worked out in the Philips laboratories is nothing less than a revolving aerial system. Here are some details of its construction:

Briefly, the new aerial comprises two wooden lattice masts 195 feet high, which rest on a massive steel girder bridge mounted on a centre pivot and eight heavy wheel trucks. The whole system turns on a circular steel track, the circle of the outer rail being 145 feet in diameter, and the inner circle about 40 feet. The massive centre pivot is carried by a solid block of some 25 cubic yards of concrete. The weight of each mast is 18 tons, and that of the steel bridge on which they rest is 95 tons.

This unique aerial system can be revolved in any desired direction, either by electric motor or hand winch, and a somewhat amusing feature is a number of signposts around the circular track, bearing such indications as "Africa," "Argentina," "Brazil," and so on.

Careful allowance had to be made for wind pressure, which in normal conditions is of the order of 4½ tons on each limb, but during storms may rise to as high a figure as 48 tons. Each of the eight wheel-bogies is therefore, provided with heavy steel claws, which can be screwed up tightly on to the rails when the necessity arises.

The aerial system proper consists of 12 vertical di-pole aerials on each mast—24 in all, each aerial being fed separately. And it is claimed that with an input of 60 kw. the effect of the special construction of the system is that the energy radiated in the direction of the beam is 24 times that of the radiation of an ordinary di-pole aerial, or, in other words, equivalent to the radiation from a di-pole aerial of a 2,000-kw. transmitter.

For the time being, this new aerial system will be used only on the 31-metre band, but if it proves as successful as is expected it is probable that an identical system will be constructed for other wavebands.

THE QUEEN USES MARCONI MICROPHONE

An important occasion on which Marconi equipment was again used by royalty was the ceremony in connection with the opening of the new Maternity and Child Welfare Centre and Day Nursery, performed by Her Majesty the Queen recently.

The equipment included three microphones, one of which is reserved exclusively for the Queen wherever Marconi P.A. apparatus is installed. The special microphone in question is a new design of the moving-coil high sensitivity type. Prior to the event described, this microphone was used by Her Majesty when she opened a new wing of St. Mary's Hospital earlier this month.

Amplifying apparatus was installed in the hospital's Sun Room, and a relay was made to Lady Walston's Clinic close by. The Queen's speech was broadcast to the large crowd in front of the building via several giant Marconi projector loudspeakers.

Comprehensive arrangements for calling the cars of the various dignitaries taking part in the ceremony were also made.

P.A. EQUIPMENT AT "MARINA" ICE REVIEW

A smart piece of work by Marconi engineers was carried out recently when they completed a new P.A. installation at the vast Empress Stadium, Earl's Court, with less than three days' notice.

The occasion was a special performance of the Ice Review in aid of that worthy cause, the Subsistence Production Scheme. Her Majesty the Queen, who is interested in the scheme, graciously decided to attend the show, and a large and enthusiastic crowd packed the arena. Howard Marshall, the well-known commentator, was engaged to give a running commentary, providing the crowd with added enjoyment of what is already accepted as a really fine spectacle.

Owing to the great size of the building certain difficulties in rendering transmission entirely free from echo had to be overcome. But in spite of the

short time at their disposal, Marconi engineers accomplished a first-rate installation, and every word of Mr. Marshall's well-delivered narration was heard perfectly in all parts of the hall.

A Marconi Reisz Microphone, a 100-watt amplifier, and 20 Marconi High Fidelity loudspeakers made up the new equipment, the splendid functioning of which is yet another tribute to the excellence of Marconi workmanship and design.

MURPHY LUXURY RECEIVER

Here are some further details about the new Murphy A.40RG quality set to which we referred in last week's Bulletin.

A side-by-side arrangement of the radio receiver and motor board is used, and the volume control is on the front of the cabinet. Altogether there are twelve receiving valves, and two rectifiers in the set, and it is equipped with automatic tuning correction, the L.F. output being a pair of push-pull pentodes giving an undistorted output of 12 watts. For short-wave reception there is an H.F. stage, and frequency-changer in front of the medium-wave receiver, this giving a high gain, freedom from noise, and easy tuning on these particular wavelengths. For gramophone records a Piezo-electric pick-up is employed, and the automatic record-changer will take eight records of mixed 8-inch and 10-inch sizes.

The makers state that the quality of reproduction is the best they have been able to obtain in a floor type cabinet. There are two special speakers, these being contained in an acoustic tunnel to eliminate boom and air column resonances. The mains consumption is 200 watts.

The cabinet work is fully in keeping with what one would expect of a set of this type, and is in dark, straight-grained Bombay rosewood with medium-toned Babinga, an African wood of rosewood type.

FOR CHRISTMAS PARTIES

Those who are holding children's parties at Christmas will be interested in the G.E.C. "Party Lights" with their coloured shades of non-inflammable, translucent material. Each bears a charming representation of some well-known English nursery rhyme. Twelve 3-watt Osram lamps are included in this attractive kit which costs 15s. 6d. Also available are decoration lights in various colours—an ideal method of giving a party atmosphere to the surroundings. A complete outfit of these lights costs 19s. 6d.

YOU MAY BE A B.B.C. SAMPLE SOON!

(Continued from page 345.)

work to Vertical Divisions. Meaning the questions elucidate only specific problems, without really touching on the many general "grouches" of listeners.

And so, in the New Year, Mr. Silvey will attempt what he calls a Horizontal Sample. He will, by some means known only to himself, select a large number of listeners more or less at random, and will write to them direct.

You may, therefore, wake up one morning to find in your post a polite letter from the B.B.C. asking you to be so good as to fill in the enclosed form. What the questions will be about even Mr. Silvey does not yet know, apparently.

But this experiment will prove one thing, if nothing more. Whether, in other words, the ordinary listener will, when the initiative is taken away from him, co-operate with the B.B.C. or not.

I must say I am impressed with Mr. Silvey's grasp of his subject. Almost he has mesmerised me into believing his research may at last give the B.B.C. a box-office index. But what worries me is that the more infallible the method is the less likely we are to be asked just the sort of questions we are simply dying to answer.

But there's always a snag, somewhere. Not that it's likely to depress Mr. Silvey. Still, when he runs short of questions I can provide him with a few. Only I fear the B.B.C. won't let him ever ask them. That would be just too much of a joke.

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SEEN ON THE AIR

News and Views on the Television Programmes by Our Special
Radio-Screen Correspondent

L. MARSLAND GANDER

THE other day I took part in another television programme and, as a consequence, afterwards fell to musing. There is a great risk that producers and artists may be unable to see the wood for the trees. They may enjoy themselves so much during a transmission that they entirely lose sight of the fact that it has no entertainment value for people watching the small home screen.

I do not think this was true of the programme in which I played a small part, but the experience served to make the danger apparent. Perhaps I ought to say that my own presence made very little difference to the production in the direction of making or marring it—in fact, I was only playing the part of television "extra."

We (myself and few Press colleagues) were at Elstree for one of the transmissions which are giving viewers glimpses behind the scenes of filmland. The programmes showed four of the most rapid changes of climate ever seen in this or any other country. My colleagues and I were crouching in an archway in the quaintest street imaginable. At our end it was part of old Limehouse, with a little general shop opposite. Farther up it turned into a Persian bazaar, full of chattering brown-skinned salesmen and their customers. A fork to the right took the visitor into the snows of Russia (best rock salt) which crunched underfoot in the most realistic manner. Here the saracenic arch was the prevailing mode, while from the ledges and balconies hung long stalactites of frozen snow (best cotton wool).

A long tracking shot opened the broadcast. That is to say, Aileen Marson and Leslie Mitchell were seen walking down this curious street, while the camera (on a trolley) retreated unseen in front of them. Then they came to the Persian market. Mr. Mitchell did a quick change act into a topee and Palm Beach suiting and stood "grilling," while lights overhead poured down tropical sunshine. There was suitable patter.

Producing Snow

Presently they came to the snow. Overhead on lofty perches two studio hands held trays full of tiny white flakes, rather like confetti. They were busily fanning this "snow" into the air with large pieces of cardboard. Below the flakes settled on the huge square beards of men whom filmland would have us believe are typical pre-Revolution moujiks. The illusion was pretty good at close range, and I am told that on the home screen it was perfect. Mr. Mitchell, having accomplished another speedy change, stood shivering in Russian furs.

Then came the turn of the Limehouse street. We were advised to take cover, and scurried under the shelter of our arch just in time to avoid a deluge of rain spraying down from a system of overhead pipes. A solitary policeman braved the storm, and macintoshed figures flitted through the downpour. Miss Marson and Mr. Mitchell were excused a drenching, watching out of range.

While Mr. Mitchell did more gagging, preparation began for the last weather change—to fog. Some smoke bombs were lighted, and soon the air was full of choking fumes. Wind threatened to disperse the fog somewhat pre-

maturely, but the stage hands with rare cunning rapidly shifted their positions, and within seconds the black-out was complete. During the "fog" it was Mr. Mitchell's intention to introduce my colleagues and me to Miss Marson.

We were supposed to loom out of the fog. I suspect some hidden satire, but never mind that. That fog was perhaps a little bit too effective. I stumbled through it coughing and spluttering, and, with relief and triumph, reached my objective. I understand that my face was mercifully obscured by the smoke, but the introduction was effected satisfactorily. I had already enough of that fog when I stepped away into the thick of it. I couldn't see six inches ahead, I coughed and choked, and I can taste those fumes even now.

Well, presently the smoke cleared, and while we wiped our smarting eyes everybody was busy congratulating everybody else. In spite of the mild discomforts, I thoroughly enjoyed myself. It was great fun for everybody taking part, but did the viewing audience appreciate it?

Faked Weather

Mr. Dorté, the producer, learnt with chagrin that some telephone calls had been received from persons who thought that they were being shown film shots. In the evening a special announcement was put out explaining that the weather had, in fact, been genuinely faked. Some viewers contend that it does not matter whether they are seeing models, reality, or film. I believe them to be wrong, and here is an excellent case for argument. If sections of film taken in Persia, Russia, and Limehouse had been introduced the transmission would have been entirely pointless.

Personally, I award full marks to those who thought of this way of demonstrating the resources of filmland, though I am inclined to think that it will be increasingly difficult

to infuse fresh interest into these film studio transmissions.

I must add that I have asked a number of people who saw the transmission on the screen. Once assured that no film was used, they agreed that the pictures had been most effective and that it all made an enjoyable programme. For my part I, for once, cannot express an opinion, having been on the wrong side of the screen.

Two-Way Television

On the same evening there took place between Alexandra Palace and Elstree the first two-way transmission of television in the world—an event which, so far as I am aware, did not have a single line of publicity in the Press.

Mr. Gerald Cock, in the studio at A.P., talked to Mr. Walter C. Mycroft, productions manager of the Associated British Picture Corporation at Elstree. Each could see the other on the screen of a television receiver. It was the same principle as the television telephone except that the words and vision were, in this case, carried over the air and not by land line.

As I write, preparations are going forward for a television birthday celebration, marking the 100th edition of "Picture Page." Miss Joan Miller, the telephone girl who has announced every item, will cut a birthday cake. And here are some figures illustrating how television absorbs material by the number of persons and animals who have taken part in the transmissions since the beginning.

There have been 729 men, 350 women, 57 boys, 9 girls, a lion, a horse, a cheetah, a parrot, a mynah and 10 other birds, 3 cats, 14 dogs, and a silkworm.

The silkworm did not survive the ordeal, by the way, though it just lasted long enough to rear up in front of the camera.

GOLDERS GREEN RADIO AND SCIENTIFIC SOCIETY

The fixtures for the remainder of December and the first two weeks of January are as follows:

Dec. 21st—A visit to the Odeon Cinema, Swiss Cottage. Attend the full programme, inspect the sound and vision apparatus, and also the new electric organ, 8.30 p.m.

Jan. 8th, 1938.—Visit to the General Electric Research Laboratories, Wembley.

Jan. 13th.—Quality Reproduction demonstrating Hartley Turner Apparatus, by P. K. Turner, Esq., B.Sc.

Tickets are obtainable from Lt.-Col. H. A. Scarlett, 60, Pattison Road, Hampstead, N.W.2. Stamped and addressed envelopes must be sent with applications.

WEYMOUTH AND DISTRICT S.W. CLUB

This society has been granted a licence for transmitting, the call-sign allotted being G 8 W Q.

The headquarters of the society are 15a, Hope Street, Weymouth, and the Hon. Sec. is Mr. W. Bortlett; 59a, Franchise Street, Weymouth.

CLUB NEWS

ILFORD AND DISTRICT RADIO SOCIETY

ON Friday, November 12th, a representative number of members visited the Southend Society at their headquarters at Leigh Technical College, where a lecture on Modern High-Definition Television was given by Mr. Watson, of E.M.I.

The lecturer gave an interesting talk, and went very fully into the subject from all angles. The proceedings terminated with many questions, especially in regard to the Emitron camera, which was shown to the meeting; also C.R. tubes, etc. Mr. Watson was heartily thanked by the chairman on behalf of everyone present.

The society, which is one of the oldest established in the South of England, has recently produced a new Bulletin for circulation to members. Full details of the society are obtainable from the Hon. Sec., Mr. C. E. Langer, 44, Trelawney Road, Barkingside, Ilford, Essex.

AIRCRAFT WIRELESS By **J. C. JEVONS** (SEE PAGE 373)

Popular Wireless & TELEVISION TIMES

TRAINING
RADIO ENGINEERS
+
DO CONDUCTORS
DECAY?

EVERY
WEDNESDAY
PRICE

3^D

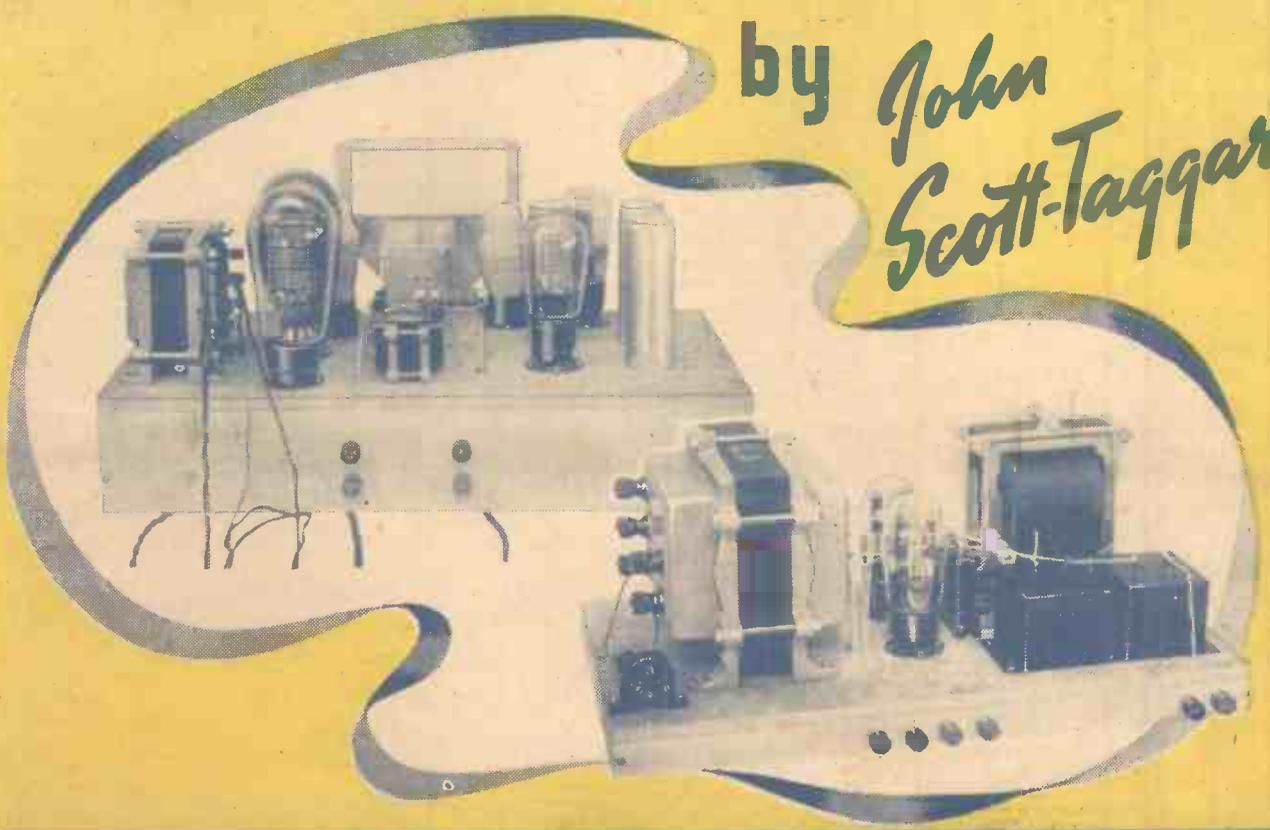
No. 811.
Vol. XXXII.
Dec. 18th, 1937.

Building the

Super Quality

14-WATT RECEIVER

by *John
Scott-Taggart*





Grand Xmas Gift Books for Boys

TRIUMPH Annual

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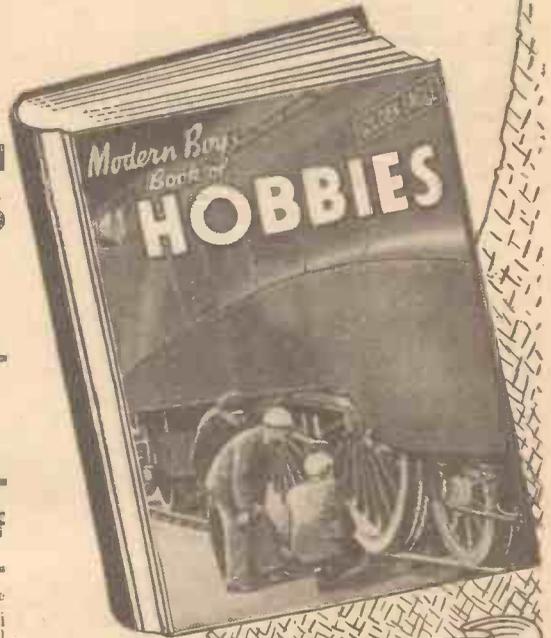
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THOSE fortunate boys who choose their Christmas presents from this selection of famous Annuals will be certain of hours and hours of entertainment—long after ordinary gifts have lost their interest. All these books are strongly bound in coloured covers and packed with splendid features. See them at the Newsagents, today!



Editor: G. V. Dowding

Asst. Editors: A. Johnson-Randall, A. S. Clark

MONKEY BUSINESS
ON FULL TIME
COLD COMFORT

RADIO NOTES & NEWS

WIRELESS WHOOPEE
HOODED MEN
RADIO STAMPS

Into the Unknown

EVERY man who has cracked an egg is more or less akin to Columbus, and is able to get some thrill out of the exploration of the unknown. We cannot all sail the seas, but it is surprising how often a short-wave set will keep in touch with the modern expeditions of exploration.

Those who comb the 40-metre band with some thoroughness should prick up their ears if they hear a station calling V P 3 M R, or other V P class station, for they may be lucky enough to eavesdrop in on the Holden Expedition, which is surveying in the unknown interior of British Guiana. The expedition's call sign is V P 3 P H E.

Another expedition which may fall to the ears of a lucky listener has been heard just above Zeesen DJ L on 19.85 metres. This is the McGregor Expedition, quartered somewhere among Greenland's icy mountains.

Monkey Business

DID I ever tell you of Professor Quizz, who delights American radio audiences by broadcasting mental teasers and ingenious problems?

One of his posers excited extraordinary interest. The Professor said, "Imagine you have a well-oiled pulley with a rope hanging evenly from it, half on either side of the pulley; the rope would rotate the pulley wheel if weighted, unless exactly equal weights were fixed to the ends.

"Now suppose you have a live monkey on one end of the rope and a weight, of exactly the monkey's weight, fixed to the other end. What happens when the monkey starts to climb up the rope?"

This teaser caused so much discussion that it was arranged to try it out, and the pulley, rope, monkey and monkey-weight were all duly assembled in the studio.

Amid breathless interest, the monkey climbed the rope and the weight on the other end started to rise. Can you say why? But I'm afraid I cannot offer any prizes.

On Full Time

WHATEVER the unemployed figures may do in the winter months, they will receive no assistance from the B.B.C. engineers, who are busy now—and getting busier.

Extensions at Daventry are one source of engineering activity; and the new Start Point station has been finally approved, so there is another, which will keep some of the staff busy for many months.

In addition, there is talk of another station on the South Coast to relay the National programme. A 5-kilowatt, or the Penmon model, would certainly improve reception in the Southampton area, and a site in the neighbourhood of Calshot is

favoured for this type of radio station. The Norwich district is another which calls for strengthened facilities, so there is work a-plenty in prospect for the Engineering Department.

7 Metres—2,000 Miles

WHEN the G.E.C. erected a 7-metre transmitter on the top of the State Office Building, Albany, N.Y., they designed it to serve an area of twenty miles or so around the immediate neighbourhood. But, as "P.W." tests have proved in the past, the "visual range" of the ultra-short-wavelength transmission is often to be taken with a pinch of salt, for even the 7-metre transmission will reach out astonishingly at times.

The G.E.C. engineers were not wholly surprised, therefore, to get letters reporting that their low-powered experimental programmes were appearing well beyond the twenty miles limit.

What did surprise them was one letter from Arizona, which reported good reception at a distance of about 2,000 miles. This must be nearly, if not quite, the record for an overland-all-the-way ultra-short-wave programme.

IN MEMORY OF POLDHU



The granite column erected by the Marconi Company to commemorate the site of the former Poldhu wireless station at Poldhu Cove, Cornwall. As stated by "Ariel" last week, it was from this station that the historic three-dot signal (letter S in Morse) was transmitted, and received by Marconi in Newfoundland. Many old-time operators on the Atlantic route will remember M P D'S (Poldhu's call signal) Press messages.

Cold Comfort

IF Christmas should prove to be so cold that you cannot poke your nasal organ out of doors, you may want to get some comfort from comparison. Try your luck with the short-wave transmissions from the Soviet North Polar Expedition.

It is so truly cold up there that the Russians will probably spend Christmas Day working hard on the radio to keep themselves warm. They use the call-sign U P O L (short for Up-at-the-POLE), and they favour the evenings from seven-ish onwards.

Their taste in wavelengths is a bit erratic, but nobody can blame them for that when they are working in temperatures where zero on the thermometer would represent a heat wave.

The likeliest wavelength on which to try is 21 metres, or one of the adjacent dial-markings.

(Continued overleaf.)

SPECIAL RADIO STAMPS TO BE ISSUED

If you succeed in logging them you will have linked up with some intrepid spirits who deserve a bouquet for the way in which they have tackled the coldest job ever.

Wireless Marketing

IN Budapest they not only have the Blue Danube at their doors, but also a good many blue housewives, who grumble daily because the food prices jump about so erratically. It's very upsetting to a housewife to snap up a bargain at one shop, and then to find that she could have obtained in the next street a juicier joint or a fatter kipper at half the price.



So acute has the grumbling become that regulation food prices are to be broadcast from the central market daily, and wireless sets at all the retail markets will inform purchasers of the ruling rates.

Detectives will watch the working of the new system, and if the irate housewives now catch anybody overcharging it will need all the available police protection to keep the offender from an enforced dip in the Danube.

Greeks Get Going

THE Athenians are making good progress with their new Broadcasting House, which will officially inaugurate a new service on January 1st, 1938.

The Radio-Athens station will join Rabat and Sundsvall on the 499.2-metre wavelength, with a power of 15 kw.—quite enough to get over to this country when conditions are exceptionally favourable.

The privately owned station announcing itself as "Radio-Thessaloniki" will carry on with its infrequent programmes on 225 metres until it is rendered unnecessary by the projected new national station.

Wireless Whoopee

AUSTRALIA is going to make wireless whoopee next year, when the World Radio Convention is to be held at Sydney. It will be a great occasion, for Sydney will be celebrating Australia's 150th anniversary.



Reports from the Commonwealth indicate that some of the boys of the backwoods, always glad of an excuse to go gay, are going to converge on Sydney and paint that burgh every shade in the spectrum.

In addition to these cheery souls Sydney is expecting some distinguished visitors. It is hoped that Mr. David Sarnoff, President of the Radio Corporation of America, will visit the Convention, taking with him Giulio Marconi, son of the late Marchese Marconi, now studying in the States.

Professor Van der Pol, the noted Dutch radio scientist, is another visitor whom the Australians hope to welcome.

Germany's Record in Danger

RECENT British television experiments with land-line transmission suggest that the German record of reception at a distance of 300 miles will shortly be exceeded, says the *Daily Telegraph and Morning Post*.

Among the interesting disclosures made are two of special interest: British research experts have shown in the laboratory that pictures of superior quality to the German pictures can be transmitted and received over 400 miles of land line.

BROADCASTING BREVITIES

"Music Hall" on Saturday of this week (December 18th) brings to the microphone Bennett and Williams, two jovial boys with their phono-fiddles; Albert Whelan, the well-known entertainer; Billy Bennett—"Almost a Gentleman"; The Two Leslies (Sarony and Holmes), Britain's brightest entertainers; Marie Burke, mezzo-soprano (by permission of Mr. Prince Littler); and Wee Georgie Wood, the Peter Pan of vaudeville. The B.B.C. Variety Orchestra will be conducted by Charles Shadwell, and the show will be produced by John Sharman.

George Formby, one of the most brilliant of recent captures for the microphone, has signed for a series of six weekly broadcasts in the New Year, starting on January 7th. "A Lancashire Lad in London" is the title of the sketches in which George Formby will be assisted by a cast including Beryl Formby, his wife. As the Lancashire comedian will be engaged at the time in a Newcastle pantomime, the sketches will be broadcast from a Newcastle studio, and Gordon Crier will travel from London to produce.

Theatre variety in the Midland programme, on December 23rd, will come from the Hippodrome Theatre, Aston. Artists in the bill there during the week include Linga Singh, Tom Hughes, Joe King, and Sammy Dunne and his Urchins.

David Porter, North Regional variety producer, will be the host at a Christmas party called "A Right Good Do," which will be broadcast in the Northern programme during the evening of December 21st. Harry Korris, the comedian, will be the principal guest and among the many others attending the party will be artists who were "discovered" for broadcasting by Porter.

And it is probable that if television transmitting apparatus was installed in such centres as Birmingham, Manchester and Edinburgh, no local studios would be required, since all the television programmes could be relayed from Alexandra Park.

The Hooded Men Scare

WHILE the French police were busy investigating the activities of the famous Hooded Men there was great excitement near Toulon, for a number of mysterious radio messages were picked up. They consisted of code, and expert decoders were soon engaged in trying to solve the mystery.

No sooner had the police got seriously to work than they began to laugh, for they found that the secret radio station was merely a bit of ingenious home constructional work by schoolboys who had got hold of a blue print. And the messages, when decoded, were to the effect that "Old Stinker is a fool" or "Don't buy your toffee at Blanks. They give you light weight."

Impressed by the ingenuity displayed, the police are allowing the youngsters to carry on with their radio experiments—but under strict supervision.

Radio Stamps

WIRELESS men who do a bit of stamp collecting on the side might with advantage make a note of the Telecommunications Conference to be held in Cairo next February. To commemorate the event the Egyptian Government has decided to issue special stamps of radio interest, and one of the issues will bear the portrait of the late Marchese Marconi.



I suggest to stamp collectors that anyone specialising in stamps of wireless interest might prove to be on a very good thing, for one of these days some wealthy collector who happens to think highly of both hobbies will be willing to pay a lot for such double-interest specimens.

A good variety of such stamps has already been issued, including some effigies of the pioneers.

Radio for the Bedfast

IF your rich uncle has bequeathed you the unexpected fortune which he made in Phanssee-Thatnow or other foreign part, or if your pool forecast was a winner, remember the bedfast.

Up in Stockport they have a society for providing wireless for the bedridden poor, and, although Toc H helps with the servicing of batteries and so forth, there is urgent need of more funds.

Donations, large or little, will be gratefully received by the hon. treasurer, Mr. T. Greenhalgh, Williams Deacon's Bank, Underbank, Stockport.

Look Out for Delhi

THE new 10-kw. short-wave station at Delhi is expected to begin testing at any moment. The other new Indian stations are also progressing, and Lahore will probably be on the air by the New Year.

Lucknow will follow soon afterwards. Bombay and Madras have their new station buildings in hand, while Dacca and Trichinopoly are looking at the plans of theirs, and selecting dumps for the materials. Meanwhile, a professor in the Indian Institute of Science has worked out designs for an Indian "People's Set," which could be manufactured by mass production methods to sell at low cost.

It looks as though 1938 will be an eventful year for Indian radio which, after disappointing set-backs, now promises to be the pride of Asia.



ARIEL

BUILDING THE 14-WATT RECEIVER

By

**JOHN SCOTT-TAGGART,
M.I.E.E., F.Inst.P., Fel.I.R.E.**

Complete diagrams and instructions for the construction of the super-quality receiver described in our two previous issues

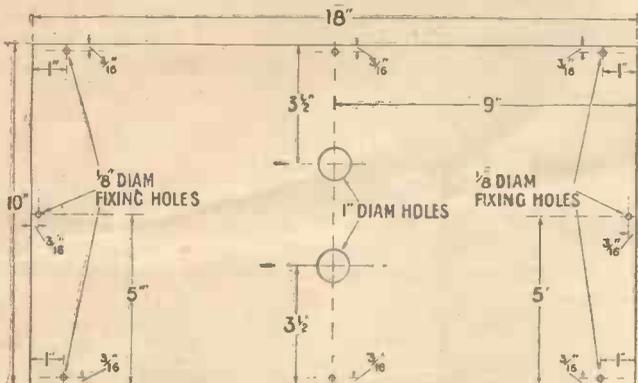


Fig. 1. Drilling instructions for the baseboard of the power-pack chassis.

THE following constructional notes will assist the builder of this 14-watt receiver and give him sufficient detail, although no actual blue print is supplied.

There are two parts to the set: the receiver proper and the power pack. The chassis of the receiver consists of a "Metaplex" baseboard (both sides metallised), mounted on three wood supports. Details of these supports are given in Fig. 6.

The back support carries aerial, earth and pick-up terminals. The loudspeaker is connected directly to the output transformer. The coil unit is mounted on the underside of the chassis below the tuning condenser. This makes for short leads and a more compact lay-out.

The power pack chassis is made in a similar way, a Metaplex (both sides) baseboard, mounted on wood supports, which in this instance are on all four sides and only one inch deep. The terminals for L.T. and H.T. are mounted on one of the supports.

Preparing the Baseboard

First mark out and drill the baseboard of the receiver proper. That is, drill the holes for valve holders and electrolytic condensers, and also three holes through which yellow leads from coils pass. The underside of this baseboard is shown in Fig. 7. The holes through which leads pass from underside to top of chassis are drilled when wiring or when components have been mounted. It is then simple to get them in their correct relative positions. Actually the three lead holes through which yellow leads from coil unit pass are drilled as shown in baseboard-drilling diagram. It is essential to drill these holes before the components are

mounted, as it is impossible to do so afterwards. Prepare wood supports for receiver baseboard as in Fig. 6. Now mount baseboard on supports. Use 3/4 in. No. 4 round-head brass screws. Prepare aluminium brackets as shown in diagrams. Mount the left- and right-hand brackets on underside of baseboard so that vertical portions carrying component-mounting holes are flush with front edge of baseboard. The left-hand

LEFT-HAND BRACKET

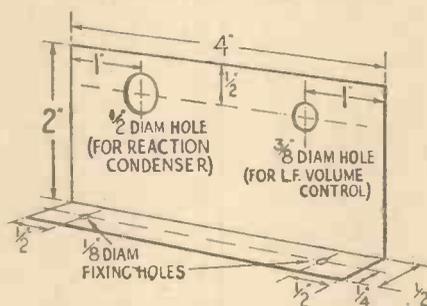


Fig. 2. The controls are carried on metal brackets. This bracket is for the reaction condenser and L.F. volume control.

bracket is 2 1/2 in. from left-hand side of baseboard, and the right-hand bracket the same distance from the right-hand side. The middle bracket is mounted in the centre of front edge of baseboard with 3/4 in. No. 4 countersunk brass screws, so that the edge nearer fixing screw is flush with top surface of baseboard. The chassis is now complete and ready to take the components.

First mount the coil unit on underside of chassis so that the spindle is the same dis-

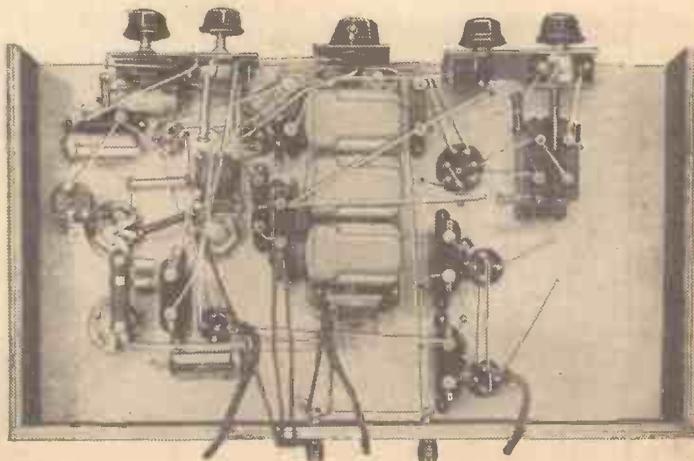
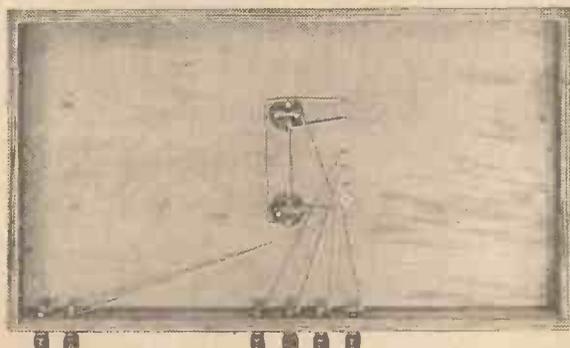
tance from both sides of the baseboard and projects beyond front edge and through the hole in centre bracket. The three yellow leads on the coil unit must be passed through their respective holes in the baseboard as the coil is placed in position. Use 3/4 in. No. 4 round-head brass screws. The other leads on the coil should be brought out in their correct positions as shown in wiring diagram. Cut off the yellow leads, leaving a projection of 1/2 in. above top of baseboard, on each. Push back insulation 1/4 in. Mount tuning condenser immediately above the coil unit so that its spindle is the same distance from each side of the baseboard. See that the bared ends of the yellow coil leads come on the outside of the fixed vane tags of the tuning condenser ready for soldering. Fix tuning condenser with 3/8 in. No. 4 round-head brass screws. Fit valve holders and electrolytic condensers. This enables the other components to be fitted in their correct relative positions.

Mounting the Components

Place chassis on bench so that it rests on the electrolytic condensers and support other end of set with books or block of wood of suitable thickness. Mount components on underside of chassis. Resistances mounted in wiring are not, of course, fitted until wiring is done. Mount aerial and earth and pick-up terminals on back baseboard support.

Fit reaction condenser and L.F. volume control to left-hand bracket. The reaction condenser is insulated from bracket by means of insulating washers. The bush of the volume control is already insulated from the element, so that in this instance insulating washers are unnecessary when mounting.

(Please turn to page 366.)



These two photographs show the undersides of the power-pack chassis (above) and the receiver chassis (right). Photographs of the tops may be seen on our front cover.

ON THE SHORT WAVES

THE FINAL ONE VALVER

By W. L. S.



AS I promised last week, I am rounding off this single-valver business this week with the final circuit of the set and some comments on possible refinements. I sit down to write this page after having spent an entire week-end with the very set I am going to talk about, so you can really regard this as "straight from the horse's mouth."

First of all, I would be glad if every reader who has lost all patience with this single-valver racket would switch right off and read something else—for I don't want to be constantly apologising for describing a small set. Theoretically, I know, it's all wrong; it isn't *done*, using a set with only one tuned circuit; you can't *possibly* hear weak signals without an L.F. stage; you're *bound* to have hand-capacity effects without an H.F. stage; and so on, *ad lib*.

Yes; I know all that. I know that, theoretically, it's true, but I also know that, practically, it's the bunk. Nothing hurts me more than to have to admit that my own funny little single-valver pulled in signals that thirty pounds' worth of single-signal super wouldn't get—but there you are, so what?

The Question of Noise

Incidentally, I have been forced to another decision—that I am going back to battery sets for a while. I don't mind A.C. on the filament, in fact it's a great advantage to use an indirectly-heated valve in the single-valver. The use of an all-A.C. set, however, unless one goes in for expensive noise-silencers, does definitely bring in all sorts of spurious noises which need not be picked up at all. And this effect seems to be worse on the upper wave-bands than on the lower.

So, for the present, let's have a quiet set—one valve, battery operation, and all the little gewgaws that make it a little better than a mere "ordinary" set.

The circuit on this page is the same old circuit we have always used, but there are some comments to be made. First, note that I have settled down to a six-pin coil with a coupling condenser in series with the aerial winding.

With a 67-ft. outside aerial I use a value of rather less than 00001 for this coupling, and still don't notice any deficiency in signal strength. Selectivity is all that could be desired except where it concerns local stations. If I am listening on the 20-metre amateur band and a transmitter a mile away starts up on phone, he naturally blots out a few kilocycles which he doesn't affect on the big

superhet—but I'm prepared to put up with that for the present.

The letters (a) and (b), referring to the band-set and band-spread condensers, are an important pair. I suggest that (a) should not be larger than 0001, in spite of the fact that the modern valve-base-type coils are meant to run with a 00015. The 0001, with a band-spread condenser of 000015 in parallel, gives just the small overlap between coil ranges that you want.

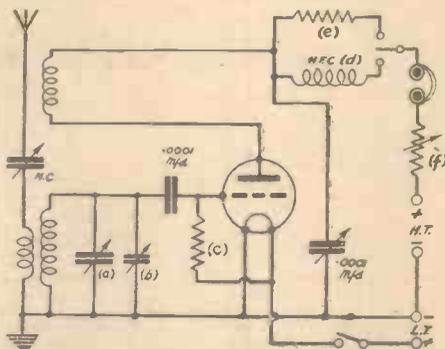
There's no particular reason for playing about with the size of the grid condenser. The conventional value of 0001 suits modern valves for short-wave operation. The grid leak, however, must be chosen

it might continue to oscillate with the reaction condenser at zero.

The last specially labelled component is the series resistance between the phones and the H.T. positive terminal. This is to give a continuous control over the H.T. voltage, which may be far more critical than we are apt to realise. You can choose 60 or 66 volts on most batteries, but—far-fetched though it may seem—you may find that 63 volts is what your detector really wants. You've got to be some critic for this game! You must never be content with anything that can be improved, no matter by how small a margin.

Mind you, this is a DX receiver. I wouldn't be so dumb as to advise anyone to go in for a single-valver if his chief thrill in life happened to be listening to short-wave broadcast programmes. You can get them, of course, and you will get them more free of interference on this midget than you will on a big set, but you can hardly sit back in your luxurious chair and listen to them for hours on end.

A DX SINGLE-VALVER



Although fundamentally a straightforward single-valver, this circuit has several interesting features. For instance, a switch enables either a resistance or an H.F. choke to be tried in the detector anode circuit. Also, the variable resistance (f) provides a means of adjusting the H.T. voltage at will.

to suit the valve you want to use, and you may find that a value as high as 5-megohms gives quieter operation and smoother reaction control than a lower value. Even if the improvement in reaction smoothness is only 10 per cent. or so, it's worth considering. Anything that makes an improvement, however small, has got to go into a set like this.

The reaction condenser can always be a 0001, and again there's no point in trying other values. Whether you use an H.F. choke (d) or a resistance (e) is largely a matter of personal preference. Use whichever suits your set best, but do try both to find out. Sometimes I find that a choke gives better results on some frequencies, but generally I prefer the resistance, and I usually give it a value of 10,000 ohms. After all, with a series-fed circuit like this, its only function is to see that all the H.F. goes round through the reaction condenser. The only reason that you can't run the set without a choke or resistance at all is that

An Interesting Test

No, this is the set for the man who wants to receive all those distant stations that are just swallowed up in the mush on a big mains-operated set. I amused myself a few days ago by trying to find the weakest signal on the whole of the short-wave spectrum, first on the big superhet and then on the single-valver. On the big set it was *just* submerged in the mush. I could tell that it was there, but I couldn't read it. On the single-valver it was very, very weak, but perfectly clear, and I got a call-sign out of it without any difficulty.

If you are a loudspeaker addict, by the way, may I repeat my old, old suggestion of a beautiful L.F. amplifier, entirely separate from the rest of the set, and mounted, so to speak, in a unit with the loudspeaker? That, in my opinion, is the way to convert a really hot headphone receiver into an equally hot loudspeaker job. I have a 3-watt amplifier with a pretty hefty overall gain and a nice speaker mounted on the end of it, and when I feed the single-valver into it I get what seems to be a magnified version of what the single-valver picks up, *without* a lot of additions in the shape of mush, clicks, scratches and bangs. Keeping the mains out of the way of the detector valve is what produces this subtle difference.

Well, I must leave the subject now but I hope a good many enthusiasts will try the circuit out for themselves.

ON THE SHORT WAVES—Page 2.

POINTS *from the* POST-BAG

W.L.S. Replies to Correspondents

THERE is a great demand from readers for a set covering all the ultra-short-wave bands—roughly, 3-12 metres—as mentioned in my recent reply to L. C. B. (Coulston). I have had fifteen letters backing it up this week, and so I must get down to it and construct a really hot set for that special purpose.

H. C. P. (Bletchley) writes a glowing testimonial to the powers of a much-hotted-up "W. L. S. Single," with one stage of L.F. added. He passes on the tip (which used to be standard practice years ago, but is now almost forgotten) that if you have any trouble when you add an L.F. stage, the easiest way to cure it is to reverse the leads to one side of the transformer—either primary or secondary. With the "wrong" connections the set will generally eat out of your hand. H. C. P.'s "sits up and purrs." Although he is on the main Holyhead Road, he can receive 20-metre Yanks on the speaker by day or night. As a certain experience between 1914 and 1918 prevented H. C. P. from roaming about the world as much as he'd like to, he says that his greatest pleasure is to roam all over the place while comfortably seated at the controls of a well-behaved set.

A Stable Set

H. F. H. (Tadworth) in claiming two gold seals for his "18" Club certificate, sends in an awe-inspiring list of calls heard on 10 metres. Although it's not H. F. H.'s normal set, he has a "Simplex" Three working, and he says it is the most stable set he has ever handled.

F. W. (Saltash, Cornwall) reports good reception of the sound programme from Alexandra Palace, which seems extremely good going to me. His is the first report of the kind that I've had from that part of the world.

T. W. M. (Topsham, Devon) sends in his log of 10-metre DX phone stations, which number over 300. He comments on the "signature tune" of W 5 E T R ("Easy to Receive")—quite a good one, that. One that made me sit up recently was W 3 D B G ("Three Darned Beautiful Girls"). One puzzling thing about T. W. M.'s log is that he adds, in brackets, the States in which the stations are located, and says that these have been definitely heard on the air. He has three W 3's logged as "Florida," which, of course, is in the 4th District. I'm wondering how that misunderstanding could arise.

J. M. C. (Kendal) had a long reply from me a few weeks back, about the high noise-level of which he was complaining. He now writes to say that it all came from inside the set. By moving a transformer from off the sub-panel and mounting it on ebonite he now has a set "as perfect as any set ever was." There's a moral in that somewhere, especially in view of the number of letters that include the words "Of course, I live in

the noisiest spot in the British Isles . . ." J. M. C. wants me to give an up-to-date list of international prefixes as soon as possible. I'll see what can be done.

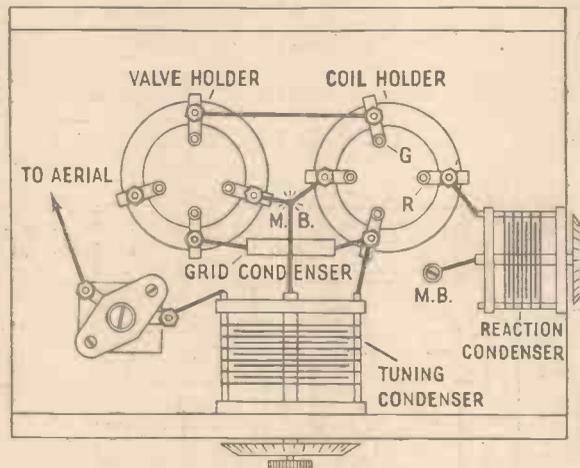
H. J. B. (Manchester) is now 2 B C X, having obtained his artificial aerial "ticket." He still can't locate the 5-metre band, but is having excellent results on 10 metres, including several Australians and S T 2 C M, F Q 8 A, H R 4 A F, P Y 1 B R, V S 7 M B, and Z B 1 C. On the transmitting side he has a very fine Morse key, but that's as far as things have gone so far!

Reversed Connections

S. J. (Croydon), to whom I have lent the original "Simplex" Three, tells me that it's a joy to be able to get W 2 X A F completely free of interference from its neighbours. He has evolved yet another layout for four-pin coils by reversing the connections to both the reaction and grid windings. This certainly gives very short leads, and I give a diagram of it on this page.

S. J. asks me to mention that the Short-Wave Club of which he is a member (I

SHORTENING THE WIRING



A scheme suggested by S. J. (Croydon) for shortening the wiring of a four-pin coil in the detector circuit. Both windings of the standard coil are given reversed connections—grid and plate going to the inside ends instead of the outside. The diagram shows what a compact layout may be made of this arrangement.

don't know its official title) meets at 8 p.m. every Wednesday at 24, Penrith Street, Streatham, S.W.16. The secretary is Mr. C. J. L. Goldsworthy (2 C W I), and new members will be welcomed.

"PALACE OF VARIETIES"

FOR his gala production of "Palace of Varieties" on December 21, Ernest Longstaffe has assembled some notable stars. Gertie Gitana will make her first microphone appearance during this show. Her programme will include "Nellie Dean."

Frances Day, star of screen, stage and radio, is in the same bill, and so are the Western Brothers, Fred Douglas, Stanford and McNaughton, and Stanelli.

An atmosphere of naphtha flares, brussels sprouts, and pale celery is to be the background of a Christmas shopping scena "Down Our Street," which George Buck has written for the same broadcast. He himself will take part in it, together with Norah Blakemore and a company of twelve children—with barrel organ—and an ex-servicemen's band.

Short-Wave News

AS I stated briefly in a previous issue, there really will be a determined attempt to make some transatlantic contacts on the 160-metre amateur band this winter. Throughout this month and January the tests will take place every Saturday and Sunday morning, from 4.30 onwards. On Saturdays no attempt will be made to secure two-way contacts; the American and the European stations will transmit during alternate periods of fifteen minutes, so that each side will have a quiet period to listen for the others.

During these periods European stations may work other Europeans, and Americans may work other Americans—this will not reduce the chance of either side hearing the other. On Sunday mornings the going will be free for all, and attempts at two-way work will be made.

During January comes the R.S.G.B.'s official 160-metre contest, which takes place largely during the small hours of the morning. Thus we may easily see some transatlantic work being done by some of the winning stations, who will certainly be on the look-out for points from that source.

Hampered British Stations

British stations, of course, are sadly hampered in their attempts to get across the Atlantic on 160 metres by the regulation which fixes their maximum power on that band at 10 watts. Even the amateurs who have 250-watt permits for other wavebands have to stick to a meagre 10 watts on 160 metres. The reason for this, presumably, is that the band is shared with various other important services—lightships, for example—and the risk of interfering with them must obviously be reduced to a minimum.

A little group of well-known British amateurs have become so thoroughly fed up with the terrible jam on 20 and 40 metres that they are confining all their activities to the extreme bands, 160 metres and 10 metres. Some of them—those who hold 80-metre permits—also work on that band, on which there should be quite a lot of transatlantic work this winter. At any rate, there is sufficient amateur activity on these three "outside" bands to interest any short-wave receiving enthusiast, and those of you who are fed up with the jamming on the more frequently used bands might well follow the example of the transmitters I have mentioned and look over the other bands a little more frequently.

I am rather keeping off the short-wave broadcast bands nowadays. Conditions are so good and the powers used by the chief stations are so high that a list of stations heard sounds like an extract from an official list of stations. It's worth mentioning, however, that U.S.A. may be received equally well on 19, 25 and 31 metres during the evenings just now.

W. L. S.

TELEVISION TOPICS—Collected by A. S. Clark

OUT OF THE LABORATORY STAGE

THOSE who have followed the development of television will be nearly as familiar with the "Television is out of the laboratory stage" statement as with the one "Television is just round the corner." But the first statement is the more literal and logical of the two because all scientific developments pass through a laboratory stage.

Some may ask what exactly is this "laboratory stage"? Surely, they maintain, if a thing can be done in a laboratory it can also be done on a wider and commercial scale.

The Question of Finance

Looked at theoretically, that is quite true, but in practice there is a lot of difference. And that difference lies mainly in the question of finance.

In the laboratory apparatus thousands of pounds are spent on producing one installation, time taken in constructional work is of little consequence, as also are the robustness and permanency of the whole. When it comes to producing the same thing for sale to the public or for commercial use the cost has got to be in direct relation with the intrinsic value to the user. Prestige to a firm and the obtaining of knowledge for future use cannot help to make the cost worth while.

And in order to keep price down to certain limits methods of rapid production and production by machinery have to be made available—often an impossible task. The hand-building—sometimes of every little detail—that is often needed in scientific apparatus is out of the question. And then strength and lasting qualities must be present in production models.

Apart from finance, there is also the question of the politics of the case. Do people want the new invention? Are they prepared to change existing apparatus and methods?

Colour Television

All the considerations thus outlined have played a big part in the production of public television, and are still doing so in connection with developments of the science. And the different states of progress in different countries is entirely due

to varying financial and political conditions appertaining, and not because there is much between the state of development in the countries so far as laboratory gear is concerned.

Take colour television for instance. There are a number of ways in which this could be carried out in the laboratory, but it could not in any way be said to be ready to put on the market. Ordinary television receivers cost a lot of money as it is—sets for colour would cost a whole lot more.

Then the transmissions would have to be different and present sets would not work on the new transmissions. So it's no good thinking of colour television at the present. No doubt, however, before long demonstrations of colour television will be provided by the technicians. Then people will say: "Colour television coming out of the laboratory stage."

"TELEFRAMES"

Items of general interest

PHOSPHORESCENCE IN SCREENS

MOST materials that are fluorescent are also phosphorescent to a certain extent. Fluorescent materials give out light under the influence of an electron

Those who have cathode-ray tubes can note the fluorescent nature of the screen by shining a bright light on the screen and then throwing the room into darkness. The circle of the tube's screen will be seen to glow with a light similar to that given by the figures on a luminous watch dial.

THOSE DUMMY FEEDERS

Some readers may have been puzzled to notice that on some television dipole aerials the feeders appear to be duplicated for the first few feet, and that one of these feeders appears to stop short and to serve no useful purpose.

Close inspection would reveal the fact that this type of television aerial is invariably used with what is termed concentric feeder cable, namely there is one wire inside a spaced and metallic outer casing which forms the other connector. When the more usual twisted wire feeder is used, the short length of dummy feeder is not employed.

The purpose of the dummy feeder is to obtain a phase reversal which is necessary with the concentric cable, but not with the twisted type of feeder. The outer casing of the dummy feeder, which is a quarter wave in length, is joined at its end to the outer casing of the main feeder.

FLATTENING THE TUNING

Those who have carried out reception of the television signals with an ordinary oscillating detector circuit will have noted that tuning is rather sharp with the values of components usually to hand. One interesting way in which the tuning can be flattened enough to help is to put up the aerial in triplicate.

Assuming the usual type of dipole aerial is employed, instead of one length of wire or rod with a break in the centre for the feeders, three are put up in parallel, the wires being

the distances between about an inch and a half.

The effect is to reduce the inductance of the aerial, and at the same time to increase its capacity, which in turn produces a flattening of the tuning.

SCOPHONY PROGRESS

The chairman of Scophony Ltd. at the recent meeting of this company said that the alterations to the synchronising signals from Alexandra Palace had proved a great help, and that the Company were now in a position to receive satisfactorily the television broadcasts.



This photograph gives point to the article in the first column of this page, since it shows the inside of a television laboratory and emphasises the special conditions which appertain.

bombardment while that bombardment lasts; phosphorescent materials "store up" the effect of light rays and give out light after the source has been removed.

It is the phosphorescent properties of the fluorescent screen that help to give it its lag. The light produced by the electrons on the fluorescent nature of the material affects the phosphorescent nature so that the light continues to be given off after the electron bombardment has passed. Thus the lag in a cathode-ray tube can vary according to the extent of the phosphorescent nature of the material from which the screen is made.

SEEN ON THE AIR

News and Views on the Television Programmes by Our Special Radio-Screen Correspondent

L. MARSLAND GANDER

WHY this absurd secrecy about the sales of television receivers? The most contradictory and perplexing reports are floating about on the subject; yet there is every reason to suppose that the Television Advisory Committee has the figures and would have no difficulty in obtaining the permission of the various parties to disclosure.

On the other hand we have Mr. David Sarnoff's statement in America, after his return from this country, that the total number of television receivers sold up to and including the period of the Radio Exhibition was 1,100. In heartening contrast a Sunday newspaper published a remarkable graph purporting to show that in the last few months the number of receivers in the hands of the public has suddenly quadrupled and that there are now upwards of 8,000 in the London area.

Even this last figure, the most optimistic estimate, might not have been considered particularly good if it were not for the exceptional rate of increase within recent months. It is obvious that if this steep slope were continued there would be within a very short time 50,000 receivers in the London area. No wonder the trade was in a flutter over the figures which were published in one of the more serious and trustworthy of Sunday newspapers. In the absence of any authentic information my own opinion is that the figures are on the optimistic side. I should not like to say that there are more than 5,000 receivers, at the outside, in London homes.

Increased Buying Interest

But I feel sure that within recent weeks there has been a considerable increase of buying interest on the part of the public, judging from personal experience of inquiries. Why? I will come to that presently, but before I do so I want to make an urgent plea for the release of the information which is available on sales.

It might be disappointing to know that only a few hundred or a few thousand sets have been sold, but nothing could be worse than the present uncertainty. Manufacturers cannot budget; they cannot definitely judge whether this or that factor is holding back sales. They do not know whether to lay down 100 or 1,000 receivers at a time. I do not say that statistics of sales would at once solve all these problems, but a little light would certainly help. For example, it might be possible to say that during such and such a period certain programmes produced sales. It might also be possible if full disclosures were made to decide that certain types of set were more acceptable than certain other types, and also to ascertain what relative importance was attached by the public to screen size.

Why has there been increased interest lately? Chiefly, I think, because of marked improvement in the picture. A more sensitive camera has arrived, the home

screen has become brighter, there has been a revolution in the lighting arrangements at Alexandra Palace which has resulted in far better and clearer pictures. Full-length plays have been transmitted, demonstrating the great entertainment value of the long feature. Outside transmissions have stirred curiosity and roused expectations of future possibilities.

Incidentally, in conjunction with the special cable which is now being developed, there is no reason why events should not be televised from any part of the country.

Progress in production is now so rapid that I grow almost tired of referring to it. Nowhere in the world is anything like it or anything approaching it being done. This will be written large in entertainment annals one day; in the meantime, it is good that the staff at Alexandra Palace should take things in their stride, not pausing to gloat over achievement but always pressing on.

This last outburst of mine is occasioned by the televising of "Once in a Lifetime," a play performed entirely in the studio with

laughs; the fun is fantastic, but Hollywood is a broad target.

But I thought that, perhaps unconsciously, the B.B.C. had presented a parable. If television can accomplish in the home something as good, or nearly as good, as a film produced with all the muddle and money of Hollywood, what then?

Joan Miller, as May, added to her reputation as the finest television star. Oddly enough though she is persistently cast for comedy or semi-comedy, I prefer her in more serious moments. Charles Farrell as the "dumb" George Lewis who scores Hollywood's greatest success by working from the wrong scenario was in good form. Jos Greenspun as the excitable film chief and Kay Lewis as the wooden "discovery" both deserve special mention.

And now for some personal matters: Congratulations to Mr. Cecil Madden on the hundredth edition of "Picture Page." His has been a grand achievement involving how much toil and nervous strain he alone knows. I was present in the studio for the hundredth edition, and once more must utter the warning that what sounds and seems fine in the studio may be a pain in the neck to the watcher. The material was there in profusion—Jean Batten, Gerald Brockhurst, General Drummond, and the rest. But the programme ran to seed, almost every item was too long.

Still, though we all grumble at "Picture Page" on occasion we all look at it, and that is the test.

Baird and Scophony Demonstrations

Congratulations also to Mr. J. L. Baird, who tells me that he has at last accomplished coloured television on an experimental basis. He has promised me an early demonstration, and until then I reserve judgment.

Finally, congratulations to Mr. S. Sagall, of Scophony, on the personal triumph involved in the first demonstrations of 405-line reception by his system. As I write I am on the point of going to a Scophony demonstration of the screen 24 inches by 22 and the small hall receiver giving a picture 6 ft. by 5 ft. I anticipate excellent results, for I know that no demonstration would be given if Mr. Sagall was not fully satisfied.

* * *
"The Old Lady Shows her Medals," perhaps the most famous of the one-act plays of the late Sir James Barrie, will be televised in Christmas Week, the first performance being in the evening of December 20. It will be repeated in the afternoon on December 28.

In this wartime story, the pathetic Mrs. Dowey deceives the world into thinking that, like her charwomen friends, she has a son fighting at the front. The play, which is in the best Barrie vein, should make ideal material for television. It will be produced by J. Moultrie Kelsall.

SOLUTION TO "P.W." RADIO CROSSWORD PUZZLE

which appeared on page 356 of
last week's issue.

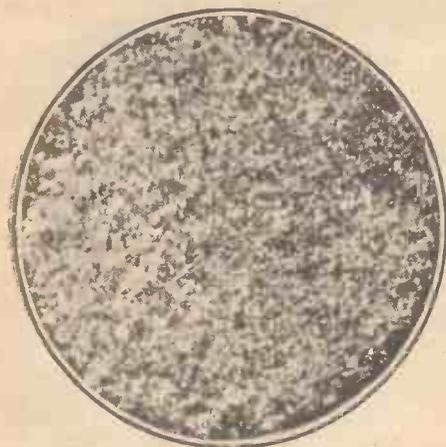
- | ACROSS: | DOWN: |
|--------------------------------|-----------------|
| 1. Selectivity | 2. Echo |
| 6. Tune | 3. Valve |
| 7. Three-valver | 4. Supersonic |
| 9. Mete | 5. Heterodynes |
| 11. Antenna | 8. Van |
| 15. Realm | 10. Transmitter |
| 17. Amp | 11. Amateur |
| 18. Arm | 12. Tap |
| 19. Sat | 13. N A A |
| 20. Eon. | 14. Ammeter |
| 21 (Across and down).
Extra | 16. Australian |
| 22. Nut | 22. Nat |
| 23. Encre | 25. Crime |
| 24. Reactor | 26. Oil |
| 27. Talk | 28. Brag |
| 29. Oscillators | |
| 30. Exam. | |
| 31. Meteorology | |

all the technical skill of a big feature film and lasting ninety minutes. I should like to know what the Hollywood film of this play cost, also how long it took to make. The television version must have cost a tithe of the money and could have had only a fraction of the rehearsal time devoted to it.

Mr. Eric Crozier, aged 23, the youngest producer at Alexandra Palace, based his effort on the stage play. Both the studios were used and five different "sets" were constructed.

As I sat watching I felt for the first ten minutes or so that here was a film play performed very much as it might be in amateur theatricals. Then abruptly it seemed to slip into gear and began to run more smoothly and with a quickened tempo. This farcical satire on Hollywood is full of

DO CONDUCTORS DECAY?



A magnified photograph of a section of a metal bar showing its essentially crystalline nature. It is supposed that electric current, in passing along a metal conductor, increases the "grain-size" of the crystals, causing them to rearrange themselves into complex patterns.

IMAGINE for a moment that you held in your hand two pieces of copper wire, identical in length, diameter and other characteristics. One of the wires is a new one; the other has been in use for a quarter of a century, during which time it has passed current intermittently, day in and day out. Would you expect to find any essential and vital difference between the physical nature of the two conductors? Would you hope to find the twenty-five-year-old wire as strong and as electrically conductive as the newly manufactured one? Would you anticipate its passing all the stringent physical tests which the fresh piece of wire would undergo successfully?

In brief would you expect to find the old conductor to be as efficient, electrically speaking, as the new one?

The probabilities are that you would plump in favour of the new conductor for any electrical apparatus you were constructing. And you would do so more or less automatically, perhaps, for the simple reason that the human mind has acquired, from past experience, the fixed idea that anything which has been used a good deal must necessarily have deteriorated.

Resistance Increase

It is extremely probable that if you measured carefully the resistances of the two wires you would find the old wire's resistance to be greater than that of the new conductor, if only for the reason that complex changes, about which very little is known, do actually take place within the interior of metals in the course of time.

The point at issue in this article, however, is whether the prolonged passage of electricity through a conductor has a deteriorating influence on the latter. Curiously enough, this is a topic upon which both physical and electrical science are extraordinarily silent. The fact of the matter is, of course, that we do not know with any accuracy the effect on a metal of the flow of electricity, in large or small amounts, through it over a prolonged course of time.

It is possible to meet practical electricians who will tell you that in re-wiring old

The possibility of electrical currents exerting a deteriorating influence upon the conductors through which they pass seldom presents itself to the mind of the radio worker. Yet it is very probable that the continual passage of electricity through a conductor does set up a decay of the latter

By F. S. POUND

houses for electrical supply, they came across lengths of flex which simply powdered away in their hands. Such assertions may be strictly truthful, but the decay of the wire cannot be ascribed entirely to the flow of current through it. Atmospheric corrosion, the influence of moisture and various other causes may, and probably will, have combined together to bring about the decay of the flex.

It is well known that if an imperfectly insulated conductor is allowed to carry current for a prolonged period, the wire will gradually corrode away. Such deterioration, however, is due not so much to the actual effect of the current upon the conductor but to the influence of stray electric currents which, parting from the conductor, seek an easy path to earth via the imperfect insulation. If continual moisture is present, electro-chemical action will be set up at all areas of the conductor from which the stray currents part from it and the consequent corrosion of the main conductor will be more or less rapid.

Effect of Metal Junctions

When an electric current flows from one metal to another of a different nature, there is generally some electro-chemical action at the junction of the two metals. Such action is only very slight, if the junction of the two metals has been well made; but in practice it is found that the resistance of this junction of the dissimilar metals slowly but surely increases. Frequently, also, the metal on both sides of the junction tends to become crystalline and to powder away.

The soldered joint well known to all radio workers is a common example of the electrical junction of dissimilar metals. Soldered joints are a necessary evil in any radio or electrical apparatus. They are, naturally, a lesser evil than are unsoldered joints, for, usually, such junctions show an even higher resistance. Yet the fact remains that a length of wire containing, say, ten soldered joints has a smaller resistance to the flow of current than a conductor of equal dimensions containing fifty such joints. Each soldered joint very slightly inhabits the flow of current and, more than that, at each soldered joint something mysterious happens to the internal economy and arrangement of the metal junction—we do not know exactly what this mysterious happening is—which results in the well-known gradual decay of the junction.

It is well known to most radio experimenters that the copper employed for electrical usage is invariably of an exceedingly high order of purity. "High-conductivity" copper (as the metal used for



A section of a piece of pure copper very highly magnified. Note the individual copper crystals in the metal. If, by any chance, they increase in size, the resistance of the metal increases.

electrical purposes is termed in the metallurgical trade) contains, on an average, 99.96 per cent. of copper, the remainder consisting of a trace of oxygen. Let as much as a half per cent. of impurities be added to the copper and its resistance immediately increases. When currents are passed through conductors of low-grade copper (and such conductors were common enough in the earlier days of electricity), not only do the currents encounter a higher resistance, but gradually the resistance actually grows. This is due to various internal changes taking place within the copper under the influence of the current and the impurities present in the metal. Pure copper, however, so far as can be ascertained, is free from such effects.

Thus we see that impure copper wires may actually deteriorate under the prolonged influence of current flow. Naturally, the heavier the current the greater the change.

But what of pure copper conductors? Does the prolonged flow of current exert any effect on them? Is the copper wire in a radio tuning coil any the worse for having been in use for fifteen or twenty years?

A Mysterious Process

Here our present knowledge, or, rather should I say the *certainty* of our present knowledge, comes to a dead end. We do not know. The mechanism of current flow, no matter whether the current be a faint trickle of electrical energy through a radio set leakage path or the fierce rush of power along the main feeder of a generating station, is an intensely mysterious process and our present-day knowledge concerning it is still lamentably small.

All metals are composed of masses of crystals. A cube of a metal is much the same as a lump of sugar in physical make-up, except that the individual crystals of the metal cube are very much smaller than those of the mass of sugar. Now, it is very probable that, under the prolonged influence of current flow the individual crystals which make up a metallic conductor actually

(Please turn to page 381.)

RANDOM RADIO REFLECTIONS

By VICTOR KING

NEW YORK NEWSPAPER'S RADIO COMPETITION ::
DEVELOPMENTS IN METALLURGY :: MAKING WAR
A REAL "RACKET"

AMERICAN RADIO

ONE of the New York newspapers is running a radio competition in connection with the new U.S. radio sets. Of course, the idea behind it is to get advertising from the manufacturers. The competition is quite a simple one. All you've got to do is to put "True" or "False" against each of nine questions. Oh, yes, and you have to supply a twenty-five word slogan as well as a kind of "by the way."

Why I am particularly interested in this competition is because the nine questions are so frightfully difficult to answer—for an Englishman. They illustrate that American radio is, after all, American radio. No doubt the average Yank would be able to answer them off his head without the slightest trouble. Here they are:

1. A new 1938 radio features "No Squat—No Stoop—No Squint" tuning.
2. None of the new 1938 radios has "Touch Tuning."
3. One of the new 1938 radios has "Robot Self-Starting Tuning."
4. One of the new 1938 radios is not a "Super-Eleven" Console.
5. "Waterfall Front" Console is a feature of one of the new 1938 radios.
6. A new 1938 radio features "Push a Button—There's Your Station."
7. One of the new 1938 radios does not have 20-Push-Button Automatic Tuning.
8. The new 1938 radios may not be purchased with a small down payment.
9. "Magic Keyboard" is a feature of one of the new 1938 radios.

These little queries have set me thinking. Why shouldn't I have a competition like that? No sooner said than done. Here's mine:

Answer each of the following questions with either "Yes," "Perhaps," "Maybe," or "No."

1. Do B.B.C. announcers have to wear spats?
2. Is there a set which gives you the London National when you are tuned-in to Knockisblov?
3. Is there a television station at Wigan?
4. Does Sir Walford Davies wear a kilt?
5. Do crackling noises from a set mean it's raining at Broadcasting House?
6. Is fried fish and chips sold in paper at the B.B.C. staff canteen?
7. Did Sir John Reith hear the "all lit up" broadcast?
8. Is a "promenade concert" something you hear on a portable set?
9. When did you stop swearing at the programmes?
10. Write twenty-five words describing the technical equipment at Brookmans Park.

All entries, each accompanied by ten shillings to cover cost of postage and packing of prize, should be addressed to

Victor King, c/o
The Great Snoring
Almshouse,
Norfolk.

IMPORTANT NOTE.—As I know all the answers I have arranged for the magnificent prize to go to my third cousin (by marriage) on my mother's side.

So what's the good of telling you what the prize is?

GREAT TIN ADVANCE

I WAS very interested in a Paper that was read to the Institute of Metals by Professor Hanson and Dr. Pell-Walpole. They described certain researches into tin-base bearing metals.

The first step was to investigate the ternary system tin-antimony-cadmium by thermal and microscopic analysis, in order to determine the constitution of the alloys, so that later on the mechanical properties might be examined methodically. Which they did, very thoroughly.

I won't go into details regarding this original work, because I know many of you would find it rather too advanced.

My object in drawing attention to it is to indicate something of the work that is being done in metal research. You might think that all there is to know about mixing one metal with another was found out years ago. But that is very far from being the case.

Every week I receive from one or other of the scientific societies to which I belong, or from one or other of the various trade associations, tens of thousands of words descriptive of new advances and new facts about metallurgy.

In no other branch of science or industry is so much being done. And it isn't this re-armament business that is stimulating the activity, either. It has been going on for years.

That part of it isn't so surprising, because, after all, metal and its fashioning assume a pretty big dimension in this modern civilisation of ours. What is staggering—to me, at least—is that there is so much pure research—science for science's sake.

A NEW WEAPON

TALKING about re-armament reminds me of a new angle on this warfare racket that comes to light (or hearing) in the States. Someone over there has had a brainwave.

It generated in this fashion: A general was expected at a big navy display at



Nora Swinburne and Richard Ainley (as the Regional producer) in a broadcasting sequence from "Lily of Laguna," a new Butcher film, which is being made at the Walton-on-Thames studios.

Brooklyn. A popular general and the navy lads were determined to give the old boy a right royal salute. But all they could muster for the purpose was a pair of one-pound signal guns. Not good enough!

They put their heads together. Someone had an idea. Why not shove a microphone near those guns, amplify like stink and push the result out through a battery of big public address speakers.

They did it. The result was tremendously successful. The little one-pounders gave out a roar, with the aid of the P.A. outfit, like a broadside from a battleship.

A brainwave was born. Why not use amplification in warfare to make small guns sound more terrifying?

A machine gun merely goes tat-tat-tat-tat-tat! Like a rather noisy typewriter. Use a mike, a few hundred watts of power and a big speaker and you'd get boom-boom-boom-boom instead.

Visualise a trench full of boom-boom-boom machine guns. Enough to make the enemy run home to mother with a story about cannon that can be carried on men's backs and fire half-ton shells straight at you at the rate of a thousand a minute.

Think of an army with only five guns making a racket like fifty thousand guns!

Make war a real "racket" and we'll all get tired of hearing about it!

Send little Tommy and his cap-gun, plus an amplifier outfit, to the wars and deafen the enemy so that he can't hear any orders from his officers.

TIP ON THE AIR

HAVING nothing else to do at the moment the other evening I thought I'd carry out a spot of idle searching on the short waves. I found a station telephoning the moment I switched on. He was saying:

"—old man. DX is hopeless to-night, so I'm going to work (—)."

It was, of course, an amateur station—with very useful information. So DX was hopeless, was it? O.K. I'll have to fill in time getting round the armholes of that red jumper I'm knitting.

AIRCRAFT WIRELESS

By J. C. JEVONS

Radio has for long played an important part in aviation, and new ideas in navigation are continually being evolved. One of the latest "homing" radio devices is described below

DURING the Great War it was customary at times for the R.F.C. to help our gunners to shoot straight. For this purpose an aeroplane fitted with a small wireless spark-transmitter would be detailed to cruise about over the enemy target during a "strafe," and send down code signals in Morse to the battery to let them know where their shells were falling and what correction was needed to score a bull's-eye. The power for driving the spark-set was taken from a low-tension battery carried in the plane, and the signals were radiated from a trailing wire aerial. It was the simplest outfit possible, but it did useful work.

Provision of Operating Voltages

Later, telephony sets were installed, both for transmission and reception, so that machines could communicate with each other and with the ground from the air. Thanks to modern improvements it is now possible for an air-liner to keep in constant touch with the ground staff at the aerodrome throughout the whole of its journey.

An aeroplane in flight is like a motor-car, in the sense that it must be able to provide all the operating voltages required for its wireless equipment. For transmission, this becomes rather a problem because a high-tension supply of from 1,000 to 1,500 volts is required for the anode of the transmitting valve. Usually it is generated by a small dynamo driven by the stream of

A machine in flight is far removed from the ordinary earth, and so one must make the best possible use of what is at hand. This is done by bonding together all the metal parts of the machine, including the frame of the engine, so as to form one mass of metal, which then acts as an artificial "earth" or counterpoise into which the aerial currents can ebb or flow. Nowadays, ultra-short waves are being widely used, particularly for what is called "blind landing," and the signals are received on dipole aerials, which do not, of course, require earthing.

For long-range direction-finding the machine carries a pair of frame aerials, which are continuously switched over or rotated, so as to show the direction of a distant "beacon station" in visible form on a chart or map. This does away with the necessity of using headphones, and also gives a more reliable result than can be secured by depending upon audible changes of signal strength to indicate the required direction.

The increasing use of all-metal aeroplanes has introduced a new problem. Usually the frame aerial is mounted inside the fuselage, but if the latter is made of metal it naturally acts as a screen and prevents the D.F. signals from reaching the aerial. To overcome this difficulty, the frame aerial is sometimes set inside a recess in the framework of the machine when out of use. Incidentally, it cannot then add to the air resistance — which is rather an important point.

When the wireless operator wants to take a bearing he raises the aerial, outside the fuselage, by pushing on a kind of lazy-tongs arrangement, and similarly draws it back again, out of the way, as soon

as the reading has been taken.

The biggest future for aircraft wireless lies in the new methods of navigation which are now being developed, particularly for flying at night and in foggy weather. The simplest method of navigating by wireless is that known as "Homing," in which the familiar directional property of a frame aerial is used to guide the pilot straight on to a distant "radio beacon" or transmitter.

Aerials At Right Angles

Suppose an aeroplane is fitted with a frame aerial, arranged around the struts, as shown at A in Fig. 1. The signals received on such an aerial will keep at maximum strength so long as the plane of the windings is pointed directly towards the transmitter. This gives the pilot his "homing" course, because the signal strength promptly falls off if he deviates to one side or the other.

SUITABLE AERIAL SYSTEM

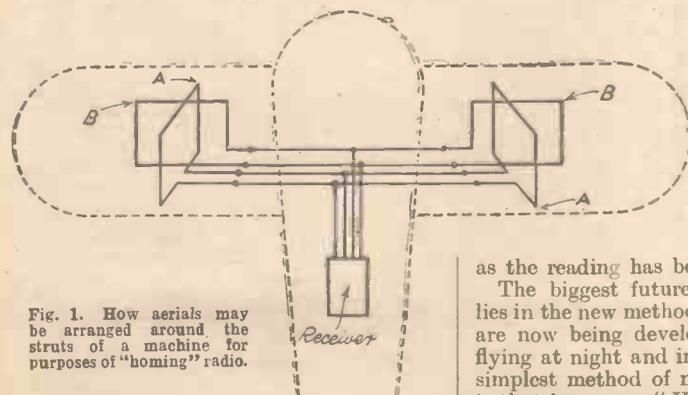


Fig. 1. How aerials may be arranged around the struts of a machine for purposes of "homing" radio.

air coming from the main propeller, any variation in flying speed being automatically compensated by a regulating-coil in the field windings. This keeps the output voltage from the dynamo constant so long as the machine is in the air.

For reception, static interference from the ignition system of the engine is cut out by methods similar to those used on a motor car, namely by careful screening of all leads and the use of rejector or suppressor circuits. When a trailing wire aerial is used for the longer wavelengths, it is also necessary to provide an "earth,"

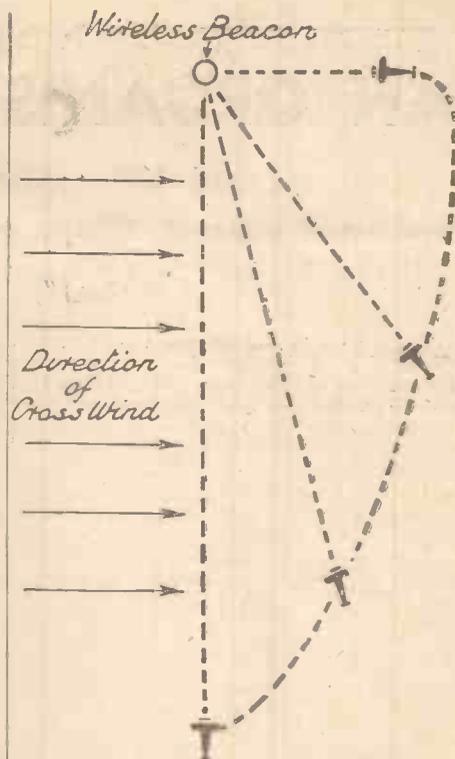


Fig. 2. The uncorrected path that a machine using "homing" radio would follow.

Similarly he could, in theory, steer the same course by flying so as to keep at minimum strength the signals received on a second aerial B, arranged at right-angles to the first. But it is difficult to know when a signal is at minimum strength in an aeroplane, owing to the prevailing noise of the engine. Accordingly, a better plan is to steer by the loud signals received on aerial A, and to use the second aerial B as a check. If the pilot is flying straight there will be no pick-up on the aerial B, and therefore no change in the strength of the signals from A when B is switched, first in series with and then in opposition to, the aerial A. If the received signals appear louder on one side of the switch than the other, the pilot knows he is flying off his proper course, and can steer accordingly.

The presence of a cross-wind tends, however, to complicate matters, because even if the pilot keeps the signals at constant strength, he may find himself steering the kind of course illustrated in Fig. 2. It is like a swimmer who wants to cross a river and land at a point exactly opposite on the other bank. If there is no current, he can swim in a straight line. But if there is a current and he heads straight towards his objective, he will find himself following a curve and will have to finish by swimming directly upstream. To offset the "drift" of the current he must, of course, start off by heading a little upstream, and the current will then automatically land him at the right spot.

In the same way a pilot who is "homing" must offset the effect of a cross-wind by heading slightly into it, instead of following strictly the bearings given by his D.F. instrument. In the latest type of D.F. equipment this correction is made automatically, so that the pilot can now depend upon his radio instruments to show him the shortest way home in any kind of weather, including fog.

FROM OUR READERS

AN ORGANIST UPHOLDS BATTERY SETS

A well-reasoned letter from a reader on a subject which will interest all who place importance on quality of reproduction

Dear Sir,—It is both strange and amusing the number of listeners who have allowed themselves to be humbugged into the idea that mains operated sets and radiograms are far and away superior to battery equipment.

The other day I had occasion to buy a second-hand battery set for someone, and I was fairly amazed at the ignorance displayed by salesmen of these fascinating and ubiquitous models. Several sets gave poor reproduction and I was astonished when the seller remarked: "Well, but that is very good for a battery set!" This is typical of the attitude of too many salesmen, who ought to know better.

A Battery Set Preferred

Personally, I prefer a good battery set for radio or for the reproduction of records, every time.

This is no idle tale—and here I would say that I am out for quality exclusively.

Mains operated sets take the palm for cheapness of operation and power—but here, with the exception of a few very expensive contrivances, their qualifications end.

Battery sets built by constructors who have faith in their job can hold the field for quality of reproduction, although the renewals of batteries admittedly is a snag.

As an organist I am keen on the reproduction of classical church organ recordings, and after several years have found that a good Class A battery equipment gives a realism I

have failed to experience with any but the most expensive mains radiograms.

I have electric mains at home and have compared many mains sets with their battery competitors, and I willingly put up with the small inconvenience of batteries for a really enjoyable and untiring evening.

E. R. J. ROBBINS.

334, Hanworth Road, Hounslow, Middlesex.

REMOTE CONTROL

The Editor, "Popular Wireless."

Dear Sir,—Here is a diagram of my Remote Control, which switches a set ON and OFF and in which the Relay Battery is not in use when set is ON.

Interlocking relay and double push-button can be easily made from my diagram. There are three wires to the push-button, but I don't think this is a drawback.

The two wires to the set are connected across the battery switch; it's then independent and can be used when set is switched OFF or the switch of set can be used when Remote Control is off.

A. HEMPSTEAD.

2, Brackley Road, Bedford.

A SIMPLE AERIAL

The Editor, POPULAR WIRELESS.

Dear Sir,—I have wondered if it has occurred to those who have a telephone installed in their homes that they have ready to hand a very good wireless aerial.

There is a length of lead-covered cable running from the inside junction-box to the telephone itself, and the elevated wires one sees outside in the street run through this cable.

Therefore all one needs to do is to connect a piece of flex to the aerial terminal of their set and lay it in close proximity to this lead-covered cable, and the condenser so formed is sufficient to pass H.F. impulses to operate the receiver well.

There is no need to make any direct connection to the lead-covered cable, so that the phone itself is not interfered with, and the one does not affect the other when both are in use.

J. D. MASTERMAN.

31, Nowbury Street, Wantage, Berkshire.

WHY NOT LONGER AERIALS?

The Editor, "Popular Wireless."

Dear Sir,—As a regular reader of your journal I greatly appreciate your contributors' ideas.

But in one matter, aeriels, I differ from most ideas of radio technique. Some boost doublets, others inverted L's, but all are comparatively short.

Is this best for an O-V-2? I have one, and have experimented with various aeriels and have, without exception, found every type and length inferior in signal strength to a long, 75-ft. inverted L.

I take it this is due to the fact that the longer aerial has a greater pick-up but a lesser

degree of static background than the shorter varieties.

ALAN OWEN.

Cartliff, 3, Cawdor Road, Inverness.

LIFE ON PLANETS

The Editor, POPULAR WIRELESS.

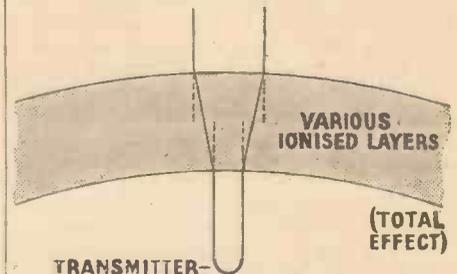
Dear Sir,—I noted with interest the recent letters of Messrs. Sugden and Sim, and would like, if I may, to have my small say.

I agree with Mr. Sim in the greater part of what he says; but I have one or two suggestions to make.

Mr. Sim says that intensity of radiation is subject to the Inverse Square Law; this is, of course, quite correct for omnidirectional radiation—but in the case of a parallel beam (assuming no losses due to absorption, etc.) no power is lost; a wave of the length of a few centimetres would penetrate the Kennelly-Heaviside and Appleton layers, probably being, you super-scientific blokes, somewhat widened on the way, as per sketch.

Think of light going through glass! The spreading wouldn't be great, and the beam would still be parallel when it came out, and, assuming the presence of intelligent beings on Mars (after having read Lowell on the subject, I am

CALLING MARS



This diagram illustrates Mr. Armstrong's letter and shows how a beam might be affected by the ionised layers of the atmosphere.

rather inclined to agree that there are) who could pick up a message, communication might be possible. Incidentally, assuming that the various layers have parallel "edges" (theoretically speaking) the beam would continue in a line parallel to its original direction.

But this is a bit thick. Very thick, in fact. No bacteria (even the so-called anaerobic varieties) can exist without having some oxygen in their composition. They must get their oxygen in some form; they do not get it directly from the atmosphere—hence their name.

I agree entirely with Mr. Sim's theory as to life on Venus; the Earth was at one time completely covered in cloud (as Manchester usually is now!) and it is quite possible that Venus is now passing through the same stage as Earth was then.

I've said enough—having eased my conscience (I can't let mistakes, as I think them, pass!), I'll QRT.

All the best to "P.W." and all its staff.

LEN. R. ARMSTRONG.

Holly Bank, Kendal, Westmorland.

AND WHY NOT?

The Editor, "Popular Wireless."

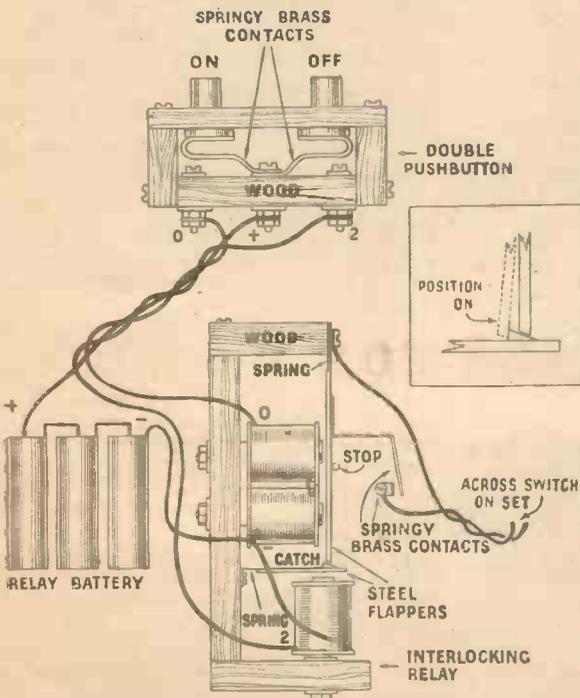
Dear Sir,—I obtained inspiration for this poem from Robert Southey's "The Battle of Blenheim." You may publish it—if you think your readers can stand it! Anyway, here it is:

TALE OF THE FUTURE

It was a winter evening,
Old Grandpap had the "screws,"
And he before a cosy fire
Was settling for a snooze;
And by him frolicked on the floor
His little grandchild, Eleanor.

(Please turn to cover iii.)

FOR SWITCHING YOUR SET



Details of Mr. Hempstead's remote-control switch, from which other readers can build similar relays.

It comes
out at
night!



Its music comes out of your radio—but how? Does it come out recognisable as a saxophone (because that's what it really is)? To make sure it always sounds like one you'd better get an Exide.

DX28



Exide

BATTERIES FOR RADIO

'Still keep going when the rest have stopped'

EXIDE 'HYCAP' BATTERY (*High Capacity L.T. Battery*)

For modern multi-valve sets—lasts longer on one charge. For small sets use the Exide 'D' Type. Both have the Exide Charge Indicator. Your dealer will tell you which to use. For High Tension use Drydex.

From reputable dealers and Exide Service Stations. Exide Service Stations give service on every make of battery. Exide Batteries, Exide Works, Clifton Junction, near Manchester. Also at London, Manchester, Birmingham, Bristol, Glasgow, Dublin and Belfast.

CATHODE-RAY DEVELOPMENTS

AMPLIFYING LIGHT

An ingenious method of increasing the brilliance of the picture on the end of a cathode-ray tube

By CARDEN SHEILS

THE cathode-ray receiver, in spite of all its expensive trappings, has one fault in common with the simple crystal set. In broadcasting the crystal gives a clear and faithful reproduction of the transmitted programme, just as the C.R. tube does in television. But the crystal falls down when it is asked to deliver power, and the cathode-ray tube does the same.

Thanks to the valve and loudspeaker we can now get as much volume of sound out of the broadcast programmes as our neighbours will stand for. But we have not yet

a second fluorescent screen so as to reproduce the original picture.

As shown, for instance, in Fig. 1, the picture P, originally produced on the fluorescent screen of the C.R. tube, is projected at close quarters on to a sensitised screen S, forming part of a separate "intensifier." The resulting electron stream is focused by electrostatic "lenses" L, L₁ on to the fluorescent screen F. The "lenses" are, in fact, curved lines of electric force spreading out from the electrodes M, M₁, which are at different potentials.

So far there is no amplification of light. All that has been done is to introduce an electron stream between the picture focused on the screen S and the picture reproduced on the screen F.

Obtaining Feed-back.

The next step is to produce a "feed-back" effect between the screen F and the screen S. To do this the light from the screen F should be focused back on

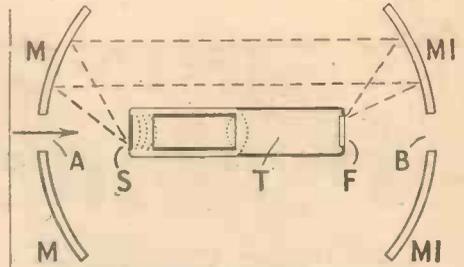


Fig. 2. The light produced on the screen F is picked up by the mirror M₁, which reflects it back to the mirror M, from which it falls on to the screen S.

original picture, and the extra electrons, in turn, produce an added illumination on the fluorescent screen. This is, of course, again fed back through the mirrors M, M₁ on to the screen F, and the process continues until the picture, finally built up on the screen F, reaches its maximum brilliance.

The arrangement, as will be seen, resembles that of reaction in a back-coupled valve, except that it serves to amplify light instead of an electric current.

The use of a light intensifier involves an extra fitting to the cathode-ray receiver, but on the other hand it allows much lower operating voltages to be used than would otherwise be required to secure a picture of anything like the same brilliancy.

In practice, the picture first produced on the fluorescent screen of the cathode-ray receiver may be so faint as to be hardly visible. All that is required is that it shall give out sufficient light energy to set electrons free from the sensitive screen S of the "intensifier." Once this comes into action, the feed-back effect is started and continues automatically to increase the brilliance of the picture shown on the final viewing screen.

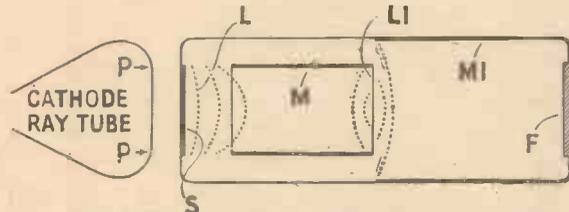


Fig. 1. The picture P is projected at close quarters on to a sensitised screen S forming part of a separate "intensifier." The resulting electron stream is focused by the "lenses," L, L₁, on to the fluorescent screen F.

found any corresponding way of producing large pictures of dazzling brightness on a television screen.

The trouble is that the C.R. tube gives out only a dim fluorescent light, and there is no easy way of amplifying or intensifying it. The valve, though a perfect amplifier of electric currents, cannot handle light-energy as such, so that we have to look elsewhere for a solution.

One possibility is to do away altogether with the fluorescent screen, and to replace it by an incandescent picture so brilliant that it will stand up to enlargement by optical means. This has been successfully tried out in the new projector tubes, but the operating voltages required to heat the screen to red and white heat are too high to be practicable in the home.

Passing on the Picture

If, however, we are ready to agree that the future of the cathode-ray receiver is bound up with the use of a fluorescent screen, then it becomes a question of finding some way of amplifying or increasing the quantity of light produced by it. In short, what is wanted is something equivalent to the valve amplifier as used in broadcasting.

But in the case of a fluorescent screen, it must be remembered that we are not dealing with electric currents, but with light energy, and the direct use of a valve amplifier is therefore out of the question.

We can, however, attack the problem from a different angle. Suppose the light from the cathode-ray screen is focused on to a photo-sensitive surface, such as a plate coated with caesium. There it will set free electrons, which can be projected against

to the photo-sensitive screen S in such a way that it "boosts" the effect of the original picture. The idea is, in principle, similar to that used in a back-coupled valve where the plate is back-coupled to the grid so as to increase the strength of the applied signals.

Fig. 2 shows how it is done. A tube T, similar to the one shown in Fig. 1, is fitted with a photo-sensitive screen S at one end and with a fluorescent screen F at the other. A pair of parabolic mirrors M, M₁ are arranged around both screens. The mirror M at the left-hand side is provided with a central aperture at A to allow the light from the fluorescent screen of the cathode-ray receiver to reach the photo-sensitive screen S, whilst a similar aperture B in the other mirror M₁ allows an observer to view the picture in its final form.

The action is as follows: The dim fluorescent light from the fluorescent screen of the C.R. receiver is projected as shown by the arrow on to the photo-sensitive screen S of the intensifier. The resulting stream of electrons is focused on to the fluorescent screen F by electrostatic lenses, as already explained in connection with Fig. 1.

The light produced by the impact of these electrons on the screen F is picked up by the mirror M₁, which reflects it back, as shown by the dotted lines, on to the mirror M, from which it falls on to the screen S. It is a comparatively simple matter to arrange the mirrors and the focusing lenses so that the image fed back in this way reaches the screen S in accurate alignment with the original picture.

The returned light then acts to increase the number of electrons set free by the

THE SUPERHETERODYNE RECEIVER

THE majority of receivers employing four valves and over, which are on the market at the present time, make use of the superheterodyne principle. Hence the radio student or experimenter who is not well acquainted with this particular type of circuit is out of date.

Modern radio demands a sound knowledge of the superhet principle and its various circuit features, and this information is only obtainable from lectures or a suitable text-book.

Fortunately, there is an excellent book which fulfils these requirements, and that is "The Superheterodyne Receiver," by Alfred T. Witts, A.M.I.E.E., published by Pitman (price 3s. 6d.).

In this comprehensive guide the author covers the superheterodyne circuit from A to Z, and in addition to the basic theory of this class of circuit gives some very useful information on typical commercial sets. Also there is a chapter on the superheterodyne as applied to television.

The book is profusely illustrated with circuits and should prove invaluable to the service engineer, student and experimenter. We recommend it to all those who wish to obtain a really sound knowledge of this very important type of receiver. A. J. R.

TRAINING RADIO ENGINEERS

A description of a visit to the Marconi School of Wireless Communication at Chelmsford

By A. S. CLARK

WE recently had the pleasure of paying a visit to the unique Marconi School of Wireless Communication at Chelmsford. The main object of the school, which had its beginning at Frinton in 1901, is to train new recruits to the staff of the Marconi Company in the application of radio to communication work. The various departments are thus relieved of the necessity of initiating newcomers into the special technique required.

A Post-Graduate Course

Specially selected engineers on the staffs of the firms who are large customers of the Marconi Company are also trained at Chelmsford in the technique of radio communication, and since last year, when an entirely new school building and other extensions were erected, the company has been prepared to accept suitable private students. Many of these come from foreign countries, but all have to satisfy the school authorities that they have either graduated elsewhere or have reached a suitable standard in theoretical study at which they will be able to benefit fully from the course of instruction at the school.

The reason for this will be fully appreciated when it is stated that the study is really in the nature of a post-graduate course, and that it is mainly of a practical experimental nature. Every attempt is made to develop the initiative of the students by allowing them a free hand to work out experiments along the various lines suggested. If they get into difficulties, it is preferred that they should find their own way out.

Well-Equipped Throughout

A general guide to the lines along which to proceed are, of course, given, and there is always a willingness to discuss matters with students. A course takes about five months, and there are lectures running parallel with the practical work which is adapted to the particular line along which each student desires to work. A course costs £75, but for those taking two consecutive courses the charge is £100.

About 150 students can be trained at a time, and for those who desire residential accommodation there is a hostel for about twenty at a charge of two guineas a week.

Having given readers a good idea of the constitution of the school, it will be interesting to deal with some of the apparatus that we were able to see. The apparatus generally is of the most up-to-date kind, and in some cases extremely elaborate.

Before dealing with radio gear, it is worthy of note that the school has its own printing plant. This is capable of turning out the highest class of work, as is in-

stanced by the fact that all the squared paper—of very special type in many instances—is printed on the school plant. The chief advantage of a printing plant on the premises is that instructional matter can be produced and altered when necessary with the smallest amount of time lapse and with the greatest assurance of accuracy in every detail.

The chief items of interest in the Main Experimental Laboratory were a number of models which showed in solid form the shape of the radiations from varying types of aerials and the effects on these waves of reflectors, etc. In the Research Laboratory speech inversion was both seen and heard.

Speech inversion is one of the systems used to render telephone conversations via the ether private, and a cathode-ray oscilloscope was employed to make the differences visible. Incidentally, it is worth noting at this point that a very large number of such oscilloscopes are used in the school for various purposes.

Screening the D.F. Gear

In the telephone laboratory the most interesting item was the direction-finding gear, not so much because of what it was, but because of the fact that the screening was bolted every inch and a half where joints were needed. We were informed that this proved necessary, in spite of the fact that there was no varnish or paint along the edges of the screens. Without such close bonding it becomes possible to measure the leakage losses.

The Standards Room had three items of special interest. First of all, there was a cathode-ray oscilloscope showing a normal sine wave as received through the L.F. side of a receiver. Then, by altering the value of the coupling grid leak until it was well from its correct value, the curve on the screen was made flat at the apex, showing that distortion of wave-form was taking place.

The second item was also a cathode-ray device, but in this case a resonance curve of a tuned circuit was shown. By altering the coupling between two coils in the circuit, the band-pass and double hump effect on the resonance curve could be watched. This idea is not, of course, new, but in the case in point the curve was calibrated in decibels, which certainly is out of the usual.



A view of the magnificent new school building which contains many of the laboratories.

And the third item was a magnificent frequency measurer that gave on a piece of tape the exact number of cycles per second that any broadcast station was working off its allotted frequency at any moment.

Our next port of call was the transmitter section, where there was quite an assortment of transmitters of varying wavelengths from 1.5 to 1,600 metres. Again cathode-ray oscilloscopes were in evidence, this time for noting the form and depth of modulation.

Cooking Toast By Eddy Currents

An interesting experiment on a 5-kw. input outfit working on 3 metres was the cooking of toast by means of eddy currents. The toast would not be of great use for domestic purposes, since it was done from the inside outwards, and thus was more like a complete rusk than normal toast with a layer of hot dough in the centre.

The tuning condenser of one of the transmitters had demountable plates, so that the best number could always be in use.

Another outstanding feature of the transmitter section is the Model Broadcast Transmitter and Studio, which is at present in the course of construction. This is to have a power of two kilowatts, and will work on wavelengths between 180 and 200 metres. The main purpose for which it is being built is to provide experience in various modulation systems and for modulation experiments. Generally, it will work on an artificial aerial, but provision for actual radiation is being made. The apparatus is being assembled behind panels of the type familiar in all modern broadcast stations.

Altogether, we spent a most pleasant morning, and came away realising why Marconi engineers are so "hot stuff," and wishing we could spend a few months at the college experimenting with some of the wonderful gear.

Those who have received a technical training with the intention of adopting radio engineering as a career, and who can make the necessary arrangements for time and so forth, would be greatly helped by a course at the Marconi School which would considerably enhance their standing.

QUESTIONS AND ANSWERS

By K. D. ROGERS

YOU CAN'T GET L.T. FROM YOUR H.T. BATTERY!

Sounds an obvious statement of fact, doesn't it; but that's what one of our querists tried to do

I am fed up, writes N. H. (Newcastle). I have just built a new set and during the first try-out the L.T. battery died on me. I then had a brain-wave and tried the effect of connecting a mains transformer across the H.T. battery to try to get L.T. from it.

I got nothing, and I believe I actually injured the H.T. battery. What was wrong, for I should like to get over the snag of the battery (L.T.) dying like that.

So would everyone. There is only one way to do it other than running the set on the mains or using a trickle charger. That is to have a spare battery by you.

I am afraid you cannot get your L.T. from the H.T. battery. Not in any sane way. You could connect the battery—or part of it—in place of your L.T. battery, but it would not last long. You certainly cannot get any current by connecting a transformer across it and taking the secondary to the filaments of the valves.

A transformer is a device that does not work except on A.C., and your H.T. battery gives D.C. All you did when you connected the transformer across your battery was to pass current through the primary of the transformer (much more current than the battery was supposed to give), and thus run down the H.T. battery.

You got nothing out of the secondary side because there was no A.C. going through the primary.

The only way energy is transferred from primary to secondary in a transformer is by means of magnetic lines of force which are built up by the current flowing through the primary. And these lines of force must be constantly moving (increasing or decreasing) in order for a voltage to be induced in the secondary. The only type of current that does that is A.C. (or intermittent D.C.).

With a contact breaker moving quickly and making and breaking the primary circuit you could have got a crude form of A.C. in the secondary, but that would be no good for battery valves. It would cause bad hum and, further, the H.T. battery would be very badly run down in a short time by the current that would be needed by the transformer.

I am afraid it's no go. The spare accumulator (in lieu of all mains operation or a trickle charger) is the only hope.

Or perhaps you might keep an eye on the state of the battery and toddle off down to the charging station BEFORE it runs out.

Don't think me unsympathetic. I agree with you that the constant diving into the innards of the set in order to inspect the L.T. battery is a nuisance, to say the least. But it's got to be done unless you have the battery outside, where it can be seen easily.

S O S

Could I encroach on the generosity of readers of "P.W." to see if they can supply me with particulars of the S.T.100, Revised Edition, published in 1936 in Wireless and Television Review?—Signed, H. Beard, 4, Friary Road, Acton, London, W.3.

You certainly can, Mr. Beard. Readers will be only too pleased to help if they can. I can vouch for that.

So don't let me down, readers. Drop him a line and say you'll lend a hand. Thanks.

ARE YOU ONE?

Being the festive season, I will ask you another question. How many of you are wedded to headphones for ordinary listening to the complete exclusion of the loudspeaker?

No, that's not meant to be rude. I want to know. In my ignorance I received a great shock the other day when a man of about fifty-five, whom I know well, but whose house I had never visited, told me that he always listened on phones. He has never had a loudspeaker in the place, and won't have one.

He is an intelligent man in every way. But he considers the speaker is an invention of, well, shall I say Babel.

Strange, isn't it, in these enlightened and "ennoised" days? Yet somehow, though I could not stand the inferior quality of the phones, I rather envy that man.

Think of the peace in his house!

Which brings me to a query I have received. What is the lowest note to which headphones will go? I have been told they do not reproduce the bass as well as speakers.

You have been told rightly. They do not. Nor the high notes, either. Being of iron diaphragm (or in some cases aluminium) they have a good many resonant points. Their lowest notes are probably in the region of 120 to 140 cycles, and the highest cannot be much in excess of 3,000. It depends on the phones and the matching of the set, of course—but mainly on the phones.

I HAVE BEEN ASKED . . .

P. T. (Brondebury).—I have been told that my set gives even better quality than the local cinema. Is that a compliment?

No.

F. G. H. (Royston).—Why won't the B.B.C. have sponsored programmes?

Listen to Luxembourg or Radio Normandie. The answer is clear.

D. P. (Norwich).—I have a six-volt accumulator and a two-ohm resistance. If I put these in series and connect up to my two-valve battery set how much current will flow through the valves?

Quite a bit for a second or so—then none. The valves will burn out.

A CONTRAST IN SIZE

Batteries of every conceivable type are manufactured by the Exide Co. at their works at Clifton Junction, near Manchester. This Exide employee is holding in his hand the smallest cell made by the firm. Contrast this with the submarine type cells with which he is comparing it. Each of these submarine cells weighs half a ton.

S. W. (Cleethorpes).—Where do the electrons go in a battery set?

Just round and round like a merry-go-round, until the thing breaks down and the batteries have no more push in them. Then the electrons stop.

USE OF TRANSFORMERS

D. H. E. (Glamorgan).—I have read a great deal about the use of transformers in stepping-up voltage, but am not clear as to what they do between valves in a set.

Actually, they do the same thing. You have the primary and secondary, and through the primary is passed the anode current from the valve.

This current consists of two distinct types of current, direct current from the H.T. supply and alternating current, or intermittent direct current due to the action of the valve (depending on whether it is a rectifier valve or an amplifier).

Now a transformer which has either intermittent D.C. or alternating current passing through its primary will build up fluctuating lines of force and will induce in its secondary similar voltages to those in the primary, but at a greater voltage. Thus, in a three-to-one step-up transformer, if you have a variation of current at one volt in the primary you will obtain a similar variation of voltage in the secondary at three volts.

The D.C. is Ignored

Now it does not matter whether the currents in the primary are mixed or whether they are simple and pure A.C. They may be a mixture of A.C., intermittent D.C., and ordinary D.C.—what will come through into the secondary will be the A.C. and the intermittent D.C. The pure unidirectional D.C. will not affect the secondary one whit.

Now to our valve anode circuit: There we have a steady current of, perhaps, five milliamps flowing nicely along between the valve and the H.T. supply. It passes through the primary of the transformer, but it does not give rise to a varying magnetic field, and so it does not affect the secondary. There is no voltage induced in the secondary due to the current in the primary.

When the set is tuned to a station, however, the steady current through the primary undergoes a change. Although it continues in the same direction, it is varied from moment to moment by the signals coming in. At one moment it may be the steady five milliamps, another moment may see it only two milliamps, and a fraction of a second later it may have increased to seven milliamps.

Varying the Magnetic Field

Those changes in intensity of current have an effect on the transformer. They give rise to variation in the steady magnetic field that is built up round the primary and secondary by the steady current. I take it you realise that the primary current builds up a field which is maintained at a steady strength while the steady current is flowing.

Now, you have your primary current of five milliamps varying between three and seven. Thus you have a current which is changing in value and therefore is giving rise to a changing magnetic field in the transformer.

That changing field causes a fluctuating voltage to be developed in the secondary of the transformer which hitherto has had no voltage in it at all.

So we get the difference of voltage change in the primary current represented by the change of four milliamps in the current transferred to the secondary AND INCREASED IN THE PROCESS BY THE STEP-UP RATIO OF THE TRANSFORMER. Thus in the three-to-one transformer it is multiplied three times.

Suppose that the voltage change in the primary to bring the current down from five to three milliamps was six volts. Then we shall have a voltage of eighteen induced in the secondary. (I have exaggerated the figures throughout in order that you shall more easily grasp the idea.)

Now, here is an important point: Disregard in your mind the steady current in the primary and think only of the fluctuating portion. To decrease the steady current will require a drop in voltage (we have said it is six volts.) To increase the current to the seven milliamps will require an INCREASE in voltage. The decrease and increase are supplied by the signal, of course.

(Continued on next page.)

QUESTIONS AND ANSWERS

(Continued from previous page.)

But in effect we have a voltage in the primary which is in one direction at one time and in another a moment later. Put untechnically it is minus (bringing the current down to three) and plus (bringing it up to seven).

That minus voltage will be transferred by the primary windings of the secondary in reverse form. It will be PLUS of positive in relation to earth in the secondary. And it will, we have seen, be three times as great as in the primary.

So we have a voltage of PLUS eighteen at one moment.

The next moment sees the increase of voltage in the primary bringing the current to seven milliamps. That also we will take to be six volts. In the secondary it will "reappear" as eighteen volts NEGATIVE.

So our fluctuating D.C. in the primary has "come out" of the transformer as a magnified A.C. There is NO direct current or direct voltage in the secondary. It is all fluctuating.

That is how the transformer works in valve coupling. The valve is a voltage-operated device. It wants varying voltages on its grid (that is, between grid and filament or cathode) to enable it to give rise to variations of current in its anode circuit. These variations are then coupled (in transformer sets) by a transformer to another valve where they apply varying voltage to the grid of the next valve in exactly similar manner to the varying currents taking place in the anode circuit of the previous valve.

In so doing the transformer increases or steps-up the voltage, and that is why transformer-coupled sets are so very sensitive.

Just get hold of any circuit showing a transformer-coupled valve and you will readily be able to follow the rather long-winded explanation I have given.

A NEW YEAR'S TEST

By Leslie W. Orton

EVER thrown a "tanner" to the bottom of a swimming pool and dived for it?

It's an exciting business, but not nearly as exciting as the latest POPULAR WIRELESS reception test. Besides, water's damp, you know, and who yearns for an icy plunge these days? Well then, how about joining in a delightful splash into the ether waves on January 1st, 1938?

Having whetted your curiosity, I will tell you what I propose to do on this momentous occasion. You may remember that during the last POPULAR WIRELESS test we endeavoured to discover varying reception conditions in different localities.

Iron deposits, mountains, rivers, and even the tree outside my back door, play an important part in the matter, yet some ideal looking places are enough to give one a pain in the neck when it comes to reception.

Take my locality, for instance. Everything looks ideal. I am situated on an island and am comparatively free from tall buildings. You will doubtless visualise excellent earths and fine reception. In the latter I am well blessed, but when it comes to arranging an efficient earth I find it almost as difficult to arrange as to shoot a lion at my back door—which just shows how misleading outward appearances may be. The explanation is simple, the soil is of a clayey nature and "holds" the water on the surface.

The Last Test

During the last test conditions were wretched, and when it came to looking over the reception reports I received almost as many shocks as the "guys" who emulated Benjamin Franklin and tried (too successfully!) to collect electricity from the upper atmosphere by means of wires slung to kites.

Some stations were hardly heard at all. Others were good local, but wretched distant, signals, whilst others got "out" but were useless near at hand—a poor kettle of fish all told!

This new test is more or less a continuation of the last, many stations will take the air, calling "special test," but we want you to give concise reports of reception of all the British amateurs you hear. In this way we stand a better chance of finding out something interesting.

A Moving Job!

My job is going to be an interesting (I almost said "moving"!) one, for, you see, I shall be travelling in the guard's van of an express train running between Paddington and Bridgend in South Wales, through the

kind co-operation of the Great Western Railway. I'm hoping that the "puff-puff" will try knocking spots off existing speed records, but whether it does so or not I'm going to have a good time—I'm yearning to know what reception will be like under the River Severn!

I also hope to have the pleasure of meeting "P.W." readers at journey's end. If I don't, it will be the first test I have conducted without so doing, and I'll be downright disappointed.

Well, boys, I think we all know our jobs. You and I will receive as many British amateurs on 10, 20 and 40 metres as we can on the afternoon and evening of January 1st, 1938. Drop your reports along to me—they will all be acknowledged—and so I'll conclude with "Here's To the Next Time."

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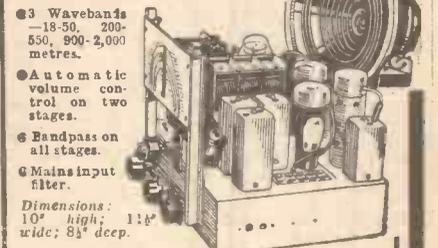
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SURFACE LEAKAGE

The surface condition of components influences a set's efficiency very considerably. Read in this article how moisture, dirt and other impurities act detrimentally to wireless reception

By J. F. Stirling

MANY radio men have noticed that when a wireless set which has been stored away for some considerable time is brought again into active use, its efficiency, for a short time, does not come up to expectations. Something mysterious appears to have happened to the set during its period of storage. A careful check-over of the receiver proves that the set's components and their connections are quite O.K., yet in the reception itself there is something wanting.

Layers of Fine Dust

Of course, components have been known to deteriorate structurally during long periods of storage, but this is seldom the case with wireless parts of modern and good-quality manufacture. Batteries, naturally, we rule out of our consideration, since everybody knows that batteries cannot be stored without slow deterioration and that even accumulators function best when they are continually used and not left unworked for lengthy periods.

There is one factor which constantly tends towards the depreciation of a radio receiver's efficiency, and that is the surface condition of its various components. If the component surfaces are allowed to accumulate layers of fine dust—and remember that much of the very fine dust of our towns is invisible on dark surfaces—it must follow that minute current-leakage paths are set up between component and component.

Sets frequently become very dusty and moisture-ridden during storage and it is often for this reason, and for this reason alone, that a set which has been stored is found to acquit itself less satisfactorily when brought into use once again than it did before it was placed in storage.

Stringent Conditions

Consider, further, the "family" receiver which functions day in and day out throughout the long year. This, perhaps, is allowed to remain in one position in the kitchen or living-room of the house. Such a receiver frequently has to bear the continual onslaught of smoking chimneys, cooking fumes, the clouds of dust arising from household cleaning and various other everyday influences. Perhaps, too, this household receiver stands permanently up against a damp wall or in a recess of the room in which it gets little ventilation.

The reader will have little difficulty in appreciating the fact that a receiver which is continually subjected to everyday conditions such as the above must slowly get into an internally dirty and moisture-ridden condition. Layers of sooty grime containing considerable amounts of moisture gradually cover the surfaces of the set's components, and, adhering tenaciously, provide excellent slow leakage paths for the

current in the circuit. The receiver slowly "goes off." Its owner is perplexed. Valves, batteries, components—everything—come in for a share of the blame, but it is seldom that the probable real cause of the trouble is realised.

The photomicrograph, shown above, depicts the microscopic appearance of the surface of a piece of ebonite which has been allowed to remain in a damp atmosphere for a week. Note the water droplets which have formed on it. There is, under the microscope, not a fraction of an inch of this panel surface which is free from moisture. Yet, to the unaided eye, this ebonite panel was seemingly quite clean and bright. Only by drawing the finger along its surface could the pressure of a thin film of moisture be detected.

By studying the illustration it will quite easily be realised by all that dust falling upon a surface in the condition shown will not exactly improve the assumed insulative nature of that surface. As a matter of fact, the moisture film will have the effect of "binding" any particles of dust which fall upon it. Then, when the moisture evaporates, as it will do, of course, when the room in which the receiver remains is warmed up, the dust particles will no longer form a loose and readily blown-away



This photomicrograph shows a moisture film on a sheet of ebonite. It is, of course, enormously magnified.

layer. On the contrary, owing to the "binding" effect of the moisture, the dust layer will become hard and will resemble in some respects a microscopic coating of a paint consisting of carbon particles.

The Effect of Cleaning

Vigorous rubbing and drying of such surfaces removes this unwanted layer. Thus it is that a set which has given unsatisfactory reception suddenly and for no apparent reason improves in its performance merely as a result of a thorough and careful cleaning. The surface dirt-layer has been more or less completely removed in the cleaning process. Leakage and capacity paths have been eliminated and the set has automatically returned to its erstwhile sweetly running condition.

It behoves the constructor, if he would maintain his apparatus in the pink of condition, to reflect at times upon the condition of the surfaces of his various electrical equipment and to realise the fact that all impurities (moisture included) represent potent leakage paths for current.

CAUTION IN MAINTENANCE

Getting the best from your L.T. accumulator

CONTRARY to popular belief that everything deteriorates with use, there is perhaps one almost perfect exception in the form of the secondary cell, or accumulator. In fact, provided overcharging is not permitted to any great extent, the cell actually keeps in a healthier condition when it is subject to alternate charging and discharging at regular intervals. In this way the greatest enemy to the plates, namely, sulphate, is not allowed to collect, and consequently internal corrosion and short circuits cannot occur.

The discharge curve of a cell shows that when immediately charged the actual voltage is approximately 2.6 volts, due to the freshly formed acid round the plates. This voltage rapidly drops to 2 volts, where it remains constant during the cell's useful life. Below this point the falling-off is once again fairly rapid and the listener should never allow this limit to be reached if a healthy condition is to be maintained. Moreover, as sulphate attacks the plates most rapidly when the cell is in a weakened state, the cell must not be kept idle in this condition for very long.

The voltage method of testing cannot give

a true state of discharge, because, despite the voltage remaining constant during the cell's useful life, the acid strength slowly weakens, and it is for this particular reason that the hydrometer, which measures the specific gravity, or weight of the acid in comparison to that of water, is a more reliable indication. The change in specific gravity differs from the voltage in that it does not keep a steady level, but falls slowly consistent with the discharge at any moment.

Storing Accumulators

If at any time it is desired to place the receiver out of commission for any length of time, say, two or three months, the cells should always be completely recharged beforehand. Such care as this is entirely in the hands of the listener, and will prove itself invaluable by a good healthy discharge from the cells in return.

On the other hand, those who make full use of the mains supply by home charging, have other considerations which are normally left to the service station. Before placing an accumulator on charge it should be ascertained that the acid level is at least $\frac{1}{8}$ in. above the plates and that the terminals are thoroughly greased to prevent the risk of corrosion. Obviously, the grease must be of some conducting nature, and petroleum jelly fulfils this requirement very satisfactorily. The resistance employed must also be of the correct value for the cell concerned because overcharging is just as detrimental as undercharging.

A. W. Y.

DO CONDUCTORS DECAY?

(Continued from page 371.)

grow in size. A number of such crystals, also, may clump together and form complex internal networks and patterns within the metal. All such processes will invariably have the effect of increasing the electrical resistance of the metal. The metal, becoming more crystalline, will take more current to exert a given electrical effect at the end of the current path. Thus, with the gradually increasing amount of current which is forced along the conductor, the internal crystallisation and rearrangement of the particles within the metal will gain more and more ground. After a time the conductor will be found to have become brittle and to have increased very markedly in resistance. Such is probably the decaying influence of the current on the conductor.

When Currents are Small

In the case of conductors carrying only relatively small amounts of current, as, for instance, in the instance of radio coils, connecting wires and so forth, the influence of the current on the conductor, though undoubtedly present, is far too small for its effect to be appreciated within a lifetime. Probably, though, if great-great-grandfather had been a keen wireless enthusiast and the radio fever had remained in the family throughout the succeeding generations, great-great-grandson, succeeding to the much-used radio heirloom, the pioneer tuning coil of great-great-grandfather, might find that its total resistance had slightly increased under the influence of the quantity of current which had flowed along it during the ages.

Certainly, however, conductors carrying small radio currents are not appreciably deteriorated by the current-flow over extremely long stretches of time. With heavy-current conductors, however, such as lightning mains and so forth, the tale may be very greatly different.

SPORTS BROADCASTS ON BOXING DAY

ICE HOCKEY features in the broadcast programmes twice on Boxing Day. In the afternoon listeners will hear Stewart MacPherson describing the last period of the National League Ice Hockey match between the Rangers and Racers at the Empress Hall, Earl's Court.

The Greyhounds and Tigers, meanwhile, will be in action in the evening at Harringay arena. Stewart MacPherson will journey there to give listeners a description of the last period of this National League match.

"International Sport of the Year," is the title given by Michael Standing to a programme which he is compiling of excerpts from sports commentaries during 1937. The method being used is somewhat like cutting a film, but in this case the excerpts are placed on a master record. Various members of the Outside Broadcast Department staff will connect up the records in one or two words, such as: "From the All-England Wimbledon Championships," or in the case of the America's Cup: "From Rhode Island Sound..."

Such contests will be covered as the Farr-Louis fight, Wimbledon, Test Matches, America's Cup, the Ryder Cup, the Open Golf Championship, Donnington Park Motor Racing, Athletics, Association and Rugby Football, International Title Fights in England—in fact, the feature will be a cross-section of the highspots of commentaries on the big sports events of the year.

FOR NORTHERN LISTENERS

What will probably be the biggest North Regional programme of the Christmas week will be produced on December 24th—a cavalcade of carols, which will be in the form of a Christmas radio journey through the carols, hymns, and verses of four centuries. This will be a semi-dramatic feature in which several types of programme

are to be combined. The first part of the programme will have the seventeenth century as its period and Alnwick as a background; the next sequence will be an outside broadcast from a mummers' performance at a Cheshire village; and Christmas hymns from Selby Abbey are to follow. A choir and the B.B.C. Northern Orchestra, under the conductorship of H. Foster Clark, are among those who will contribute to the final part, which will be mainly from a Manchester studio. The title of the whole "journey" is "Christian Men, Rejoice."

On January 1st, Yale Speers and his Three Keys will be heard in a programme which will take listeners back to the days of which they now have only memories—of melodies which were once popular hits of the day.

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PERFECT SPEAKER REPRODUCTION

The enthusiast must of necessity estimate fidelity by the ear, since there are few who have instruments with which accurate measurements can be carried out. In this article our contributor jots down some useful pointers for those whose aim it is to achieve the best possible reproduction

LET me begin this article by saying that there is not at present, and that in all probability there never will be any such thing as perfect speaker reproduction. For it is pretty obvious that, in the mechanical and electrical world at any rate, the reproduced cannot be the same as the original. The finest photograph is not to be compared with the original scene or individual which it attempts to portray. A mechanical copy of any article is seldom as good as the original article itself. And, likewise, the quality of loudspeaker-reproduced sound can scarcely hope to come up to that of the original sound itself.

Mind you, of course, reproduced sound, particularly if the sound-wave pattern is not too complex, can come astonishingly near to its original in quality. But in these matters of sound and light reproduction, a miss, to a keen critic, is as good as a mile. Consequently there will always be a number of good people who will only too willingly point out the fact that loudspeaker reproduction is never so good in quality as the original.

To such superior critics one can but bow and acknowledge the basic truth of their assertions.

A Sound Miniature

It is very difficult to say what constitutes perfection (in a practical sense) in loudspeaker reproduction. Naturally, a loudspeaker must reproduce a mass of sound in miniature only, just as a camera lens condenses a wide landscape within the relatively small area of the photographic plate. A loudspeaker which reproduces a B.B.C. Orchestra at actual B.B.C. Orchestra strength within the confines of an ordinary sized room would be, to say the least, a most undesirable home instrument, for, so reproduced, the strains of the orchestra would cease to be music and would become ungovernable noise.

It seems to me, therefore, that the loudspeaker which the average radio man would term ideal is the one which serves up the most accurate reflection in miniature of the original transmitted sounds. Most of us recognise this fact unconsciously, and when we try to judge speaker quality and to assess its good and its bad points we automatically conjure up into our minds a mental auditory picture of what the original transmitted sounds should be like.

There may be in the remote districts of Siberia a musical instrument known as a "kosmuntu." I very much doubt, incidentally, whether there is such an instrument in those remote Siberian districts. In fact, I feel sure that there isn't, for I have only a minute previously coined this name. Such a consideration, however, is immaterial. What I want to bring out is the fact that if you suddenly heard a new loudspeaker reproducing a "kosmuntu" recital in which nothing else than that imaginary instrument was allowed to be transmitted, you would be more or less incapable of judging the speaker's performance or, at any rate, its

essential reproduction quality, simply because you (like the rest of the world) had never heard a "kosmuntu" in the original.

As I said, therefore, in judging speaker quality with our ears, we automatically compare it with a memory picture of the original, and if the result is satisfactory to us as individuals, the receiver receives its "pass" mark from us.

In assessing the reproduction quality of a speaker which is being newly tried out, there is, on the whole, nothing better than subjecting, if possible, the instrument to three tests, to wit those of its reproduction



AN EARLY TYPE

Here is an early type of horn speaker. One didn't expect to get perfect reproduction from these "loud-speaking telephones." But the modern moving coil is a "different pair of shoes." In this case the reproduction does come very near the real thing; a fact which shows the great amount of research which has been carried out on this subject.

of the speaking voice, the pianoforte scale and a stringed instrument.

A loudspeaker which approaches perfection will reproduce the speaking voice in a perfectly natural manner. I am not going to be led into an attempted explanation of what constitutes a "natural" speaking voice. But if the speaker's reproduction of the human voice gives you the impression (when you close your eyes and turn your back upon the instrument) that the person speaking is not very far away and that the words are not coming out of a tunnel or a cave, then you may be pretty sure that the speaker under judgment is acquitting itself in a very capable manner.

That Trumpet Effect

The modern loudspeaker shows an enormous advance upon its more ancient brethren in the "forward" quality of its reproduction. Reproduction which does not possess this most vital characteristic of

"forwardness" gives the impression that the sounds are issuing from a trumpet. The early gramophones were great sinners in this respect. Hence, what I may term (with every respect to the modern record reproducing instruments) the "gramophone effect" should not be present in ideal loudspeaker reproduction.

"Boominess," of course, condemns a speaker, so far as its approach to the ideal is concerned, but not so a peculiar hissing or loss of clearness in the sibilants of speech reproduction, for often this latter defect sometimes has its original in the studio amplifiers dealing with the microphone current.

After speech come the notes of the piano as a medium for assessing the qualities of a loudspeaker. The piano has always been a difficult customer to reproduce, but nowadays, thanks to the modern microphone, with its almost uniform range of sound response, piano music is transmitted almost without quality loss. Listen, if possible, not only to the lowest notes of the piano but, in particular, to a chromatic scale (an ascending or descending series of notes in semitones) played upon the instrument.

Distorting the Piano

Expressions such as a "string of liquid drops," a "rope of pearls" and so on have been brought up from time to time to describe such note-successions played by a good pianist upon a decent instrument. If you can truthfully say that the speaker incorporates into its piano reproduction any such effect, well and good. If, on the other hand, the speaker under test consistently endeavours to turn the pianoforte into a rather good banjo, so much the worse, so far as the loudspeaker's pass marks are concerned.

When a pianist dwells upon a base note on the keyboard, the affected pianoforte string can be heard vibrating sonorously. This effect should be reproduced almost to the full by a good loudspeaker, provided, of course, as in all these tests, that the set itself is working efficiently and that the output valve has a decent reserve of power to deal with the temporary overloads which these heavy sonorous notes place upon it.

"String quality" in loudspeaker reception is best judged by listening carefully to a violin or 'cello solo. The loudspeaker should "take" the lowest note of the 'cello without giving rise to a peculiar jarring sensation and (provided that the player is a first-class one) the highest note of the fiddle should be reproduced without squeak. A combination of stringed instruments is reproduced in an effective modern loudspeaker with that peculiar and characteristic lustrous mellowness which is to be experienced before it can be appreciated adequately.

Organ music—the music of the church organs, I mean—has always been difficult to reproduce, not merely on account of the

(Continued on next page.)

(Continued from previous page.)

volume of sound given forth, but also, in view of the great tonal range of the sounds produced by a good instrument of this kind. There are, indeed, few speakers which will do perfect justice to a first-class organ. Still however, they are not to be blamed for that. You cannot put a gallon into a pint pot, nor is a very wide landscape reproduced as well in a photograph as is a close-up view. Similarly, the vast tonal range and power of a big church organ reproduces itself in an ordinary loudspeaker very frequently in a less satisfactory manner than anything else, when critical judgment is made of it. A good speaker, however, despite this fact, will reproduce those deep organ notes which vibrate rather than sound, and this peculiar organ characteristic will sometimes be sufficient to set up synthetic vibration of articles in the room in which the loudspeaker is standing. A final test for loudspeaker quality may interest readers. I term it the "gramophone test."

Get the speaker on its best behaviour and listen carefully to the transmission of a gramophone record. If, honestly, you can tell from the speaker reproduction that a record is being played, then the speaker is assuredly an excellent one. But even if the speaker fails in this test, it may still be a first-class instrument, for modern sound-recording on gramophone records is of a very high order of perfection and, given accurately balanced pick-up circuits and amplifiers, it is often very difficult to distinguish gramophone music from that of the "natural" variety when it is reproduced from radio transmissions by means of a small-sized loudspeaker. **J. F. S.**

READING YOUR SIGNS

EVERYONE is to a considerable extent in the hands of his or her glands, says Mr. G. V. Dowding (Editor of "P.W.") in his new book "True Prediction." Your character depends upon them, and the fact that they also affect your appearance enables anyone to be his own psychologist if he knows how to "read the signs." For example, if you answer to the following description you can count yourself very fortunate: Tall, spare, well-knit, well-muscled, oval-faced, long head, prominent bony features, large teeth, thick eyebrows, tendency to have hair on arms and legs.

If you have these physical indications, says Mr. Dowding, they mean that you are thoughtful, resolute, ambitious, self-controlled, trustworthy, imaginative, have ability to realise your ambitions, and are strong physically and mentally, and can master both yourself and your circumstances.

The next step in "True Prediction" brings in the recently discovered Cosmic Rays. The author suggests that they directly affect our lives and he gives predictions based on their variations. It is all very interesting and entertaining, and it looks as though the "stars" have now a very formidable rival in glands and Cosmic Rays for character reading and foretelling the future.

"True Prediction" is published by the Millway Publishing Co., High Holborn House, London, W.C.1, price 2s. 10d. post free, or from any newsagent or bookstall, price 2s. 6d.

NEW YEAR RADIO DRAMA

SEVERAL new plays specially written for the microphone are included in the radio-drama schedule from January to March, besides such classics as Shakespeare's "Hamlet," and six Experimental Hour programmes. Among the latter will be subjects as diverse as T. S. Eliot's "The Waste Land"; a radio adaptation of Charles Swinburne's "Atalanta"; and "Saint-Louis Blues," a programme by Irving Reis, of the Columbia Broadcasting Company of America.

Another play of outstanding importance will be a translation into vivid and dramatic English verse by Humbert Wolfe of Rostand's "Cyrano de Bergerac." Ernest Thesiger joins the ranks of radio-dramatists with a slight but amusing sketch, entitled "The Elixir of Count del Bosco." Other newcomers include E. Dunning Gribble with a fantasy entitled "Scarecrows"; J. A. la Bern with "Girl Missing"; and René Fauchois' "Nocturne," translated by Marianne Helweg.

Norman Edwards has written a new social comedy with a surprising dénouement, which he has called "The Case of Lady Talond," and Eden Phillpotts will be represented by a radio-adaptation of "Jane's Legacy." "The Count of Monte Cristo," perhaps Alexandre Dumas' most thrilling romance, will be heard as a serial throughout the quarter. It has been adapted by Patrick Riddell.

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0.10,000	ohms.
0.50,000	"
0.1,200,000	"
0.3	megohms.

TECHNICAL JOTTINGS

(Continued from page 366.)

Convention which is to be held from April 4th to 14th, 1938, at Sydney. It is already known that engineers from many parts of the world will be present, and a number of important Papers have been arranged for, dealing with all phases of radio. The Secretary of the Convention is Mr. O. F. Mingay, General Secretary of the Institution of Radio Engineers, Sydney, Australia.

Radio in War

The use of radio communication for military and police purposes is constantly developing; as you can well understand, the different military authorities throughout the world cannot afford to allow themselves to fall behind in any particular in regard to the efficiency of short-range radio communication. It is stated that the United States War Department have decided, as a result of experiments during field manoeuvres held this summer, to improve several methods of army communications which were becoming obsolescent and were not up to the standard required for the speed of mobile fighting forces. Short-range radio communication played an important part in the Great War, and there is no doubt that, in any future wars, short-range and short-wave communication will be of the most vital importance.

A Record in Communications

A very interesting example of multiplex radio-telephony is to be found in the communication system in the Belfast-Stranraer ultra-short-wave radio link between Ireland and Scotland, which was opened on August 31st. This system employs a carrier frequency of 76 kc. in one direction and 83 kc. in the other direction and can carry 9 telephone messages simultaneously on a single carrier, which constitutes a new record. The nine telephone channels employ individual carriers between 150 kc. and 300 kc. and all these carriers, together with their sidebands, are used to modulate the transmitter. At the receiving end the signal is amplified and rectified, the individual channels being then selected by suitable selector circuits.

Repairing Valves

I said something the other day about loose valve caps and how to secure these effectively to the glass. The usual method is to use Seccotine or some other form of glue, as glue, being a colloid, sticks very effectively and tenaciously to glass, which is physically of a somewhat similar character. Several readers have written to me giving me their experiences in this matter, one reader telling me that he uses nail-polish, which, I suppose, is simply a conveniently obtainable form of cellulose cement. I am rather surprised that this works as well as he says, because normally cellulose cement does not appear to stick very well to glass.

Radio Serviceman to the Rescue

Another reader, who is engaged in radio service work, says that he frequently has to repair loose valve caps, both bases and tops, and he thinks that the best fixing medium is a paste made of plaster of paris—

presumably the dry powder—mixed with Seccotine. He says, "In the case of four- and five-pin valves I generally remove the base to do the job, but in the case of seven- or nine-pin valves this is hardly practicable; in the latter case the paste has to be forced into the cavity and elastic bands fitted from the dome of the glass bulb to the valve pins and left in position until the paste has thoroughly dried."

"In practice I find the method never fails and the only objection is the slight inconvenience in mixing the paste, which is rather a messy job. In the case of mains-valves I find the heat generated from the filament or heater actually hardens the paste, making the joint firmer than ever."

Ganging and Efficiency

A letter from a reader this week raises, amongst other things, the old question as to whether ganging reduces efficiency. As many of my readers are aware, it has often been maintained that ganging reduces efficiency, at any rate in ordinary conditions of ganging. Many people believe that unless the coils are very accurately matched, and the condenser very accurately ganged, there will be heavy loss on the ganging principle, and people who hold this view—for which there is, of course, a certain amount to be said—prefer to do without ganging.

On the other hand, it must be remembered that the loss of efficiency due to ganging, as compared with individual tuning, has been largely eliminated by the improvements which manufacturers have made in coils and condensers, so that nowadays you can get ordinary mass-produced components, at the right price, which match or gang to a remarkable degree of accuracy.

MARVELLOUS GIFT BOOKS FOR THE MODERN BOY

MOST fellows are keen to know "how things work," and many like to make their own working models, or to take up a new hobby, so that the new **MODERN BOY'S BOOK OF HOBBIES** (6/-), which deals exhaustively with these things, is a most appropriate gift book. It includes illustrated articles on locomotives and ships, wireless and stamp-collecting, model-making and sports and other interesting things. There are two pictorial sections in 'graveure and a colour plate. This is a book that will develop boys' ingenuity and manual skill.

The **MODERN BOY'S ANNUAL** (6/-) is a splendid book for any boy who enjoys stories and articles with an up-to-date appeal. It's really thrilling. Illustrations include two colour plates and many photographs and drawings.

A wonderful new annual that will appeal to every manly boy is the **MODERN BOY'S BOOK OF TRUE ADVENTURE** (5/-). This deals with air, land and sea adventure all over the world, and the outstanding feature is that all the stories are true, and concern real people and events that have actually happened. Colour plates are included, as well as a wide variety of other pictures by popular artists. There are 192 pages in all—and each one thrills in the way that only truth can! You will find it hard to better these annuals as presents for a boy!

ANNOYING TRIFLES

MASS production has brought first-class components within reach of all. Any occasional lapses on their part are mostly in small matters of assembly, but are none the less troublesome on that account. Particularly exasperating is the untightened lock-nut.

If one is lucky the nut can be screwed up from above, but in bad cases the nut and bolt go whirling merrily round, and there is nothing for it but to remove the component and tighten with a screw-driver from beneath.

Those Terminal Arrangements

The components, in my experience, most likely to be attacked by this complaint are valve holders, switches and safety fuses. Transformers and variable condensers are singularly free from such little annoyances. On the other hand, transformers have their own pet troubles. Only on one point do transformer manufacturers agree. They don't like the other fellow's terminal arrangement. This is all right if you stick to one make, but if you prefer a spice of variety it can be very awkward. Terminals on top, terminals on the base, staggered terminals and terminals as upright as an old soldier.

Not content with this, some have the connections across the long sides of the rectangle, some across the short ends. Others transpose P. and H.T. or G. and G.B. So that the experimenter, every time he changes the transformer, is forced to cut a new set of wires to fall in with the idiosyncrasies of that particular make.

One article in which uniformity of action is sadly lacking is the small bakelite dielectric condenser. You may get one working with silky smoothness. Your next venture will probably slither around like a flat-iron on ice or grip unpleasantly at certain points!

A Little Patience Is Needed

It may even lure you into a false sense of security, working amicably in the open, but become uncommonly stiff when firmly attached to the panel. It is all a matter of assembly, for a certain amount of patience in reassembling the condenser effects a cure in every case.

Still, if and when these little troubles are remedied by the makers, I'm afraid we shall all take the improvements for granted and look farther afield for something fresh to grumble about. Apropos of which a harrowing true-life story may serve as a timely warning.

An acquaintance of mine runs a stationer's shop. In the holiday season a lady came in each morning and bought a picture postcard, and invariably asked for a stamp. The first few mornings she was quite effusive in her thanks.

By the end of the week she was taking the stamp without comment. Towards the close of her holiday my friend's stock of stamps became temporarily exhausted, and he ventured to point out that the local post office was just round the corner. She tossed her head. "Huh, no stamps? Then I'll no be wantin' the card." The moral? Well, I leave that to you." **E. O'M.**

The RADIO Bulletin

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

THOSE who suffer from outside interference may often completely cure the trouble by using a suitable type of aerial system with a screened down-lead. One remarkably effective aerial of this type is the "Eliminoise," made by Messrs. Belling-Lee. As is well known Belling-Lee are specialists in the elimination of "man-made" static, viz. interference caused by electrical machines, medical apparatus, neon tubes, trams, and so forth.

The "Eliminoise" costs 55s. complete. Those who want to give a valuable Christmas gift to a friend who is unfortunate enough to suffer from outside interference will be interested to know that the complete aerial kit is obtainable packed neatly into a gold-coloured box specially suitable for presentation purposes.

Sometimes it is impracticable to erect the most efficient type of outdoor aerial, possibly owing to space difficulties or other restrictions. For these the Belling-Lee "Spike" aerial is well worthy of consideration. Consisting of a 12-ft length of drawn tube it is self-supporting, and the assembly makes a very rigid and workmanlike job.

An angle bracket, together with corner plates and iron lashing cable for fitting the aerial to a chimney, are supplied.

The makers state that the "Spike" is more effective for short-wave reception than an aerial of, say, 60 feet span—probably because it is approaching the characteristic of a half-wave aerial. This makes it particularly useful for use in tropical countries where short-wave reception is most important. The "Spike" costs £3 3s.

COSSOR BATTERY PORTABLE

From A. C. Cossor we get news of two releases. One is a battery portable known as the model P44. This is the first portable receiver ever marketed by the firm.

Costing £6 19s., the set utilises a straight four-valve circuit—a screened H.F. pentode H.F. amplifier, followed by a screened pentode detector which feeds into two L.F. stages, comprising a triode and an economy high-slope output.

Other features are single-knob tuning; combined volume and reaction control; automatic grid bias; combined on-off and wavechange switch and a tuning scale calibrated in metres and station names.

The loudspeaker is a moving-coil having a six-inch cone. Underneath the case, which is leather finished in black, is a ball-bearing turntable. There is provision for connecting an external aerial and earth and also for extension speaker or headphones.

The P44 may be had on hire purchase terms, these being as follows:

Twelve months, 10s. deposit and 12 payments of 12s. 4d.

Eighteen months, 10s. deposit and 18 payments of 9s.

The second set is an All-Wave Superhet Console costing 16 guineas. Special attention has been paid to the question of reproduction, and to ensure that this shall be of a really high order a matched-to-output wide response 10-inch moving-coil speaker is employed. The following are details of the specification:

Waveband range: 16 to 52.2, 196 to 566 and 968 to 2,050 metres. 5 valves, viz:

Special triode hexode frequency changer. Variable-mu H.F. pentode, I.F. amplifier. Double diode-triode second detector/amplifier and A.V.C. special high slope output valve. Heavy duty full-wave rectifier. Illuminated wavelength scale with station names. New positive action 30-1 slow-motion drive. Special eight-position combined bandwidth and tone control. Volume control and separate on-off switch. High "Q" coils. Permeability-balanced, iron-cored I.F. transformers. Independently full-floating sub-chassis and full-floating 3-gang condenser. Provision for connecting extension speaker and gramophone pick-up. Walnut-finished cabinet 36 in. high, 17½ in. deep and 17½ in. wide. For A.C. only, 200/250 volts (adjustable); 40-100 cycles.

FOR THE S.W. ENTHUSIAST

Short-wave experimenters who wish to try out regenerative circuits sometimes wonder from where they can obtain a quench coil. Well, they can purchase these from A. F. Bulgin, for 3/9 each. The model listed (list No. S.W.46) is designed to oscillate at approximately 50 kilocycles.

Another useful line marketed by this firm is a neat preset condenser for chassis or panel mounting. The base is of "Ceramate," and the prices of the various capacities range from 5/- to 7/6.

FROM OUR READERS

(Continued from page 374.)

And saw her brother Algænon
So happy with himself
At finding a most curious thing
Upon old Granpap's shelf.
He came and gave Granpap a jerk.
"Say, Gran. What's this? How does it work?"

Old Granpap took it from the lad,
Who stood, all wonder, by;
And then the old man gave a sniff,
And, with a moistened eye—
" 'Tis a short-wave set, boy," said he,
" I built way back in 'thirty-three."

" Tell us what you did with it,"
Young Algænon then begs,
While Granpap lifted out a valve
And fingered its four legs.
" Tell us all about the set;
About these short-waves—are they wet?"

" 'Twas from 'P.W.'," Granpap said,
" That I obtained the circuit,
And after I had wired it up
It was sheer joy to work it.
We travelled far beyond the seas,
This set and I, at home, at ease.

" My brother lived in this town then;
He had a four-valve set.
Like me, he stayed up half the night
To see what he could get.
Gosh, he was jealous on the day
I got a 'veri' from Malay!

" I was a good 'un with the dial;
My hands were steadier then.
I had a pile of 'veris' tall—
The envy of all men!
Your dear Grandma, who died last year,
Was mighty proud of all my gear.

" You cannot know," old Granpap sighed,
" The pleasure of such things—
You, who may swiftly tour the world
Between two metal wings;
Gone is the romance of Malay,
Now one may fly there in a day!"
DONALD T. KEAR
Hang Hill, Bream, Glos.

Our Guinea for what, in the Editor's opinion, is the best letter of the week, goes to Mr. A. HEMPSTEAD, for his description of his Remote Control.

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All communications should be addressed to Advertisement Department, "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

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THE DIAL REVOLVES

By Leslie W. Orton

Good "DX" Work on the Ultra-Shorts :: Improved Conditions
on 49-Metre Band :: Low-Powered Reception

WHEN Dame Nature gets wild she's apt to play some funny games, and one of her latest exploits was to shoot a meteor at British Guiana, much to the amazement of the members of Dr. Terry Holden's expedition, who are exploring the area.

"That's a meteor—that was!" exclaimed the doctor, or he might well have done so, as the little spit-fire shot through space and felled a path thirty-five miles long through the jungle like a super road-making machine.

Dr. Holden has a short-wave transmitter with him and if operates, I believe, on 20 metres, so there's a chance that some of you boys will pull him in. If you don't, don't be disheartened, for several American stations relay first-hand descriptions from the expedition. So how about keeping your ears on the alert? You never know what you may hear.

DX-ing in the North—and South

Power stations to the right, grid system to the left, trolley buses behind and before. Sounds like a bad dream, doesn't it? But it's stark reality, and yet, despite the terrifying sound of it all, Bill Horton, of Rotherham, has as fine a log as one could wish for.

On 10 metres he has heard W1JAR, W2ICY, W3DXT, W4CYU, W6KLY, W6NLS, W6ITH, W8TXD, W9FOL, VE2KX, VU2CQ, K6OQE, SP1HH, and many more. On approximately 9 metres, Bill got a kick out of receiving W2XEM and W9XJL—evidently life's worth living in Rotherham—whilst his 20-metre log is as full of thrills as a box of "crackers." A few of the "star" catches are CO6OM, CO7VP, HC1JB, CE2RC, H17G, K4SA, PY3EP, YV5AE, LU1EX, TI2KP, CN8AM, VE2GA and, need I add, scores of "Yanks"?

Incidentally, our friend is greatly cheered by the news that a bigger and better power station is being erected within 200 yards of his aerial. Jumping snakes! What an outlook!

It often surprises me how much reception varies in different localities. From Rotherham let us take a magic carpet to Dorset—but mind you don't slip off mid-way, otherwise you may land in the "Potteries."

J. Morcambe (Dorset) has an unusual log in that "Z's" are common. Here it is: ZB1E, ZB1H, ZS2F, ZE1JK (also on 10 metres), CN8AI, CN8AM, PY7AI, PY1AL, CT2AG, ES5D, OF6DK, VO6D, SV1NK, and many more.

CUY Calling DON

Conditions have livened up wonderfully on the 49-metre band, and W8XK, Pittsburgh, has frequently been a powerful signal by 9.35 p.m. Later in the evenings numerous South, and a few North, American stations have joined the "fray," but, oh, the code interference! It's nearly driven me "dotty," and it's certainly made me "dash" occasionally!

By the way, have you heard CUY (presumably in Portugal) yet? I heard him calling DON, Berlin, on two occasions recently on approximately 32 metres. What a racket he kicked up—a deaf man might well hear him.

On 31 metres the German stations have been the "star" signals, but W2XAF, Schenectady, W1XK, Millis and W3XAU, Philadelphia, as well as several Latin-Americans, have made their presence felt in no uncertain manner. VK2ME, Sydney, was heard playing a recording of "The Red White and Blue" the other afternoon.

A few metres lower we find Radio Espana, a powerful signal on approximately 28 metres, whilst Moscow's "shadow" "Rainona" has been replaced by a noisier recording—so you know what to expect!

Challenges

By the way, a few weeks ago I remarked that, following the advice of a reader, I would present a small prize to the enthusiast receiving the greatest number of low-powered DX stations. Well, Bob Everard (Sawbridgeworth) and F. W. P. (Yeovil) are having a lone struggle for first place, and if someone doesn't step up quickly with a spectacular log there's no denying that one of the above champions will pull in the

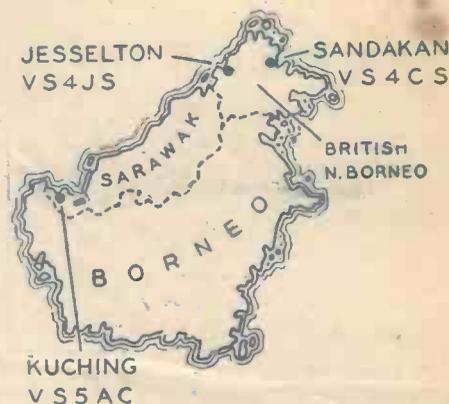
S.W. Station Identification

By F. A. Beane

A NEW STATION TO LOG

EVERY ardent DX-er takes great pride in the number of countries he has "bagged" or verified, and invariably displays a notice to this effect on his reporting card, but after a while new lands are difficult to find unless one adheres to the 20-metre amateur band where new outlets, such as Iraq and Arabia, occasionally spring up.

In comparison the "BC" man has a lean time of it, but now and again he is favoured with the opportunity of hearing something new, such as Martinique, Madagascar or Paraguay. Now we have Curacao, and, unless many of you are philatelists, I expect you will have to bring out your maps to find its exact situation; I did, anyway! To save you the trouble—it's a small island just north of Valencia in Venezuela, one of the Dutch West Indies. To hear it, listen at about midnight on approximately 50.5 metres, immediately below the powerful YV1RL, "Radio Populares" of Maracaibo. Strength is generally poor and the programme marred by a heterodyne, but diligent listening will reveal announcements in Dutch at about six-minute intervals, and a programme very reminiscent of those we hear from Holland, or from any Dutch colonial station. Although I listened for almost an hour to its transmission I did not hear any interval signal or any other special characteristic, but the fact that it uses Dutch and is the only Dutch speaking station anywhere near that wavelength at that time of day is sufficient to prove that it really is PJC1 of Curacao.



Borneo offers the enthusiast a chance of real DX.

prize—so come on, lads, there's not much time left!

Among the Amateurs

Well, I haven't left much room for my amateur log, have I? Actually it's not very spectacular, but extremely cosmopolitan! Stations heard include ST (or SV) 3HCQ calling "long DX"; ES5D, Esthonia; OZ5BW, Denmark; ST9RT (presumably Sudan); NR6RG; F8WT; CN8AM, and CN8RS, French Morocco; LA1FL, Norway; G15QX, Belfast; G12CC, GM5MW, GM6WD, G5WB, G8MA, G8SB, and E13J, Cork.

I suppose you are wondering what has happened to our friends the "Yanks." So am I! I've heard very few, and the best heard have been W3AU and W2IKG—a mighty poor log! But perhaps things will improve shortly.

Readers Help Required

And now I seek help in the question of identification! Every night at approximately 20.15 I hear the strains of the "Internationale" on about 39.5 metres—two verses played in the version so frequently heard from Spanish Popular Front Government stations—followed by a talk, consisting of news and the Spanish War, given by a woman announcer in Portuguese. At 20.45 the programme ends in the same way as it is begun; that is, with the same anthem. From announcements it appears that it is situated in Oviedo, Portugal, and operated by the Portuguese Popular Front Party. Strength is generally colossal, although the transmission is generally subject to telegraphy interference or interruptions from the telephony RIM, Tashkent (39.32 metres)—of all stations!

Finally, I am extremely puzzled by a mysterious station on about 42.5 metres. I first logged it at 20.50 and noted the call "Aqui, Radio Fusooa," or something very similar phonetically. At 21.00 a clock chimed 9, then came an anthem—undoubtedly that of rebel Spain—and a programme of singing and Hawaiian music; a male announcer was at the microphone, while the interval signal was very novel and unique: the crowing of a rooster and the clucking of hens! At 22.00 the clock chimes were heard again and "Radio Fusooa (?) vanished. Once I imagined that Barcelona and "Radio Catalanas" were mentioned, but no other clues as to its identity were secured—Your help would be appreciated!

A "NIFTY" HOOK-UP FOR "TEN"

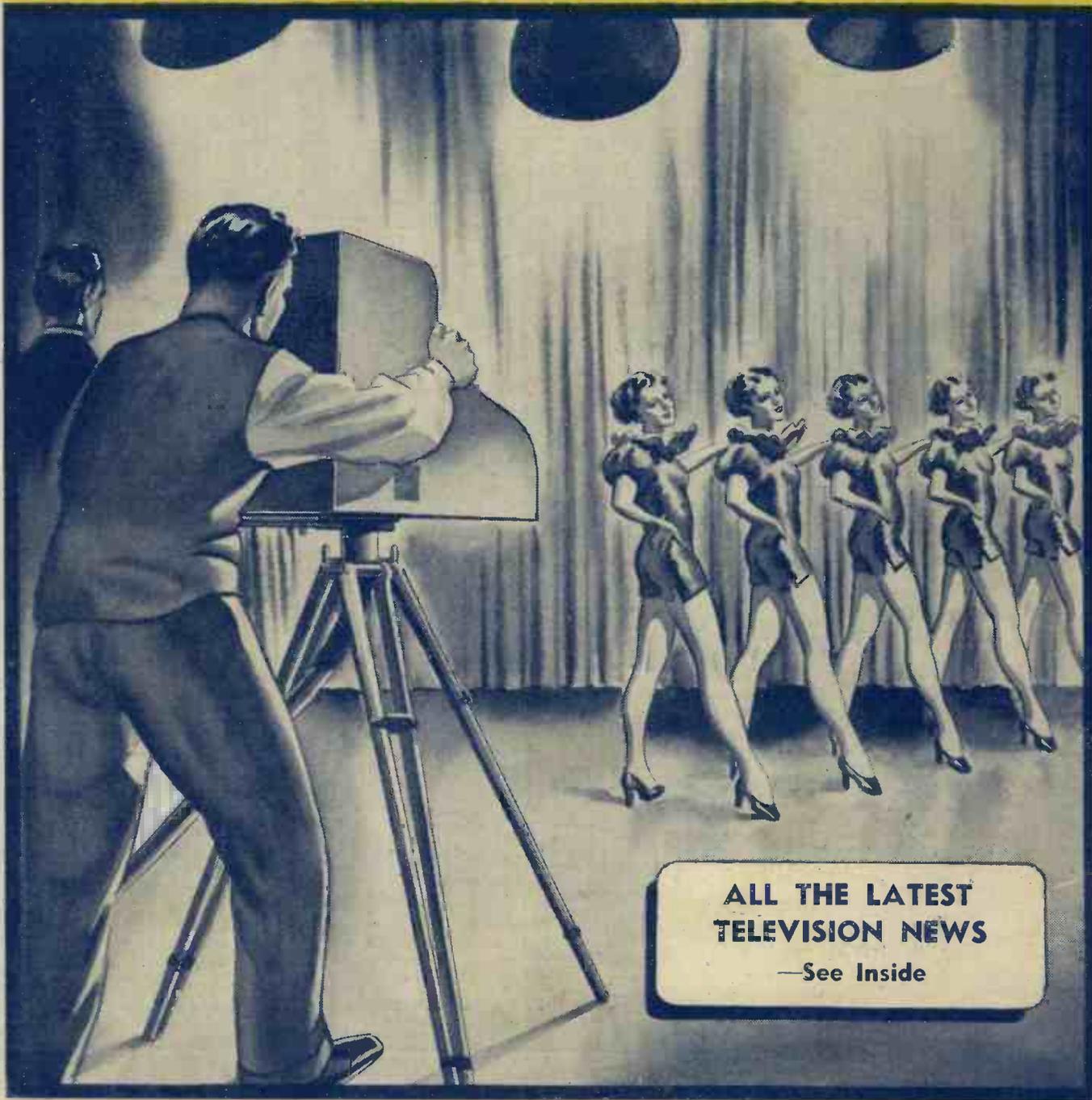
By
LIONEL CHESTER

Popular & Wireless TELEVISION TIMES

CUTTING OUT
THAT INTERFERENCE

PRICE **3^D**

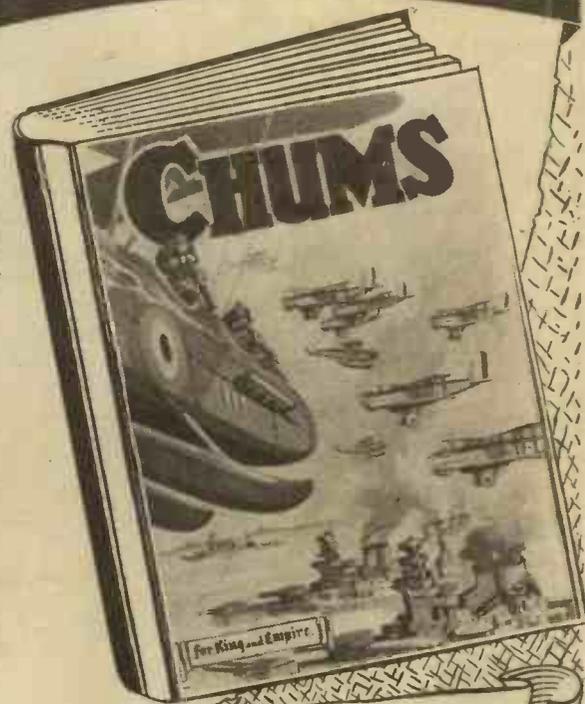
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LEARNING MORSE
THEY SAID IT
A SUGGESTION

RADIO NOTES & NEWS

SUCH LANGUAGE
SWING IT
HIGH JINKS

Looking Up

LOOKING up towards Aberdeen, the student of British broadcasting will find plenty of work going forward. By the beginning of the summer the new transmitter at Nigg should be erected, and the North will know better programmes than ever before.

Meanwhile, the Aberdeen Town Council has approved the plans for the new studios at Beechgrove House, which will take over from the premises in Belmont Street next year.

In addition to the large main studio there will be a dramatic studio, a talks studio, effects, and the usual echo room.

It is hoped to have the new premises ready for the B.B.C. to work in by the autumn of next year.

Itemettes

LESLIE MITCHELL, television announcer at the Alexandra Palace station, has resigned from the B.B.C. to take an appointment as commentator with British Movietone News. The resignation is to take effect in February.

An American radio firm, with its eye on summer sales, is developing an all-electric flypaper. Innocent of adhesive, this ingenious gadget has a flex lead which plugs into any convenient power point.

The exposed grid on which flies may alight is harmless if touched by the finger; but if a moth, mosquito or fly alights there is a momentary flash—and no moth, mosquito or fly.

Learning Morse

IF you want to learn Morse or to improve your speed of reception, you will be interested to know

that Italy will help you, though I do not suppose that this was the intention in Rome. [However, that may be, you will find that the Italian Ministry of War has arranged for half an hour's instruction in the Morse code to be radiated on Mondays, Tuesdays, Wednesdays and Thursdays, commencing at 3 p.m.

The stations concerned are Bari 2, Florence 2, Genoa 2, Milan 1, Naples 2, Rome 1 and Turin 2.

Of these, Rome on 420.8 and Milan on 368.6 are high-powered stations well worth trying for if your set is in the hot-stuff class.

They Said It

THE Prime Minister, in reply to a question in the House of Commons asking if

arrangements could be made to broadcast the proceedings of the House, said he could not see his way to adopt the suggestion. He had made inquiries, and had ascertained that broadcasting the proceedings would not recommend itself to any considerable section of the House.

The Highgate magistrate, addressing a woman: "You say that you are in the radio business and are doing badly. Why, everyone has a radio to-day!" The Woman: "But that's the trouble."

"Before next year is out it is practically certain that television broadcasts will be regularly relayed from theatres and music-halls. The experts are experiment-

ing already with an improved camera with which it is hoped to overcome the difficulty of lighting."—(*The Star*.)

Just a Suggestion

WHEN Mr. Lachlan Macrae, the Glasgow Station Director, answered his telephone some time ago he recited his usual "Hallo" formula, and was surprised to hear the distant voice ask, "Excuse me, mister, but have you got an aeroplane?"

The puzzled station director replied no, he had not.

"Then git yin," said the voice, "fill it wi' bombs, mister, and drop the lot on where the programme is coming from."

Believe it or not, that is a true story. Mr. Macrae made it public at a luncheon meeting of the Glasgow Publicity Club, when telling his audience of some of the criticisms which reach the B.B.C.

(Continued overleaf.)

THIS IS THE FINAL ISSUE OF "POPULAR WIRELESS"

We have to announce with very great regret that after this issue POPULAR WIRELESS will cease to exist as a separate publication.

We are naturally reluctant to bring to an end an association of more than fifteen years standing with that great body of readers whose interest and enthusiasm has been a source of constant encouragement to us in our work. For some little while past, however, we have realised that under changing conditions the time could not be long in coming when POPULAR WIRELESS would have fully served the purpose for which it was originally devised.

In saying good-bye to our readers we are happy in the knowledge that this paper has contributed much that will remain of permanent value to the development of Radio in the home, and that its memory will be preserved through the hosts of friends it has created both in professional and amateur circles.

We are also glad to have the opportunity of reminding readers that THE WIRELESS WORLD is a paper to which we can heartily recommend them to turn if they are not already readers of it. THE WIRELESS WORLD was the first wireless paper to be published and dates back to 1911. It maintains a very high standard of reliability, and has always appealed to the reader who is interested in wireless and aims at improving his knowledge.

We understand that, in addition to the many excellent features of that paper, a new series of articles is about to start which will be unique in character. A range of sets for the amateur constructor is to be described, and these designs are to serve as practical illustrations of articles which will explain how sets are designed and the reason for the choice of every component and value.

THE WIRELESS WORLD is published every Thursday, price 4d.

COUNTRY SIGNPOSTS FOR EINDHOVEN'S NEW AERIAL

Open That Door

ONE of my friends who has a high reputation for veracity (some of my other friends haven't!) is going round telling of a very queer radio coincidence.



He says that he was in one of those restaurants where pukka-sahibs resort when his attention was drawn to the door through which the waitresses fetched and carried. As the waitress approached it, tray-laden, this door

opened of its own accord to let her through. It was so extraordinary that, after watching, he asked the head waiter about it, and learned that it was an application of the radio amplifier linked with photo-cell apparatus.

Murmuring his surprise in a Well-I-never, Fancy-that-now manner, the diner turned to his paper to read an article by Miss Margaret Bondfield, Britain's first woman Cabinet Minister. And the first words on which his eyes fell were "Radio can open the door to a wider life for women."

Black Broadcasting

ILLEGAL transmitting stations—what the Germans call "black" broadcasting stations—are so unpopular with the German Government that a law has been passed whereby anybody who is found to own a clandestine station is liable to penal servitude.

This is the penalty merely for having a station which is not licensed; if the too-enthusiastic broadcaster has been unwise enough to send out any programme which is considered hostile to the Government he is in far worse case, for he may then be charged with high treason.

High treason may render the offender liable to the death penalty.

Such Language

THE missionary zeal which aims to leave no native mind untutored in the niceties of civilisation is cumulative in its action.



At first we had just one or two radio propaganda stations broadcasting in other people's language at infrequent intervals. Then the propaganda grew hotter, the stations became more powerful,

their number increased.

Recently Great Britain, who had been adopting a Benevolent-Old-Squire attitude, decided to join in. Italy, as from December 1st, is increasing her talks in Arabic and Hindustani. In addition to talks in the chief European languages the Italian stations will now transmit in Serbian,

Greek, Turkish, Rumanian, Albanian, Chinese and Japanese.

Swing It

THE "swing it" idea has caught on in the radio world. That great little Dutch pioneer station at Eindhoven is trying out a novel form of beam aerial which is the very essence of swing.

Instead of being laid out permanently to throw a beam in the direction of say the East Indies, the new aerial has a system of revolving reflectors, arranged on a circular track.

At various points round the track are signposts indicating the directions of "East

garden path from which he had climbed with so much trouble.

The police, the reveller, and his wife all laughed so much that they woke the neighbours—and a good time was had by all.

High Jinks

YOU would hardly expect that a high wind in Kent would put French wireless sets out of action, would you? And yet a great deal of bad language which simultaneously arose from Boulogne, Calais, Bethune and other French towns was entirely the fault of the Kentish wind.



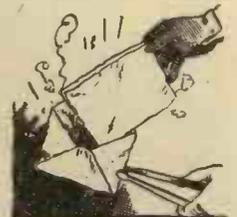
The trouble began when a powerful gust tore a captive balloon from its moorings at the Manston (Kent) aerodrome. Trailing nearly two miles of cable behind it, the balloon made straight for the Continent, evidently bent on making a Channel crossing in record time.

Its safe arrival on the other side certainly created a sensation, for the trailing wires brought down some high-tension cables. Lights went out in thousands of homes, mains sets became dumb, lifts stopped between floors, trams and trolley buses shuddered to a standstill, and about a million people made pointed inquiries about what the blankety-blank was the matter now?

While electricians were putting this right the balloon made off again.

Postman's Knock

TWO of my letters this week have well-nigh burnt their own envelopes and blistered my fingers, so hotly have they been phrased and penned. One of them was posted at Brighton, from a gentleman whose initials did nothing to denote the state of his mind—for his initials were O. K., and his state of mind anything but.



O. K.'s cup of gall has been brimmed by what he calls the "beastly B.B.C.'s neglect of the South Coast." My sympathy with such robust criticism would have been complete but for the recollection that the Start Point station is now under way. Its aerial system will be directional towards the east, and its power may be 100 kw., so my conscience compels me to remind O.K. that the B.B.C. engineers really are tackling the problem at last.

The other letter—from J. M., of Cocker-mouth—I have passed on to the parties concerned, with all the weight of my pen added to its plea.

(Please turn to page 399.)

ROUND LONDON'S AMUSEMENTS

(National Programme.)

Eavesdropping on several entertainments on the same night has always proved an amusing experience for listeners. On December 29th the B.B.C. is arranging to place microphones in several centres of varying kinds of amusement. It is hoped to cover a London circus, a Palais de Danse, Ice Hockey, an East End Working Men's Club, a Fun Fair, a Cinema, and a Musical Comedy. The microphones will be connected to one of the Broadcasting House Control Panels, at which a B.B.C. comperé will be sitting. All the microphones will be "live," that is the various programmes will be on tap, the comperé seated at the control panel will talk about them and, with a switch, take listeners on a magic carpet round London's entertainments.

This novel form of amusement will last for some forty minutes. Much depends on the entertainment value of the different places at the moment of call, and so visits and re-visits will be timed accordingly. For example, listeners may hear a short flash from an ice-hockey match and then, after visiting a fun fair or a cinema, go back to the ice-hockey match to hear what progress has been made. In the case of the circus, some of the acts are not suited to broadcasting. During this period the other microphones will be called on to fill the gap and so back to the circus for some part of the programme more suited to the listening audience. Continuity will be maintained throughout by the comperé at the Control Panel.

Indies," "Argentine" and other places, so the canny Dutchmen will be able to swing the beam in any desired direction. At the conclusion of that programme the beam can be swung round to cover the next country to which it is desired to transmit—a cute idea which saves a lot of aerial arrays.

Revelry by Night

THE police mobile squad who dash in cars to investigate suspicious circumstances, as directed by radio messages, often have some queer experiences. I doubt if any have had a more amusing chase than the car-load of which I heard recently.

Somebody phoned headquarters to say that very late at night a man had been seen climbing into a window. A police car was on the spot within five minutes, and caught their man, red-handed, coming out of a door.

But investigation proved that he was the owner of the house, who returning blotto from a dinner, had determined to get indoors without waking his wife. With infinite difficulty he had managed to climb through a small window, only to find that it belonged to an outdoor lavatory, the door of which was ajar and led straight back to the

RADIO POINTS THE WAY

By J. C. JEVONS

How wireless can ensure a safe aircraft landing in mist or fog

THE railway traveller is safeguarded from point to point along his journey by a system of signalling which is as nearly foolproof as human ingenuity can make it. The time is not far off when the traveller by air will be in practically the same position. He will fly from aerodrome to aerodrome along an invisible track formed by the "overlap" of two beams of wireless energy, and at the end of his journey will glide safely down to earth on the back of a short-wave "landing" beam.

In a sense the airway will be even better served by radio than land transport is at present, because wireless signals are not

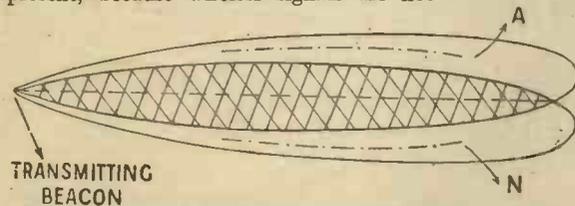


Fig. 1. Two directional transmitters are arranged at an angle to each other so that they radiate beams which overlap slightly along their length.

affected by mist or fog. Road and railway lights and semaphores become practically useless as soon as fog sets in, and land-going traffic is then compelled to go slow for the sake of safety. But once the air is properly "charted" with wireless beams the pilot will be able to keep to his course simply by following the indications of his radio instruments, and will fly with the same confidence and ease as he does in clear weather.

All this may seem more like a fairy tale than solid fact, but air navigation along wireless beams has already proved a success, both in America and on the Continent. Sooner or later the installation of "approach" and "landing" W.T. gear will be made compulsory at all aerodromes, and we shall hear of no more fog disasters like the recent one at Ostend.

For producing a radio "guide-way," two directional transmitters are arranged at an angle to each other, so that they

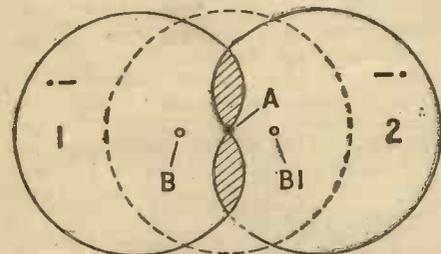


Fig. 3. The effect of switching in the two side reflectors, B, B1, is shown in this diagram.

radiate beams which overlap slightly along their length, as shown in Fig. 1. One beam is modulated with the Morse code letter A, which consists of a "dot" followed by a "dash," whilst the other carries the Morse letter N, formed by a dash followed by a dot.

Along the overlapping portion of the beams (shown shaded) the two sets of dots and dashes will be heard simultaneously, and since they fit neatly together the received signal merges into a single long-drawn-out note. Anywhere outside this region the signal is, of course, broken up definitely into the code letter A or the letter N, and the pilot knows, according to the particular sequence received, in which

direction to steer in order to fly towards the shaded zone. Once there, it is a relatively simple matter to find and keep on the centre line.

If the pilot is wearing headphones, he judges by the continuity and strength of the received note. More usually the machine is fitted with a visual indicator, in which two equal columns of light show when the pilot is keeping to the equi-signal line. Or a balance ammeter may be used, on which the correct course is indicated by the needle keeping steady at the centre of the dial.

If the machine deviates to one side or other of the charted course, the radio indicator at once shows by its deflection what is happening, and how the steering must be corrected to get back "on course."

Ultra-Short Waves

Long-range navigational beams of this type are effective up to distances of the order of 150 miles, the signals being received on trailing-wire aerials. For "approach" work, that is for guiding an aeroplane into the aerodrome from distances of less than ten miles, and for "blind" landing in foggy weather, ultra-short beams on 10 metres or under are used. These are transmitted and received by dipole aerials.

Fig. 2 shows the arrangement of a short-wave "approach" beacon. The centre dipole aerial A is energised directly from a high-frequency source, whilst the dipoles B and B1 act as reflectors to modify the shape of the field radiated from A. Each of the B dipoles is fitted with a short-circuiting switch, which is operated periodically through a relay from a rotary commutator C. When a switch is closed that particular dipole acts as a reflector and distorts the field radiated by centre dipole A. When the switch is open the dipole exercises no effect upon the radiated energy.

The field radiated from the dipole A, taken alone, will spread out equally in all directions, in the horizontal plane, so that it can be represented as a horizontal circle with the dipole at its centre. The effect of switching-in the two side reflectors B, B1 is shown in plan in Fig. 3. When the switch of one dipole is closed, and that of the other

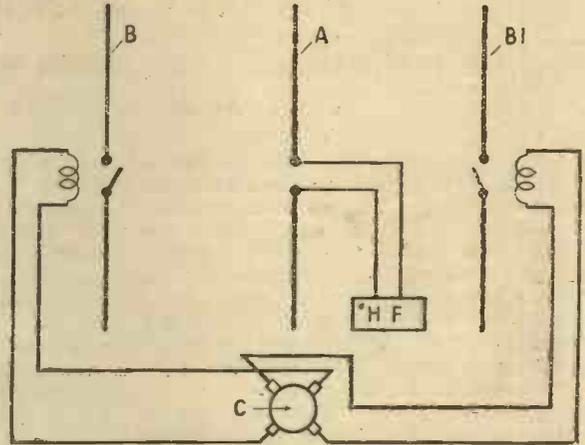


Fig. 2. The arrangement of a short-wave "approach" beacon.

opened, the original circular field (shown in dotted lines) is distorted into the shape marked 1, whilst when the switching is reversed, the field changes over into the curve marked 2. This produces a central overlap (shown shaded) which looks like a flat-shaped figure-of-eight, and serves as an "approach" beam to guide the pilot towards the aerodrome.

As before, the radiated field 1 is modulated with the Morse code A (· —) whilst the field 2 is modulated with the letter N (— ·). The centre shaded path then becomes an equi-signal line along which the pilot flies horizontally by keeping his indicator at zero. The effective range of the approach beam is from six to ten miles.

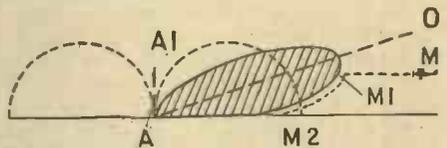


Fig. 4. The pilot starts to put the nose of his machine down when he reaches M1, and by always flying to constant signal strength is automatically guided along the contour of the beacon, thus reaching the point M2 at the proper landing angle.

In addition to being guided horizontally, it is necessary at a certain point to start the machine on its downward path to earth. This is usually done by means of a second club-shaped field inclined at an angle to the horizontal. For this, another reflecting aerial, similar to B and B1, can be placed vertically above the dipole A in Fig. 2. The additional dipole is also connected to the commutator switch C, so that the "approach" beam is periodically changed over into a "landing" beam, the change-over being made so rapidly that both beams are practically in operation at the same time.

Taking a vertical section through the field radiated by the dipole A alone, it will have the circular form shown in elevation in Fig. 4. There is zero radiation vertically, but maximum radiation in the horizontal plane. When a reflecting dipole, such as A1, is placed immediately above the dipole A, it distorts the original circular field, and pushes it over to one side, as shown by the shaded curve. This, it will be observed, cuts the ground some considerable

(Please turn to page 405.)

THE DIAL REVOLVES

By LESLIE W. ORTON

THE 20-METRE BAND :: JZK WORTH TUNING-IN :: ROUND
ABOUT 10 METRES

YOU can say what you like (and doubtless will!) but the 20-metre band takes some beating for irregularity these days. On most Sundays lately I've been able to pull in "G's" with a regularity that was astonishing, but the pendulum has reversed, Fate has once again played havoc, and on many occasions I've found hunting for a "G" (even G8SB!) as difficult as looking for a needle in a haystack during a fog at night!

Nevertheless, my "log" is decidedly attractive, for it includes VO1I, VO4A, VO2N, Newfoundland; YI6JA (calling Newfoundland); CT2AB, Azores; CE2QC, Chile; LA6A and LA6N, Norway; QZ5BW, Denmark; PA2AW, Holland; ON4TZ, Belgium; CT1AY, Portugal; CN8GA, French Morocco; W2EI, W2UCI, W4AH, F8PQ, F8DN, F8CN, etc. A Russian station (possibly the North Pole station, Radio UPO L) was heard faintly, but clearly, on about 21 metres on several occasions.

By the way, I've received a further batch of "logs" from readers, and the following from D. D. of Musselburgh, Scotland, is of such startling proportions that I can't refrain from quoting it: CE2EW, CN8AT, CO2AB, CX1AA, ES5D, FA8LC, FB8OO, FT3LY, HA8N, HB9J, HH5PA, HI1X, HK1AZ, I1KM, KA1MF, K4FNY, K6KFZ, LU1GA, LX1TW, LY1AA, NY2AE, OF1FX, OK2MA, OQ5AA, OZ1NW, PK4AU, PY2BA, SU1KG, TF3P, TG12AY, TI2AV, U3BC, VE9AF, VK2HF, VK2XU, VO2Z, VP2CD, VS2AK, VU2CQ, and many, many more. Can any of you hardened DX-ers beat this Scotch enthusiast's log? His receiver, by the way, is a detector-pentode affair.

Johannesburg Heard

Since Japan took over parts of Shanghai, some startling changes have taken place. XOC on 28.46 metres is now (I understand) in the hands of the Japanese, and I assume the same to be the case as regards XGW on 29.79 metres.

By the way, JZK, Tokio, on the 19-metre band, is well worth tuning-in—he's a colossal signal.

Which reminds me (I don't know why!) that I was startled out of my usual calm when the announcer at an outside broadcast apologised for giving the wrong call! The real call was W8XK, Pittsburgh—it's seldom that such an error occurs.

The 49-metre band has been particularly interesting of late, and "poor old Jo" (ZTJ, Johannesburg) has been heard occasionally. Its schedule is given as from 5 to 9 p.m. on 49.2 metres. A fraction of a metre higher up (on 49.31 metres) you may be lucky enough to tune-in VQ7LO, Nairobi. I've heard him on a few occasions lately.

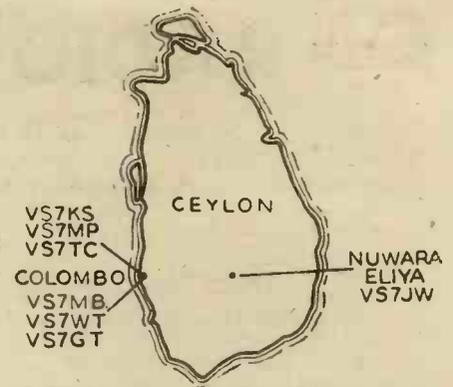
W2XE, Wayne, on 25.36 metres has been a "star" signal. I heard an excellent rendering of "Lost Chord" from here the other day. Volume, using a five-valve "super," was so great that a friend was puzzled at not finding the programme in the "Radio Times." I almost thought I'd have to get some brandy when the call came!

Excellent Ultra-Short-Wave Results

Fed-up to the teeth with DX-ing on 20 metres (there aren't enough "Yanks"), I've been only too thankful to turn my attention to the 10-metre band, for it frequently provides more thrills per minute than all the other bands (not including Henry Hall's!) put together.

My log's not very spectacular, but W1AA, W1HTR, W1CRI, W1FFI, W1JFU, W2IQC, W2TD, W2KAX, W4FT, W5BA, W5EJO, W8HST, and W9FEW were moderate to good loudspeaker signals.

On about 9.55 metres I picked up an American broadcaster broadcasting a talk on wireless stations. Just before the



Here are some Ceylon amateurs worth searching for.

station call, the station faded completely. I'm wondering whether I was listening to a harmonic of W2XAD, Schenectady. I understand that one has been giving DX-ers the thrill of their lives (until they've heard the call!) of late.

Even more mysterious was a station heard on about 9.5 metres. I always managed to tune him in when closing down with a "Good-bye. 2, 3." I never was much good at puzzles, and this mathematical-sounding fellow has me floored. Perhaps one or other of you DX-ers hold the key to the mystery. If so, I'll be everlastingly grateful if you will let me into the secret!

The 9.494-metre band is well worth attention. I've heard concerts, talks, and even the "Session chimes" at excellent strength, but, having a touch of 'flu, I've invariably sneezed when the call came!

S.W. Station Identification

By F. A. Beane

LATIN-AMERICAN CHANGES

THE Dominican Republic is constantly clamouring for etheric limelight, and like numerous other Latin-American republics frequently makes changes in its channels, adds to its transmitters, or even shifts them from town to town, completing the move with a new slogan or identification characteristics.

Quite recently HI5N moved to Moca City and adopted the title "The Voice of Moca City"; Santo Domingo became Trujillo City; HIN became "Broadcasting Nacional," and so on. Now HIZ, operating on 47.5 metres, has caused considerable confusion by giving up its old slogan, "La Voz de Muchachos," and becoming a second "Broadcasting Nacional"! In full the call is given thus: At 23.40 or 00.40 (the hour Dominican Time), four or five chimes, and the Spanish announcement "HIZ (phon. ah-chay ee thay-tah), en Ciudad Trujillo, Republica Dominicana, Broadcasting Nacional," or alternately as "HIZ, Broadcasting Nacional en Ciudad Trujillo, Republica Dominicana," which, I suppose, is much the same thing!

CB 615, Santiago, Chile

An air of mystery has hung around CB 615, "Radio Service," of Santiago, Chile, formerly of 12,300 kc., for some time. Right from the inauguration of its

once well-heard broadcasts there was much speculation as to its correct call, then suddenly it disappeared; some said it wandered to the 49-metre band, while others suggested 25 m., but no matter where diligent search was made nothing could be definitely traced of the erstwhile "star." After a while "Radio Service" was forgotten, especially when the Anglo-American Hour broadcaster CB 1170, of the same city, made its sensational debut, usurping all others from stardom, a month or two ago. Now a verification (and there is a lot to be said in their favour, particularly from broadcasting stations) from CB 1170 has cleared up the mystery—CB 615 is off the air, having been taken over by Otto Becker, owner and operator of CB 1170, the latter is apparently our old friend CB 615 in new guise. In the verification it is stated that CB 1170 (now on about 25.65 m.) broadcasts thrice weekly, on Tuesdays, Thursdays and Saturdays, from 23.00 to 23.45 with the Anglo-American Hour, while the full schedule is daily 15.00-19.00 and 21.00-04.00 G.M.T. In English the station call is invariably given as "You are listening to stations CB 89 and CB 1170, Radio Otto Becker, on 25.64 m., transmitting the Anglo-American Hour," or in Spanish as "CB 89 y CB 1170, Radios Otto Becker, Santiago de Chile."

ON THE SHORT WAVES

BAND-SPREADING

By W. L. S.



A FEW days ago I was reading some very ancient numbers of "QST," the A.R.R.L.'s official journal, from which so many real advances in short-wave technique have come in the past. Way back in 1924 I found references to the new technique of "electrical band-spreading." This title naturally attracted my eye, and I read on to see what this epoch-making discovery might be.

IN SERIES

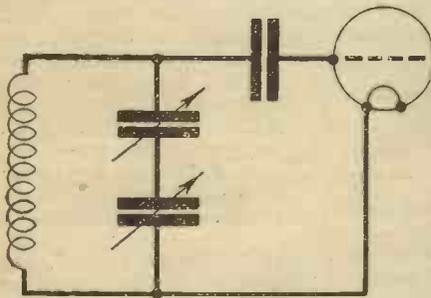


Fig. 1. One form of band-spreading, viz. using two variable condensers in series.

Actually, as it didn't take me long to discover, it meant band-spreading just as we do it to-day—by electrical means such as the use of tapped coils, parallel or series condensers, and so on. Up to that time all band-spreading had been carried out by mechanical means—the use of reduction ratios in dial drives, and so on.

The Usual Scheme

It's rather strange to reflect that the need for band-spreading was realised as long ago as that, when the really short waves weren't in use and when all listening took place above 90 metres or so. Still, I suppose it was the fact that the amateurs had to huddle together in narrow bands that led to it. A commercial receiver which tuned from 90 to 200 metres in one swoop was obviously at a disadvantage when its owner only wanted to receive stations between 90 and 105 metres—so what could be more natural than the reduction in size of the tuning condenser, or the addition of a smaller condenser which would spread the required band out over a full revolution of the dial instead of a few degrees?

Every reader knows the usual band-spreading scheme—the use of two condensers, one small, and one large. The two are connected in parallel, the band is "set" by the larger condenser and tuning over the desired band is then carried out on the small one.

A little while back I mentioned another one—the use of a tap on the coil, so that the given condenser was reduced in its tuning range by the fact that it was connected only across a few turns instead of across the whole coil.

This week I want to bring two more band-spread schemes to your notice, in case you've never come across them. They're worth trying, anyway, and there's a chance that some little characteristic of one or the other of them will just suit your own requirements.

The first (Fig. 1) consists of using two variable condensers *in series* instead of in parallel. Imagine, for the moment, that they are both of '0003 capacity. Set the top one "all in" and tune on the bottom one. It will then have a capacity of '00015, effectively, and will cover just the ranges that you normally expect to cover in short-wave work.

Suppose, however, that you would like these ranges spread out a little, just decrease the setting of the top condenser, and it has the effect of reducing the maximum capacity of the one you use for your tuning.

ALTERNATIVE CONDENSERS

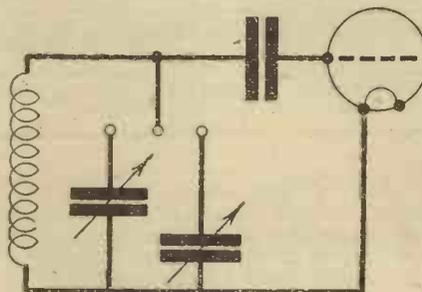


Fig. 2. Another scheme, in which alternative condensers are employed.

Take your coil labelled 41-94 metres. With the top condenser all in, that's the range you will cover. But perhaps you're only interested in the range 41-60 metres: put the top condenser about half-in, and you've got it.

Even if you want to cover the band 41-43 metres, you can do it. Set your bottom ("tuning") condenser all-in, reduce the capacity of the top one until you come to 43 metres, and then leave it alone and tune on the bottom one.

This scheme, as well as the next one, has the disadvantage that you can only spread the band starting from the bottom end. You can't, for instance, get a range of 60-64 metres or anything of that sort. The whole point is to use coils of such a size that the

bands you are most interested in come near the bottom end of the tuning scale.

The second scheme (Figs. 2 and 3) is interesting because it involves no extra components and can be arranged entirely by yourself. It consists of using two alternative condensers, one large and one small. Furthermore, these condensers are both on the same shaft, and to change from one to another you use a change-over switch or a crocodile clip, but go on tuning on the same dial, which is, in many instances, a great advantage.

An Old Type Employed

To make the special condenser required you want an old type of short-wave condenser in which the fixed plates are supported by a threaded rod held in an insulating strip at each end. You have to cut through this rod about one-third of the way along, removing one or two fixed and moving plates to give a gap as shown in the sketch.

Thus you have one rotor (divided into two sections) and two completely isolated sets of fixed plates. The sizes of the two sections may be arranged to suit yourself, but I have shown, in the sketch, one with two fixed plates and one moving, and the other having seven of each.

This arrangement can be used with excellent results on the standard four- or six-pin coils if it's amateur bands that you want to spread. Because of the lower *minimum* of the small condenser, the minimum wavelength covered falls down a bit, and the 22-47-metre coil gives roughly 20.5-23 metres, the 41-94-metre coil gives 40-43.5 metres, the 76-170-metre coil gives 75-84 metres.

CONTROLLED BY SAME KNOB

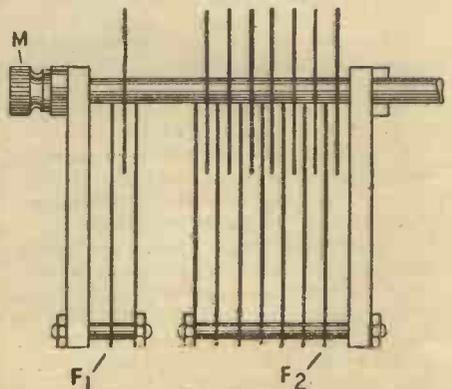


Fig. 3. The condensers in Fig. 2 may both be on the same shaft, and to change from one to the other either a crocodile clip or change-over switch is used.

POINTS *from the* POST-BAG

W.L.S. Replies to Correspondents

LOTS of letters this time, so they must be short replies. L. C. B. (Coulsdon) has got his "hot" one-valver down on 10 metres and doesn't find any difficulty in logging DX phone on it. He also gets the sound and vision between 6 and 7.5 metres, and hopes to cover the 5-metre band soon—in fact, he may be doing so already, but hasn't heard anything of note down there.

L. E. S. (S.E.23) reports a great lack of Eastern stations from his new locality, and also South Africa doesn't seem to exist. He can hear anything to the westward—Hawaii and West Coast Americans—although there is a 300-ft. hill to the west of him. I don't imagine that hill will make much difference—work out the path of signals from California and Hawaii on a globe, and you will see that they have to come nearly over the North Pole.

L. E. S. has added aerial reaction to the H.F. stage of his short-waver, and remarks that while nearby G stations are talking about bad conditions, he's raking in DX stations all round them! He sends a programme schedule from the Java stations, part of which I quote in column 3.

Using Converters

R. McI. (Norwich) comments on the popularity of the converter. He says, "When you have a 13-guinea set for which you are only offered about £3 in part exchange for a new one, what's more natural than to start thinking about a good converter to make a short-waver of it?" I know lots of people who have bought new sets (not all-wavers)

and rather than part with their old ones at knock-down prices have kept them and turned them into really nice short-wave outfits.

T. L. W. (St. Bees) asks if the long-promised plans of a band-spread "Simplex" Three have yet appeared. No, T. L. W., they haven't. If you use a separate condenser, the best thing is to put the band-setter up high on the panel, the present position of the tuning condenser being occupied by the band-spreader.

F. A. (Chingford), whose letter apparently went astray and reached me a month late, tells me that Z M B J, the New Zealand "luxury liner" is no longer broadcasting. Her transmitter now uses scrambling equipment for ordinary ship-to-shore telephony, and you are therefore lucky if you recognise her. You may, however, pick up Z M B J during tests on ordinary phone, and then when she starts scrambling you'll know that you've got her all the same!

A. M. S. (Birmingham) recently scrapped the "Simplex" Two in favour of an eight-valve superhet, but finds that he can no

longer log the real DX stations, although the super naturally brings in all the well-known stations at terrific strength. He wants to know whether to build a new short-waver, such as the "Simplex" Three, or to add the two-stage H.F. amplifier to his superhet in the hope of cutting down the noise and getting DX on it.

Well, A. M. S., it's a problem, but I have found my own superhet much improved by the amplifier. The huge additional H.F. gain makes it possible to keep the L.F. volume control well down, and the noise-level certainly is reduced to an enormous extent. I think you would find the same.

Old Components will Serve

D. G. J. (Middleton) wants a complete list of parts for the little baby two-valver of which I recently gave the circuit. That was the set using a Class "B" valve as a detector and L.F. Well, my own set on these lines uses "all-sorts" throughout—any old variable condensers that happened to be in the cupboard, a set of four-pin coils with the standard turn-numbers, and so on. The condenser in the aerial lead-in is not on the front panel—it is a neutralising condenser mounted on the baseboard. I don't think there's any point in specifying a lot of individual parts for this set—treat it as a junk-box receiver and use up whatever you may have on hand.

WHEN TO LISTEN IN JANUARY

	Below 15m	15-26m.	26-50m.	Above 50m
N. America	12.00-18.00	11.00-21.00	20.00-05.00	04.00-07.00
S. America	16.00-18.00	20.00-23.00	22.00-03.00	—
Africa	16.00-18.00	18.00-21.00	—	—
Asia	10.00-15.00	13.00-17.00	—	—
Australasia	10.00-13.00	14.00-17.00	07.00-09.00 14.00-17.00	17.00-19.00
Europe	—	All Day	All Day	All Day

D. P. (Wrexham) asks whether the all-mains two-valve short-waver described in the September 25th issue can be used with a pentode in the output stage. Certainly it can. And the pentode you mention, D. P., will run nicely on your power supply of 250 volts 60 m/a.

W. W. (Edgware) has rebuilt his set on an aluminium panel and baseboard in an attempt to get rid of hand-capacity effects, but finds that he has only made them much worse. As he tells me that he has a difficult situation and a very long earth lead, I suggest that he tries the old dodge of tuning the earth lead with a series condenser between it and the set. This simple dodge has been known to work wonders in the most difficult cases.

J. W. (Bolton) wants to build a de luxe all-wave one-valver. I haven't written much about such a thing myself, but I have often thought of converting the single-valve short-waver into an all-wave set, simply by carefully winding high-efficiency coils that will cover the broadcast bands with the .0001 tuning condenser.

Short Wave News

THE following are details of the short-wave broadcasting stations at present active in Java:

YDA (Batavia) uses 10 kilowatts on 98.68 metres; YDB (Soerabaia) uses 1 kw. on 31.2 metres; YDC (Bandoeng) has 1.5 kw. on 19.8 metres. These stations are on the air on weekdays from 03.30-07.00, 10.30-15.00 and 23.00-00.30—all times G.M.T. On Sundays they broadcast from 00.30 to 07.00 and from 10.30 to 15.00.

In the early mornings, however, YDA uses 49.67 metres instead of 98.68, and YDB uses 19.61 metres instead of 31.2. The other stations are PLP and PMN (both at Bandoeng), on 27.27 and 29.24 metres respectively. Both broadcast at the same times as the stations mentioned above. The remaining station is PMH on 44.64 metres, which broadcasts Oriental programmes only.

In addition to the above, there are no fewer than eighteen other stations, but they are not intended for long-distance work. These transmitters are fed from the "key" station at Batavia, but the stations at Soerabaia, Bandoeng and Semarang also have full studio equipment from which important local events can be transmitted.

Poor Conditions

The first week-ends of the transatlantic tests on 160 metres have not been successful because of unsuitable conditions. There is no doubt that the "Yanks" will break through some time before the end of January, but at the time of writing they have been non-existent. On 80 metres, on the other hand, there is quite a lot of activity in the

early mornings, American stations coming through with at least the strength that is generally expected of them on 40 and 20 metres.

This long spell of bad conditions that we have been having has proved to be something new to the many short-wavers who have not had more than a year's experience. Conditions have been good for a longer period than I have ever known before, and when they suddenly began to fall off at the end of November I thought "This will shake some of 'em up!" And it certainly did. I have been deluged with letters from listeners who innocently inquire what has happened.

Nothing to worry about! We'll have plenty more spells like this, but, on the whole, the next two years should be very good indeed. After that—well, who can say? If conditions gradually creep back to the level of 1933 and 1934, there are liable to be a few disappointed listeners among the crowd who don't realise what a tremendous effect the sunspot cycle has on short-wave radio. **W.L.S.**

A "NIFTY" HOOK-UP FOR "TEN"

WITH my old cherrywood drawing nicely and my latest "invention" close by, I hasten to record my further experiences in the nether regions—namely ten metres and under. I feel pretty braced with life at the moment because, after a lot of trials and errors, I think I have got down to brass tacks—and ten metres!

I left off last time with some dial readings obtained with my home-made coils. Since then a really beautiful set of Eddystone ultra-short-wave coils has arrived, and much work has been done putting them into action.

In case you've not met them, let me say they are wound with 14-gauge copper wire—silver plated into the bargain. The ends

try any reputable system of interchangeable coil units.

And that, roughly, is what I have been doing. My first effort was not exactly a success, mainly because I did not think enough, and simply mounted the coil bases on the baseplate of the metal chassis as with any other coils.

True, the leads were not overlong, but I managed to get my reaction connections reversed—oldest of mistakes by the amateur!—and the ensuing squawks through forcing some kind of oscillation with far too big a reaction coil had to be heard to be believed!

Still, that was put right after vainly suspecting the coils and the ultra-short-wave choke, and away she went—the Chester Two for Ten! At 4 p.m. I resolved a very strong carrier at 128 degrees on the dial—and heard, for the first time, W1COO, of New Hampshire, U.S.

I gather this is one of the strongest of the 10-metre fone brigade, so I could not exactly call the reception a triumph. Do you know, I suffered from what I believe has been described as "divine discontent"—I felt there was something not quite right with my set.

And then came the inspiration! I was idly surveying my metal chassis, musing thus: "Hm, if only I could get those coils really close to the condensers—but that means a long lead from the reaction coil to the anode terminal of the valve holder."

And then I saw it! I could have kicked myself for being so blind. Of course, move the detector valve holder and the coils up on to the vertical metal panel!

If you will do me the honour of glancing at Fig. 1 you will see how things took shape when I had realised how to use these coils to best advantage. I think you will agree that all the important leads are short.

All it meant was putting the detector valve holder roughly where the reaction condenser was before, and shifting up and sideways the reaction condenser to a spare space near the top right-hand corner of the metal panel.

The tuning condenser stays where it was in the set pictured last time—and the two leads are actually no longer with the Eddy-

stone coil and base than when I had home-made coils soldered direct on.

The three coil bases are arranged in a line above—so that the coils, when plugged in, come about 1½ in. below the top of the metal panel. Actually, I have elongated the drawing of the panel's height so as to get some lettering in—but the leads from the H.F. choke and from the L.T. positive terminal of the valve holder are not more than an inch or so long before going sub-chassis.

This layout means that the detector valve, when inserted in its holder, is horizontal—that is, parallel with the baseplate. There is about one inch clearance between the metallised bulb and the chassis, actually.

On the baseplate itself only the low-frequency components are placed—so there is loads of room to fit these in as the fancy takes you. Indeed, with so much spare room I have not put anything under the chassis, except a wire or two.

Using the Duplicate Tags

Reverting to the panel layout—or rather the back of panel layout!—do please note that I have had to make full use of the duplicate fixed plate tags on both tuning and reaction condensers. But then, they are meant to be used—what?

In case you have forgotten the circuit I am using for these experiments, Fig. 2 will remind you it is a simple detector with series-fed reaction and an R.C.C. low-frequency stage, the output being a Harries type pentode with choke and condenser output.

I feel the circuit, so long as it is simple and good—like this one undoubtedly is—plays second fiddle to layout in ultra-short-wave working. I say this because of the truly remarkable difference in results obtained when I got this latest hook-up going.

The signals on ten metres really have been

THE DETECTOR LAYOUT

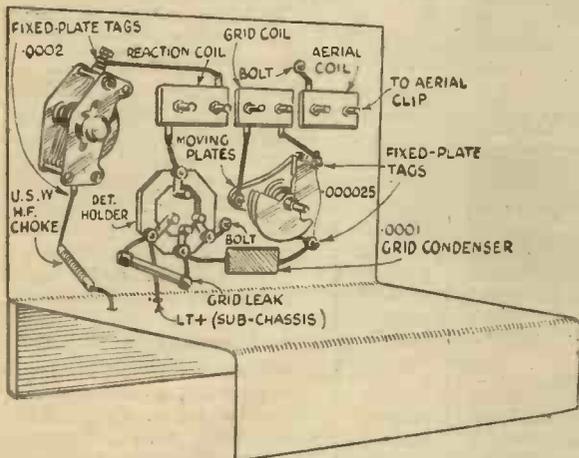


Fig. 1.—Lionel Chester's panel lay-out is clearly seen here. The L.F. components, which are mounted on the chassis base, are omitted for clarity. The diagram illustrates the detector wiring which of course, is the critical part of the set.

of each coil act as the plugs, which make a nice tight fit into a little Frequentite base.

Of course, their virtue is "easy change." The 4-turn covers the 4 to 6-metre band, the 6- and 8-turn coils covering between them the 6 to 8 and 8 to 10-metre bands. There's a 3-turn coil for aerial coupling, too.

Now, I started off with the notion that for ultra-short waves plug-in coils were entirely taboo. I had horrible fears of losses through the contact between the coil plugs and the base sockets—not to mention inductive loops in the leads.

Excellent Coils

But I imagine even the purist would not have much to say against this Eddystone system, which seems to me to cut down any possible losses to a negligible minimum. And as for the connections, I hope to show they need be no longer than when the home-made coils are soldered direct on to the tuning and reaction condensers—as I did in my first hook-up, you remember.

One thing is certain: It is quite wrong to try to cover the whole 5 to 10-metre band with one-coil-and-condenser combination. Indeed, I imagine that would be almost impossible. As we MUST use different coils for each section of the 5 to 10-metre band, it seems a good thing to

A. STRAIGHTFORWARD CIRCUIT

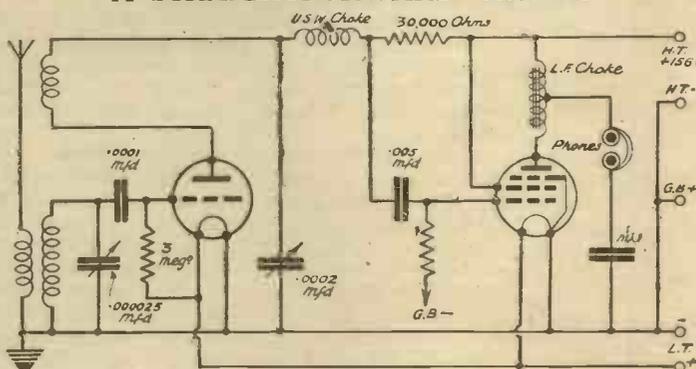


Fig. 2.—The circuit is a straightforward series-fed reaction arrangement with an R.C.C. stage of L.F. Note the choke output scheme.

roaring in. At last—rather late in the day—I can believe what others have been saying and writing of the strength of the American amateurs down there.

Loudest of the lot to date is W6NLS.

(Please turn to page 405.)

VALVE VITALITY

SOME FACTORS WHICH AFFECT IT

By J. F. STIRLING

HOW long should a valve last! What is its average working life? What makes a valve "go off"?

Such questions regarding the allotted span of the modern valve are ones which are often asked, especially by the beginner in radio. Seldom, however, are they answered satisfactorily.

There is a reason for this, however, because valves, even though they be of the same type, tend to vary somewhat among themselves. Then, of course, the conditions under which they are required to work are always liable to vary enormously. It is thus an exceedingly difficult, if not, indeed, a totally impossible task to lay down any fast and binding law relating to the longevity of present-day valves.

The "Good Condition" Life

Needless to say, modern valves have a very much increased life over their predecessors of a few years back. Nevertheless, there is no doubt of the fact that even the best of valves has only a limited "good condition" life. This being the case, it is always advisable to bear this fact in mind whenever maximum efficiency is required from a receiving circuit.

Quite a number of valves slightly increase in efficiency during their first three or four hundred hours of working life. This is because a valve operates at its best in a very high vacuum and because many valves tend to have their degree of vacuum increased, or, as the term is, to become "harder," during the first portion of their active lives.

After this, the efficiency of a good valve will remain pretty constant for from 800 to 1,100 working hours—a period of time which, on an average, represents about a year's running.

Why Efficiency Loss Occurs

Thereafter, the valve—even the best of valves—will begin slowly to decrease in efficiency. Gradually its performance will become more and more unsatisfactory. Its insensitivity will grow and grow until eventually it will attain that lifeless condition to which the epithet "dud" is most aptly and properly applied.

Now, why does a valve decay like this? Why should it not go on functioning with reasonable satisfaction month in and month out over a very prolonged period?

First of all, in reply to these queries, there is the filament, that slender life-line of the valve, to consider. Filament deterioration is responsible for by far the majority of the ills which affect the average valve.

The filament of a valve, as the reader is probably aware, is finer than a hair. It comprises an extremely thin tungsten wire which, by one process or another, has been coated with certain oxides which increase its electron-emitting properties. After a time, however, the filament coating begins to acquire a coarse-grained "crumbly" structure. Bit by bit, particles of the filament coating fall away from the inner

tungsten wire, thus decreasing the valve's electron-generating capabilities. As a consequence of this deteriorating process, the valve slowly but surely decreases in sensitivity both as a detector and as an amplifier.

Again, after a thousand hours of life the valve gradually becomes "softer." That is to say, its vacuum decreases. We shall see the reason for this later.

Slowly, also, after the above period of active life, the impedance of a valve diminishes.

Now the impedance of a valve is what we might term its own peculiar electrical resistance. When the impedance or resistance of a valve goes down, its plate-current consumption goes up. Suppose, for instance, that we have a valve of, say, 30,000 ohms impedance. Normally running, this

UNDER THE MICROSCOPE



Seen through a powerful microscope this valve filament instances the manner in which the active coating is slowly shed, thus reducing the valve's efficiency.

valve takes a plate current of a little over a milliamper. The valve's impedance, in the fullness of time, drops to 20,000 ohms or less. The plate current taken by the valve will now rise to $1\frac{1}{2}$ milliamps, or perhaps even more. Hence, a greater demand will be made on the H.T. supply.

Imagine a series of four or five valves each suffering from this old-age decrease in impedance. A little calculation will suffice to show that the increased demands on the H.T. supply made by such an assembly of veterans will be very considerable. It is on account of this fact that radio technicians are loud in their assertions of the fact that it is never economical to work a valve after it has reached a certain stage in its natural process of deterioration.

A Softening Effect

Mains valves, particularly those of the power variety, suffer from a peculiar form of senility after the limit of their efficient working lives has been reached. Besides undergoing a loss of filament emissivity due to the deterioration of the filament coating, they tend to develop a grid emission. This emission of electrons from the grid of the valve increases the plate current taken, and it also has the effect of "softening" the valve—that is to say, of reducing its degree of vacuum.

All valves suffer from this grid emission sooner or later, and thus all valves undergo a decrease in vacuum as they become more and more senile.

Battery-operated valves have about the longest life of any. A thousand hours of

active life in first-class condition which, as we have seen, corresponds in an average case to about a year's use is normal for a battery-operated valve. After this the valve's efficiency begins gradually to wane. Nevertheless, a valve of this type is quite "good" for another year's employment—that is, of course, providing its owner does not object to a little loss in its operating efficiency.

Uneconomical to Work Them

Some valve owners will tell you that they have had valves in operation for three, four and even for five years. Such valves, of course, whilst they may still retain their lives, do not, cannot, work economically. It is therefore a snare and a delusion to endeavour to work a valve after its days of functioning are properly over.

Valves are frail things, even in these days. You may protect your valves from all mechanical shock and injury. Nevertheless, within them go on ceaselessly processes over which you have but little control. Every valve, therefore, has a very definite expectation of life and, averaging all things up, that expectation of life amounts to a year's normal use (1,000 hours, or thereabouts) in tip-top condition, and a further year during which period the valve will show a gradually lessening efficiency.

It is rarely economical and satisfactory to operate a valve after it has got very much past its second year of life—a fact which, although of sorry import to the radio fan, is certainly not without benefit to the valve manufacturer!

FOR NORTHERN LISTENERS

Variety from Rusholme on
December 30th

AT Christmas, Leslie's Pavilion at Rusholme will have the privilege—unique in Manchester, at any rate—of being the only theatre running a variety show—all the other theatres are staging pantomimes. Described as a "Super" Concert Party, "The Nobodies" is run on original and, it is said, absolutely new lines. An exceedingly strong cast includes Jimmy Charters, the popular comedian from Morecambe, and an operatic tenor—Duncan Shawe; Christine and Ronald—Christine being hailed as another Nellie Wallace—are Glasgow comedians; and Paul Conrad plays the solo pianoforte in his Bachelor's Band—composed of six single boys—hence the band's title.

Instead of the "Bachelors" holding the stage for, say, twenty minutes at the end of the show, as is the usual custom with bands, they are on continuously from the opening chorus which, incidentally, was composed by Paul Conrad himself. Northern listeners to the Concert Party will, on December 30th, have an opportunity of hearing variety which may prove a welcome change from the prevalent pantomime programmes. It should be a programme well worth hearing.

TELEVISION TOPICS — Collected by A. S. Clark

"A.P." TRANSMISSIONS ON BIG SCREEN

WE have had the privilege of witnessing the first demonstration of television pictures received from Alexandra Palace on a large screen by mechanical means. And when we say large, we refer to a picture nearly six feet wide.

Big-screen "mechanical" pictures have been shown before, but either they were sent by land line or employed a much lower definition than the 405-line transmission from Alexandra Palace.

We were shown into a small theatre in which was a decorated stage reminiscent of the average cinema theatre. At three o'clock the lights were dimmed, the curtains parted, and on the screen we saw the usual opening picture of Big Ben, accompanied by the striking of the hour. Then followed a demonstration of ballroom dancing, and our biggest difficulty was in realising that we were actually looking at television and not watching an ordinary film being run through.

Good Detail

The detail was as good as on most cathode-ray television receivers giving a small picture, and the amount of light was equivalent to a cinema projection. The picture was certainly large, clear and bright enough to be comfortably viewed in a theatre holding two or three hundred people.

After a while we moved to where a home television receiver, working on the same principles, was being demonstrated, and strangely enough we were here better able to realise that we were watching television and not film projection. In this case the size of the screen was two feet wide, and of an amazing brightness. Except in so far as the source of light was concerned, this home receiver is really a miniature of the apparatus used for the larger pictures.

A Mechanical Principle

Most readers will realise by now that the apparatus demonstrated was of Scophony make, for what other system is there at the present which can offer so much? The Scophony instruments work on a mechanical principle involving the modulation of a normal light source, and rather confound the prophets of a few years ago who said that the whole future of television was bound up in the cathode-ray tube.

The Scophony System is based on a number of fundamental inventions. It is because of these inventions, some of which are absolutely revolutionary in their character, that Scophony Limited has been

enabled to produce *projected* high-definition pictures of a size, brightness and quality so far unequalled. The two chief inventions employed are *Split Focus* and *Supersonic Light Control*.

The first of these, the "split focus," is an optical arrangement of cylindrical lenses with their axes crossed, so that a beam of light is focused in two separate planes. An advantage of the split focus is that where scanners are employed they can be of a considerably smaller size than would be necessary with ordinary spherical lens systems. Vice versa, with the same size of scanner, a considerably greater amount of light can be usefully employed. For instance, without the split focus the scanner in the Scophony Home Receiver would have to be at least twelve times larger.

in the cinema) is available. This great light deficiency had been overcome by the invention of Scophony light control.

The Scophony supersonic light control consists of a container, filled with a liquid, at one end of which is a quartz crystal. When the quartz is actuated by a modulated carrier frequency, supersonic waves are set up at a speed corresponding to the velocity of the sound waves in that particular liquid.

An Ingenious Scheme

The container has on either side of it a lens, and when light is passed through the container and focused on to a scanner, and from the scanner on to a screen, an image of the light control itself is, by means of suitable lenses, formed on the screen. If the modulated carrier frequency is now applied to the quartz crystal nothing will be seen on the screen until the scanner, which is between the screen and the light control, is rotated at a speed that follows exactly the speed of the liquid.

The modulation then becomes visible on the screen as an image. In the liquid the waves produced by the element frequency on the quartz crystal are equivalent to one scanning spot on the screen. A large number of scanning spots are therefore used simultaneously.

In the demonstrations we saw 150 of these scanning spots were thrown on the screen simultaneously. Incidentally, only 5 to 10 watts is required to operate the Scophony light control, thus avoiding excessive power requirements and keeping the maximum voltage in the receiver down to two or three hundred.

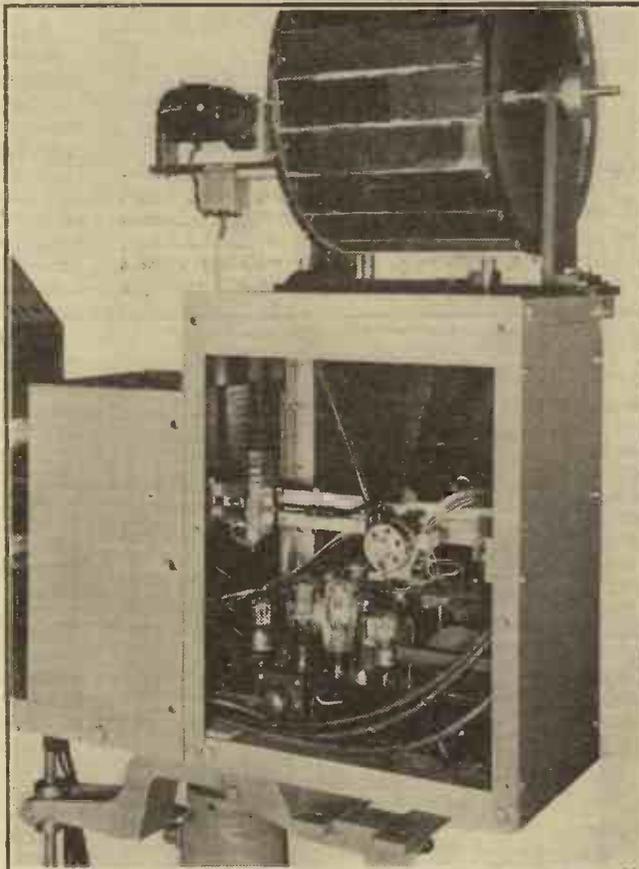
Simple Operation

The operation of the home receiver is extremely simple and there are no expensive parts requiring frequent replacement.

Finally synchronisation is obtained by the use of synchronous electric motors controlled by the synchronising line frequency transmitted with the pictures from Alexandra Palace.

The only way in which a cathode-ray receiver could be said to score over the Scophony is that in the reproduction of stills there is a slight movement to be detected due to mechanical methods of scanning. But even this almost negligible criticism will no doubt be overcome in later models.

THE SCOPHONY PROJECTOR



A photograph showing the essentials of the Scophony big-screen projector. The mirror drum which controls the number of pictures per second can be seen at the top of the picture.

"Scanning" causes an unavoidable loss of light. The picture is scanned in the normal way by a single spot, whether at the transmitting or the receiving end. This spot has to traverse the whole picture at regular and equal intervals.

If the picture is made up of 405 lines and along each line are 500 elements, the single spot goes into the picture about two hundred thousand times.

Consequently only one two hundred thousandth part of the light which could be obtained if no scanning were employed (as

PANTOMIME FROM "A.P."

"Dick Whittington and his Cat," television's first Christmas pantomime, will be transmitted from Alexandra Palace on Boxing Day, with Queenie Leonard making her first appearance as a Principal Boy. A strong cast will also include Olive del Mar, in the part of Alice; Cyril Fletcher as the Emperor of Morocco, Dudley Rolph as Fitzwarren, and William Stephens as Sammy. Tiddles the Cat will be played by Brenda Perry.

TELEVISION TOPICS—Continued

"TELEFRAMES"

Items of general interest

REFLECTION EFFECTS

HAVE you ever noticed when looking at television pictures a sort of shadow or ghost outline around a sharp-edge dark object on a light background? At first thought it might appear that this was due to some maladjustment in the receiver or some light effect at the transmitter.

What is the most likely explanation is that some form of reflection or echo is occurring and the signals are being received twice by the receiver. The ghost effect represents the second and weaker reception of the signal.

MAZDA VALVE CHANGES

Users of Thyatron valves for time-base circuits should note that the makers of these valves recommend in the case of the T.21 that the maximum generated voltage across it should be limited to 120 volts.

While on the subject of Mazda valves, the following notes will also be of interest: The filament current of the L.21/DD has been reduced from 0.15 to 0.1 amp., the other characteristics of the valve remaining unaltered.

Stocks of the following valves are now completely exhausted and no further sup-

VERY little is known concerning the precise nature of fluorescence. The prevailing theory which seeks to explain the production of fluorescence has it that when a ray of light, a beam of terrifically high-speed electrons such as constitutes the cathode rays, or other form of energy rays, strikes a fluorescent material, the energy beam thrusts aside some of the constituent electrons of the fluorescent substance. Immediately the energy beam ceases, the electrons in the material take upon themselves an "as-you-were" position, that is to say, they return to their former positions within their atoms. In doing so they give out tiny quantities of energy, this energy-emission manifesting itself in the form of light—the pale, somewhat ghostly, yet, at times exceedingly vivid, light of fluorescence.

Phosphorescence

That, in a nutshell, constitutes the present theory of fluorescence, of the mechanism of light production at the screen surface of a television cathode-ray tube. Exactly why such effects should take place in certain materials and not in others we do not know. Nor, for that matter, have we any precise idea as to why the electrons of the fluorescent substance should allow themselves to be thrust aside so readily by the cathode-ray or other fluorescence-exciting beam.

There is another form of fluorescence which has been known for hundreds of years. This is called phosphorescence, a phosphorescent substance being one which shines in the dark after being previously "excited" by exposure to strong light rays. Clock and watch dials are frequently

plies will be available: S.215B, Pen.425, P.625A, P.625B, PP.3/425, U.65/550 and D.C./H.L.

BETTER FILM TRANSMISSIONS

More or less coincident with the installation of the new and more sensitive Emitron camera at Alexandra Palace studio, an improvement has been noticed in the illumination of the films transmitted. Although we have at present no confirmation of the fact, we believe that the new camera technique has been applied to film transmission and accounts for the recent improvement.

SPEED IN AERIAL ERECTION

To look at a television aerial you would gather that it was a complicated thing to erect. In many cases it may be, but not in the case of the Murphy model, which has been specially designed for easy and quick erection. One of the firm's engineers recently erected one of these television aerials in eleven minutes! It is stated that the timing was taken from the arrival with the ladder, but did not include the final fixing in place of the feeders.

SOME COSSOR RECTIFIERS

Those building-up apparatus for television should not forget the useful range of rectifiers in the Cossor range. Among types recently introduced are the following:

A full-wave rectifier with an output rating of 20 milliamps at 2,000 volts; a

voltage doubling valve. With a good transformer, the latter valve should give a voltage of about 2,000 across the load points of the circuit, and up to 20 milliamps should be available. A third valve is the S.U.2150, a half-wave rectifier capable of giving voltages up to 5,000 providing the current taken does not exceed 2 milliamps.

PATTERN TESTING

Patterns obtained on the screen of the cathode-ray tube are used very often in the testing which precedes the passing-on of a complete instrument to the packers. The processes in a television receiver are so different from those in a normal radio receiver that special methods of checking them over have to be adopted.

A chosen signal is applied to the television receiver and forms a pattern—quite stationary—on the screen. The sharpness and correctness of this pattern tells the testing engineer more about the functioning of the receiver than actual pictures would, and enables him to carry out any final adjustments that may be required.

TELEVISION CINEMAS

Recent statements suggest that keen work is still going on with the possibility of television cinemas. It has been stated that a firm may start a series of 300 in the New Year.

Reproduction will be on a full-size screen, and colour films will be included in the transmissions. Recent Baird developments in big-screen and colour television have shown that the technical considerations are capable of solution.

CONCERNING FLUORESCENCE

painted with such luminous materials in order that they can be read in the dark.

Now the phenomena of fluorescence and of phosphorescence are very similar in nature. In fact, according to modern theories, they are both merely variations of the same thing. In a fluorescent substance, as we have already seen, the thrust-aside electrons return to their original positions (emitting light flashes in the process of doing so) immediately the exciting cathode ray, light or other form of energy-beam ceases. In a phosphorescent material, however, the scattered electrons return only slowly—one by one, so to speak—after the passing of the exciting beam. That is why a phosphorescent substance will shine in the dark for a long time after it has been exposed to sunlight.

Perhaps the most useful of these all-fluorescent materials is a naturally occurring mineral composed, mainly, of silicate of zinc, and which is known to mineralogists as "willemite." Willemite is a white material. It glows brightly under cathode-ray influence, but unfortunately it glows with a greenish colour. It is only by admixture of other more white-glowing fluorescent substances with willemite that the almost pure white glow of the very latest high-intensity television cathode-ray screens has been made possible.

Most amateur scientific workers are

acquainted with the ghostly glow of phosphorus in a darkened room. This luminescence of phosphorus, however, is not true phosphorescence, strange as such a fact may seem, for the glow of phosphorus in a darkened room is not due to actual light or electrical ray excitation, but merely to the slow oxidation of the phosphorus. It is, therefore, extremely unlikely that any use of the luminous properties of phosphorus will ever be made in television work.

A Remarkable Material

One of the most remarkable luminescent materials in the whole realm of Nature is radium. Radium and its salts glow vividly in the dark. They may be said to possess the property of permanent phosphorescence. Here again, however, the vivid and most remarkable radium-glow will, one believes, never be made use of for television purposes owing to the fact that the light-emission of radium, intense though it may be, is *absolutely uncontrollable*. It is possible, however, that exceedingly minute traces of radium when admixed with the usual cathode-ray screen fluorescent materials might ultimately be found to heighten the glow-intensity of the latter.

A curious fact concerning both fluorescence and phosphorescence is that the vibration frequency of the fluorescent or phosphorescent light is always *less* than the frequency of the exciting beam of rays. In this respect, the fluorescent or phosphorescent material acts as a sort of diminutive step-down transformer of energy rays, taking in rays of a high frequency of vibration and delivering up rays of a considerably lower vibrational frequency.

DESIGNING YOUR OWN SET

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"CARRIED UNANIMOUSLY!"

Ben Shaw

SEEN ON THE AIR

News and Views on the Television Programmes

By L. MARSLAND GANDER

WITH genuine and perhaps sentimental feeling of regret I say farewell with this issue to the readers of "Seen On the Air." I can only express the hope that they have enjoyed reading of the early struggles, the triumphs and disappointments of television half as much as I have enjoyed writing about them.

And now for good news: It has been officially stated in the House of Commons that, as I forecast many weeks ago in POPULAR WIRELESS, the Government will give a further grant to the B.B.C. for television. The amount is still in doubt.

A Press colleague suggests £500,000, but I think he is probably lumping in the large amount which the Government will have to find for the construction of new transmitters for the foreign language service, also the funds for the maintenance of that service: May I cheekily suggest that he misread his "P.W."?

Readers will remember, however, that some time ago I gave figures suggesting that at least £60,000 was required for the provision of new studio accommodation before the increase in daily hours of transmission from three to four. The B.B.C. is much more likely to proceed with the conversion of St. George's Hall than with the adaptation of the theatre at Alexandra Palace. There is influential backing for the proposal that immediate steps should be taken to amalgamate the sound and vision programmes so that each programme may serve a dual purpose.

The Amount

I have heard it suggested in semi-official circles that £200,000 will be the amount of the further Government grant for television, but even this must be regarded as speculative.

And now, B.B.C., the ball is at your feet. Go straight for the goal. Sunday programmes next, then another hour a day. Better and brighter programmes. We have heard the slogan so often that there is a danger it will become meaningless, but it should mean everything to the future of television.

Politicians just now are vastly interested in the future of television as it affects the cinema. The other night I was suddenly whisked off to a disused, unheated cinema at Bromley, in Kent, there to see the B.B.C. programme picked up and projected on to a large screen by the Baird system. The screen measured 8 feet by 6 feet, and the method of projection was interesting. The apparatus used resembled a magic lantern; that is to say, the picture was projected from the front

through a powerful magnifying lens. There the resemblance ended, for instead of the "slide" the picture was produced on the base of a small cathode-ray tube. The screen was directional, so that at acute angles the brightness was not particularly good. But, sitting in the centre of the stalls, at a distance of about thirty feet, the illumination was surprisingly effective.

I was informed that the brilliance was about a third as great as that of a small cinema screen. The most astonishing part of the demonstration was that the 405-line picture enlarged to such a size should have been so satisfactory as regards definition. In my opinion lack of definition was less important than the lack of light.

I regard this as striking practical demonstration that 800 lines will be as much as could be wanted on a full-sized screen. This is delving far into the future, but the Bromley demonstration and the Scophony demonstra-

The B.B.C.'s ruling is that the Corporation has no power either to authorise or prohibit public exhibition. Readers of these Notes will be familiar with all the arguments pro and con. As regards cinemas I understand that the Performing Rights Society has no objection since cinemas hold a licence. But what would happen if a Gaumont-British cinema exhibited British Movietone News transmitted by the B.B.C.?

The Government has accepted the principle that the B.B.C. must have a monopoly of television broadcasting, and on that point will be adamant. But at the same time there must be some future for the big screen. Where is all this research leading? The cinemas have the right to expect some benefits from a new invention which is closely allied with the talking film. The B.B.C. cannot adopt a dog-in-the-manger attitude, holding a monopoly and offering the cinemas nothing. Similarly, the Government cannot stifle invention and rule that television is for home consumption only.

GERMAN AIR FORCE'S RADIO EQUIPPED BOATS



Telefunken direction-finders are used on the German Air Force motor-boats. The up-to-date equipment on these boats enables them to maintain communication with seaplanes and to locate them easily when they are in trouble.

"Stunt" Valve

I do not wish to suggest that the big screen is perfect; far from it. But it is certainly well on the way to perfection, and even now has considerable "stunt" value. Matters will probably come to a head when the B.B.C. televise the Derby from Epsom next June. It may be expected then that many cinemas, both of the Gaumont-British and the Odeon circuits, will seek permission to reproduce to their afternoon audiences pictures of the Derby as it is run. Will the Government grant permission? The way out seems to be to do so on payment of a fee, which money will help to provide the funds the B.B.C. need so sorely for television.

tion, which I understand is being described elsewhere in this issue, bring the whole question of cinema television into practical politics. Before dealing with the implications I should like to say one more thing about the Baird big screen: The picture was not green, as other large pictures produced by the cathode ray principle are. It seemed to me more of a sepia than a black and white, though it had a faint yellowish-green tinge in it.

I was informed that the Gaumont-British group, in one of whose cinemas this big screen was shown, intended to give public exhibitions of the B.B.C. programmes. Whether cinemas may legally give such exhibitions is a question which can only be decided by the Government, and at the time of writing there is a question down for answer by the Postmaster-General on the subject.

There is no analogy in sound broadcasting which will help in the solution of these matters. On national occasions, such as the Christmas broadcast by the King, the B.B.C. raises its ban on reproduction in public, but there has never been any suggestion that people should pay for admission to public halls to hear complete programmes through the loudspeaker.

Television will look back to the early days of Radiolympia, 1936, and recall all that has happened since then in "Diary for 1937," an hour's programme to be presented on the last night of the Old Year. D. H. Munro, productions manager, who has been planning this ambitious pot-pourri since September last, is arranging a combination of film records and "live" studio presentation which will tell the story of the world's first high-definition television service. Guest artists; films taken side by side with the television camera at events such as the Coronation Procession, sporting contests, and shooting in the film studios; memories of the high spots in "Picture Page"—all these will be combined in a high-speed programme.

CUTTING OUT THAT INTERFERENCE

A chat on the "man-made" static problem, and some hints on its elimination

ALTHOUGH the modern radio set does everything that is required of it in the way of separating one station from another, and eliminating interference from this source, there is still another form of interference which no set can deal with.

This is the particularly irritating trouble known as "man-made" static, or in other words the picking up on the set of external electrical interference.

Where does this interference come from? you may ask. Well, there are unfortunately a large number of sources from which these annoying noises can originate. To mention a few, there are trams and trolley-buses, neon signs, nearby electrical machinery such as motors and dynamos, vacuum cleaners, electric sewing-machines, medical apparatus of the high-frequency type, and so on.

How It Can Arrive

How does the interference get to the set? The answer is that it can be picked up on the aerial in just the same way as broadcasting, or it can come in via the mains, and into the set by way of the mains connection. At this stage we would mention that interference from this latter source is prone to attack mains sets. Battery receivers are immune from its direct effects, but they can still pick up the trouble by induction. In fact, any metal objects passing close by the set or aerial lead may act as carriers for the interfering waves, and so pass them on.

This sounds rather tragic, and makes one wonder how on earth one can hope to remedy matters. Fortunately, it isn't so bad as all that. There are special devices which stop the unwanted interference from getting into the set.

For example, Messrs. Belling-Lee, to mention one firm, have carried out a lot of research into the problem of "man-made" static, and are able to supply suitable suppressor devices for stopping mains-borne interference, as well as suppressors for fitting to electrical apparatus and thus eliminating the trouble at the source.

When you hear strange buzzing or crackling noises in your set you must first of all find out whether the set itself is faultless. Sometimes the noises may be due to a defect inside the receiver, and not to "man-made" static, so it is useless thinking about corrective devices if the trouble is one which merely requires the attention of a service engineer.

Tracing the Trouble

But assuming the set to be in first-rate order, how does one start to track down the trouble?

First remove the aerial and earth leads and listen to whether the noises are still present in the loudspeaker. If so, it is evident that the aerial and earth leads are not picking up the interference. Hence it is probable that the mains are acting as interference carriers. The remedy is not difficult. You can get a service engineer

or other competent person to fit a suppressor at the point where the mains leads enter the house. Such a suppressor consists of a couple of condensers and a choke (or two chokes), thus providing a means of bypassing the interfering waves to earth. If the interference is being picked up on the mains wiring inside the house, then a suppressor can be fitted to the main socket from which the connection is made to the set.

Sometimes a vacuum-cleaner or other household device is the culprit, in which case a suitable suppressor will prevent any interference from this source affecting nearby sets.

Interference that is picked up by the aerial can be overcome by the fitting of a screened downlead or one of the special anti-interference aerials sold for this purpose.

Erecting a Special Aerial

The idea is to erect the horizontal part of the aerial above the interference zone, and screen the downlead so that this part of the aerial system is immune from any external effects. The efficiency of a well-designed "anti-static" aerial is high, and its fitting is frequently the only solution to the trouble.

Actually, the best scheme of all is to silence the interference at the source, always provided the source can be located and that the owner of the offending apparatus is willing to have the necessary suppressors fitted. Nothing, however, can be done to compel the owner of offending apparatus to have a suppressor fitted, but soon it is probable that legislation will come into force making it an offence to interfere with sets used for broadcast reception. Those who are troubled with interference from external electrical equipment can always rely upon helpful advice in a practical form from the Post Office engineering department.

There is a special section who deal with this type of interference, and a complaint from a listener quickly brings the interference sleuths to the spot. Then with their special apparatus they are able to locate the source of trouble, and so indicate the best method of overcoming it.

As can well be imagined, unless the source of the interference is quite obvious—as, for example, it would be if there was a



All complaints of interference are investigated by a special G.P.O. squad who are equipped with suitable trouble-tracking apparatus. Here is one of the G.P.O. experts with a portable set and small interference-locating aerial.

generator or high-frequency medical apparatus in a neighbouring house—special forms of interference-locating equipment are necessary. So you will appreciate that expert aid is practically essential.



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LIGHT AND ELECTRONS

By CARDEN SHEILS

An ingenious application of the electron-multiplier

WHEN an electron travelling at high speed strikes against a metal surface, the force of the impact sets free other electrons by secondary emission. This effect has, of course, been known for quite a long time, but it is only recently that it has been applied to produce a type of amplifier which promises to rival the valve in sensitivity and general performance.

The "electron-multiplier," as it is called, is a natural development of the growing importance of the photo-electric cell, particularly as applied to television. Like the valve, the photo-electric cell works with free electrons, but it can only produce them in small quantities.

Colossal Amplification

The filament of a valve liberates a copious stream of electrons, and there is no particular advantage in using secondary emission to produce more. But in a photo-electric cell, the initial supply of working electrons depends, not upon heat, but upon the relatively feeble impact of a ray of light, which at most is only capable of producing an output of a microamp or so. A current of this order must be amplified by passing it through a valve before it can be put to any useful purpose.

The new electron-multiplier is, however, capable of delivering all the current that is required to operate any relay, or to perform any ordinary duty—for it will give an output up to several amperes if necessary. The few electrons that are first liberated when a ray of light falls upon the photo-sensitive cathode are promptly focused into a beam, which is then propelled against a "target" electrode, where each individual electron produces a crowd of others. These are, in turn, forced to strike against a second target, where they set free more secondary electrons, and the process is repeated from target to target until the stream has "multiplied" itself up to the required strength.

Application to Television

This method of amplification is specially marked out for use in television, where everything depends upon making the most of whatever light is available. At the transmitting end, for instance, it offers a way of increasing the effect of the light from the picture or scene to be televised, so as to improve the strength and quality of the outgoing signals. At the receiving end it can be used to "intensify" the light produced by the fluorescent screen so as to increase the brilliance, and therefore the size of the final picture.

One of the latest applications on these lines is based on the discovery that it is possible under certain conditions to regulate the amount of secondary emission given off from a surface, the control being effected by the action of light.

Suppose, for instance, that one side of a specially prepared screen is bombarded by

primary electrons, so that it gives off a uniform cloud of secondary electrons. Then a ray of light focused on the other side of the screen is found to regulate the strength of this cloud, making it stronger or weaker as the light itself changes in intensity.

The action is illustrated in the accompanying Figure, which shows a cathode-ray tube provided with two cathodes K and K1, and two screens, S and S1. The first screen S is made of a very thin sheet of oxidised aluminium, which is covered with a coating of caesium, only one molecule thick. When such a screen is bombarded with primary electrons, it will liberate many more secondary electrons from the surface in the ordinary way, but the number given off at each point can be regulated by the intensity of a ray of light focused at a corresponding point on the reverse side.

The purpose of the cathode K and its associated "gun" is to "spray" a stream of electrons equally over the inside face of the screen S, so that a uniform emission of secondary electrons takes place from every point of its surface.

If the picture to be televised is now focused on the outer side of the screen through a lens L, the different light-and-shade values of the picture produce a change in what is happening on the other side.

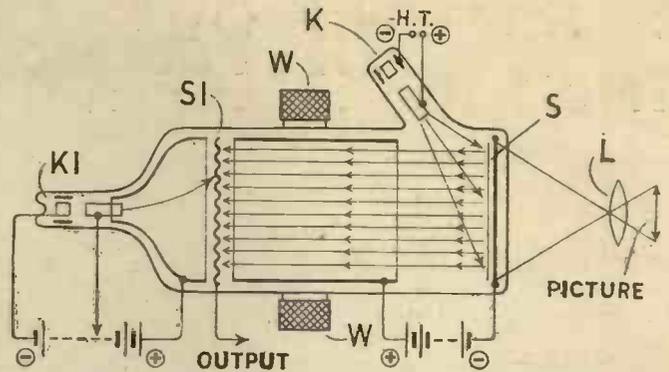
The uniform cloud of secondary electrons is at once broken up by the effect of the light, so that the electron stream now varies in density from point to point. That is to say, the different tone values of the picture begin to show themselves as variations in the strength of the stream of electrons coming from the inside face of the screen.

The first point about all this is that the feeble energy of the ray of light from the picture has been replaced by the energy of a fluctuating stream of electrons.

The second and more important point is that the stream itself has been produced by secondary emission from the screen S, and is therefore altogether of a higher order of density than the ordinary or primary emission produced when light acts directly upon a photo-sensitive surface. The net result is that the effective energy of the original light has been "stepped up."

Once having made this step-up transformation, the production of television signals follows the usual course. The stream from the screen S is focused by an external magnetic winding W on to the photo-sensitive screen S1, which is similar to that used in the Iconoscope "camera," except that it is double-sided.

The charges produced by the stream on the inside surface are therefore repeated on the outer surface of the screen S1, where they are scanned by an electron beam from the cathode K1, and used to modulate the outgoing carrier-wave in the ordinary way.



The cathode-ray tube in this figure is provided with two cathodes, K and K1, and two screens, S and S1.

RADIO NOTES AND NEWS

(Continued from page 385.)

"Sweet Lavender"

CRRIES of Old London have a sentimental appeal to the collector and antiquarian. But "Sweet Lavender," "Chairs to Mend" and the other old favourites must now beware of a rival, for somebody with more brains than breath to spare has suggested the idea of using an amplifier for street cries.

The advantages are obvious; the musical tinkle of the muffin-man's bell may strike a sentimental chord in the bosoms of the faithful, but for good, rousing, clear-cut descriptions of crisp crumpets or other street wares it cannot compare with a loud-speaker. Thus equipped, no street-vendor need fear that a husky throat would halve his advertising powers; he merely holds his microphone closer, turns up the volume control, and makes every housewife within hearing acutely muffin-conscious.

"Radio Letter-Box"

FURTHER news of those radio-news-paper receivers in America to which I referred recently suggests that they will retail at a little over £20.

Instead of having an audible output they will work through the night at printing the news supplied to them by a special radio news-casting station. This news will appear on a strip of paper about six inches wide, and will contain all the last-minute stuff, together with sketches, cartoons and so forth.

The Last Round-Up

I HAVE already wished you a Happy Christmas in our Christmas Number, but as these words will appear just before the great festival I want to sign off this week with a rousing salutation to one and all.

Have a good time, my hearties, for life is short and time is fleeting. What the future holds nobody knows; but the Cup of Life which Fate hands you to drink is always palatable if laced with some good old-fashioned courage, and a dash of humour. So why fret about what's coming to you?

Here's hoping that the New Year will fulfil your old desires, will bring you new friendships, and will, now and then, give you time to think of your old pals.

ARIEL (P. R. Bird.)

THE FOOLPROOF PHOTOCELL

How the once popular radio rectifying crystal has contributed to the evolution of the photo-electric cell

DO you remember—I address here the many “older hands” at the wireless game—those departed days during which you contentedly and even enthusiastically fiddled about with various crystal rectifying contacts in an endeavour to abstract the last ounce of sensitivity and signal-loudness from your crystal receiver? Valve-operated sets were an expensive luxury to many of us in those days, and the humble home-constructed crystal receiver completely filled the radio horizon of countless amateurs.

The precise mode of action of the crystal rectifier was something of a mystery. It is, indeed, a more or less unsatisfactorily explained phenomenon even in modern times. But many wireless amateurs in those early broadcasting days who were sufficiently keen to take a more than passing interest in the subject of crystal rectification found, to their surprise, that these mysteriously functioning crystal contacts were possessed of a number of remarkable powers. Crystal contacts, for instance, could be used as ordinary current-rectifiers, the contact passing current in one direction but almost entirely suppressing current flow in the opposite direction. Crystal contacts were found which would amplify. Curious heat effects were found to be associated with some crystal contacts. Other contacts, again, were discovered to be sensitive to changes in pressure. It was apparent to all who took the slightest interest in the subject of rectifying crystals that the average crystal contact possessed very versatile powers.

Experimentally Discovered

In 1924, Dr. L. O. Grondahl, an American physicist, when experimenting with crystal contacts discovered another latent power which they possessed. Dr. Grondahl found that many contacts between dissimilar crystal or mineral surfaces were sensitive to light and that, in actual fact, such contacts could be utilised to convert light-energy into electricity, currents of the order of microamperes being sometimes obtained when special mineral contacts were exposed to strong sunlight.

If you have an old crystal detector and a very sensitive galvanometer you may be able to demonstrate crystal light-sensitivity for yourself. Connect the crystal contact across the galvanometer and illuminate the contact very strongly by burning a length of magnesium ribbon a few inches away from it. If the contact is at all light-sensitive and your indicating instrument is sufficiently delicate to give an indication of a few microamperes of current, you will obtain a reading on the instrument, proving that a portion of the light-energy of the burning magnesium ribbon has actually been changed into electricity by the crystal contact.

Galena-copper, molybdenite-silver, iron pyrites-tellurium are good contacts for carrying out the above experiment with, but, generally speaking, any contact between two dissimilar materials is more or less light-sensitive.

From the elementary experiments detailed above to the latest forms of all-purpose photocells may appear to be a long stride in the sequence of technical development. Actually, however, such is not the case. Having obtained an insight into the nature of the light-sensitivity of crystal contacts, technicians and physicists have not found it a difficult matter to develop stable photocells which are capable of being put to many different uses. Such cells are of the type now known as the “Dry Disc Photo-voltaic cell.” They all operate upon similar principles and they make use of a light-sensitive contact between metallic copper and a film of copper oxide.

In commercially produced photocells of

poses there exist more suitable and specialised forms of photocells than those of the type described above, these “dry disc” photo-electric cells can be put to multitudinous uses. A well-made cell of this type constitutes, indeed, a veritable foolproof photocell. So far as one can tell, the cell never wears out, never becomes insensitive, and it is not put out of action by mechanical shocks and similar disturbances. Of its very construction, the light-sensitive contact cannot get out of adjustment and, exposed to good illumination, the cell will deliver up a current which can be measured in milliamps.

Photocells of the “dry disc” type have a sensitivity very closely approaching that of the human eye. As the light rays decrease in wavelength from the ultra-violet end of the spectrum, the sensitivity of the cell, like that of the human eye, increases up to a point somewhere in the green-yellow region of the spectrum. After that, the cell's sensitivity decreases as the infra-red end of the spectrum is approached.

The reaction of the “dry disc” photocell to light influence is instantaneous. There is no “lag” effect. Also, the current delivered up by the cell is proportional to the intensity of the light.

Measuring Light

Hence it is that cells of this simple type are being used increasingly for scientific and technical purposes of all kinds. Measurement of light intensities in connection with television illuminations forms one of the cells' applications. Another application is the cells' employment as photographic exposure meters, not only in connection with television-camera work, but for all amateur purposes as well.

For detecting and registering the presence of light rays and light beams of all kinds the photocell of the type described in this article possesses innumerable uses.

Yet, strangely enough, the exact mechanism of the cell's functioning is not known. Based upon principles very closely related to it, indeed, not identical with those underlying the operation of the crystal radio rectifier, the “dry disc” type of photocell is, undoubtedly, atomic in its action. In some way the light waves are able to knock electrons out of the copper oxide constituent atoms, and these electrons find it comparatively easy to travel across the copper-copper oxide contact in the direction of the copper, but experience a great difficulty in proceeding in the reverse direction.

Exactly how the light rays knock electrons out of the copper oxide atoms is a problem which electrical physics has yet to solve satisfactorily. Fortunately, however, the uncertainty about the cell's precise mode of action in no way affects its use in actual practice. These simple and foolproof photocells, based, fundamentally, upon the action of the now almost obsolete radio rectifying crystal, have come to stay for television purposes and other uses.

J. F. S.

A SHORT-WAVE “FOUR”



This attractive short-wave set is one of the “Pilot” four-valvers marketed by The Peto-Scott Co. It is supplied as a Kit and is assembled on a standardised chassis,

which enables the experimenter to commence with a simple single valve set and progress to a four, using the same chassis, components and panel.

this type a small disc of highly purified metallic copper has deposited upon one side of it by chemical means a very fine film of copper oxide. So fine, indeed, is the copper oxide film that it is transparent. A coating of varnish is laid over it in order to protect it from the deteriorating effects of the atmosphere. The copper disc is fitted into a moulded case and suitable connections are taken from the metallic copper of the disc and from the oxide film. The moulded case possesses a glass window through which the disc is illuminated. When light rays impinge upon the face of the disc, the oxide film becomes negatively charged and the copper behind it acquires a positive charge. As a result, negative electrons are shot out of the oxide film and they pass across to the metallic copper with which the oxide film is in intimate contact. So long as the light influence acts upon the disc, electrons continue to be ejected from the oxide film. Thus, a small current flows through any external circuit to which the instrument may be connected. If the instrument is not connected to any external circuit, the ejected electrons, after traversing the copper disc, return to their starting point in the oxide film.

Now, although for actual television pur-

RANDOM RADIO REFLECTIONS

By VICTOR KING

EXPERIMENTING ON THE LISTENER :: GIVE US BETTER TELEVISION PROGRAMMES :: MISUSE OF THE ENGLISH LANGUAGE

THE EXPERIMENTAL HOUR

THIS B.B.C. of ours entirely and completely amazes me at times. For example, that so-called "Experimental Hour" that they are running. What is it? They shove on a play about spiritualism. Where's the experiment in that? What was the difference between that and some of the previous spook plays they have run? Only, so far as I can see, that the others dealt with ordinary, straightforward spooks in the manner that is traditional for spook stories and plays, whereas the "experiment" introduced the orthodox medium and seance circle.

There was no experiment in technique whatever. If it could be called an experiment at all it was merely a try-out to see if the listening public would stand for spiritualism on the air. This is my opinion. And it is my further opinion that— But I expect you all think the same way.

The second "experiment" was to do Shakespeare in the language of his day. Thank goodness it occupied only half an hour. I don't mind dipping into a book of selected wise-cracks from the "Avon Bard's" works, but I can't sit and listen to yards of it spilled pontifically by actors, however good. And to make it even worse by jangling up the language— Phew! What an "experiment!"

NOVEL PLAY PRESENTATION

I'd like to see some real "experimenting" done. Something original and enterprising. Or at least something the B.B.C. itself has never done before. For instance, why not combine variety and symphony? Have some good single and double comedy acts and a sketch or two superimposed on Bach, Wagner or whatnot.

Or throw the "mike" open to amateur dramatic societies for an hour or two per week. Let the "amateurs," through a central organisation, compete for the honour of going on the air. Some of the amateur companies are every bit as good as professional ones. And they'd bring disinterested enthusiasm and perhaps new ideas and technique to the mike.

But they'd have to have a free hand or it would never be an "experiment" at all, but merely bunches of players drilled round to standard B.B.C. ways.

I've tried to get the B.B.C. to run a play experimentally on American lines. But they wouldn't.

I still think British listeners would like it. You know the sort of thing—really snappy presentation with a commentator to pull the whole thing together. The thing is pushed off in this kind of way:

Fade in string rendering of some quiet melody. Fade down after a few bars and superimpose voice of commentator.

Commentator.—Ladies and gentlemen, the story which you are now to hear concerns the last will and testament of John Bonnaker. And with obvious appropriateness it commences in a solicitor's office. That of Messrs. Smith, Smith, Smith, Smith, Pottleberry and Tootington of Chancery Lane, London. The Smiths are no

longer *in situ*, so to speak, for the last of them retired from the legal front line in Coronation year. Queen Victoria's coronation! They are the voices of the present partners, Messrs. Pottleberry and Tootington, which we shall hear, and it is Mister Pottleberry who says—
Fade out background music and switch Pottleberry straight in.

With no break at all the voice of the artist is heard, and the dialogue gets under way.

At the end of a scene there is no pause, a spot of music breaks straight in and then the commentator is off again. In this manner:

Fade in theme melody for short period. Then fade down and superimpose voice of commentator.

Commentator.—Fifty thousand pounds for Martha Bonnaker and the equally fortunate Anne! If—and there is that one little condition—they will live together for one year. Twelve months under the one roof and all expenses paid! And their reward? Twenty-five thousand pounds each! And no questions asked. Is it all quite as simple as it seems? We wonder. Anyway, the scene changes to Cincinnati in the United States of America. Picture a busy main street (*fade out music and fade in background of not-too-loud street noises*), with a constant stream of cars gliding along it; hurrying pedestrians, leisurely policemen—cops they call them over there; lots of shops and all the other things you find in busy streets anywhere. Even a stationary car, which appears to have stopped because of engine trouble. A young woman is diving under its bonnet. She seems rather annoyed about something. She is saying—
(Switch straight over to Anne Bonnaker and fade-down street noises and bring in car engine with periodic popping.)

There is one very obvious advantage in this "re-iterational" treatment, and that is those who switch in after the play has begun can easily pick up the threads of it. But more importantly the action is pepped up. With a first-class commentator the whole dramatic content of the play is lifted right up.

HENCE THE "PLUMS" ?

Well, I note that the B.B.C. have adopted yet another of my various suggestions. This time that they should run episodic serials. Hence the "Plums." Of course, it isn't an entirely original suggestion. They've been doing that sort of thing for years in the United States. Perhaps we shall get plays soon on the lines I have mentioned. In any case, here is subject-matter for an "Experimental Hour" much more in line with popular tastes than "jargonised" Shakespeare. At least, that is what I think. But then, I must admit I'm a bit of a low-brow!



Lovely Lesley Brook, Warner Brothers First National star, finds rest and relaxation in listening to broadcasting on her Marconiphone receiver.

AND THIS TELEVISION !

SOME of it's very good. But— My hat! The other day they put on a foreign choir, and for about a quarter of an hour all we got was just a row of not-too-attractive faces bellowing queer yodelling sounds.

And that "ballet" and "Masque" stuff! No, I'm not pleading for an unbroken series of "red-nosed" comedians and jugglers, but I do plead for a bit more imagination and a holiday from the be-spatted highbrow element.

"Journey's End" was a grand success, but for every hour of that sort we get two or three of mediocre stuff that is sheer waste of the television camera's time.

QUESTION OF GRAMMAR

I HAVE been severely taken to task by a Brighton reader because, as he puts it, I "misuse the English language." He bases his accusation mainly on a split infinitive or two and an occasional misplacement of prepositions. He also dislikes "Americanisms."

Well, I'm quite unperturbed. It's always been my idea that an intimate kind of feature like this should be written in an unpedantic, conversational sort of way. After all, this is V. King having a weekly chat to his "P.W." friends. Not an essay.

Besides, I'm not so sure that it isn't arguable that a "chat" in print would be wrong if it endeavoured to maintain a purely literary style. Normally, the written word tends to lag behind the spoken word. For language is a dynamic, changing thing. How many of us speak in accordance with the strict rules of grammar?

I do feel that a colloquialism, even a slight looseness of phraseology here and there, is quite defensible if colourfulness such as you get in animated conversation is to be transmitted to the printed page.

Which reminds me: Our Editor, Mr. Dowding, is very worried about a slip in his amazing little book, "True Prediction." For the benefit of all of you who possess a copy it occurs on page 22. Eight lines from the top the second "inorganic" should read "organic." He tells me he read the original "copy" through twice and the printed proofs three times, and is quite at a loss to understand how the slip escaped his eagle eye.

I can quite appreciate that a little "brick" of that kind in a book so obviously carefully written must be very annoying, and I sympathise with the author very much, though it doesn't affect his arguments in any way.

(Please turn to page 405.)

QUESTIONS AND ANSWERS

By K. D. ROGERS

CROSS-MODULATION AND ITS EFFECT ON SELECTIVITY

THAT FAINT BACKGROUND

H. F. P. (St. Albans).—*I have a selective and sensitive five-valve set with two H.F. stages and bandpass. I get a very large number of stations but, unfortunately, I can hear the two London stations together.*

When I am tuned to National I can hear the Regional, and vice versa. I cannot understand it, for I can tune-in other programmes between these two without their interfering.

You have probably got your H.F. valves biased wrongly. It sounds to me as if you have that nasty phenomenon called cross modulation. This is due to one or other of the H.F. valves of the set receiving too strong a signal from the local—a signal which causes the valve to rectify owing to the fact that the grid input voltage from the station runs too far to the right—the positive end—and the valve rectifies slightly.

In the output circuit you then have a mixture of H.F. and rectified H.E. That in itself will not matter, except that when the valve is in a state of bias—applied by the signal, not the bias arrangements of the set—which makes it a rectifier, any residue of a local powerful station which gets through the tuning of the set will also be rectified. And it will mix with the other components in the anode circuits of the valves.

Now, when you are properly biased and the H.F. valve or valves are not rectifying, you have full control of the tuning circuits of the set. Even if a slight amount of an unwanted station gets through the first H.F. valve—as it will do—it can be tuned out in succeeding stages of tuning. It will then not arrive at the detector circuit.

That cannot be said of any rectified signal in the H.F. circuit. The rectified impulses of the unwanted station—which have arrived because the wanted station is coming in too strongly and is biasing the valve too far towards the positive—will become inextricably mixed with the H.F. in the anode circuit of the first valve. They will then be passed on in a form of modulated H.F. to the second H.F. valve, be amplified and then passed on to the detector.

You have, in fact, turned your first valve into a sort of transmitter. It provides H.F. in its output, but you are applying rectified signals—the unwanted ones, for the rectified portion of the wanted station does not matter—to its output, and you have them modulated H.F.

If you are listening to the Regional and the National breaks through, is rectified and passed to the anode circuit of the first H.F. valve, you have in that circuit the H.F. of the Regional plus a little of it in rectified form, and on top of that you have traces of National in rectified form. The result is that the second H.F. valve and the detector are supplied with Regional H.F. cross modulated with National. That modulation you cannot get rid of, no matter how much you tune.

The cure can take either of two ways, or a combination of both. It can be a cut down of the input to the set from the aerial by some convenient means, or it can be carried out by further negative biasing of the first valve in order to prevent the strong Regional (or wanted signal) biasing it too positive and causing rectification.

I prefer the former method or a combination of the two. If you go piling negative bias on in order to prevent the valve becoming too positive, you may upset its curve and you may make it rectify on the negative swings instead of the positive ones. I am assuming, of course, that you are using multi- μ valves. Even these will rectify at the negative end if the bias is overdone. But before they do so you usually obtain a certain amount of distortion which is undesirable.

Cut down your input from the aerial and you will be all right. A switch cutting out the aerial altogether when you tune to locals will probably do the trick. With the set you have you can probably get the station on a short piece of wire instead of the aerial, and if a short length is left between the switch and the receiver you will be all right.

SPEED OF CHARGING

T. P. K. (Salisbury).—*I have a battery set and am getting a trickle charger. What should be the rate of charge for the L.T. battery?*

That depends on its capacity. The rate of charge is usually provided on the battery by the makers. A trickle charger generally gives about .5 amp, so that you can reckon that is the rate at which you will be charging your battery. If the battery is a large one, however, it would be better for it if you bought an ordinary charger giving perhaps one or two amps, and instead of putting the battery on to trickle-charge every time the set was switched off, you put it on charge about once a week, dependent on how much it was used.

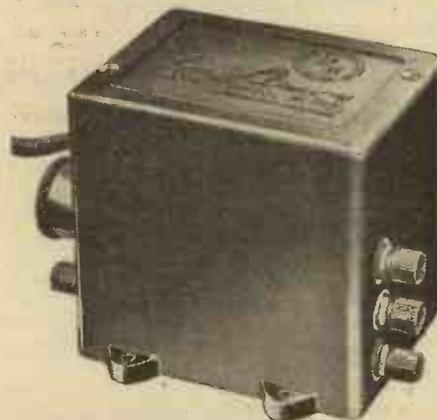
Most battery charging should be carried out at about a tenth of the actual ampere-hour capacity of the battery. In other words, if the battery is small—having a capacity of 10 ampere hours it should not be charged at a greater rate than 1 amp. If the capacity is 30 ampere hours it should not exceed 3 amps.

You will find that in small batteries a standard charging rate of about .5 amp is used and recommended.

Be careful if you use a trickle charger on a small battery that you do not over-charge. It is easily done, and I have seen more than one battery ruined by being on constant charge, even though it was not being used on the set. One battery I came across had disintegrated badly. It had been used about four hours per week, and the rest of the time—night and day—it had been left on trickle charge at .5 amp.

You should calculate roughly how much power you take out of the battery and arrange to put in just a little bit more.

THE W.B. "LONG-ARM"



This compact unit is the W.B. "Long-Arm" control for extension speakers. It provides a means of switching a distant set on or off at the extension point—an ideal scheme for those who have an extension in their bedroom or some other part of the house remote from the receiver.

Thus if your valves take .4 amp total and you use the set twelve hours a week you will be taking 4.8 ampere hours out of the battery. You should then give it sufficient charge to recover that amount and a little bit more "for luck."

Something like the teapot with its teaspoonful for each person and "one for the pot."

With a .5-amp charger and the consumption of 4.8 ampere hours you should give the battery about 10 to 12 hours of charging. You can see that this can be given all in one go—during a night and part of a day, and it is definitely a good plan to run the battery without the charge for four or five days and then to boost up for a number of hours at the end of that period. That is much better for the battery than charging for an hour or so every evening or night, or leaving it on the charger overnight each day.

It is not good for a battery to go on charge all the time it is not being used unless you take a fair amount out of it. It results in unnecessary gassing. Let the battery run a down a bit, then put it on charge and let it gas for a couple of hours quite freely before it is taken off charge.

WHEN THE PENTODE GOES

My pentode valve seemed to blow up the other night. I was doing something to

the loudspeaker while the set was going, and one of the leads slipped off. There was a flash in the valve and it is apparently ruined. Would the speaker leads coming off do that?

They might. It would depend on whether the signal coming through the set was large or not. If you had the receiver going full blast and it was a mains set with an output of perhaps three watts you might quite easily ruin the valve in that way.

What happens is this: When the loudspeaker is disconnected it takes the "load" off the valve. In other words, the valve is not supplying speech output. The path for the speech current has been broken. But the input to the grid of the valve is still present, a matter of some volts. And the valve itself in such a set is frequently still being supplied with H.T. through some choke filter.

So it goes on piling up voltage in its anode circuit voltage which cannot—to put it loosely—get away in the form of current. With a pentode valve of large calibre the voltage may build up to considerable figures and with a powerful signal it may and does build up to a figure sufficient to break down the insulation inside the valve between its electrodes.

There is a sudden flash in the bulb and the accumulated A.C. voltage (caused by the amplification of the speech signal voltages) jumps across inside the valve, often ruining it.

That is what has probably happened in your case. It is never safe to disconnect a speaker from a set when in use. And that being the case it is obviously not safe nor desirable to fiddle about with the speaker leads while the set is running.

In any case, it is rather unwise from the aspect that you might receive a considerable shock when handling a mains operated receiver in that manner. Don't forget that you have not only the H.T. voltage but the A.C. voltage to contend with. When these are added you might have a very nasty surprise.

THE SUPER-QUALITY RECEIVER

K. P. (Maidstone).—*Can I use a Piezo electric pick-up with the super quality receiver described by Mr. Scott-Taggart?*

You can, but I am not sure whether you would have trouble with overloading or whether you would obtain good enough volume control with it in the detector position.

You would have to keep the control well over to the minimum end most of the time. But I should certainly try it. If you find that it is too sensitive for the set you can transfer it to the grid circuit of the first L.F. valve quite easily. But try it in the detector position first. If you have to transfer it you will find that it is quite easy—merely the usual pick-up change-over switching arrangement.

AERIALS FOR PORTABLES

A. J. (Bexley).—*How is it that a portable set works without an aerial when every other type of set needs one?*

A portable has an aerial just like any other set, but it is built into the cabinet and takes the form of a closed loop or frame. Actually it is similar to a large tuning coil and acts as the first tuned circuit of the receiver. Of course, the signal pick-up is not so effective as on a normal aerial, and for this reason portable set circuits need to be pretty sensitive. One of the advantages of a frame aerial is its directional properties, a characteristic which adds to the set's selectivity. You will notice that portables are invariably provided with a turntable so that the set can be rotated into the best position for reception.

IMPORTANT NOTICE

Readers are advised that technical enquiries and other communications which they have been accustomed to send to "POPULAR WIRELESS" may in future be addressed to "THE WIRELESS WORLD" for attention, at Dorset House, Stamford Street, S.E.1.

UNCONVENTIONAL WAYS OF USING VALVES

WE have become so accustomed to plugging in a valve and leaving it that we are apt to forget that a valve is capable of performing duties other than was intended by the makers.

For example, a pentode valve may be used as a triode by regarding the auxiliary grid as an anode. This gives the valve somewhat the same characteristics as a small-power valve, and is particularly useful in those cases when a pentode does not give satisfaction. I mean, you need not regard such a pentode as being in the nature of a white elephant.

Similarly, a screen-grid valve often makes an excellent detector by using the screen grid as an anode. You can connect the legitimate anode and screen grid together, but this hardly makes any difference.

If you are interested in low-voltage work you should certainly try using a pentode in the following manner:

Apply a voltage of about twenty to the anode. To the grid apply about 9 volts. The signal should go to the auxiliary grid. This can be used either for detection or low-frequency amplification. Some pentodes have the outermost grid connected to L.T.—, but this idea works best with those valves which have the outermost grid connected to the innermost.

The diode is a classical example of what I mean. By taking an ordinary three-electrode valve and joining the grid and plate together we have what is called a diode, giving distortionless rectification. Unfortunately, it is somewhat insensitive.

There is scope for finding out new uses for valves in the multi-grid and combined valves. The Q.P.P. pentodes can be used as a pentode detector and pentode output, thus giving loudspeaker reproduction from one (?) valve. The combined driver and Class B can also give loudspeaker working by using the driver portion as a detector and applying the output of this to the Class B section of the valve via a driver transformer of 1/1 ratio. Naturally, the volume is not so loud as with the usual arrangements, but there is a certain amount of novelty in being able to work a loudspeaker off one valve.

W. N.

FOR WEST OF ENGLAND LISTENERS

A GRAND CHRISTMAS CONCERT will be held in the Landithy Hall, Madron, Cornwall, on December 30; Bernard Fishwick, the Chairman, well-known as a radio actor and singer, will announce the items in dialect. Those taking part will be the Mabe Carol Singers; Peter Sandry, who will tell Cornish stories; Jack Collings, a fisherman from Port Isaac; the Slades-bridge Hand-bell Ringers; and the Madron Guise Dancers who will present a Christmas play, bringing in all the traditional figures—St. George, the Turkish Knight, Father Christmas and Beelzebub among others.

PETO-SCOTT EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

READERS PLEASE NOTE

PETO-SCOTT wish readers of "Popular Wireless" the Heartiest Greetings of the Season, and thank them for the support shown during the past 12 months and hope that in this support will continue. You will still find our advertisements appearing regularly in this other technical papers; they should be closely followed for everything radio. For those readers who have not yet built the S.T.900 we are still carrying—and shall continue to carry for many months—huge stocks of S.T.900 kits and components. We have also a limited supply of the S.T.900 issue of "Popular Wireless," and will supply them, with kits, to those readers who specially ask for them, as long as our stock lasts. Now is your opportunity to get your name on our mailing list—you are advised to fill in the Coupon below—it will ensure your regular receipt of our latest literature as issued.

S.T.900 KIT "A"

Cash or C.O.D. 55/6
Carriage Paid

Pilot Author Kit of Components, exactly as FIRST specified and used by Mr. J. Scott-Taggart, with Mr. J. SCOTT-TAGGART'S S.T.900 AUTO-DIAL CARD, but LESS coils, Konectakit, wander plugs, accumulator connectors, valves, extractor kit, cabinet and speaker.

Cash Price, Carriage Paid, 55/6, or 5/- down and 11 monthly payments of 5/3.

B.T.S. ONE-SHOT INDUCTORS

Type 9/M.W. (178 to 580 metres) per pair	5 6
Type 9/L.W. (900 to 2,000 metres)	6 6
Type 9/S.2. (15 to 43 metres)	5 0
Type 9/S.3. (24 to 70 metres)	5 0
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Cash or C.O.D. £4:5:0

As KIT "A." but with KONECTAKIT and 10 B.T.S. COILS. 8/6 deposit and 11 monthly payments of 8/-.
Down S.T.900 VALVES. 5 Specified Valves. £1/10/3. or 3/6 down and 11 monthly payments of 2/9.

FREE

SEND NOW for our two free catalogues: "The Short-Wave Experimenter," containing full details of 8 Short-Wave Receivers and the 8-in-1 short-wave constructional kit with which you can build 8 short-wave receivers, one after the other; "All-Wave Radio Catalogue," giving full details of the wonderful Peto-Scott offers in All-Wave Chassis, Complete Receivers, Television Receiver and proprietary lines. A fund of information that is yours for the asking.

S.T.900 FINISHED INSTRUMENTS



CONSOLE MODEL

All S.T.900 finished receivers are built by Peto-Scott's expert technicians exactly to Mr. Scott-Taggart's first specification. A full-size celluloid dial places the finishing touch on an extremely attractive receiver. Each component is rigidly tested on actual broadcasting on all wave-bands. The Battery Version Console Model Finished Instrument illustrated is supplied with aerial coupler control extended to operate outside cabinet. Complete with set of first specified valves and 10 B.T.S. One-Shot Inductors covering Long, Medium and 3 Short-Wave bands; also Peto-Scott Type No. 210 P.M. Moving-coil Speaker, housed in Peto-Scott Cabinet (illustrated), with spare coil rack, less batteries. CASH or C.O.D. Carr. Paid, £11/15/0, or Deposit 27/6 and 11 monthly payments of 22/-.

27/6
DOWN

CONSOLETTA MODEL

(on right). Exactly to specification. Celluloid dial. In walnut-veneered cabinet, with spare coil rack, valves, and 10 B.T.S. Inductors, Peto-Scott P.M. Speaker, less batteries. CASH or C.O.D. Carr. Paid, £10/10/0, or 21/- down and 11 monthly payments of 19/9.

21/-
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TABLE MODEL

Cabinet Only. Fixed lid. Sloping front. 18ins. wide, 14ins. high, 12ins. deep. 29/6. (Carr. and Pkg. 2/6 extra.) Or 2/6 down and 5 monthly payments of 4/-.

2/6
DOWN

Finished Instrument. Exact to specification. Celluloid dial, valves, 10 B.T.S. Inductors, Peto-Scott Table Cabinet, less batteries, £8/5/0, or 16/- down and 11 monthly payments of 15/9.

16/-
DOWN

A.C. MAINS S.T.900

KIT "A" Cash Price £10:18:6
Carr. Paid

Or 21/- down and 11 monthly payments of 20/6
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RADIO'S GREATEST MYSTERY

Our contributor discusses the perplexing problem of electro-magnetic action

DEEPEST and most profound among the many problems associated with the fundamentals of radio and electricity is the ever recurring question of what constitutes a magnetic or an electro-magnetic field and what, also, is the nature of electro-magnetic action.

Surprising as it may seem, physical and electrical science is, even at the present day, in a state of almost abysmal ignorance concerning the above matters. Yet the well-known properties of the electro-magnetic field not only underlie the whole of radio science but, also, the greater part of the multitudinous electrical applications which, during the past half-century, have, by their enormous convenience, grown into the very fabric of modern civilisation.

I am not going to solve any problems for you in this article. Rather, I am going to make one or two problems concerned with radio and electricity seem all the more mysterious and all the more insoluble. There is no doubt, of course, that, in the fulness of time, to use a Biblical phrase, a complete understanding of these mysterious matters connected with the fundamentals of radio and electricity will be forthcoming. Yet, if I may hazard a guess, the complete solution of all these mysteries will not be forthcoming in our time. A future Faraday or, more accurately, perhaps, a Clerk-Maxwell yet unborn, may, at some future age, give his life to their solution. The present generation, however, is a more utilitarian one. It cares little for electrical and radio fundamentals so long as a continual stream of convenience-granting electrical applications are poured out by the battalions of electrical and radio technicians now engaged in mass-scale industrial research.

Field of Influence

There are few people who are unaware of the fact that a "field" of influence surrounds even the simplest magnet. If we take a common horseshoe magnet and lay it down on a table and then place a sheet of paper over it and scatter iron filings over the paper, the filings will arrange themselves in such a manner as to reveal a well-defined pattern of lines proceeding from the poles of the magnet. Such are the well-known "lines of magnetic force."

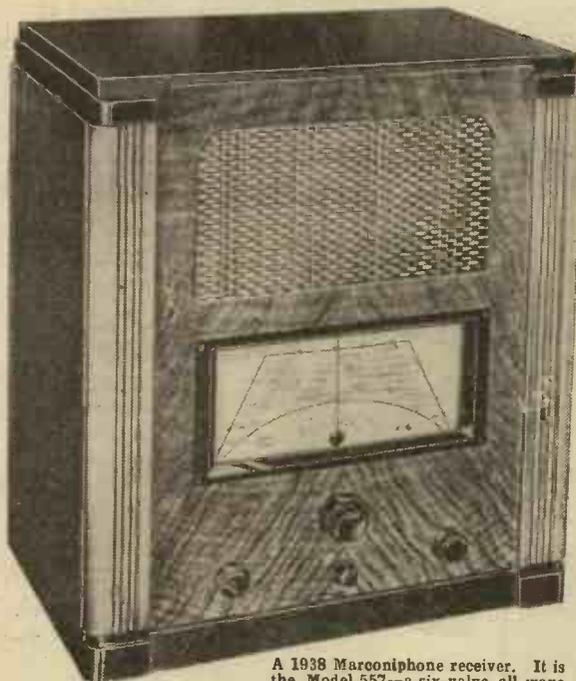
All experimenters know that similar lines of force surround a wire carrying an electric current. We find it mighty convenient to imagine such a wire as being surrounded by lines of force sticking out all round it, and by special modifications of the above iron filings experiment it is possible to make visible the supposed pattern and arrangement of these lines of

force surrounding the current-carrying wire.

Magnetism is a mystery. But, if anything, electro-magnetism, the special form of magnetism associated with electric currents, is a greater mystery still. We are gradually coming to believe that electro-magnetism is of a more fundamental nature than magnetism itself and that the latter may, in all probability, be nothing more or less than a special permanent form of electro-magnetism caused by the tiny current-generating movements of the atoms or molecules in specially treated iron and other metals and alloys.

Be that as it may, such a hypothesis does not attempt to solve for us the mean-

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A 1938 Marconiphone receiver. It is the Model 557—a six-valve all-wave superhet covering from 16'5-2,000 metres. The price is 12½ guineas.

ing of electro-magnetism and the nature of the electro-magnetic field.

Theoretical text-books of electricity have made us so accustomed to explanations which drag in time and time again the terms "electro-magnetic fields" and "lines of force" that it has become almost second nature for a technical man to believe implicitly in the reality of such phrases.

Yet—and here is the most profound of electrical and radio problems—we have utterly no proof of the existence of "lines of force" or of "electro-magnetic fields" containing so many lines of force per unit area. All such considerations are Man's, and Man's alone. They are not Nature's

creations, and it is very probable that, ultimately, we shall discover that there are no such things as "lines of force" surrounding a magnet or a wire carrying a current.

Consider a rod-shaped magnet or a rod which carries a current and which, according to present-day theory, has surrounding it innumerable lines of force arranged uniformly around it like so many whiskers or bristles. If, now, the rod magnet or the rod conductor be slowly and uniformly rotated on its own axis, do the magnetic or electrical "bristles" rotate with the rod like the spokes of a wheel when the hub is revolved? If you accept the "lines of force" theory of electro-magnetism, you must answer the above question in the affirmative because you will sink very deeply into the theoretical mire if you try to suggest that the rod revolves and yet, at the same time, its "bristles" remain stationary.

Many have been the practical experiments made in electrical research laboratories in an endeavour to determine once and for all this vexed and fundamental question. All such experiments have resulted in negative results. We cannot detect the motion of the "bristles" when a rod-shaped magnet is rotated, and slowly it is dawning upon us that, since such "bristle" motion cannot be detected, it may be on the cards that there are actually no such things as these electrical or electro-magnetic "bristles." In other words, that electro-magnetic fields and "lines of force" are all purely imaginary.

New Theory Wanted

If we do away with electro-magnetic fields and lines of force we must put something in their places. An electro-magnet, a radio moving-coil, a transformer, a choke coil—all these applications of electro-magnetic action function perfectly satisfactory, no matter what our conception of their inner mode of action may be.

It is precisely here that the trouble in the realm of theoretical electricity and radio arises. We are beginning to disbelieve in electro-magnetic lines of force, fields and what-not, yet we have nothing satisfactory to put in their places. All modern science, looking at the entire question most fundamentally, can say is that electro-magnetic action, such as that, for instance, which occurs in a transformer, is due to a strain, a local deformation in the Ether.

This may be a step forward in the matter, but it is countered by the fact that we have no knowledge of the Ether.

The more one considers the nature of magnetism and of electro-magnetism, the more one contemplates the supposed electro-magnetic lines of force and links of influence, the more mysterious do these matters become.

There is, indeed, no matter whether we as individuals realise it or not, equally as profound a depth of mystery lurking within the inner functioning of the humblest of radio components as there lies behind the operation of the colossal and universal force of Gravity.

J. F. S.

RANDOM RADIO REFLECTIONS

(Continued from page 401.)

and can be corrected easily enough in subsequent editions.

I think it's a credit to both the writer and the printer that to my knowledge no errors have come to light in the part of the book which deals with character classifications and analysis of your future prospects and probabilities, and so on.

EGG—FINAL WORDS

LET our old Birkenhead friend close the subject for us with the following amusing verses:—

"EGGSPLANATORY"

Oh, Kindly Readers, pause awhile, One little moment Stop,
Our Worthy Victor cries for aid,
His Beastly Egg won't Pop,
Because it's Incompressible, Unless, perchance, it's Not.

A Man named "Chaub," Exotic Name, Goes into things a lot,
And gives us many reasons why
The Hen Fruit will not Pop,
But maybe there are reasons which Good Master Chaub Forgot.

For instance: What was Mama's Name Amongst the Barnyard ruck?
And was Papa, by any chance,
The Famous Donald Duck?
These vital facts, we ought to know, or else we're in the muck.

Did Donald do the pressing? Was Henrietta coy?
Can Victor tell us of the Sex?
The News we would enjoy.
Another Henrietta? Or a "Ducky" Darling Boy?

Now, Hear the Truth, In language plain,
Let all contention stop,
Pressure's the Same, Inside and Out,
If Fresh—Ye Egg Can't POP.

We know Our Victor far too well. He is no Village Rube,
He'll never try to fill his Tyre
With Egg Juice in its Tube,
He'll just use Air, like all of us, we safely may conclude.

With Compliments and Respects,
"Our Old Friend,"
K. T. HARDMAN.

BUT hold on, here's a letter just arrived that I think I must let you see. It is from Mr. Armstrong, of Kendal. He says:

"May I throw my egg? Here goes:
"The gentleman who says that there is enough pressure in an egg to blow up a motor-car tyre probably means that on decomposition of the contents (albuminous) of an egg, sufficient hydrogen sulphide gas is given off to inflate a tyre. (Have you never heard a bad egg "pop" when cracked?)
"Another small matter.
"The perfect liquid has no elasticity—by that I mean its volume cannot be decreased by an increased pressure upon it. BUT PRESURE IS A SURFACE PHENOMENON—you can exert a pressure on any surface; that the substance "inside" the surface decreases in volume is merely incidental to this. (Don't you say "pounds per square inch"? And surely "square inch" denotes an area, with no indication of thickness, hence volume.)
"I wonder if any of your readers can find any holes to pick in this argument?"
Can you? I can't! But is he right? Or is he right?"

MY SHORT-WAVE ADVENTURES

(Continued from page 391.)

hailing from "sunny California," as he mentioned. He came in at 162 degrees. Then there was a vociferous gentleman at 151 degrees—who drawled away for twenty minutes and then clapped out his call-sign like greased lightning—I think he said W8FYT.

But who cares? So many others have come my way I don't mind missing a few call-signs. My log includes W3AUC, W3AKX, W1KJK, W1HQN, W9AGA, W8AUX and W8EBS—the last-named worked by a "YL" in Rochester, N.Y. Very, very snappy! I don't know where they learn all the technical jargon, but these American women certainly can shoot a good line of ham talk.

A Heterodyne Muddle

I have also got that Baltimore "high fidelity" station, call sign W3XEY on 9.5 metres—this at 93 degrees on my dial. But there seems to be a whale of a heterodyne muddle around that point, and only now and then does anything intelligible come through.

"If you wanna know, maw . . ." and then, "Yes, I do want to know, whah, whah, whah . . ." *ad nauseam*. I suppose these stations give perfectly good local reception—like the police signals on 8.4 metres or thereabouts.

I give these few details just to show how things are going—not to prove I am the "champ" DX-er!

Afterthought: I have given up my grid-leak "pot," as I find I must have full grid volts positive to get loud signals. I still get a bit of a "plonk" with my oscillation—but I have another idea up my sleeve to try dodging that without losing sensitivity.

Dear me, my pipe's gone out!

RADIO POINTS THE WAY

(Continued from page 387.)

distance in front of the beacon, so that there is a danger of the aeroplane crashing into the transmitting aerials on its way down to land.

It must be remembered that we are dealing with curves of equal field strength, so that the outer surface of the shaded curve in Fig. 4 corresponds to points in space where the field intensity remains constant. On the other hand, along the centre line A O signal strength would steadily increase as one gets closer to the transmitter, and could obviously not form a suitable gliding path.

When an approaching plane first picks up the landing beam signal at a certain predetermined strength, corresponding to the point M1, the pilot starts to put the nose of the machine down. He continues his downward path, and by always flying to constant signal strength, so that his radio indicator remains steady at the same point on the dial, he knows that he is keeping along the contour of the beam. In this way he finally reaches the tangential point M2 at the proper landing angle.

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MODERN BOY

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THE first official demonstration of wireless was given by Marconi on Salisbury Plain in the summer of 1896, when signals were received over a distance of four miles. A few weeks afterwards messages were sent across the Bristol Channel at a range of over nine miles, and Sir William Preece, who represented the Post Office, was moved to say, "There is something in this new invention."

A couple of years later, Sir Oliver Lodge discovered the principle of electric tuning, which, in effect, introduced a special bond of sympathy—technically called Syntony—between the transmitter and receiver, and greatly increased the working range. In 1901 Marconi transmitted Morse signals across the Atlantic, from Poldhu in Cornwall to Newfoundland, and long-distance telegraphy was an accomplished fact.

Transmitting Speech

The next advance was to tackle the problem of transmitting speech. This required the production of a steady train of wireless waves to "carry" the low-frequency "sound" current across the ether. Actually, the first to generate continuous waves of radiation frequency was Poulsen, who used a special form of circuit developed by Duddell from the ordinary arc lamp. But the Poulsen arc did not prove quite steady enough for the purpose in view.

In 1904 Sir Ambrose Fleming took out his first patent for the thermionic valve—a two-electrode affair—which was really invented to take the place of the "coherer"

IN RETROSPECT

The Record of Radio

By J. C. JEVONS

as a detector of wireless signals. Two years later, de Forest added the grid, and then nothing much happened until 1913, when a number of inventors, including de Forest and Armstrong in America, Meissner in Germany, and Franklin over here, stumbled more or less simultaneously upon the principle of reaction. In other words they found that by back-coupling the plate to the grid the valve became not only much more sensitive as an amplifier, but could also be used to generate continuous carrier-waves of high frequency and constant amplitude.

This discovery of reaction "revived" the valve, and launched it on its way to fame.

In wireless telephony it is necessary to "modulate" the carrier wave, which is at a high level of energy, with low-frequency speech currents of comparatively feeble strength. Colpitts found one way of doing it and Heising another. There are, of course, other problems involved in transmitting speech instead of Morse signals. For instance, the circuits must be designed to accommodate side-band frequencies; the carrier-wave must be "stabilised" at a constant frequency; and a higher all-round grade of transmission is essential.

Speech was first transmitted by radio across the Atlantic from New York to Paris in 1915. At that time there were no high-powered valves available, and no fewer than 500 separate tubes, each rated at 15 watts, had to be connected up in parallel.

Shortly after the War the stage was set for broadcasting. The valve was "in charge" at the transmitting end, right from the beginning, but was challenged for some time, in reception, by the simple crystal. The competition was, however, short-lived, and the valve and loudspeaker finally swept the board as soon as certain essential improvements had been made.

Valve Development

The original bright-emitter valve was replaced first by the dull-emitter, which consumed far less "juice," and then by the indirectly-heated type, which was still better adapted to be driven from A.C. supply mains. Next, the introduction of efficient "eliminators" units solved the problem of the high-tension supply, and the way was made clear for the manufacture of mains-driven sets by mass production.

Simultaneously a new technique of sealing metal to glass led to the manufacture of water-cooled transmitter valves, rated at kilowatts instead of watts. On the receiving side, the neutrodyne, the screened valve, and finally the pentode gave listeners more and more effective high-frequency amplification, with a correspondingly increased "reach" and greater selectivity. Corresponding valve developments on the

(Please turn to cover iv.)

425 STATIONS ON S.T.900

A further weekly report from Mr. Leslie Perrins

Reception week November 21st to 28th, 1937.

Dear Sir,—The week under review has been uncertain for short-wave reception, but despite the conditions the S.T.900 has again proved its remarkable capabilities. It is unfortunate that my occupation prevents me from giving this set a trial during the daytime, as I know there are several distant stations who broadcast only on weekdays, either in the morning or afternoon.

I, however, have obtained highly successful results at week-ends in daylight, as this and my previous reports have shown. During this week I had the opportunity to show a very proud owner of a well-known make of seven-valve superhet all-wave set the possibilities of the S.T.900. He remarked that the "X"-reaction, when operated properly, made such a wonderful difference to the signal strength of a distant station that it seemed one had added an extra two or three valves to the set. Upon seeing the coils changed, his remark was "that is simplicity itself." He was also delighted to see how I separated Podesbrady from Zeesen DJA on 31 metres, and vice versa (although these stations are only 9 kc. apart) by applying the bias to the H.F. valve through the selectivity plug being inserted in the upper socket.

The most interesting reception of the week has undoubtedly been from VK2ME Sydney, on Sunday the 28th, between 2 and 4 p.m., and I held the programme for the two hours it was on at moderate L.S. strength. The amazing part of this signal was the way in which I was able to keep powerful Zeesen DJA right in the background by the use of the selectivity plug and full application of the "X"-reaction. I am confident it would not have been possible here in Birmingham without these features. The stations received this week besides the locals were as follows:

Sunday 21st., 10.30 a.m., 19 m., Zeesen DJQ and DJB, full L.S. Orchestral records including "Die Fledermaus." 10.45 a.m., 25 m., 12 RO 4, full L.S. Music, and SBP Motala at full L.S., giving a service relayed from Stockholm. 11 a.m., 25 m. Moscow RNE, fairly lifted the roof with "Hallo! Good afternoon, everybody. This is Moscow calling from the Radio Centre. Workers of all lands unite." This was followed by a series of political talks and news in English.

Monday 22nd. Enjoyed, at 8.45 p.m., Dvorak's "New World" Symphony from Lyons PTT

without any noticeable fading. This was followed by some quite good songs in French.

Wednesday 24th., 7.40 p.m., 31 m., W2XAF Schenectady at good L.S. Duets on two pianos.

8.30 p.m., 31 m., OLR3A Podesbrady at full L.S., giving a very good pianoforte recital which included the "Funeral March" at 9.10 p.m. Closed with news and bells. No fading whatsoever. 9.30 p.m., 31 m., Zeesen at good L.S. Songs and choruses. 10.45 p.m., W2XE Wayne, N.Y., on 25.36 m. (note new wavelength) at good L.S. Concert with announcer Ben J. Lawrence. At 11 p.m., called in English, French, German and Italian.

11.10 p.m., 25 m., 12 RO 4 Rome at moderate L.S. [Talk,] 11.15 p.m., 28.94 m. EAJ 43 Tenerife (Canary Islands) at moderate L.S., announcements in Spanish. Played some call on a bugle followed by piano and violin recital. 11.25 p.m. Picked up a station about 29 m. at moderate L.S., giving Cigany music. I wondered who it could be, and at 11.30 p.m. I was informed in Dutch that I was listening to "Hler Niorom P M N, on 28.99 m., Bandoeng, Java." Then followed a programme of waltzes, including "Invitation to the Waltz" and "The Merry Widow."

11.55, 49 m., W8XK Pittsburgh, at good L.S. A serial sponsored by "Anacin" ("a sure and safe cure for headaches"). Call at 12 midnight.

12.5 a.m. (Thursday), 49 m., COCD Havana and VE9HX at good L.S. Both on the same wavelength. It was amusing to listen to these two alternately overpowering each other.

Thursday 25th. Gave a demonstration to three "P.W." readers. W. H. Brampton, 22, Wainwright Street, Aston, Birmingham; F. Crow, 75, Leopold Street, Birmingham; F. Hill, 210, Berry Wood Lane, Great Barr. Among some 30-40 stations received clear of one another within one and a half hours were Luxembourg, Radio Paris, Kalundborg, Athlone, Stuttgart, Cologne, Lyons, Prague, Fécapm, Lille, Munich (31 m.), W2XAF Schenectady (31 m.), W1XK, Mills (31 m.), W3XA U Philadelphia (25.36 m.), W2XE Wayne, several Zeesens (25 m.), Rome 12 RO 4, and (31 m.) OLR3A Podesbrady.

Friday 26th., 10 p.m., 10 m. W2XAD Schenectady at moderate L.S. News and concert. 10.30 p.m. Jack Armstrong in a "Wheaties" serial. 10.45 p.m., 16 m., W3XAL at moderate L.S., a programme of new songs.

Saturday 27th., 13 m., 1.30 p.m., Wayne W2XE, at good L.S. Concerts, etc., were enjoyed by all at home from this station without any attention to the set for three and a half hours.

8.50 p.m., 25 m., W2XE Wayne, at good L.S. Commentary on Army v. Navy match, which Army won by 6 to nil. Names of players who figured prominently in this game were Frank Case, Dusty Cook and Sticky-Fingered Solomon (the last name amused tremendously all who were listening). At 9 p.m. the lights were turned on (so the commentator said) to illuminate the ground on a very dull day. 9.10 p.m., Army had won, and the crowd charged on the field. 9.15 p.m., orchestra. 9.30, 28 m., EAJ, 43 m., at moderate L.S. War news.

Sunday 28th., 10 m., several French, Dutch and English amateurs who complained of bad long-distance conditions on this band.

12 mid-day, 20 m., amateurs. W3MD Vineland, N.J.; F8DC France; ON4QZ Belgium; G5NI England; WINWUSA.; ON4AW Belgium; G8V England; PAOWI Holland; LA1FI Norway; OZ5BW Denmark; F3KP France; SM7YA Sweden; G5NY England; all at full L.S.

2 p.m., 31 m., VK2ME Sydney, at moderate L.S., opening with Laughing Jackass, followed by the call and address of station, etc. The programme included march with male chorus. Paul Whiteman and his Trumpet Orchestra in "Ol' Man River." A ballet. Stanley Holloway in an Old Sam story. (We were all highly amused by this, as it is a long time since we have heard "Old Sam," and never thought that we should next hear him from Australia.) Carson Robinson and His Pioneers in a Camp Fire Concert which included "Old Folks at Home," "Little Liza Jane," and "Good-night, Lady." "Stein Song" by Male Chorus. Jessie Mathews in "Head Over Heels in Love," and "May I Have the Next Romance With You." Closed down at 4 p.m.

I have now increased my total number of different stations received to 425, despite the unfavourable short-wave conditions, and I feel that no matter what programme from U.S.A. may be desired the S.T.900 will receive it providing a suitable S.W. station is on.

LESLIE A. PERRINS.
101, Sycamore Road,
Aston, Birmingham, 6.

TECHNICAL JOTTINGS

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

Varied items on matters of general interest

I SUPPOSE most people who use the mains for the electric supply to their receivers nowadays are possessed of all-mains sets, in which the unit, or units, for converting the electric supply into a suitable form will be contained within the set itself. But there are still quite a large number of people who work their sets from the mains by the aid of external mains units. Most units nowadays are equipped with output terminals for supplying grid-bias voltage, as well, of course, as the various high-tension voltages, but there are to my knowledge a large number of units in existence which do not have grid-bias terminals.

If you happen to possess such a unit and you have previously been using a battery for grid bias, you can dispense with the latter and obtain the grid bias from the unit itself by some comparatively small adjustments.

A Mains Dodge

One method which is often used is to connect a resistance between the negative high-tension terminal of the unit and the corresponding terminal of the set. The previous high-tension negative terminal will now give you the negative bias voltage. It is advisable, however, to connect a fairly large capacity condenser, 1 or 2 microfarads, across the terminals of this resistance in order to bypass any alternating voltages. The value of the resistance may conveniently be 5,000 ohms (the maximum value, that is), and you can then obtain various grid-bias voltages from zero up to as much as 30 volts by adjusting the value of the resistance. This resistance must be an adjustable one, I forgot to say.

Effect on H.T.

You will notice that when using the above arrangement the grid-bias voltage is subtracted from the high-tension voltage and thus, if you vary the grid-bias voltage, you will produce corresponding variations in the high-tension voltage from the terminal of the unit which you are using. These variations will be in the opposite sense, that is to say, as you increase the grid-bias voltage you will decrease the remaining H.T. voltage.

Using the Choke

Some people object to the encroachment of the grid-bias voltage upon the H.T. voltage, and therefore do not favour the above-mentioned method. If you feel this way about it you can utilise the voltage-drop across the choke for the purpose of providing grid-bias voltage. In this case, in order to vary the voltage you will need a high-resistance potentiometer connected across the ends of the choke, the grid-bias voltage being tapped off from the slider of this potentiometer. The value of the choke may be, say, 50,000 ohms.

I should mention one point, which is that the smoothing choke must be in the

negative supply lead. This choke will act just as well as a smoothing choke in one lead as in the other, so if it is at present in the positive lead it will be necessary to transfer it to the negative lead, that is if you wish to make use of it as a source of grid-bias voltage as explained above.

Remember to Decouple

There is one further point which I should like to mention before leaving this question of getting grid-bias from the mains unit, and that is a point with regard to decoupling. You may quite probably find it necessary to put in some form of decoupling with the arrangement mentioned above. If this turns out to be the case, a simple dodge is to put a decoupling resistance, say 100,000 ohms, in series with the lead from the slider of the potentiometer, or in series with the lead from the slider of the variable resistance, according to which method you choose.

Increasing the Power

It is a very common thing for people to want to get more power out of their sets, just as there is scarcely any motorist who does not at some time or other feel that he could do with some more engine power, provided he did not have to pay anything extra for it.

As regards the extra power from the radio receiver, it often puzzles people to know how this can be done without fundamental changes in the circuit arrangement and construction of the set. As a matter of fact, however, you can sometimes get quite an appreciable increase of power from a set by relatively simple means.

Output and H.T. Voltage

As often as not you can get this extra power by nothing more serious than an increase in the anode voltage on the output stage. This will, of course, necessitate extra grid bias in order to regulate the anode current and keep the valve operating on the proper part of its characteristic curve. Obviously this will throw an extra load on the high-tension source, and if this happens to be a dry battery you must be prepared for the consequences. If the battery is of the low-duty type it won't last you so long, and it may pay you to use a heavy-duty battery.

Trying a New Arrangement

If you care to go in for more drastic changes you can consider the question of converting to the quiescent push-pull or Class B systems, in which case you will find that the question of extra current consumption is not nearly so important. In fact, you can use quite large anode voltages without unduly increasing the load on the H.T. source.

If by these or other means you have increased the power-handling capacity of the output stage of the set you must not think that this alone is sufficient. Remember that it is only the power handling capacity (I use the word capacity in the sense of ability and not, of course, in the sense of condenser capacity) which has been increased and, as I have mentioned before in these Notes, the mere increase in the ability to handle does not mean that the power to be handled is necessarily available. A manufacturer may have a factory

(Continued overleaf.)

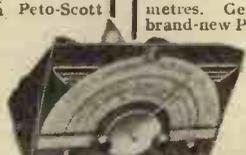
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SOME FACTS ABOUT CONDENSERS

A chat on the energy losses which may occur in even the best constructed condensers

By F. S. POUND

MANY of us, I think, are apt to imagine that a radio condenser—fixed or variable—is a perfect instrument, and that it delivers up without any loss whatever every scrap of current-energy which is fed into it.

Alas, however, there is no such thing as a perfect condenser. There is, indeed, no such thing as an ideally perfect device of any kind whatsoever which will give out as much energy as is fed into it. If such a device could be found, the solution of the problem of perpetual motion would be brought a step nearer.

Following the universal rule of all instruments, the radio condenser abstracts, dissipates or wastes a little of the electrical energy which is fed into it. True it is that in the case of a well-designed and well-constructed condenser this wastage factor is never very high. Yet, in all cases it is appreciable and no more so than when short waves, with their ultra-high frequencies, are being dealt with.

A Straightforward Presentation

The matter of condenser losses is rather an abstract subject for many radio amateurs, simply, I think, because the subject is usually paraded in all the frightening panoply of mathematical symbols. The entire subject, however—and it is one of much interest—can be presented for the reader's reflection in a few brief phrases. Thus, the radio worker, although he may not be able to control in any degree his condenser's losses, will have an ample idea of their nature and will be in a position to guard against any possible heightening of these losses.

Condenser losses are of three different types: Resistance losses, eddy-current losses, and dielectric losses.

It may surprise some beginners to learn that a condenser, with its ample metallic surfaces, may actually present a resistance to the current flow. Yet such is the case even when the condenser is well constructed. When, however, the condenser is of the old pattern, having poor and ill-designed bearing-contacts, these resistance losses mount up enormously.

The same applies, of course, to fixed condensers. If, for any reason, there is faulty contact between the hidden plates in these condensers (that is to say, between the plates of the condenser which should be connected together), the resistance of the instrument rises, and much current-energy is required to overcome it.

Unavoidable Losses

Eddy-current losses are quite unavoidable in condensers, but fortunately these current losses are the least serious of all. Such losses are due to the formation of little whirls of current ("eddy currents") which are induced in the metal end-plates of a condenser and, also, in the condenser plates themselves. The energy for the formation of these wasteful currents is taken from the electrical energy which is fed into the condenser. Hence it is that even if the creation of eddy currents was the only source of loss in a condenser, the output energy of the condenser would be smaller than its input energy by an amount

exactly representing the current energy taken in the creation of the eddy currents.

Eddy currents increase in amount with increase in the current frequencies which the condenser has fed into it. In short-wave work therefore, when the frequencies dealt with are exceedingly high, eddy current loss may at times be very considerable in a tuning condenser.

The third class of condenser losses, the "dielectric losses," are due to the absorption of a portion of the energy flowing through the condenser by the insulating materials used in the building-up of the instrument.

"Capacity losses" these might be called, for they are due to a sort of condenser effect existing within the condenser itself.

These dielectric losses are, other factors being equal, highest when the condensers have end-plates of non-metallic materials. Such losses occur frequently in fixed condensers. In order to reduce them in variable condensers, the condenser is "skeletonised" as far as practicable. That is to say, it is built up in a light thin framework embodying the least possible mass of material.

Dielectric losses decrease as the current frequencies fed into the condenser increase. Hence, in short-wave work with modern instruments they are seldom appreciable. In condensers tuning in long-wave stations, however, the dielectric loss factor becomes a matter to be carefully guarded against, since the longer the wavelength the smaller is the frequency of the current which it induces in a receiver.

What we may term "accidental" losses in condensers have not been included in the above enumeration of condenser sources of energy wastage. Yet, in actual practice, such losses may amount to much more than the whole of the "normal losses" (as we may conveniently call the resistance, eddy-current and dielectric losses) put together.

Consider, for example, a leaky condenser, a fixed condenser say, the insulating medium between two or more of whose plates has been slightly punctured and which consequently allows trickles of current to penetrate directly from plate to plate.

The "accidental" loss of such a condenser will, at times, be enormous. Indeed, it might be sufficient to prevent a set's normal working.

In all good class condensers steps will have been taken to keep the losses as low as practicable.



An ingenious scheme instituted by the Columbia Broadcasting System of America to facilitate outside broadcasts. The weird-looking arrangement with the sunshade on top is a telescopic periscope with which the commentator is able to see over the heads of spectators. The "mike" is fitted just below the periscope eye-piece.

TECHNICAL JOTTINGS

(Continued from previous page.)

capable of turning out thousands of some particular article per day, but unless he can receive the orders, on the one hand, and the material, on the other hand, the mere ability to handle a large turnover is of very little use.

Function of Detector

In particular, in the case we are considering, it usually means that you have to increase the output from the detector so that the newly found ability of the output stage can be made use of. Increasing the output from the detector means that it will be necessary to increase the voltage applied to the detector itself so as to avoid overloading. With the quiescent-push-pull arrangement you can use pentodes or triodes.

Overloading the Speaker

Finally, there is the loudspeaker to be considered. It is not very likely that you are going to increase the output from the set so greatly as to get into difficulties with overloading the loudspeaker. At the same time, if the power-handling capacity of the speaker is unusually small, or if, on the other hand, the normal output of the set was comparatively large before you increased it, then you may find that the speaker "can't take it."

SELECTIVITY IN TUNED H.F. CIRCUITS

By A. W. YOUNGMAN.

So far as the listener is concerned selectivity in a radio receiver can perhaps be best defined as the ability of the tuned H.F. circuit to discriminate between wanted and unwanted signals, or the means of receiving the desired transmission to the exclusion of all others. Technically speaking, the explanation involves the consideration of the reactances and resistance, and in order to more fully understand the behaviour of a tuned H.F. circuit it is advisable to deal with the principles governing A.C. circuits and resonance.

It is well known that when an A.C. voltage is applied to a circuit containing pure inductance and capacity, an A.C. current will flow first through the coil and then into the condenser. As the current rises to its maximum value a magnetic field will be created round the coil which acts in opposition to the current and tends to prevent it reaching its peak value. Similarly, as the current falls and the magnetic field collapses, the opposition again becomes manifest in tending to prevent the current from reaching its zero value. This opposition is not resistance in the physical sense, but an inertia effect opposing any change in the current. It is known as the inductive reactance and equal to $2\pi fL$, depending upon f , the frequency of the generator, and L , the inductance of the coil. In a pure inductive circuit its effect causes the current to lag behind the applied voltage by 90° .

The magnetic field created round the coil when the current was rising collapses when the current falls, and now flows into the condenser, reappearing in the form of an electrostatic field in the condenser dielectric. By virtue of the electronic distortion in the dielectric of the capacity a voltage is produced across the condenser plates, and the stress of this distortion against the voltage offers a further opposition known as the capacity reactance. Opposing any change in the voltage it is equal to $\frac{1}{2\pi fC}$, depending upon f , the frequency, and C , the capacity. In a pure capacitive circuit the effect of this reactance causes the current to lead the voltage by 90° .

A resistive circuit differs from the inductive and capacitive circuits in that when the current flows through the physical resistance the opposition offered does not cause a phase displacement by retarding or accelerating the current in relation to the applied voltage. Any opposition offered by the physical resistance is overcome by heat dissipation, and in consequence the current and applied voltage are at every instant in phase, or step; neither lead nor lag being evident.

Effect of Resistance

Whilst pure inductance and capacity, by virtue of their reactances $2\pi fL$ and $\frac{1}{2\pi fC}$, cause a current lag and lead respectively of 90° , and that a resistive circuit offers no phase displacement it will be clear that if resistance is included in an inductive or capacitive circuit the current will not lag or lead the applied voltage by exactly 90° , but by a figure between this angle and zero depending upon the value of R the resistance. This is extremely important, and as will be seen later, determines the ability of a coil in regard to both selectivity and magnification.

Assuming for the time being that resistance is excluded and the circuit contains inductance and capacity only, it will be seen that when the A.C. voltage is applied two similar voltages will be produced across the inductive and capacitive branches and that the current flowing will be determined by the reactances $2\pi fL$ and $\frac{1}{2\pi fC}$ respectively. The total current flowing through the circuit will be the simple sum of the two currents flowing through the inductance and capacity and if resistance is not included these currents will be exactly 180° out of phase.

As the total current flowing through the circuit is determined by the reactances, which in turn are controlled largely by the frequency, it follows that if the latter is made adjustable a point will be reached at one particular frequency where the two reactances are equal and offer similar opposition. Under such circumstances $2\pi fL = \frac{1}{2\pi fC}$, in which case the currents in the two branches L and C will be equal. As these are opposite, or 180° out of phase, one will completely cancel the other, and since physical resistance, R , is excluded the total current in the circuit is reduced to zero. Resonance is now said to exist.

In the foregoing it has been assumed that resistance was excluded. Unfortunately, this state of affairs cannot exist in practice and some resistance must be present if only that inherent in the wire with which the coil is wound. Where physical resistance is present it follows that some current must be absorbed and dissipated in heat, with the result that a small current, depending upon the value of R , the resistance, flows through the circuit. The fact that such a current flows alters the conditions outlined above, because the total impedance, i.e. opposition offered to the current, does not depend upon the inductive and capacitive reactances alone, but a combination of these values and the resistance. It has been stated that the two reactances are equal to $2\pi fL = \frac{1}{2\pi fC}$, and as these completely cancel at resonance the only opposition offered to the current is that of the resistance.

Conditions at Resonance

At resonance, then, it is permissible to replace the total impedance by R alone. This factor must also be taken into consideration in determining the dynamic resistance or, in other words, the total impedance at resonance.

Selectivity is technically expressed as the ratio of the reactance to the resistance, which in the case of the coil is equal to $\frac{2\pi fL}{R}$ and is sometimes referred to as the "Q" factor of the coil. Moreover, the magnification of the circuit is also determined by this combination from which it will be readily noted that the inclusion of R , the resistance, is not required where a high standard of selectivity is desired. Obviously the greater the resistance the smaller must be both the selectivity and magnification of the circuit, and in consequence of this resistance is deleterious.

The degree of selectivity obtainable also depends upon the ratio of the inductance to the capacity, $\frac{L}{C}$, and as the wavelength to which a circuit will tune is the sum of LC , if the inductance is doubled and the capacity halved, not only will the circuit tune to the same resonant frequency, but in addition the selectivity would be increased. In this way it would at first appear that the ideal tuned circuit to overcome the selectivity problem should include a large inductance and small capacity. Whilst this is true up to a point, the "Q" factor, $\frac{2\pi fL}{R}$, must be considered in the calculation from which it will be seen that as a larger inductance would necessitate a greater number of turns of wire the resistance must be increased by this addition. In consequence, the gain is not so great as might appear.

In practice the inductance and capacity are arranged to give the most suitable values for both medium- and long-wave working. With a fixed value of inductance and a given band of frequencies, the resistance is now the only factor which determines the selectivity.

For many years the problem of obtaining a high standard of selectivity has presented a difficulty to the radio set design. At different times various schemes were introduced which consisted chiefly of anti-resonant or wave-trap devices in the aerial circuit. In some instances large-diameter Litz wound coils were employed as a means of reducing the effective resistance with a given inductance value.

The type of coil largely employed in modern receivers to overcome the foregoing difficulties is the iron-cored type. These are smaller and more compact coils in comparison with the air-cored type, but also, and what is more important is that fewer turns of wire are used in obtaining a similar inductance value.

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JOHN WATT'S PLANS FOR THE NEW YEAR

By "P.W.'s" Special Correspondent

BECAUSE he believes that there is a real demand for them, John Watt, B.B.C.

Director of Variety, intends to continue non-vocal dance band broadcasts in the New Year. There will be three each week—"B.B.C. Ballroom," "Thé Dansant" and one late night session on Wednesdays.

John Burnaby will continue to handle the "B.B.C. Ballroom" broadcasts, and Douglas Lawrence the "Thé Dansant" programmes.

The late night programme will not come from the studios, but from an outside broadcast point.

"I am sure," says John Watt, "that there is a large number of people who loathe singers in dance bands—possibly because they have been labelled 'crooners'!"

LATE NIGHT DANCE MUSIC

Plans for the late night dance music on records, to be broadcast on the National wavelength during the first quarter of the New Year, are complete. They include the following arrangements:—

Mondays.—Record Session. A programme devoted entirely to one band each week.

Tuesdays.—Dance Music (Non-vocal).

Wednesdays.—Swing Time. This has been a Wednesday evening feature for some months and consists entirely of swing music.

Thursdays.—Dance Music. Popular current tunes.

Fridays.—Hot from the press. Recent dance tunes.

MORE DAYTIME VARIETY

John Watt intends to expand daytime variety programmes.

He feels that afternoons, particularly, have been rather the Cinderella of variety broadcasts, and as a partial corrective anyway, gramophone programmes, planned, built and produced with all the care and precision that are devoted to "live" broadcasts, will be heard more frequently by listeners during the daytime. They will be produced more on the lines of "live" variety broadcasts and will be handled by Leslie Perowne and George Gordon of the Variety Department.

"We want to get rid of the idea," Leslie Perowne said to "P. W." "that gramophone records are used merely as 'fill-ups.' We are going to try, therefore, to give our gramophone programmes more 'production' than they have, perhaps, had up to now, by means of scripts, compères, and so on. Believe it or not, people do still actually write to the B.B.C. thanking the announcer who chose the nice records I heard after lunch to-day."

GRAMOPHONE VARIETY

The projected programmes of gramophone Variety during the January-March quarter are as follows:

To-day's Favourite.—A programme devoted entirely to one British artist

(fortnightly, alternating with "Americana").

Records at Random.—As the title implies, picked from a miscellaneous collection of light records (weekly).

Sound Track.—Music from films (fortnightly, alternating with "Show Tunes").

Here They Are Again.—Old dance and popular tunes played again (weekly).

Rhythm on Records.—Popular dance music (weekly).

Americana.—A programme entirely of American artists (fortnightly, alternating with "To-day's Favourite").

Show Tunes.—Music from the theatres (fortnightly, alternating with "Sound Track").

Song and Dance.—Popular dance music and songs (weekly).

Swing fans will welcome the news that a swing music feature is to be broadcast each week during the first quarter of the New Year. The first is to be called "Boulevard Rhythm," a tour of Paris night clubs and their bands, and Leslie Perowne hopes also to have a series in which each programme will be devoted to a different instrument of the dance band presented by a well-known player.

These, too, will be daytime programmes.

"METEROLOGY"

A Serviceman's Experiences

THE other day, needing an H.T. battery, I slid into one of our village radio stores.

The shopman dived behind a bag of carrots and fished up a 120-volt battery. He put a meter across it. It read zero. He dived again, with the same result. Three times he repeated the operation. "Proper dud lot," he commented. It seemed too much of a coincidence, so I ventured to suggest that perhaps the meter wasn't altogether blameless. He gave it a thoughtful bang on the counter, put it across one of the batteries, and the pointer shot over to 150 volts. This seemed a bit optimistic, but near enough to the mark for practical purposes, so I risked it.

Good Batteries Sent Back

As he was parcelling it up, he remarked gloomily, "Sent three of them back to the makers last week, and I didn't half let them have it. Wonder what they'll say?" Unfortunately, wireless manufacturers are extremely tactful, or their report might have considerable entertainment value.

Few meters are as bad as that, but some of the inexpensive moving-iron variety can play puzzling tricks at times. In ninety-nine per cent. of tests they behave satisfactorily, but every now and then they will lead you up the garden. Usually I carry a moving-iron multi-range meter for rough tests, leaving my "Avo" at home for more delicate work. In two cases last year the moving-iron meter landed me in the soup.

The first was a cheap 5-valve portable of the aperiodic 2 H.F. type with a bare minimum

IN RETROSPECT

(Continued from page 406.)

low-frequency side increased the power output and improved the quality of loud-speaker reproduction.

The progress made in valve technique was followed by the use of automatic volume control to overcome the effects of "fading" on long-distance reception, whilst various other refinements, such as automatic tuning control and variable selectivity, gradually brought the receiver to its present stage of development.

Meanwhile high-definition television made its appearance on the ultra-short waves.

Although television is not included in the present survey, the opening-up of the wave-band below 10 metres is too significant a fact to be ignored. It clearly points the way to the future broadcasting of ultra-short-wave "sound" programmes, partly in order to relieve congestion on the medium and long waves, and partly to provide programmes of a definitely-higher musical quality than those to which we are now accustomed.

Because of overcrowding, long and medium-wave broadcast transmissions have for some time been limited to a sideband "spread" of nine kilocycles on each side of the carrier frequency, although this cuts down the full scale of musical frequencies by at least a half. By moving down to the region below 10 metres, this limitation is avoided; and a very large number of independent programmes could be transmitted at full musical quality, without any risk of mutual interference.

of components. After putting it in order, I took a m/a reading of the output. It was surprisingly high. Removed the power valve. Consumption dropped 10 m/a. Ah! open grid circuit. Tested transformers. Tested everything. No open circuits anywhere. Then the solution dawned on me. H.F. currents in the meter. I hadn't a condenser with me to shunt across the meter, but next time I passed that way I took the "Avo" along. It read sedately 7 m/a.

A Puzzling Effect

The second case was still more puzzling. It was a 5-valve superhet with Q.P.P. output. With the meter in H.T. + (max.) and screen leads, readings were quite normal. But an attempt to gauge the total consumption with the meter in H.B. — lead produced a surprising result. The needle kicked right across the scale with such violence that, but for the "stop," I feel sure it would have done several complete revolutions before coming to rest. At the same time the volume from the set increased alarmingly. I switched off, and detached the meter. Volume came back to normal.

I was so surprised that I wrote to the makers. They, in turn, were equally surprised, as they had never come across a similar case. What was really puzzling was that the same meter had read, without any pranks, the output of quite a number of these receivers. An investigation brought to light no flaw in the receiver, and as the set was obviously getting plenty of bias it was judged safe to let it carry on. That was three months ago. The owner reports that the set is still going strong on the same H.T. battery. Its A.V.C. is operating correctly, and quality is up to standard. At the moment it is one of life's little mysteries, but I have a shrewd suspicion if that little moving-iron meter could only talk, it would burst into a flood of abject apologies. E. O'M.