POPULAR WIRELESS, September 1st, 1928. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

NEW SERIES FOR BEGINNERS (See Page 861.)

Popular Wireless

Every Thursday PRICE 3d.

No. 326. Vol. XIII. INCORPORATING "WIRELESS" September 1st, 1928.

OTHER SPECIAL FEATURES THIS WEEK

Radio's "Stars"—and "Stripes" — B.B.C. Contradictions — The Perfect Detector

THE "CHOKE-RETURN" ONE

The B.B.C.'s Housing Problem — Mind That Switch! — Does A Condenser Condense?

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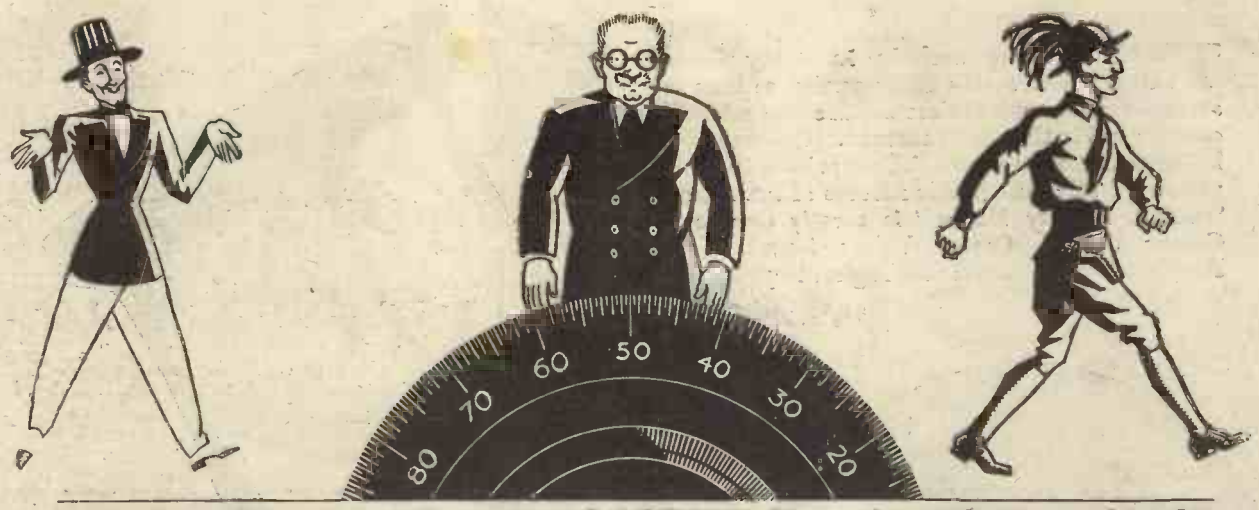
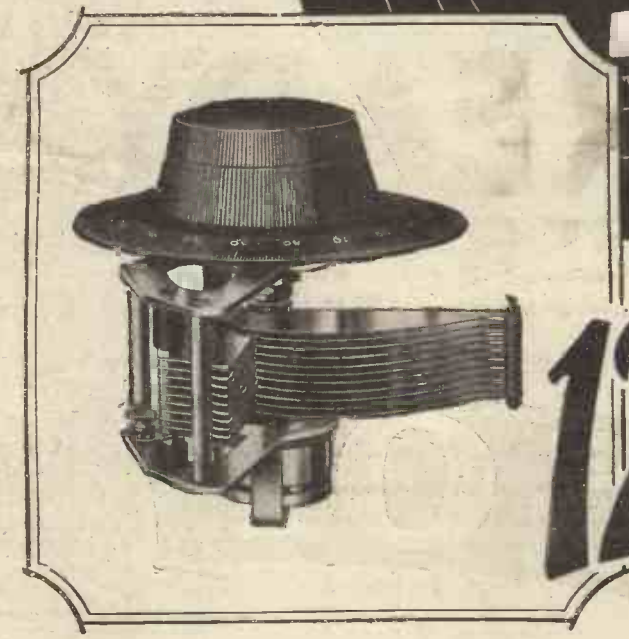


THEY COME IN AND GO OUT-

Without Colliding



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Popular Wireless

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NORMAN EDWARDS.
Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS, P. R. BIRD, G. P. KENDALL, B.Sc., A. JOHNSON RANDALL.

RADIO NOTES AND NEWS.

The Regional Scheme—Theatre Broadcasts—Has Radio a "Season"?—News from Afar—Blow at Elementary Education—Canada Takes Action.

Nothing Like "Brass."

THIS is rich! We are all familiar with the type of tenant who expects his landlord to bait the mouse-traps, repair the boot-scraper, fit the coalshed with draught excluders, and have the dust-bin dry cleaned. But I recently heard of a man who actually S.O.S.'d his landlord on account of a broken-down aerial!

Still Hope.

YES, I have hit on something new to be achieved by the home constructor. A winner! Whilst strolling through the "old town" of a seaport, all amongst the fisherfolks' cottages, I saw something in a parlour window which reminded me that no one has yet built a set in a bottle. Has he? Well, if a tarry old skipper with thumbs like potatoes can get a full-rigged barquentine, with all the canvas on her, into a bottle, why can't our nimble-fingered comrades insinuate a crystal set into a similar position?

The Choice of a Set.

WE, of course, do not choose sets; we are inspired—and then we make 'em. But some people, who "garden" or collect things, must perforce buy ready-mades. Hence the numerous articles on "How to choose your set this coming season." As if a man buys a set for a season, like ladies their costumes! Here is *my* advice. Ask the man whether it is thoroughbred and past the distemper; how many hours to the gallon can she put up; guaranteed unshrinkable; fast colours; left or right drive; does it deliver talks, music, or voh-de-ville; has it a television attachment, f.w. brakes, and a little oil-bath?

The Bad (Not Very) Old Days.

ALL this chatter about sets calls to mind the great progress made in design and marketing since 1922, which year saw the birth of broadcasting. Some of the sets sold then would now make a discriminating listener fly to cocaine as a solace from the nightmare. Crystal sets, with solenoid inductances as big as mangle rollers, sold easily for £5 apiece, and if you were lucky you could get a nice three-valver for £60. Oh, gollies! I helped a relative to one of them, all in good faith, and you ought to hear the row! Only about ten controls, too! And wood and ebonite enough to build a maisonette!

The Regional Scheme.

LIKE the notorious "mills of God," which are reputed to operate on an exceedingly low gear, the regional scheme slowly grinds along. London settled, I now learn that the studio for the Northern station is to be at Manchester. That's something! But the site of the transmitter is still a matter on the knees of the gods, though it is supposed to be somewhere in the Pennines. Yes, please choose a nice hilly place!

French Broadcasting.

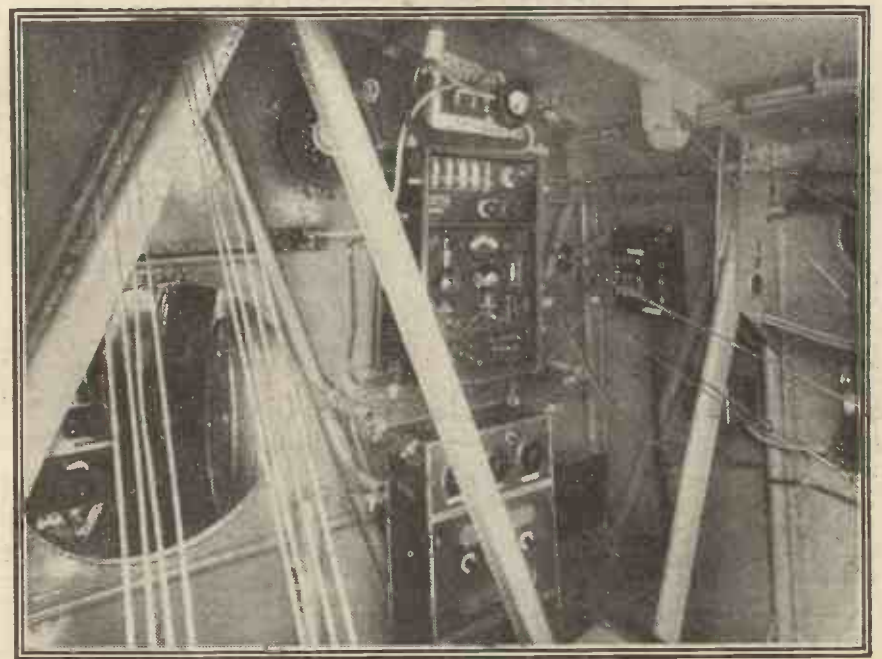
FRANCE seems to be in agonies over broadcasting. Why they do not plan some simple, common-sense scheme is not exactly a mystery but a wail of despair from an Anglo-Saxon confronted with the Latin mind. The French are said to be so frightfully logical, too! The latest idea is to give private, ten years' concessions, to encourage the erection of regional stations by local initiative and to empower Agricultural Committees, Departmental Councils of Chambers of Commerce, to found limited companies for broadcasting, etc. They want three national and eighteen regional stations, and all sorts of offices and councils are to be created. I'm sorry! Another mess in the offing!

Theatre Broadcasts.

THE Sir O. Stollian theory that broadcasts of theatrical pieces is damaging to theatrical interests has spread to

(*Continued on next page.*)

RESCUED BY RADIO.



This is the Marconi apparatus which was installed on Captain Courtney's plane, and which was the direct saviour of his life when he dramatically dropped into the vast Atlantic. The gear was installed in the pilot's cockpit, and the photo was taken looking at the rear of the machine. A special Marconi A D 6 receiver and transmitter and the Marconi A D 6 Direction Finder, consisting of tuner (top) and amplifier (lower panel), were employed.

NOTES AND NEWS.

(Continued from previous page.)

Paris, in the face of the proofs that such selected tastes of good fare do, in effect, attract people to pay money at box-offices. I give it up, and can say only that theatre proprietors generally must be lacking in the *flair* for publicity.

Has Radio A "Season"?

DR. A. N. GOLDSMITH, who is a pioneer in radio-telephony, has given birth to the axiom that "Radio, unlike canned goods, has no winter or summer season." I don't think that he is quite so sound as friend Euclid in the matter of axioms. That pest Euclid holds good for time, space, and eternity, but A. N. G. surely writes for America alone. Because I feel sure that over here the B.B.C. consciously regulates its programmes *à la* season. This summer has been "drivelling" in the radio line, and the turn "for the better" occurred when the first Queen's Hall "prom." concert was relayed.

The Phoenix.

AMERICAN news relates that "Ford is negotiating for the purchase of Menlo Park, N.J.," the place where Edison worked when he leapt into fame as the "Electrical Wizard." F. and E. are thick as thieves, and hurl bouquets at each other. As we perhaps owe the valve to the "Edison effect," this news is of interest, but one dreads what may come of the deal. Will F. breed mass-produced electrons there, or will he bring forth a cheaper kind of electricity suitable only for his cars and for sets which respond only to chamber music?

The Yellow Underwing.

THE juniors can push a pretty pen when they choose, and we are always glad to hear from readers whose voices are not broken and whose consciences are still working. Much association with Valve Barts renders us cynical, I fear. Here's young P. H. (Langport), aged 13 ("aetat," he calls it, which is Maori, if I mistake not), who has been trying to make the blood of the Editor of the "Wireless Constructor" creep. Mr. Harris's blood has not crept for many years, so he has passed the letter to gentle Ariel.

The Yellow Underwing (Part 2).

I HAVE no blood to creep. My vascular system is filled with the milk of human kindness. So I'll try yours. Behold a peaceful "interior." Mother seated, writing! Suddenly enter a noise like the gnawing of a rat. Shoo-ing wouldn't stop it, and after a search the source of the row was D.F.'d to the "Baby" Sterling loud speaker, which became silent on being inverted. Next evening, again the ghostly fret of the worm that dieth not. Post-mortem on the loud speaker revealed a Yellow Underwing moth flapping heftily against diaphragm and getting a big output for its money.

The Young Die-Hard.

HULLO-EE! What's this? A fifteen-year-old, who has forgotten his name but who lives at Hythe, Kent—where the crypt is that harbours oodles of skulls belonging to ancient warriors—actually has the priceless nerve to demand a Valve Bartship. My secretary simply said, "It's not done," and swooned away. My young disciple is a stickler for long-wave work and does it all with a "Hale," 1–C–2. He produces 23 stations, including Eiffel Tower, Scheveningen, Norddeich, Paris, Daventry, Hilversum, Ostend, and (bless him!) Lympne and Croydon, plus three mysteries, two "probably Russian," and one "probably Stamboul." Take a radio badge, sonny! And build the "Sydney" Two.

News from Afar.

COME we now to sterner work! No less than the radio game as played by Britain's sons at Risalpur, on the N.W. Frontier of India. E. R. T., who I take to be Acting Lance-Corporal of the R.A.F., owns one of four sets round about. This cheery gang of radio ruffians, when not in the air "on their lawful occasions," comes to earth to lend a few ears to the ether. They want 5 S W good and hard, as "P C J J is not very good now; in fact, 5 S W is the only one of note. Java next." Greetings from Tallis House, boys! The Elephant and Castle still stands. Also the Empire! Cheer-oh! Mine's a weak lemonade!

Listeners' Notes.

SEPTEMBER 5th. 5 G B. "Grave to Gay" programme, from solemn overtures to merry German (Edward) dances. September 6th. 5 G B. Our Mabel and the Bugginses again. I forgot to mention September 1st at 2 L O, when Ella Retford and Tommy Handley appear. *And*—where is the Vicar of Mirth? He was a tonic, indeed.

Blow at Elementary Education.

THE B.B.C. says that after four years' negotiations with the L.C.C., that body has now agreed to permit listening *at any time during school hours* after the present holidays. I am sorry to hear it. Schools ought to be places for children to work in.

If the matter to which the children listen is educational it would be better given by the masters and mistresses. If the subjects are outside the curricula they are not necessary—if the L.C.C. Education Dept. is doing its job properly.

B.B.C. Versus Fish.

IT is really pleasant to discover instances of the usefulness of the B.B.C.'s non-recreative items, as they are so few and far between. The skipper of the drifter "Ascendant" wrote to the Aberdeen station recently, as follows: "I went to sea on Monday and caught nothing. So was laying out. I received your four o'clock broadcast which said that good fishing was got 50 miles S.E. of Stronsay, so I proceeded there and was lucky enough to get a shot of 90 crans of very fine herrings, which sold for 39s. 3d. per cran." It seems almost unfair to the fish, doesn't it?

The Wireless Doctor.

I HAD a very instructive half-hour recently with the owner of a "wireless" shop, who is continually being consulted by non-technical radio users. His record of "cases" shows that the majority of casualties are due to spent H.T. batteries and burnt-out transformers. Second place is taken by aerial faults and connections wrongly replaced after movement of batteries. Cheap sets, he says, develop the most obscure and amazing faults; wherein lies a moral. And he added that in many instances, in which his clients were ladies, he found that by some peculiar mental process they blamed the B.B.C. for their trouble.

Canada Takes Action.

CANADA is going after interferers with radio with the deadly persistence of the bloodhound. Practically all the electrical power there is carried on overhead lines, to which, during 1927, 80·7 per cent. of the interference with broadcast reception was traced. Now—*all the revenue, nearly £40,000, derived from licence fees, is devoted to detecting and suppressing electrical interference.* Golly! What a Government! Fifteen cars are on the job. During the year ended March 31st, 5,436 sources of trouble were investigated, of which 4,880 were definitely reported cured. It sounds too good to be true, yet I believe it, because I know the "live wire" who does it.

Yo, Ho, Ho!

OVER here we call them "pirates"—those innocent gentry who bilk the Post Office of licence fees and give the most heartrending excuses for so doing. In Germany they are not so romantic, and call them "Schwarkörer," which is very nasty. Nevertheless, the penalty seems to be having effect, because in the quarter Jan.–March only 551 were sentenced, as against 618 in the period Oct.–Dec., 1927.

ARIEL.

SHORT WAVES.

Salesman: "This is the most selective set we have. You can absolutely tune out every station except the one you want."

Sandy: "Aweel, it seems tae me 'twould be better, gin ye could get mair than ane. 'Tis nae use wasting guid music when ye ha' paid oot siller tae hear it."—"Radio News."

* * *

"Valueless wireless set; new device," we read in a Sunday paper.

Well, ours hasn't been much good since father tried to repair it.

* * *

When you buy that new super-six valve set with a range of ten thousand miles, if at first you don't succeed, lie, lie, lie again.

* * *

ALWAYS FOLLOW INSTRUCTIONS.

Sharpe (radio expert): "What on earth are you grinding up that copper wire for?"

Dulle (radio novice): "Well, I'm putting in my radio set, and it says here that good ground wire is the most important thing about the installation."

* * *

The debt I owe to radio
I know I cannot pay;
And now there whispers down the wind
A wonder due to-day—

It's all that television plan
(Confusing, I confess);
I hope to see that "Magic Isle"
The "Wrigley Spearmen" stress.

* * *

Blinks: "The senator's a consistent prohibitionist, isn't he?"

Jinks: "I'll say he is. He wouldn't even have a wet battery on his radio set."—"Radio News."

* * *

"Such tests are doubtless interesting, but they do not prove that wireless as such has any particular power to overcome deafness, nor does one quite see how that could be," we read in the "Morning Post."

In fact, one often fervently wishes it would have the opposite effect.

* *

Householder (from above, disturbed by voices downstairs): "Who's there?"

Burglar (with great presence of mind): "W R N Y now closing down. Good-night, everybody."—"Science and Invention."

RADIO'S "STARS" AND "STRIPES"

Some further interesting facts relating to radio conditions across the Atlantic.

By LAWRENCE W. CORBETT,
Formerly "P.W.'s" Correspondent in America.

A DEVELOPMENT that is likely to have a far-reaching effect on radio broadcasting in the United States has recently come about—a development that carries more significance than at first meets the eye. The nomination of Herbert Hoover by the Republican party as their candidate for the presidency of the United States will be generally approved by the radio industry, and if, as is popularly predicted, Secretary of Commerce Hoover is finally elected to be the spokesman of his country, listeners throughout the United States may feel that their president will see to it that an intelligent and shrewd administration of radio is effected.

It would be silly to say that Secretary Hoover was unknown before the advent of broadcasting; but it would, on the other hand, be no exaggeration to add that he made millions of friends through his judicious control of broadcasting when in its swaddling-clothes days. Nowadays, as most people know, broadcasting in the United States is controlled by a commission, the members of which are appointed by the President; and Secretary Hoover, who at one time reigned supreme, has no longer any say in the matter.

Radio Control.

It was largely due to his political opponents that power of control was removed by legislation from his hands, for they feared at the time that he was becoming too influential in State matters and was gaining in favour as a possible presidential candidate. It is interesting to see of what little avail their efforts have been.

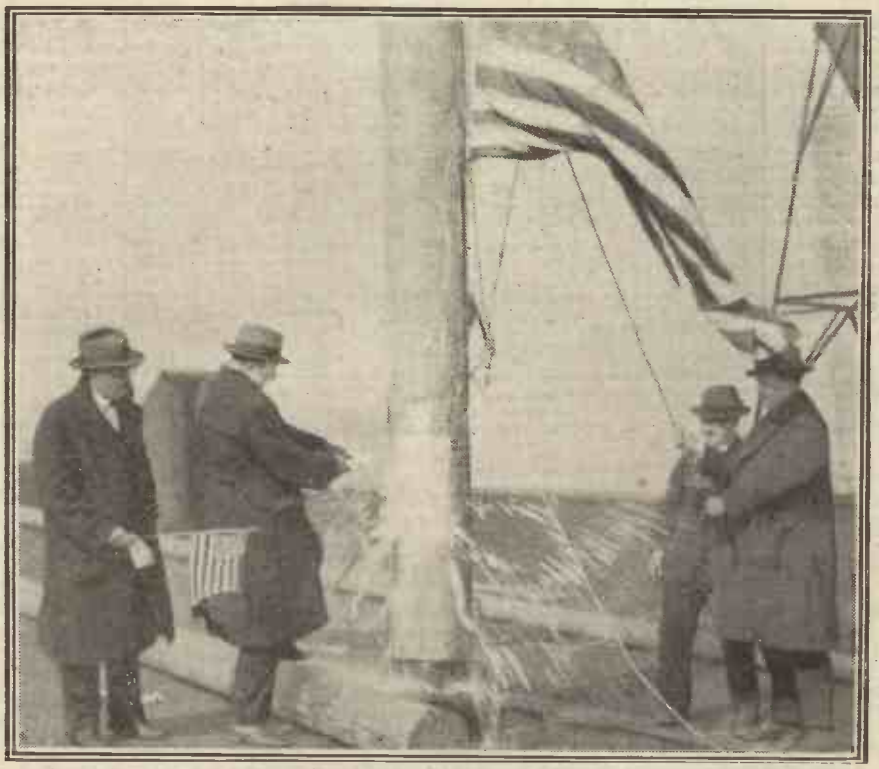
Herbert Hoover's election to the presidency would be a popular one to the American listener if for no other reason than that, as President, it would fall to him to elect new radio commissioners when the terms of the present radio commission members expire, or in the event of their premature resignation.

A Non-Technical Commission.

The present radio commission has been singularly lacking in initiative in the administration of its business. Although it came into being over a year ago it has done nothing useful to alleviate broadcasting congestion. Sadly, none of its members can claim that technical knowledge which one would rightly suppose should be an essential qualification of a commissioner entrusted with the correction of the present chaotic state of affairs.

The commission, indeed, has had a stormy time, for, by death or resignation, most of the original five members have had to be replaced. Each time a vacancy occurred it was hoped that President Coolidge would fill the post with a technical expert, but every time he has failed, turning instead to a lawyer or such-like.

The latest appointee is Judge Ira E. Robinson, who is now chairman of the commission. As an expression of the feeling which coincides with most of the President's steps in choosing radio commission members, we cannot do better than quote from a recent editorial in "Radio Broadcast" of New York:



An impressive ceremony at the occasion of the opening of station W G B S, of New York. The American flag was hoisted on one of the poles supporting the aerial system, while Dailey Paskman, the station director, broke a bottle of champagne, thus officially "christening" this new Astoria station.

Unqualified!

"We weary of complaining of the President's appointment to the Commission of men totally unfamiliar with the problem. Judge Robinson is a delightful character and adds decidedly to the social grace of the Commission. Years of legal training have vested him with what might be termed as an excess of caution, and the President may rest secure that, while the Commission is under his leadership, nothing but well-considered steps will be taken. The Judge is totally unqualified from the radio standpoint, having not the least understanding of service and heterodyne ranges and broadcast congestion.

(*Continued on next page*)

RADIO'S "STARS"—AND "STRIPES."

(Continued from previous page.)

. . . What the Commission most needs is one or two commissioners who have some understanding of radio."

With a man like Hoover, then, whose sympathies are in accord with those of radio listeners at large, we can see a silver lining to the cloud which so darkly and persistently has been hovering over the American broadcasting industry. "Hoover for President," will be the cry of all American wireless enthusiasts.

Everything else notwithstanding, the commission did break through its shell a little while ago and actually ordered a station off the air! Naturally, that station was warned many times before that it was not keeping precisely to its allotted frequency, but, as in the case of hundreds of warnings to other stations, it probably found its way to the waste-paper basket!

Can you imagine the courage that the commission must have mustered actually to order a station off the air? Let us not remember, though, that the commission was expected to order three hundred stations off the air ages ago! The station deleted, incidentally, was only a baby two-hundred watter on 214 metres. Congestion is so bad on these shorter waves, anyhow, that one stray station more or less down there cannot do much more damage. The commission's step will serve as a warning to other offenders.

Chaos Everywhere!

The word chaos applies not only to the state of radio broadcasting in the United States but to the radio industry itself. A sure indication of this is the failing condition of the wireless press, due, in turn, to lack of support of the manufacturers in their advertising columns.

One popular monthly wireless magazine is trying a plan radical in nature in an endeavour to make both ends meet. The editors have approached a group of manufacturers, put before them the figures representing the cost of producing the magazine, and have asked those manufacturers to foot the publication costs bill in return for editorial and advertising space of a guaranteed amount. In its new form the magazine in question can be considered nothing more nor less than a house organ of the combined manufacturers.

Many and varied have been the theories advanced in explanation of the upset condition of the industry. Over-production, combined with a superabundance of manufacturers, seems to be one very logical reason.

Another is that there appears to be an everlasting stream of developments, minor in nature, yet each heralded as epoch-making, and this naturally shakes the confidence of the prospective purchaser. If each day he hears of something new and revolutionary being developed he is going to wait for the ideal receiver which cannot be so very far off.

That poor programmes are the cause of lack of interest in wireless is only a weak excuse applicable, perhaps, to out-of-the-way towns and villages where talent is at a premium. In the larger cities the programmes, bearing in mind that there are several to choose from, are excellent. And "chain," or simultaneous, broadcasting has been developed to such a point that it would be hard to find a spot anywhere in the United States that could not be reached, at a pinch, with a simple valve receiver, providing, of course, that conditions are favourable.

The Patent Position.

Naturally the present state of broadcast congestion does not help the industry, but potential set purchasers have not really been influenced by conditions, for they have believed the Radio Commission's oft-repeated promises that broadcasting will be improved "almost immediately."

This photo shows the massive control panel of W E A F's new 50-kw. transmitting plant at Bellmore, L.I., N.Y. It is being operated by Raymond E. Guy, one of America's radio "old-timers."

Perhaps the patent laws most of all things are helping to unseat the American wireless industry. So bad have they become that an investigation, instigated by Senator King, has been instituted. It is said that there are 95,000 patent applications for attention in the Patent Office.

Applications Waiting for Months.

Many of these have been waiting for anything up to eight months, while it takes two to seven years after a patent is applied for before protection is actually granted. As matters now stand a wireless manufacturer may apply for a patent for a piece of wireless equipment which may be out of date by the time the patent is granted.

Wireless "Pirates."

Unscrupulous manufacturers, as soon as a new wireless device appears on the market, copy it to the minutest detail. They know full well that they will hardly be proceeded against, for the cost of litigation is prohibitive and might possibly absorb all the profits made from marketing the device under discussion.

There are very few exceptions to the rule that three months after any new piece of wireless equipment is placed on the American market it may be purchased retail at a third off list price. This, again, doesn't help the industry and is a direct result of over-production.

Usually it is a case of a jobber becoming overstocked and selling the merchandise to the retail outlet for whatever he can get for it—at what it cost him, probably, enabling the shop dealer to cut out middleman's profits and perhaps take a sharp cut himself with the hope of doing a big turnover.

There is a special district in Downtown, New York, where cheap wireless goods may be purchased at anything from a third to three-quarters off list price, depending upon the supply and demand. There are, perhaps, fifty of these shops within a half mile of a central point—even more than fifty.

Receiver Design.

Very often when a manufacturer decides to concentrate on a new line he will sell out his present stock to these dealers in "gyp" street, as it is called (but more correctly known as Cordlandt Street), sometimes amounting to ten thousand cone loud speakers, or such-like. Thus it is not unusual to see a loud speaker advertised for £5 one day and offered for £2 "to clear" the next.

It is difficult to say just what are the main tendencies in receiver design. Curiously enough, a receiver which over here may be described as the latest thing from America, very often enjoys the briefest stay. The Loftin-White, for example, although available in commercial form, created little interest among home constructors.

The popularity of a circuit really depends on the cleverness with which it is marketed and the amount of eulogy it obtains in the press. Your American cousin would not dream of wasting his energy winding a coil at home, and if he takes a fancy to a circuit, likes to be able to go out, put his seventy-five dollars on the counter, and pick up a cardboard box with all the necessary parts ready for assembly—the "kit" set!

An interesting and recent development is the use of buttons instead of knobs for tuning. A receiver has been placed on the market with the innovation and is likely to have a large appeal. Due to the dial mechanism it is only necessary to press a button to tune-in successive stations with this receiver.

The "CHOKE-RETURN" ONE

A really inexpensive and easy-to-build little set which embodies a novel circuit. The majority of the components used in it have figured in the previous one-valvers recently described by the author.

Designed and described by C. P. ALLISON, A.M.I.R.E., F.Inst.P.Inc.

WHILE looking through my notebooks recently I came across a circuit which I first discovered during the course of some experimental work which I was carrying out on super-regenerative circuits in the late autumn of 1923. To the best of my recollection this circuit has received very little attention, and I do not think that its exact action is really properly understood.

I have checked up the results I obtained when I first tried out this circuit, at various times, and found them to be remarkably consistent, and I finally decided to use this scheme in the series of single-valve receivers which I have been describing.

COMPONENTS REQUIRED.

- 1 ·0005 variable condenser (Formo or other baseboard mounting type, such as the Lissen).
- 1 ·0003 variable condenser (see above).
- 1 Sprung valve holder (Ashley, Benjamin, Bowyer-Lowe, Burndept, Burne-Jones, Cosmos, Igranic, Lotus, W.B., etc.).
- 1 H.F. choke (Burne-Jones, Climax, Colvern, Cosmos, Igranic, Lissen, Peto-Scott, R.I.-Varley, etc.).
- 1 ·0003 grid condenser (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 ·0005 fixed condenser (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 Fixed resistor for filament control.
- 1 ·3-meg. grid leak (Dubilier, Igranic, Lissen, Mullard, etc.).
- 2 Baseboard-mounting single-coil holders.

Terminal strips, wire for connecting up, screws, soldering tags, and a wooden baseboard 12 in. × 8 in., and about ¾ in. thick.

The special feature about the circuit used in this set is that the bottom of the tuned circuit is not taken direct to low tension, but is connected through a low-frequency choke, which is shunted with fixed capacity.

Origin of the Circuit.

The experimenter who has done any work with super circuits, especially those of the single-valve "flivver" type, will immediately see how this circuit, which is shown in detail in Fig. 1, was evolved.

On consulting the theoretical diagram it will be seen that the aerial is auto-coupled to the grid circuit of the detector, tappings being provided on the inductance L_1 for this purpose. Another inductance, L_2, which is coupled to L_1, in conjunction with the variable condenser C_2 and the usual H.F. choke, shown as L_3, enable capacity control of reaction to be obtained.

Magnetic Reaction Available.

In view of the fact that many experimenters are of the opinion that magnetic reaction is more efficient than capacity reaction, the circuit is shown re-arranged for their benefit in Fig. 2, employing throttle control for the feed-back. This gives all the advantages of magnetic reaction from the electrical point of view, combined with those of capacity reaction as regards ease of operation. The same number of components is required in either case, so that the question of cost does not enter into it.

It will be seen from Fig. 2 that I have shown the reaction coil L_2 coupled to the low-tension end of the grid coil. Care should be taken to do this if possible, since then the least interaction between reaction and tuning controls will result.

In the actual construction of this receiver I have adhered to the more or less standard lay-out which I have employed throughout the series. I have designed this particular set so that plug-in coils can be used, though, should you wish to, there is no reason why you should not use an interchangeable six-pin former as long as it is provided with suitable windings. The coil unit which I have employed in the "Free-Grid" One, for instance, could successfully be used, or

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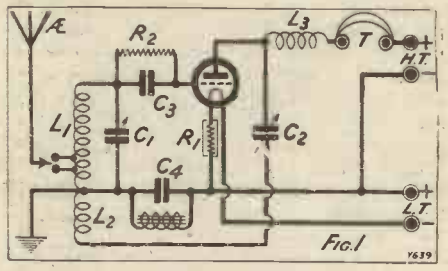
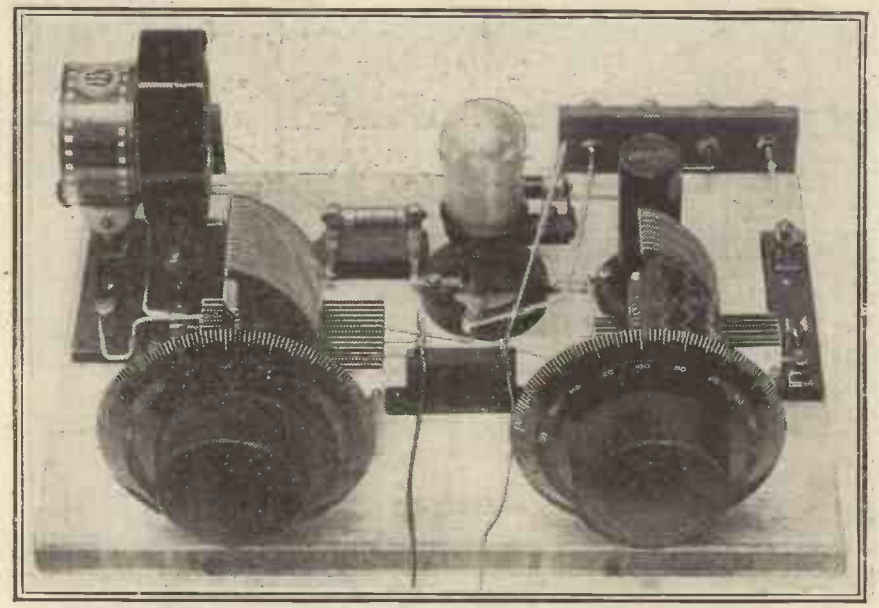




The set is assembled on a simple wooden baseboard, and this makes the wiring very easy. It will also be appreciated that this scheme is an excellent one in a more or less experimental set, in that it renders all components and accessories completely accessible.

THE "CHOKE-RETURN" ONE.

(Continued from previous page.)

else a Reinartz transformer or a split-primary H.F. transformer.

As a guide to those who have not seen the previous issues of this paper which contained the first sets in this series, I think it advisable to give a list of the components I have used for the construction of this receiver.

POINT-TO-POINT CONNECTIONS.

Connect socket of coil base for L_3 to plug of coil base for L_1, to moving vanes of C_1, earth, and one side of C_4.

Other side of coil base L_1 to one side of grid condenser C_3, and to fixed vanes of C_1.

Other side of C_3 to grid terminal of valve holder.

H.T. — to L.T. + to one side of R_1 and other side of C_4, other side of R_1 to filament +.

Anode of valve holder to terminal A on H.F. choke and fixed vanes of C_2. Moving vanes of C_2 to plug terminal of coil base L_2. Other side of H.F. choke to one telephone terminal, other telephone terminal to H.T. +.

L.T. — to filament —.

Connect a piece of flex, provided at one end with a spade tag to the aerial terminal. This may be connected to either tapping of the X coil.

Connect two pieces of flex to each side of C_4 for connecting the L.F. choke.

Those, however, who have made up one of the previous receivers will find that they already have practically all the components required to make up this set should they decide to experiment with it.

The constructional work involved is practically nil, all you have to do being to make up the terminal strips and mount them together with the components on the baseboard. A very handy size for the baseboard for all these sets I have found to be 12 in. × 8 in. The wiring diagram gives all the details required to complete the receiver, which, it will be seen, is an easy piece of work, requiring the expenditure of but little time and still less energy.

Connecting Up the Set.

The first point to check up after the completion of the receiver is that the correct control of reaction is obtained. For this purpose connect the receiver up to its batteries, insert the requisite coils, connect the telephones, and put a valve in the holder. It should be noted that as the value of the reaction condenser is increased a point is found at which a slight rushing, hissing, rustling, or breathing sound becomes audible. In cases where dissimilar makes of coil have been used for L_1 and L_2, it may be found necessary to reverse the connections going to the second of these. Don't reverse the connections to L_1, since this is an X coil, and if you do the aerial will be tapped on to the grid end of the coil instead of the earth end.

Having got the reaction control to function normally we will now consider some of the points relating to obtaining the maximum efficiency of the set.

You will no doubt have noticed that no L.F. choke is shown in the practical wiring diagram, a couple of leads only being shown going to the fixed condenser, which is connected across this choke. I have done this in order that different chokes may be tried out, so as to see which will give the best results under your particular conditions. I have found that the secondary of an L.F. transformer works very well here, and you may have a broken-down transformer somewhere which will do well in this position. On the other hand, you may have a suitable choke which you do not wish to tie up permanently in the set. The provision of the flex leads, therefore, makes it an easy matter to connect an L.F. choke temporarily while the set is in use.

I have found it important that the choke used does not approximate to the telephones as to its characteristics, since, should this occur, it will be found that the control of reaction is impaired, and a threshold howl may result.

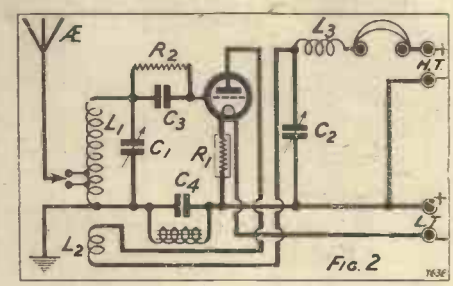


Fig. 2

Almost any valve is suitable for use in this set, preferably of an H.F. type.

The grid coil should be a tapped coil, such as a Lissen X or a Lewcos tapped coil, No. 50 or 60 being the correct size for the broadcast wave-band. The aerial will be connected according to the degree of selectivity that may be required. The reaction coil will lie between 25 and 40, and a suitable size will allow the set to oscillate with the reaction condenser half-way in at the midpoint on the tuning dial.

Long Wave Coils.

For the reception of 5 X X the coils required will be No. 250 X coil (No. 200 if a Lewcos is used), and the reaction coil will be between 75 and 150.

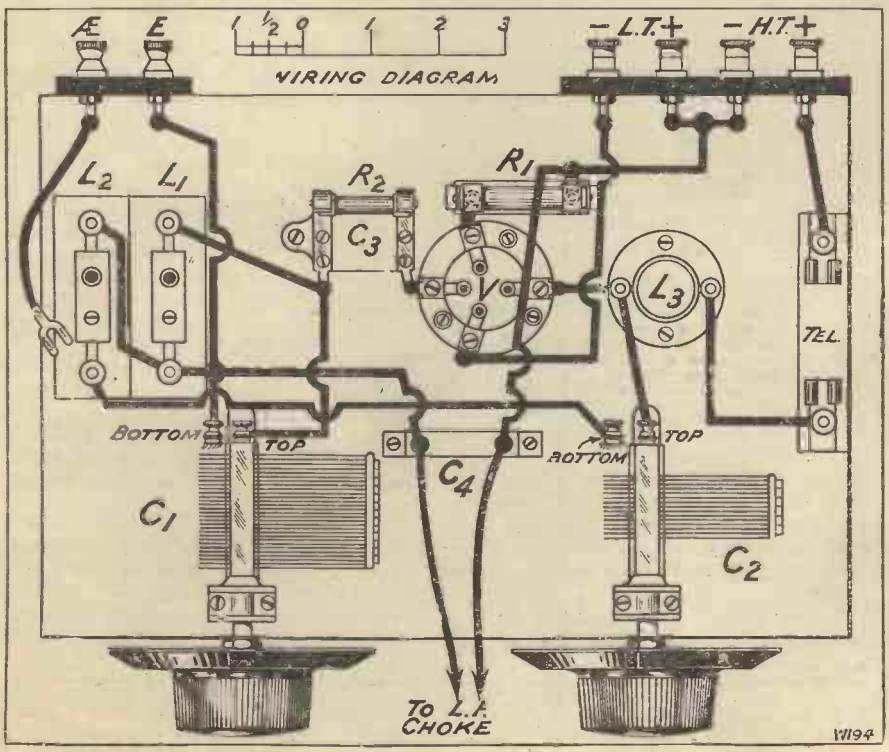
In order to obtain the maximum efficiency from the valve as a rectifier, it is desirable to use as high a value of high-tension as available, and suitable coils should therefore be chosen for the reaction winding, bearing this fact in mind. Of course, if you only have a small high-tension battery, say 50 or 60 volts, a larger coil for reaction will be needed.

It will be noticed that I have retained the clip-in base as a means of connecting the telephones in circuit, as used in the previous sets, though, of course, if you prefer to do so, fit a couple of telephone terminals by all means.

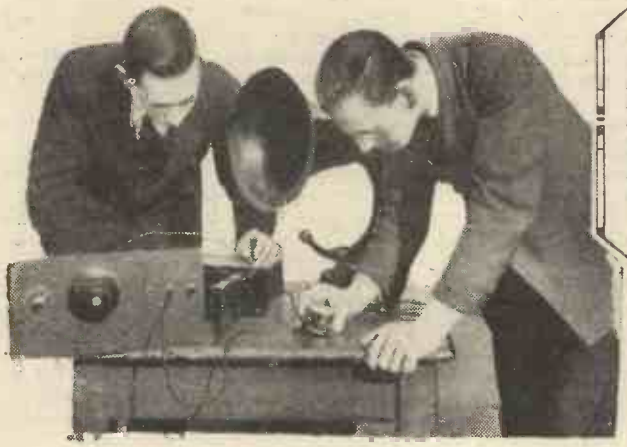
Operating the Set.

This circuit is somewhat more critical than the usual detector circuit as regards the value of grid leak which will give the best results. It is difficult to say just what value would be best in every case, since the choice of the grid leak is governed to a certain extent by the characteristics of the L.F. choke used in the grid return. The effect may also be tried of connecting various values of capacity across the telephones, not with the idea of by-passing any H.F. component—obviously this is not present, since an H.F. choke is used—but because the particular advantages of this circuit would appear to be due to the presence of a certain amount of L.F. reaction.

Should it be intended at any time to follow this set with a stage of L.F. amplification it may be necessary to try out various L.F. transformers in order to find one which would be most suitable for this circuit.



THE NEWCOMER TO RADIO



This is the first of a short series of articles written especially for the Beginner in Radio, although it is probable that even advanced amateurs will find it of interest and value. You need not expect a long diatribe on dry-as-dust theory in this series; actually it consists of a fascinating combination of a chat on how to build a set and breezy descriptions of what all the parts in it do. You are shown how to construct a powerful valve set in stages, and you can leave off at any stage without the work being wasted. Ask your radio friends if they remember Mr. Dowding's popular Beginners' Series and Progressive Set of last year. This series is a combination of two such ideas, written for the absolute novice who wants to take a short cut to the possession of a first-class set and a knowledge of how it works.

By G. V. DOWDING, Grad.I.E.E. (*Technical Editor.*)

I AM going to assume that your ideas regarding radio are of the vaguest; that you know only that there are broadcasting stations and that there are instruments which, by the twiddling of knobs, let one hear what those broadcasting stations have to say for themselves. If you have picked up, in one way or another, one or two scraps of information which you think will be of value to you, do please try and forget them, for they might keep cropping up in the wrong places. At least forget them until you have read these articles and I have taken you up to the point where I am going to leave you to your own devices.

Beating the Manufacturer.

Now, it is very hard for me to know exactly where to start, for every newcomer to radio will not want to take exactly the same road. The best thing I can do is to indicate a general direction and, as we proceed, sketch one or two alternative routes. First of all, you must ask yourself exactly what you are going to do, for we must now dispense with vagueness and get down to hard brass tacks.

You are certainly going to make your own set, for that is half the fun of this radio business. Also it is the most economical procedure, and, further, it is the way to attain the best receiver. I am letting you into no secret when I say the constructor is always just a little ahead of the radio-set manufacturer. There are cases when he is a long way ahead.

You see, the art of set design is always advancing, and I cannot remember a period of even three months where it has stood absolutely still. Broadly speaking, the progress may be slow, but it is very sure. A set manufacturer cannot always be altering his designs. If he produces a new series of models every year, like a car maker, then he is going forward just about as fast as is economically possible. But the set constructor who takes a real interest in his hobby can be bang up to date all the time.

Keeping Up to Date.

He can take advantage of every minor development and can embody in his set every new refinement as it comes along. Do not get the idea into your head that every two or three months there is a revolutionary radio discovery made known. Actually there have only been two or three revolutionary radio discoveries in the whole history of wireless, and in order to keep abreast of the times you do not have to rebuild your set every two or three months. But every year sees a series of minor developments of which only the radio-set home constructor can take real advantage.

Not an Expensive Business.

And it is not an expensive business. Do not imagine that you will need to pour a steady stream of money into your hobby. Many of the developments I have referred to mean only slight rearrangements of existing parts. The majority of the actual components very slowly indeed grow obsolete.

As a matter of fact, you are coming to radio at an opportune time. Many of the components appear to have reached a standard from which it is difficult to see that they can materially advance for some very considerable time. For instance, the variable condenser, a component which figures in practically every set. I think I can safely say that if you purchase a good make of variable condenser to-day it will still be giving you as good service as any obtainable some years hence. And similarly, it would take a revolution which it would not be practical politics to anticipate to render obsolete a very great number of the other components for a further decade or two.

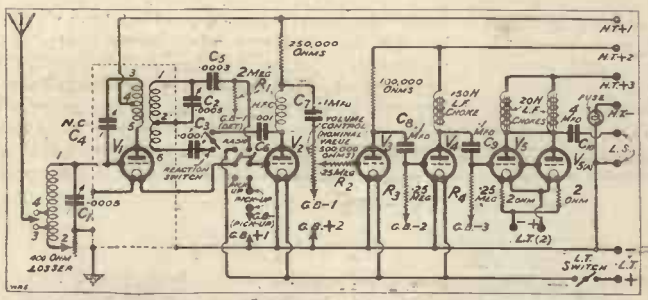
I want to press this point home, for it is imperative that you should realise that, despise the progress in radio, there is still, and perhaps, paradoxically, a high degree of stability in the art. The pounds you spend to-day are going to be a good investment and you can take it from me they will give you ample return.

There is not the faintest sign of anything on the horizon that will come along to upset things. Even television, when it does arrive, in the misty future, will no doubt necessitate another instrument *supplementary* to the ordinary receiver.

Just note this point. That great revolutionary development—I think I can call it that—broadcasting, started in this country in 1922, but the wireless receiving set which I built in 1911, eleven years before 2 L O started its programmes, is quite suitable for the reception of broadcast concerts. True, it is a crystal set, but it is interesting to note that the loudness and quality of its results fall very little short of those given by modern sets of the same character. So much for that.

Three Classes of Enthusiasts.

The next point, and one which it would be advisable for you to settle right away, is whether you intend to make one set and one set only and then become an appreciative or critical listener for ever after, or whether you intend to make the construction of radio sets a real hobby. Maybe you would prefer to leave the decision till later on, after you have given set-building a trial. But remember this point, because you will find it of importance later on.



You have probably seen drawings like this before, and have been led to believe that radio can only be a real hobby to those who have been scientifically trained to read such masses of mystic symbols. But if you find the first Beginners' article of interest, carefully keep this copy of "P.W.," and in a few weeks' time refer back to the above diagram. You should then be able to glance at it with a new interest.

In my own mind I have always classified enthusiasts under the three headings of—listeners, constructors and amateur experimenters. And I do not call a man who makes one set and then settles down to a life of solid listening a home constructor. I suppose he is really, but the building of a modern receiver, in view of the way in which manufacturers cater for the man who "makes" a set these days, does not in my mind imply so much construction as a mere assembly of parts.

The Home Constructor.

My home constructor makes a fair number of his own parts, such as coils, and so on, and having built one set does not mind taking it to pieces again and rebuilding it if he sees another circuit that takes his fancy. And, by the way, the real home constructor has a unique opportunity of trying out a large number of circuits.

(*Continued on next page.*)

THE NEWCOMER TO RADIO.

(*Continued from previous page.*)

In order to do this he does not have to have new components every time. The same components can figure in all sorts of sets. If you want to try six circuits in each of which figures what is known as an L.F. transformer, this does not mean that you have got to buy six L.F. transformers. It is not only possible but highly probable that the same transformer can be used in every case.

Anyone Can Build Sets.

My third class of enthusiasts comprises people who branch out into experiments of their own. They do not merely assemble sets in accordance with published specifications, but try "wangles" and variations of their own. But one must graduate into this class slowly, for a fair amount of experience is needed before you can "leave the book."

But the beauty of radio is that one does not need scientific training before creative work is possible. In fact, many minor improvements have been contributed by amateur experimenters who, before broadcasting, knew practically nothing at all about radio or even electricity. But again, I must repeat that you cannot jump right into my third class.

Here is an enthusiastic constructor connecting up his new set for the first time. Will it work? is the question he asks himself as he fits on the final lead. You can confidently anticipate success with the "Newcomer." Three if you carefully follow the fascinating how-it-works series about it which starts this week. No previous radio experience of any kind will be needed.

However, it is my purpose in writing these articles to prove how interesting and comparatively easy is the route that has to be covered. At the moment you may consider that the assembly of even a simple type of receiver is a very tricky and difficult affair, but in so doing you will be quite wrong. I have no hesitation at all in saying that provided you can use a screwdriver and can manipulate a pair of pliers you can assemble a radio set.

Supposing you pick on one of the receivers described constructionally in POPULAR WIRELESS as being the sort of set which, according to the introductory remarks and so on, would give you the service you demand. You can go to the radio store and show them the list of components, and they will provide you with a complete set of parts. You can identify the parts by the photographs in our descriptions, and screw them down as explained. The parts are then joined together by pieces of wire. And when you have them all before you and the article is consulted, you will find that the work of assembly is almost as simple as hanging pictures on a wall.

Concerning Diagrams.

But do not think I am sneering at this simple operation. It will provide you with as good a set as you can buy for the cost of the parts, and, simple though the work may be, you will have learnt at least something about radio in carrying it out. You will learn even more when you join the set up to its various batteries, and so on, and start to use it.

It is quite unnecessary to dig into the theory of wireless telephony before you start the job, although if you wish to do so a superficial knowledge of the why and wherefore of the various things you use will add to your enjoyment of the task.

An experienced constructor can build a set comfortably without referring to anything else other than what is known as the theoretical diagram. Have a look at the theoretical diagram I have reproduced with this article. No doubt, to you, it appears a bewildering jumble of cabalistic signs, the sort of thing of interest only to the advanced radio engineer. But I would not mind wagering that should you take an intelligent interest in this hobby of radio-set construction, you will, without any undue mental exertion, be able to interpret that diagram with the greatest of ease at the end of the present radio season—and, no doubt, you will by then also have your own ideas as to the electrical values of the various components used in such a circuit.

For the present I must say that I am hoping that the simple practical wiring diagram which accompanies another article in this issue (page 860), arouses your curiosity. Perhaps at the moment you do not believe it, but I assure you that it will be only a matter of a week or two before you will be able to interpret diagrams of this nature.

Theory Combined With Practice.

At the present moment you are a newcomer to radio. At the very earliest moment you must build a set. Perhaps you have heard plenty of receivers working, and have not been too greatly impressed by the sounds emanating from many of them; but you can, with confidence, make up your mind that your set is going to give results as good as, if not better, than the best one you have hitherto heard.

Having read this article through to this point, I know you are sufficiently interested not blindly to build the first design that comes to your notice with the first components the shopman puts on his counter before you. You want a set, but I am sure that now you will wait until you have read a further article or two of this series before you start work.

There are several things that you must know, and there are several problems you must solve for yourself, before you will become an appreciative constructor sufficiently enthusiastic to take the fullest advantage of the advice we are able to put in your way.

Many beginners' articles start with a lot of rather uninteresting theory. Theory without practice must always be uninteresting, but I am attempting to combine theory with practice, and there will not be much theory, but rather a lot of practice. I want you to build a set, and as you put the parts together I am going to tell you interesting things about them. This, I think, is the quickest and most interesting way to acquire a real understanding of a receiver.

Some Important Questions.

Now for one or two little points which you have got to settle before you actually get to work. What do you want your set to do? Are you going to be satisfied, for a beginning, to get only the local and alternative programmes? Are you going to aim at the highest degree of quality and purity of reproduction? In this latter case you must be prepared to sacrifice many if not all of those distant broadcasting stations in other lands.

Distance and purity do not always run parallel. How much money do you intend to spend? Do you intend to dabble in the fascinating short waves of which you have no doubt heard? Next week I am going to start helping you to answer these questions.

ODD RADIO ITEMS.

TWO new wireless direction-finding stations have just been erected by the American Government, to assist aviators on the new trans-American air line between New York and Cleveland.

* * *

By means of special apparatus which is being perfected, the new American air beacon wireless stations transmit signals which gave *visual* indications to the pilot on the air liner.

* * *

The Postmaster-General recently stated in the House of Commons that television was still in the experimental stage, and the time had not yet come to make arrangements for the provision of a public service.

* * *

It is proposed to hold a wireless exhibition in Dublin from October 6th to the 13th under the auspices of the Irish Radio Traders Association.

* * *

Berlin is contemplating the erection of three relay stations in the vicinity of the city, working upon a wave-length 236·2 metres. (The experiment will be watched with great interest, as when the stations are in such close proximity there is great risk of heterodyning.)

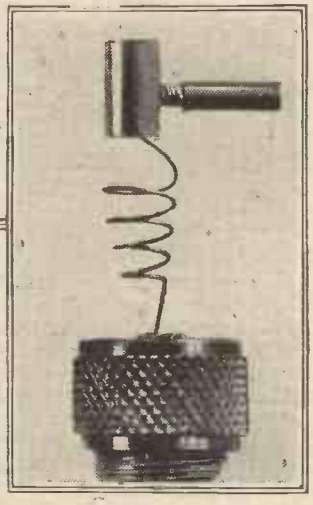
* * *

The Irish Free State made a profit of over three thousand pounds from broadcasting last year.

* * *

Relays from Continental stations are amongst the features for next winter promised to Irish Free State listeners by the Minister of Posts and Telegraphs.

The PERFECT DETECTOR



DETECTOR DETAILS WHICH MAKE OR MAR RECEPTION.

By F. JAQUET.

PERFECTION is a quality which is difficult to obtain in the majority of mechanical and scientific devices, and the truth of this dictum is no more readily to be seen than in the case of the crystal detector. At first sight, a detector appears to comprise such a simple little device that it becomes difficult to understand why a greater degree of perfection has not already been reached in its design and construction.

Naturally, the modern forms of detectors are an enormous advance on the first crude article of this nature. The reader will realise this after a glance at the illustration Fig. 1, which depicts in diagram a working crystal detector of the year 1918. Such an article consisted of nothing more than a slightly bent piece of wire which made a more or less inefficient contact with the crystal.

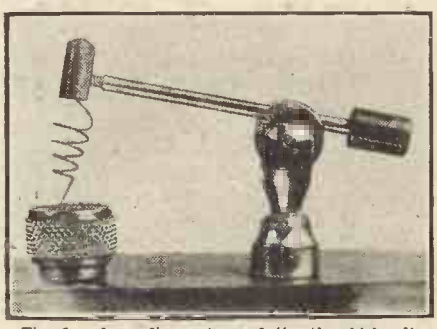


Fig. 1. An ordinary type of "cat's-whisker" detector.

The last four or five years have witnessed the commercial and amateur production of a multiplicity of detectors for crystal working. Some of them have been well-thought-out articles, others have possessed a few good points together with numerous bad ones, whilst others still have been thoroughly bad articles, fit for nothing but the speedy oblivion into which they have passed.

The Ideal.

It is possible, however, to enumerate all the necessary points which an ideal cat's-whisker detector would possess. In the first place, such a detector would be made throughout of sturdy design. It would be, to use that rather unpleasant appellation, "foolproof," and it would be adaptable for use with any type of set.

Considered purely technically, the perfect detector would possess two adjustments, one a coarse adjustment for locating easily the most sensitive spot on the crystal; and the other, a fine adjustment for putting the finishing touches to the sensitive contact. The detector would, again, make it possible to explore almost the entire surface of the crystal with the cat's-whisker, or with whatever contact was employed.

There would be a perfect electrical contact between the moving parts of the detector. The sensitive contact, having been found, would be retained, owing to the increased stability of adjustment. And finally, the whole device would be compact and dust and damp proof.

Fig. 2. A "fixed" detector containing a Perikon contact of zincite and tellurium.

Now it is plain to see that no detector so far produced combines all the above qualities to the utmost degree. The usual plain type of cat's-whisker detector is a very serviceable article for average use, and for this reason it has been able to hold its own against all the more elaborate patterns which have been put on the market.

An Improved Type.

Such a detector, however, is notoriously unstable. The sensitive contact becomes disturbed at the slightest shock, and therefore, for critical work, or for operation over long periods, this form of detector is of little use.

A more perfect form of cat's-whisker detector is typified by the illustration Fig. 4. In this detector, not only is the crystal and the contact mechanism entirely enclosed, but the fragment of crystal is gripped by a metal claw to which a spiral rotary motion can be imparted by rotating the upper knob.

Fig. 4. A completely enclosed detector, in which the cat's-whisker contact is finely adjustable.

In this manner, almost the whole of the available crystal surface may be explored for the most sensitive spots. In point of stability to external shocks, however, this form of detector is quite as unsatisfactory as the simpler pattern already mentioned—if not, in fact, worse than the latter—and therefore the use of these detectors is very small nowadays.

The "Perikon" type of detector, in which the sensitive contact is made between two dissimilar minerals, has a greater freedom from shocks owing to the considerably heavier contact pressure at which the rectification can take place. Unfortunately, however, no Perikon detector is as sensitive as a good galena cat's-whisker detector working at its best, and therefore in the use of a detector of the Perikon type we must necessarily sacrifice a certain amount of sensitivity for greater stability and freedom from shock.

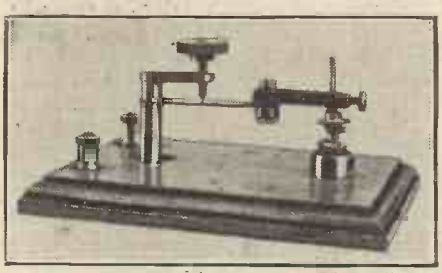


Fig. 3. The Perikon detector, on which pattern all modern adaptations are based.

The Perikon Detector.

A useful form of perikon detector, employing a contact between zincite and tellurium, is illustrated at Fig. 3. This pattern is a considerably old one, but it contains all the essentials of a good detector. The contact pressure is delicately adjustable, and by means of a side-to-side movement of the contact arm holding the tellurium crystal a goodly portion of the zincite crystal can be explored.

A still more recent example of the evolution of the crystal detector is the so-called "fixed" detector (Fig. 2). A detector of this nature would, indeed, comprise a perfect crystal rectifier if it could implicitly be relied upon. Detectors of this pattern contain a zincite-tellurium contact held together by means of an insulative medium, but once out of adjustment cannot be reset.

B.B.C. CONTRADICTIONS.

Why is it that statements concerning broadcasting affairs are so frequently issued, only shortly afterwards to be modified or denied? Is it a publicity "stunt" on the part of the authorities concerned?

By THE EDITOR.

IT is curious how the B.B.C. persists in cloaking its activities with an air of secrecy, and how often that mysterious individual, who figures so often in the daily press as "a B.B.C. official," makes statements for publication in the press which are contrary to known facts.

Within the last few weeks there have been some good examples of this "contradiction policy," as it is now being called in Fleet Street.

Not "Negotiations"?

We published in a recent issue a paragraph by one of our Wireless correspondents to the effect that Sir Thomas Beecham, the famous conductor, had opened up negotiations with the B.B.C., and that the Imperial Opera League, and the new permanent London Orchestra, which Sir Thomas hopes to form, might accept aid from the B.B.C., and that a working arrangement of value to Sir Thomas and to listeners might be arrived at.

But, as we pointed out, Sir Thomas wanted full control of the artistic side of the contemplated enterprise, while the B.B.C., which was finding the money—or part of it—wanted a say in the matter as well. Consequently a slight hitch occurred—a fact which, besides being natural, was pretty widely known to those in touch with broadcasting affairs.

But when questioned on the matter "a B.B.C. official" must needs try and give the impression that the report was not true.

"The position," he stated to a reporter, "is that friendly discussions with Sir Thomas are continuing. Certainly no deadlock has been reached. It is scarcely accurate to refer to negotiations. Sir Thomas has yet to get together a permanent orchestra, and when he has done that the question of broadcasting that orchestra's performances under his conductorship will be discussed. No definite scheme has yet been formulated, and so it is impossible to make any statement as to the progress of the conversations, but they are still going on in a friendly spirit."

Our readers will remember we never suggested a deadlock, and if friendly business talks "are scarcely negotiations," we should like to know the B.B.C. official's interpretation of the word "negotiation."

The General Election.

It is common knowledge that Sir Thomas has yet to get together his permanent orchestra—but before doing so he wants to clear the ground as regards possible future business relations with the B.B.C. It is quite likely, indeed, that the future of his proposed new orchestra, and the Imperial Opera League, may conceivably turn on the success or otherwise of his "friendly talks" with the B.B.C.

We hope all pans out well, and that Sir Thomas and the B.B.C. will come to a mutual satisfactory understanding. But the ambiguous and contradictory statements made by "a B.B.C. official" will not help matters.

Our readers are well aware that, owing to disagreement between Liberals, Conservatives and Labourites, political broadcasts have been more or less shelved by the B.B.C. But there is every reason to suppose that broadcasting will play an important rôle during the next General Election in May, 1929.

Discussions are already going on in rival party camps as to how broadcasting may best be utilised in the coming political struggle, but the scheme most likely to be adopted is one which would include the use of giant loud speakers at indoor and outdoor meetings in various centres of the country.

A Possible Scheme.

Each loud speaker or group of loud speakers would be linked by landline to the station at which a party leader would be broadcasting before the microphone and as well as reaching a huge audience by wireless the landline speakers would also convey his words to subsidiary meetings in all parts of the country. The B.B.C. will certainly repeat its invitation—which was made at the last General Election—to the leaders of the three parties to broadcast from Savoy Hill, but whether more than one speech will be allowed remains to be seen.

Capt. Kingsford Smith, C. T. P. Ulms, James Warner and Capt. Lyons, of the trans-Pacific plane "The Southern Cross," broadcasting from Melbourne after their remarkable feat.

RADIO-STAMBOUL.

Its chequered history during the past year.

From a Correspondent.

THIS station began to broadcast Turkish and European music about a year ago, and a full account of it, with several photographs, appeared in No. 268 of POPULAR WIRELESS dated July 23rd, 1927.

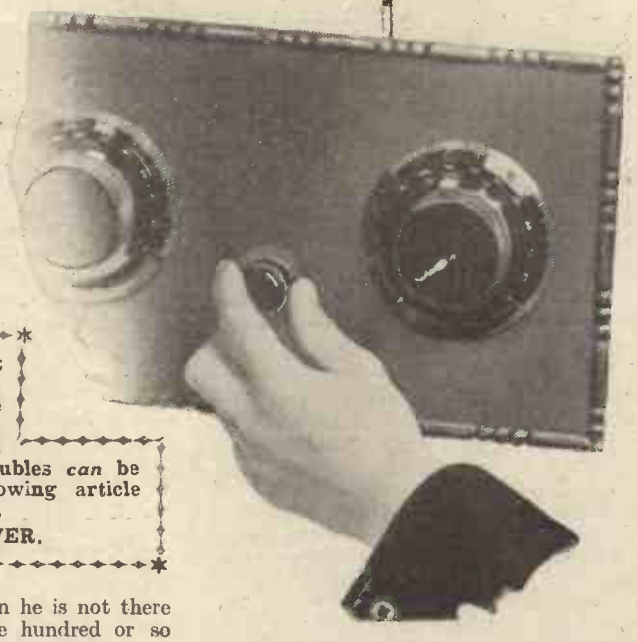
This is the only station in Europe which transmits Turkish and other oriental music. It has no doubt been picked up by amateurs in England, but I am afraid that the weird and monotonous character of this music does not appeal to the western ear.

Radio-Stamboul has had a rather chequered history during the past year. After running for a few months the station closed down for a time, the reason alleged by the company holding the concession being that the transmitting apparatus had broken down.

Curiously enough, the Turkish postal authorities at once contradicted that statement in the local press and explained that the stoppage had occurred because the company had got into financial difficulties and could not pay the electricity company for the current used. Eventually the Government took over the station themselves and broadcasting was resumed.

There are many reasons why this station has not been a success. In the first place, amateurs found great difficulty in obtaining permits. The police interrogated each applicant and made inquiries regarding him—especially if he was a foreigner. In several cases permits were refused. Then, if the application was approved, the applicant had to pay a tax of 25 per cent of the value of his receiving apparatus, besides the annual subscription of about 23s. The music has been very poor, while there is constant spark interference.

MIND *that* SWITCH



Practically every set has at least one switch, and that many are the cause of trouble in one way or another cannot be denied. Such troubles *can* be avoided, as the following article indicates.

By D. GLOVER.

A SWITCH which figures on the majority of sets these days is that one which, by breaking and making the low-tension circuit, switches the set on and off. Automatically at the same time it also controls the H.T., in that when the filaments of the valves are not glowing no H.T. current should be flowing.

This is all very well in the case of a set using battery H.T. supply, but when one comes to mains units, the switching is not quite so perfect. All the time the mains are joined to an H.T. unit there will be considerable pressures across certain components. Also, one must not forget the earth-breaking condenser, which figures in sets employing D.C. types of H.T. units. In some cases this condenser will be the only barrier between the supply system and a direct earth.

High Voltage "Live" Wires.

Should it break down—that is, the condenser—the deplorable effect might be that the device will be directly shorting the supply circuit. At the least, this means the blowing of the fuse. This indicates that if you are using a mains unit it would be inadvisable for you merely to switch off your L.T. switch and go away for a holiday. If you shut down your outfit merely by this means, it means to say that, as previously indicated, electrical stresses are present for twenty-four hours out of every day, and you should note that many fixed condensers have definite lives.

You should, therefore, every time you switch your set off, switch off also the mains unit, for preference disconnecting this entirely. It is an advantage also to switch off the H.T. should you use batteries for this supply. Especially will this be the case should H.T. bypass condensers figure in your set.

The filament switch on this set has a vertical movement and lends itself to clear panel marking in order to indicate its action.

Another point of view is that if you do not disconnect the H.T. you have a permanent system of high-voltage "live" wires. It is a fact that if the authorities demanded a safety inspection of radio apparatus no competent electrical engineer would pass the average receiving outfit. He would first of all demand much heavier leads from the H.T. battery, covered and probably more widely spaced H.T. terminals on the set, and stouter, better-protected wiring inside it.

But in the hands of the average constructor no doubt the average set is quite a safe proposition, but when he is not there he should see that those hundred or so volts which are wandering about are cut off by the disconnection of the appropriate battery. The filament switch does not disconnect anything outside the set. There are still the long leads which go to it.

If either an H.T. or L.T. battery lead becomes loose and drifts away from the set, dangerous sparking may occur.

It is a regrettable fact that all on-off switches do not operate in the same manner, that is to say some switch the set on when they are pulled out, and some do this when they are pushed in. When changing over to a new set make sure that you are familiar with the operation of the switch and, just as important, see that any one else who handles the receiver is also aware of the change, if any.

A little carelessness in this respect may eventuate in a set being left switched on throughout a whole night, or even a whole week-end, with consequent deleterious results on the accumulator and H.T battery.

Misleading Movements.

Some switches—the type that I like—have very definite actions. A slight pressure and they click in loudly and positively. A gentle pull and out they come, click, into position. But I have come across one or two switches which seem to have half-way positions. If you do not pull them quite hard enough they will come out a certain distance with a "feeling" or a click which gives the impression that they have reached the limit of their travel. It takes a further and rather harder pull actually to complete these movements.

It may so happen that this half-way position gives a similar effect to a full way one—that is to say, it is switched on, anyhow, whether it is half pulled out or wholly pulled out. But, even so, it cannot work properly both ways, for when you push this switch in you might come to this half-way point which gives the feeling that the device has been satisfactorily operated without even altering the condition. The set is just as much switched on as before.

Personally, I consider a switch of this nature ought to be scrapped, and another having a very definite action fixed in its place. Sooner or later, such a component is going to give trouble. You yourself may know of its vagaries, but one day you may ask somebody else to switch the set off for you; with the actual result that the set is not switched off at all.

Wave-Changing!

Nowadays receivers having wave-change switches are becoming very popular. Such an innovation does away with a great deal of coil changing in order to go from the ordinary broadcast wave-band to that of 5 X X, Hilversum, and so on, and it frequently happens that sets having such a refinement employ switches for the purpose of the same type as that used for the on-off operation.

Although this gives symmetry, I am not quite sure whether it is wise. It would not take a very high degree of abstraction on the part of the constructor to switch his set over to Daventry instead of switching it out of action before going to bed at night. The Cossor "Melody Maker" has its filament switch on the terminal strip at the back, a very sound attempt at solving the problem.

But even this is not a complete solution, and I cannot see that there ever could be a simple means of safeguarding the effects of the sort of absent-mindedness I have referred to. So I can take the opportunity of ending this article on the note of its title: "Mind that switch!"

LATEST BROADCASTING NEWS.

P.P.E. TO STAY.

REGIONAL SCHEME ASSURANCES.

(FROM OUR OWN BROADCASTING CORRESPONDENTS.)

A Spate of Denials.

MID-AUGUST discovered a reawakening of interest in the affairs of the B.B.C. This promises to run right on into next radio season. Gossip in the Press Club has it that the third definite denial from Savoy Hill gives the final seal of truth to any story about broadcasting.

Some newspaper men have been complaining about this method of publicity on the ground that it is due to stupidity and lack of enterprise. Observers of this kind would be well advised to study results. After the subsidence of the "Evening Standard's" attack on talks, B.B.C. publicity ebbed and nearly faded out. Then came the news of the Governors' decision about talks, of the hitch with Sir Thomas Beecham, of the Regional Scheme trouble with the Post Office, and of Mr. R. E. Jeffrey's proposed excursion to find new talent on the Continent.

Accounts of these developments were promptly and repeatedly denied in "official circles." With what result? Simply that they "ran" much more widely and effectively in the national and provincial press. And now the B.B.C. has resumed its role as a centre of controversy and discussions. The August tactics of Savoy Hill were anything but stupid. Incidentally, the absurd caution of the "B.B.C. official" prevents any news of interest reaching the public through official channels.

B.B.C. and the "British Ass."

Something like consternation has been caused among the savants by the announcement that Sir John Reith will not read his paper at the special session of the British Association on broadcasting. The British Association meets this year in Glasgow, and Sir John Reith was expected, as a Glasgow man and as one of the greatest Scotsmen of the time, to be perhaps the outstanding figure of the meetings, intellectually as well as in stature.

Much enthusiasm has been evoked throughout Scotland on his account. And now comes the news that Sir John will be in Berlin when his paper is read in Glasgow by a deputy. The B.B.C. declares that the Berlin meeting is of tremendous importance, but it will be hard to assuage the disappointment of Glasgow, Scotland, and the savants.

Will Evans for 2 L O.

A special vaudeville programme on September 10th will include Will Evans, Gracie Fields, Teddy Brown, Dorothy McBlane, Phyllis Scott and Ivan Firth. Something like a variety show! That's the stuff to give 'em, R. E. Jeffrey!

Mystery of the Parrot.

What has happened to the B.B.C. parrot, which was so warmly welcomed to the Children's Hour in the spring? Rumour has it that the parrot was billeted in the education department at Savoy Hill and was so overpowered with the dullness of his surroundings that he developed chronic somnolence.

Another more credible statement is that he was silent long enough to qualify for one of the vacant places on the B.B.C. Board of Governors. Alas, however, this must have proved too much for the poor thing, because his obsequies were appropriately celebrated recently. It is understood that the Society for the Prevention of Cruelty to Animals is investigating the circumstances of the life of the parrot as a Governor of the B.B.C.

Captain Eckersley to Stay.

The danger of Captain Eckersley's leaving the B.B.C. has been removed for the moment. He is believed to have received certain assurances from Sir William Mitchell-Thomson which he regards as satisfactory for the carrying-out of the Regional Scheme.

SPORTING BROADCAST.

Mr. H. M. Abrahams broadcasting the results of A.A.A. championship events at Stamford Bridge.

The Kursaal Again.

Now that relays from the Continent are being successfully carried out with fairly frequent regularity, listeners can expect to hear some good music by the Kursaal Orchestra at Ostend on Sunday evening, September 9th. This orchestra is one of the best in Belgium, and its programmes are often heard by listeners to "Radio-Belgique," which will also be broadcasting it on this occasion.

This relay from the Continent recalls that there has been considerable falling off in the realisation of the early hopes held out for Continental relays. It is understood that the unsuitability of programme material is a greater obstacle than technical difficulty.

Watch this page for exclusive B.B.C. news. "P.W." has an unrivalled service of the latest and authentic news regarding B.B.C. developments.

A Welsh Concert, Look You!

Every year Daventry Senior takes to itself the pleasure of broadcasting a Welsh concert. The date chosen this year is Thursday, September 20th, when a choral concert will be relayed from the Pavilion, Carnarvon.

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

TELEVISION SETS

ACOUSTIC FILTERS—"STEPLESS" RESISTANCES—DISTORTION—THE KINO LAMP, Etc., Etc.

I HAVE received some literature from Messrs. Pohl Bros., of 3541, Michigan Avenue, Detroit, Mich., giving particulars of scanning discs for experimental television sets. The discs obtainable are of 24-in. and 16-in. diameter, and of various types and styles, which it would take too long to describe.

A special claim is made for them that they are perfectly flat, which, it is stated, is impossible with the ordinary metal, and is very important in the reception of television, for the least departure from absolute planeness in the disc "throws the signal off its correct time, which is flashed in the thousandth part of a second. Consequently the picture is distorted when received and the synchronisation of the receiver and transmitter is of no avail."

According to the description: "It is also highly essential that the motor-shaft be not out of true more than two-thousandths of an inch (·002), for it is not desirable to allow more than three-thousandths of an inch (·003) in overlap, this overlap being necessary to eliminate a black line in the received picture, to cover the whole surface of the image at the transmitting end, which is also the case at the receiving end.

"Too much overlap of signals or holes makes for a very coarse picture, for it cannot give the proper shading when the latter is the case."

The above-mentioned firm also supply photo-electric cells, neon lamps, Neotrons, and Kino lamps. The Kino neon lamps are priced at 12½ dollars.

Anyone desiring to have any further information should write for particulars to the address given above.

Acoustic Filters.

The use of filter systems for radio frequencies is a comparatively simple matter, and the cost of a filter circuit for these frequencies is, as a rule, inconsiderable.

But for low frequencies, such as audio-frequencies, the filter system becomes much more bulky and expensive.

I am referring, of course, to filtering by means of an electrical circuit in the way which is commonly used for radio frequencies.

(*Continued on page* 886.)

THE B.B.C.'s HOUSING PROBLEM.

Progress has meant expansion of staff and equipment, and accommodation at Savoy Hill is at a bursting-point. "Overflow" premises have been secured, but this has meant the decentralisation of departments. What is the B.B.C. going to do? There are rumours galore, but, hitherto, no facts.

By OUR SPECIAL COMMISSIONER.

IT is more than three years since rumours began to circulate about a new home for the headquarters of the B.B.C. Accommodation at Savoy Hill was then being extended by the acquisition of more rooms, some of them previously used as private flats and others as a sports outfitter's store. The number of studios was also being increased, and it seemed difficult, in the absence of any official pronouncement, to give more serious attention to what one was constantly hearing about a mysterious new House of Broadcasting than to the scores of other rumours which are always intriguing the folk of London.

Continuous Growth.

But the staff of Savoy Hill continued to grow, and visitors saw four and five people at work in rooms hardly large enough to hold three, and not even that number, when, as often happened, the people concerned were not attached to the same department. Engineers were mixed up with the publicity staff, which, with other unsuitable hob-nobbing, inevitably impaired the general efficiency of the machine. Palliative measures were introduced by transferring some of the staff to a building in Southampton Street, just off the Strand, and later by shifting the whole of the development, research, and workshop sections of the engineering department, about fifty people in all, to some large premises in Clapham, known as Avenue House. And with each move the rumours about a new building in London for the broadcasters cropped up again, and more studios were built at Savoy Hill until the last had No. 10 painted on the door.

The truth of the matter is that the B.B.C. *is* contemplating the removal of its head office staff to larger premises, but not next week or even next year. That it would have to do so at some time or other has long been realised. But it cannot be done in a jiffy. Broadcasting is still developing, and not until the regional scheme is sufficiently advanced to stabilise some form of permanent administration will the Corporation be able to plan its requirements so far ahead as to justify such a large expenditure as the provision of new premises will entail.

Several Schemes.

In looking forward and taking the long view, the B.B.C. has naturally had several schemes under consideration. One of these concerned a large building on the Victoria Embankment not far from Savoy Hill; another, had it materialised, would have retained existing studios intact and moved the majority of the staff to a spot even closer to their present abode; while a third would have made the district around the British Museum even more famous than it is to-day. All these projects, however, were turned down.

The latest scheme, which is still very much in the air, is more ambitious than any of its predecessors. Should it happen it will mean the removal of the entire staff now at Savoy Hill and possibly those in the Southampton Street annexe to the neighbourhood of Oxford Circus. The new Broadcasting House would be worthy of its name in every sense, because, being a new structure, it would incorporate all the experience of the years since the B.B.C first started.

Whether the building will be purchased outright or leased for a long period is not yet decided. Certain it is that when the time comes, whatever may be done will be according to the B.B.C.'s own specifications and designs, upon which a certain amount of work has already been carried out.

One hears that the proposed new Broadcasting House is to have six or more floors, and contain half a dozen studios bigger and better than anything which Savoy Hill can show us to-day. The largest would probably be nearly three times as long and five times as wide as the present No. 1 in Savoy Hill, from which those programmes requiring the most artists, such as band, orchestral, and opera performances are now given. It would have a gallery for an audience and a stage for the more realistic presentation of plays. It would be, in fact, a small theatre, and, as a broadcasting studio, the envy of the whole world.

The remaining studios would be equally up to date for the purposes for which they will be intended, while provision will also be made for future development without the danger of their becoming obsolete. But while the number of studios may be actually fewer than exists at present, there would also be about a score of smaller rooms, fitted as miniature studios for use as audition and rehearsal rooms. Office accommodation would also be designed to keep each department self-contained, and not have one section overflowing into another. And what is more necessary in these days than the provision of a garage for 40 or 50 cars on the premises?

Studio Being Rebuilt.

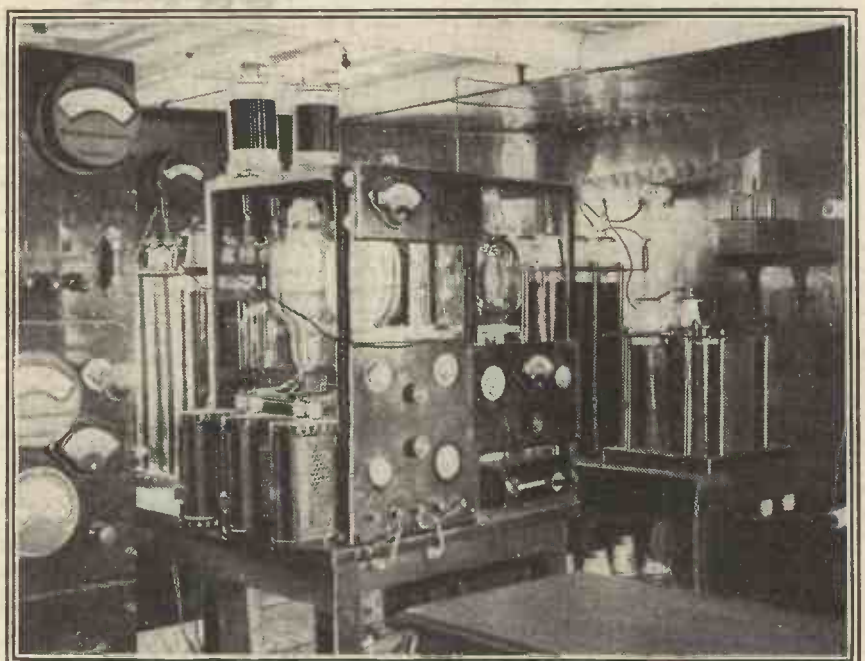
Here, then, is a peep into the future which sooner or later must and will take tangible form. The B.B.C., better than anybody else, is fully aware that the London headquarters cannot remain in their present state. Savoy Hill was too small and cramped even before the staff had taken over all the rooms it now occupies, and matters will always tend to get more and more acute.

Meanwhile, the very first studio at Savoy Hill, now called No. 3, is in the hands of the builders. It was never an ideal studio, though it did yeoman service before its younger companions relegated it to a thing of the past. Perhaps after a few feet have been added to its height, and some electrically driven lungs have been installed, and when an altogether brighter and more cheerful complexion pervades its interior, it will again assume that dignity which none could challenge, and which, by seniority alone, belong to it.

With a month's holiday, and the help of some vigorous workmen, the grandfather of Europe's broadcasting studios should be in fine fettle for next season's work.

[It is rumoured insistently in West-End estate circles that the B.B.C. has practically closed for a new site near the Queen's Hall. Savoy Hill is mute.—EDITOR.]

MARCONI'S FAMOUS FLOATING LABORATORY.



A new photograph of some of the elaborate radio gear installed on Senatore Marconi's yacht "Elettra," and with which he is carrying out an important series of new Beam experiments.

SHORT-WAVE NOTES.

Some topical news and views concerning amateur transmission and reception on the higher frequencies.

By W. L. S.

IT occurred to me recently that if the time ever does come when the majority of broadcasting stations operate on the short waves, the vogue of the portable set will be very great indeed. A portable short-wave receiver is a very different proposition indeed from a portable intended to operate on the usual broadcast band of waves; the shortest of aerials is sufficient, and broadcast up to a distance of 250 miles can be received with absolute reliability. In fact, there is no advantage in listening to the "local" station, since he will usually be the weakest one audible! Truly, our portable-set designers will reap a harvest if they set to work on the right lines.

Further Down the Scale.

All this is, of course, assuming that there *will* be more broadcasting on the short waves. This I am more and more inclined to doubt, with regard to our own country. Now that the amateur transmitters have very largely "broken the back" of short-wave work all the lower bands are very greatly in demand by Government, military and naval services, and it will become fairly difficult to fit many more stations in. All this, of course, is leading on to the investigation of the 10-metre and 5-metre bands of waves. I fully expect that they will be in use for commercial services before very long. The peculiar behaviour of 10-metre waves is probably no more puzzling to us at the present time than was the behaviour of waves between 150 and 200 metres long when 1,000 metres was the order of the day.

Just as 150 metres is now not considered among "short waves," so it seems that 45 metres or even 30 metres will fall from favour in the years to come. Probably we shall have to introduce a band of "medium waves" to fill up the gap. It will be of little use to describe our wave-lengths in vague comparative terms in a few years!

I suggest that a really serious attempt be made at the end of the year to drop "metres" and establish kilocycles and megacycles in favour. The words "20 to 30 metres" convey nothing to the listener which might indicate the amount of "accommodation," so to speak, in the band, but "10 to 15 megacycles" applied to the same band gives one a definite idea at once, since 5 megacycles (MC)—i.e. 5,000 kilocycles (KC)—will accommodate the same number of stations, no matter where in the spectrum of frequencies it is taken. Of course, it will be a strain to make the change, but it must be made sooner or later.

"Autumn Conditions."

When this appears in print what we may call "autumn conditions" should be in force again. I do not mean to infer that the summer will have departed, but we are now as far past the longest day as we were *before* it at the beginning of May, when long-distance conditions were so good. So clean the cobwebs off your condensers and set to for a bout of real "D X reception"!

I have been severely worried during the last few weeks by newcomers to the "short-wave department" of radio who have made special sets for the purpose of receiving 2 X A D and 3 L O and most of the other short-wave stations at tremendous strengths, and are now somewhat disappointed, not having heard a sound of any of them.

Bad Results.

I have tried hard to be reassuring, for, as my readers doubtless know without any reminders, conditions have been extremely bad during the last week or so. No stations but the most powerful and the nearest have been audible at times, and even 2 X A D and the other big noises have been completely absent on occasions.

On being told of this, many seem to think that they have been "swindled" into taking up short waves in the belief that there are never periods of bad conditions like this! Truly this summer has been abnormally bad, but when have I ever given the idea that D X conditions are *always* good?

Dr. Pickard, the well-known American scientist, has been making observations recently on the effects of the moon on radio waves. In the process he has dispelled a theory that many have been quoting, parrot-like, for some years, namely, that the moon can affect the height and surface of the Heaviside layer in a similar manner to the sun, and so cause variations in radio conditions which follow the phases of the moon.

Dr. Pickard points out that it is certain that the total effect of the moon is no greater than one thousandth of one per cent. of that of the sun! With reference to the intensity of moonlight, he also points out that the earth receives more polarised light in one day from a blue sky than it gets in many years of moonlight. He has been carrying out some detailed observations of 2 X A F and other short-wave stations.

Solar Effects.

There are people who declare that they have been able to plot curves showing positively that lunar effects on the shorter radio waves are very definite; they overlook the fact that the "solar areas" or surfaces of the sun, which are known to have great effects on radio, also cross the meridian at intervals of about 27·3 days, at which intervals certain "sets of conditions" will probably recur. If both sun and moon affect reception, a period of many years' observation would be necessary before we could disentangle one effect from the other.

Long periods of bad reception, such as we have recently been experiencing, are probably due to something of a much more complex nature. All we know at present is that these periods can last for as long as three months, and be a sore trial to the temper!

I believe that 3 L O will be using increased power this winter, in addition to which there will probably be several other Australian broadcasting stations in operation. We can look forward to a positive feast of programmes from the Antipodes. Whether they will receive the same from us is rather doubtful!

THE "FREE-GRID" AMPLIFIER.

Some operating notes concerning the novel unit described last week.

By C. P. ALLINSON, A.M.I.R.E., F.Inst.P.Inc.

THE first thing to do is to stabilise the H.F. valve, and where the set is used close to a broadcasting station the usual method of turning out the H.F. valve and adjusting the neutralising condenser to the minimum signal position may be employed. If, however, no station is close enough to allow of this being done the maximum reaction demand method will have to be used. This method has so frequently been described of late that I do not think it will be necessary to repeat the details of the procedure employed.

The effect may be tried of reducing the value of the neutralising condenser below that required to give the true neutralising point, and in cases where it is not possible to use a high plate voltage, owing to lack of the necessary batteries, it may result in an increased signal strength being obtained on distant stations.

I have generally found, however, that doing this makes it impossible to use the full amount of reaction on the detector, so that what is "gained on the swings is lost on the roundabouts."

I have not made actual quantitative measurements as to the actual degree of amplification obtainable with this H.F. amplifier, but when using it in conjunction with one of the single-valve sets out of the series I have described, using the Langenberg transmission during daylight for testing purposes, an increase in signal strength from R_2 to R_6 resulted, while a marked increase in selectivity was found to take place.

No difficulty in stabilising the amplifier was found when operated by a friend who is quite a beginner at wireless, and it was found to be easy to tune and handle in every way.

Interchangeable Primaries.

The use of a coil former with interchangeable primary formers was found to be a great convenience when the set was operated close to a transmitting station, in allowing greater selectivity to be obtained when receiving transmissions on a nearby wave-length, or for obtaining the greatest efficiency on greatly differing wave-lengths where interference from the local station was not experienced.

The extra H.T. and L.T. current consumption will be found to be negligible, and the use of this amplifier was found to be of great advantage on distant and weak transmission, or where a poor aerial only was available.

An exclusive series of articles describing the inner secrets of the studio.

2.—TROUBADOURS OF THE ETHER.

WHEN I was a small boy I won a prize of "A Thousand and One Gems of English Poetry," and I was rather ashamed of it. I admired pictures, and I had a fine collection of books on athletics, photography, and the Boer War. But poetry—was it not the product of men with long hair, destined eventually for mottoes on sweets or in Christmas crackers? I did not realise then that poetry might conceal the very rhythm of life!

It is true that there was some excuse for me. My book of poems was badly produced, and, although it contained 1,001 pieces, some of them were undoubtedly paste. Also, like most of us, I had been taught to think of music as one thing, poetry another, work another, enjoyment another—and all unconnected with anything else.

If you ask a man in the street if he is fond of music he may say: "Yes, a good tune; but not that highbrow stuff," or he may say: "Yes, but not that horrible jazz," or again: "Yes, good music; but not this discordant modern stuff we get on the wireless." Judging by the letters that reach me it would appear that the world is almost equally divided into three groups, holding these different opinions; although, of course, there are various sub-groups, and there are other people who look upon music as a part of the main stream of life.

Difficult.

To give music to a nation which has received little musical education, and which knows almost nothing of orchestral music, has been one of the biggest difficulties the B.B.C. has had to face.

It is unthinkable that we, in Great Britain, should have anything but the best singers and orchestral players obtainable for broadcasting, but good musicians cannot give of their best, even if they would, unless they are allowed to sing or play the finest music. It would be impossible to hold together a first-rate orchestra which was only allowed to play light music.

Modern Music.

Another point, which is not generally appreciated, is that composers to-day are not writing light music of a kind which is as easily appreciated as that of the Gilbert and Sullivan operas. The sentimental ballad of Victorian days has gone, and, apart from the Old Memories programmes, what are we to give in its place? I pin my faith to a new musical conquest of Great Britain, and, as the advance guard, I would send musicians whom I call "Troubadours of the Ether."

Medieval Methods.

I take it that we are not so very different from our forefathers. The bards, who were priests, poets, and musicians, were the acknowledged leaders of Britain long before Cæsar landed. In 1152, Henry II and Queen Eleanor took up their residence in Bermondsey and established there a court of glittering troubadours. These troubadours called themselves "Doctors of the Gay Science" (the word "troubadour" meaning inventor or maker), and they were the welcome bringers of music and poetry and legend to all the countryside.

"To be a good musician," writes one of them, "it is necessary not to play pretty tunes and jingle nice melodies, but to utter clever words and make your hearers understand every word as you chant it." "A good musician," says Ali of Isaphan (another broadcaster born out of due season) "will have at his fingers' ends a hundred pieces of poetry and countless songs, both humorous and melancholy; he will have a fluent tongue and a copious command of speech; he will be a good grammarian, and know how to form his sentences properly and elegantly." In short, he is a first-rate broadcaster.

Some of the merrymakers at the 5 W A Sunshine Carnival held at Weston-super-Mare.

(*Continued on next page.*)

MEMORIES.

(Continued from previous page.)

And, certainly, the troubadour, with his assistant jongleurs, amused and interested the people, whilst maintaining a very high standard for his art. My ideal "Troubadour of the Ether" would combine some of the qualities of A. J. Alan, Mario de Pietro, Sir Walford Davies, Humbert Wolfe, and Sir Oliver Lodge.

A Lifelike Mixture.

It is too much to expect him to take all these parts himself—even the most versatile Troubadour had his assistants—but he would arrange the whole programme, weaving the parts skilfully together and taking a leading part himself. He would intermingle mirth and melancholy, poetry and music, gossip and song—just as they are inextricably mingled in life—but with that distinction which Art can give to Nature.

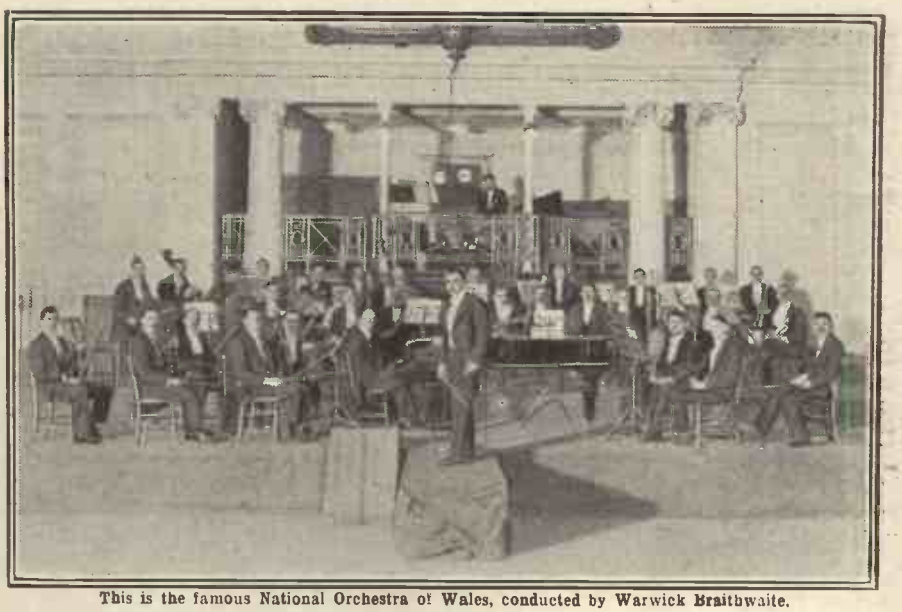
Many programmes given by the B.B.C. are developing in this direction, and we are gradually hearing less of the highbrow and lowbrow controversy. Ultimately, the development in appreciative powers will extend to the real love of fine orchestral music. But we have to go a long way yet.

The modern orchestra is, of course, the finest, but most expensive, of all musical "instruments," and not enough is known of its members. I am not suggesting that their names should be mentioned at each performance. It is good that announcers have merely to say "The orchestra will play . . . . ," for if they had to enumerate all the several instruments their hearts might fail them, if not their tongues. They might even use the expedient of the old divine who had to read that chapter in the book of Daniel in which are set forth "the cornet, flute, harp, sackbut, psaltery, dulcimer, and all kinds of music."

This list occurs four times in the course of eleven verses. The divine read the list with gusto the first time, with moderated enthusiasm the second; with boredom the third, and when he came to the fourth he could bear it no more, and amended the version to "—and the band played as before"!

Many Trials.

An announcer has many trials, but this is not one of them. It would, however, help listeners if they could have a sound knowledge of the work and qualities of the different instruments, and no doubt many people prefer actually to see the orchestra when it is playing serious works.



This is the famous National Orchestra of Wales, conducted by Warwick Braithwaite.

The National Orchestra.

To meet this need we started, some years ago, cheap popular concerts on Saturday morning for Cardiff schoolchildren, but few children attended them. They had to mind the baby, or have their music lesson, or they didn't want to come.

But last year the B.B.C., in co-operation with the Cardiff City authorities, the National Museum of Wales, and the Welsh National Council of Music, formed the National Orchestra of Wales, to give free concerts daily in the museum, and evening concerts at very low prices in the City Hall. The orchestra, of course, is also the Cardiff Station Orchestra. For years, various big towns have been striving to maintain civic orchestras, usually at a considerable financial loss; the Board of Education is continually stating that schoolchildren must have a musical education; here we have a possible solution of the difficulty.

The scheme promises well, and the concerts have been splendidly received and attended. To find an orchestra of thirty players chosen by open competition from the most skilled players in Great Britain, instead of a small local orchestra, is a good sign of the progress made by a provincial station in five years. And it is encouraging to find civic and national authorities bringing music into the City Hall and National Museum, into the affairs of daily life. How the old troubadours must rejoice!

A section of the crowd listening to a free concert given by the National Orchestra of Wales in the National Museum.

ODD ITEMS.

A CLACTON amateur has recently received what are believed to be the first 10-metre signals of American amateurs picked up in this country.

It is reported from Scotland that the Post Office wireless motor vans have recently been very active there.

A special department for research into the possibilities of wireless as an aid to the deaf has recently been opened at the Royal Ear Hospital, London.

What is believed to be the largest high-tension battery in the world has been built in this country. It weighs approximately one thousand tons! It is not intended to be used for wireless purposes!!!

Well over three hundred sets have been installed in the homes of blind people by the Blind Fund established in Manchester. (As more than sixty sets are still required, the fund remains open.)

FROM THE TECHNICAL EDITOR'S NOTE BOOK

ANOTHER NEW LISSEN COMPONENT.

AS you have probably noticed, there has been a considerable amount of activity at that Richmond radio factory of late, and a steady stream of new "lines" bearing the familiar Lissen brand (and finish) has been flowing from it. The latest production from that quarter is a wire-wound resistance. And, as we have been led by past experience of Lissen activities to expect, it is a component of high quality with a chorus of attractive points.

As you will see by the accompanying photo, the resistance is of cartridge shape, but it has terminals at its ends. A very good point this, and one which will be greatly appreciated by the amateur. Strange how these Lissen people seem to get right home to the constructor with pretty well everything they do!

Additionally, there is, of course, a holder into which the resistance will slip, and this holder can be mounted either horizontally or vertically on the baseboard.

Two of the new Lissen wire-wound anode resistances, together with a holder.

The Lissen Anode Resistance is wound with a special wire having a resistance of 100,000 ohms per foot. This wire can carry currents up to 10 milliamperes.

Careful examination of the interior of the device and tests show it to be an accurately designed and made, and a soundly constructed device. It is available in the following values: 10,000, 15,000, 20,000, 25,000, 30,000, 100,000, 150,000, 200,000 and 250,000 ohms. A sufficiently comprehensive range for all purposes. I should mention that I have tested the whole group and I find their accuracies extraordinary. Some are, in fact, dead right, a state of affairs which astonishes one familiar with mass-produced electrical and radio apparatus. Lissen grid leaks also always attracted me for their uncannily close adherences to specification.

A HIGH-RESISTANCE POTENTIOMETER.

You cannot appreciate to the full the advantages of a gramophone pick-up operating your set from an electrically impressed record unless you employ a volume control. One of the inherent disadvantages of an ordinary gramophone is that it has no really efficient volume control. But when an electrical link is interposed between the record and the loud speaker then perfect volume control becomes possible.

This can be arranged efficiently by fitting a high-resistance potentiometer at the input of the amplifier. The component must be of the high-resistance variety, and by high resistance I mean hundreds of thousands not merely hundreds of ohms.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

One such has been produced by the Wireless Apparatus Co., of Leicester. It has the useful value of 500,000 ohms, and is retailed at 4s.

I have had this particular component dismantled and photographed in order that you can see its internal structure. You will notice that the resistance element is in the form of a "pencil" line rubbed over a groove around which the contact arm runs. It certainly works effectively and its value registers closely to specification on test. How long it would remain at its original value I would not like to say, probably for a very considerable period of use, however.

At the same price of 4s. the same people supply an H.F. Choke, a neat, well-made and finished component which operates well. Its design is good and its self-capacity is really very low.

THE BURNDEPT H.F. CHOKE.

The criticisms made from time to time in this page are almost invariably received by the manufacturers concerned in the friendliest possible spirit. For instance, when recently reviewing the new Burndept H.F. choke, I made the suggestion that constructors might be prepared to pay a few pence more for this excellent component were it fitted with terminals instead of only with soldering tags.

In a letter regarding this review, Burndept Wireless, Ltd., state:

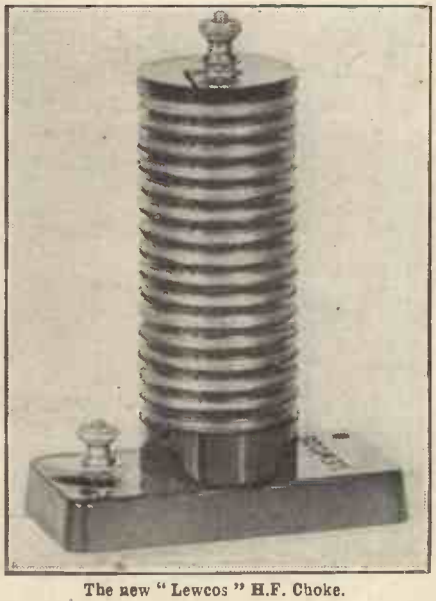
"We notice that you mention that the H.F. choke is provided with soldering tags only and are of the opinion that amateurs would probably prefer a component fitted with terminals. We ourselves have come to the same conclusion and are very glad to be able to inform you that we are now fitting terminals. This does not, however, increase the price in any way."

A "LEWCOS" CHOKE.

The latest addition to the notable "Lewcos" range of coil components is an H.F. choke which is efficient over the very useful wave-band of 20 to 2,000 metres. The design is eminently sound, and the article is very well made. The wire, of which there is nearly a quarter of a pound, is carried in slots in a vertically spaced former.

The high-resistance potentiometer dissected and clearly showing the "pencil-line" along which the contact arm travels. The H.F. choke made by the same firm is shown on the right.

The winding has a natural wave-length of about 5,000 metres, so that it will be seen that the resonance peak will be well away from any frequency that the average constructor is likely to handle. At one time it was deemed necessary to have a special choke for short-wave receivers. But with a component of the nature of this latest "Lewcos" the design of an all-wave type of set is greatly facilitated. The retail price of the new Lewcos H.F. choke is 9s.



The new "Lewcos" H.F. Choke.

DOES A CONDENSER CONDENSE?

Some interesting facts concerning one of the most vital of radio components.

By J. F. CORRIGAN, M.Sc., A.I.C.

IT is an undoubted fact that the majority of we scientific amateurs accept technical terms and means of expression without very closely examining the accuracy of their derivation. For instance, who has not met with the amateur who is ready to state dogmatically that the radio condenser is a piece of apparatus which condenses electricity?

The real truth of the matter, however, is that, strictly speaking, the condenser does not act in the manner which its name implies. One of its properties is that of *storing* an electric charge, but there is a difference between a storing agent and a condensing contrivance. It may, however, be supposed that the condenser obtained its name originally from the fact that its electrical storing capabilities formed the first-known of its several valuable properties.

Fig. 1.—One of the earliest condensers, a Leyden jar constructed about 1765.

The electrical condenser, it will be remembered, was invented about the middle of the 18th century, at which period electricity was supposed to consist of an invisible and intangible fluid. Thus, it will require no effort of the imagination to visualise the manner in which the newly-discovered storer of electrical charges was thought to exercise a true condensing action.

The earliest forms of condensers consisted of a vessel containing water into which dipped a brass chain. An electrical charge was imparted to this crude condenser by placing the end of the chain in contact with a frictional electric machine, as the reproduction of the old print, Fig. 2, will show.

The Leyden Jar.

Then came the well-known Leyden jar, consisting of a glass cylinder coated inside and out with tinfoil, a metallic chain again making contact with the interior of the device. One of the earliest Leyden jars is shown in the illustration, Fig. 1, and even this article was capable of storing up a considerable electrical charge.

You may say, however, that an accumulator is a storer of electricity. Strictly speaking, this is not the case. An accumulator does not store electricity as such. What it really does is to convert the electrical current into a form of potential chemical energy which is reconverted into electrical energy when the accumulator is discharged.

A condenser, on the other hand, is a true storer of electrical charges. The simplest form of condenser is shown in the photograph, Fig. 3. It consists merely of two metallic discs placed in close proximity to each other. Note, however, that the discs are not touching. There is an insulating air space between them. Here, therefore, we have the essentials of a true condenser, to wit, two metallic plates separated by an insulating medium (termed the "dielectric") which may consist of air, mica, paraffin wax, and so on.

A thorough grasp of the principle underlying the action of this simple device will enable the amateur to understand the working of any form of radio or electrical condenser which he may subsequently come across. Let us examine it in detail, therefore.

A Condenser at Work.

It is known nowadays that an electrical charge simply consists of an accumulation of electrons—those almost infinitesimally minute particles of matter which enter into the constitution of the atom. When these electrons are set in motion along a conductor we get the phenomena associated with an electric current.

Let us deal with the stationary accumulation of these electrons, however.

Suppose the condenser is charged from some external source so that there is an accumulation of electrons on, say, the upper plate. Under these conditions the electrons will rush away from the overcrowded plate of the condenser, through the external circuit, on to the lower plate of the condenser. This plate, however, will quickly become overcrowded, and so the electrons will rush back again on to the upper plate. This sequence of events will occur, provided the outside circuit is arranged suitably, with a rapidity of many thousands of times per second until the energy of the electrons is frittered away by resistance losses in the circuit.

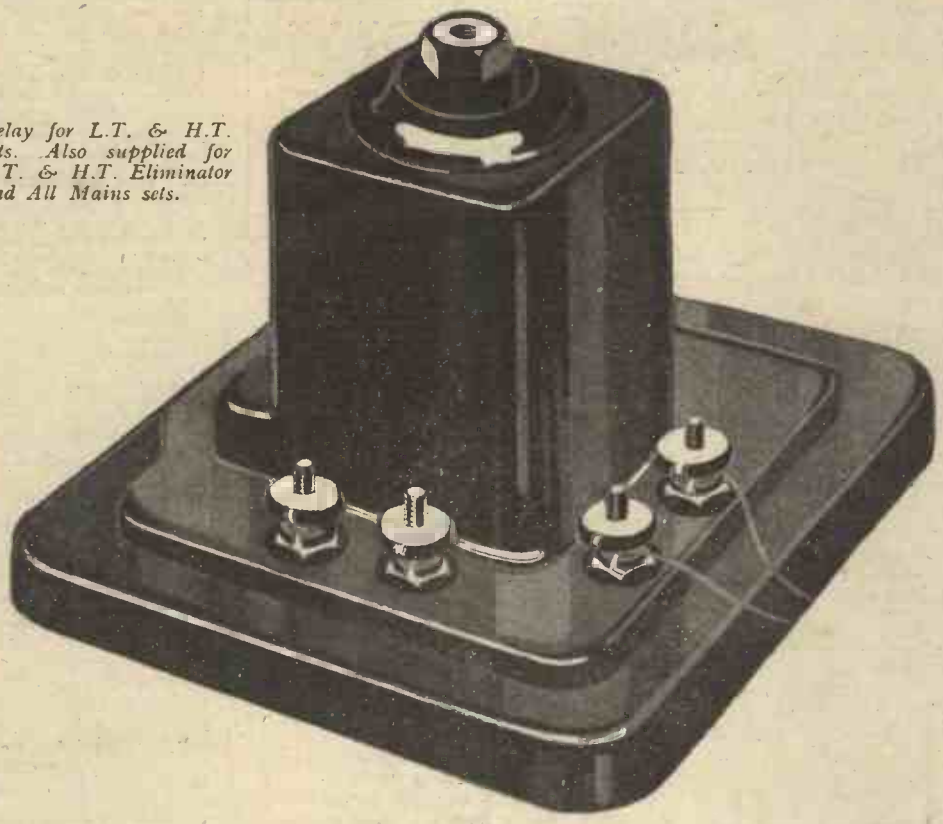
This surging backwards and forwards of the overcrowded electrons gives rise to an oscillating current, and it is this property of the condenser which makes it of so much value for radio purposes.

Fig. 3.—The fundamentals of a condenser—two plates separated by air and close together.

The Radio "Variable."

In the variable radio condenser the areas of the opposing plates can be varied at will, and with this variation we have a complete control of the capacity or storing properties of the condenser. Thus it is obvious that we obtain, also, a control over the rapidity with which the electrons rush from one set of plates of the condenser to the other. And so we govern the frequency of the oscillatory current to which the condenser gives rise.

Fig. 2.—The discovery of the condenser. Imparting to a water condenser an electrical charge from a friction machine.



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RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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QUESTIONS AND ANSWERS.

SAFETY DURING THUNDERSTORMS.

S. O. A. (Runcorn, Cheshire).—"I am told that one of the simple earth arresters costing only a couple of shillings is a good safeguard during thunderstorms. As I am nervous about thunder can you tell me if this is so, and how it works?"

The arrangement of an earth arrester is simply that of two or more metal plates connected to earth and aerial respectively, but separated by a very small air gap. The instrument is placed at the point where the aerial enters the house and the earth wire goes straight from it into the ground.

If the aerial became charged during a thunderstorm the electricity would spark directly across this small gap to earth, instead of taking the comparatively much longer pathway through the receiving instrument, which would thus be protected by the provision of an alternative path outside the house.

A CENTRE-TAPPED COIL FOR CRYSTAL SET.

E. R. W. (Cowley, nr. Oxford).—"I have a cheap little crystal set with a plug-in coil and a variable condenser for tuning, but I thought I should like to improve it, so I got one of the new centre-tapped plug-in coils instead of the ordinary old-fashioned type. I connected up as shown in the directions given with the coil, putting the aerial from off the end of the coil on to the centre tapping.

"Results, however, are no better than previously, and perhaps I am expecting too much from the coil; but a friend tells me that there is some system of using the centre-tapping as a crystal-tap instead of as an aerial-tap, and I am wondering if that would give me better results than the way I have it at present.

"Can you tell me if this is possible, and if so, how I can alter my set so as to use the centre-tap for the crystal?"

The alteration is very easily made, and it is quite probable that it will improve reception in your case. All that you have to do is to open up the set and to undo the wire which goes from one side of the crystal to the variable condenser, coil and to the aerial terminal.

Leave the aerial terminal, coil and variable condenser connected together, but undo the wire to the crystal from these, and in its place put a flexible lead with a spade terminal on to that side of the crystal. Then all you have to do is to connect the aerial to the old aerial terminal and connect the new flexible connection to the centre tap on the coil.

If you have more than one specimen of crystal on hand you should try them all, because it sometimes happens that while the centre tap does not seem to make so much difference to one specimen it may improve reception considerably with another.

DISTORTION DUE TO STRAY H.F.

N. G. (Beeston, Notts.).—"Since I fitted up the moving-coil loud speaker I have found (what I always believed to be the case) that I am getting a little distortion on certain notes which on my previous loud speaker was hardly noticeable, but which is now quite distinctly present. From what I have read about the matter I fancy it is due to stray H.F. getting through to the L.F. side.

"Do you think this can cause distortion, and if so what is the stunt of connecting a grid leak in series as a sort of an H.F. stopper?"

It is quite possible for stray H.F. to affect reproduction in this way, and we should think it is what

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RADIOTORIAL QUESTIONS AND ANSWERS

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is happening in your case. The "H.F. stopper" is certainly a very simple method of overcoming this difficulty, and it is extremely easy to insert.

All that you have to do is to break the grid-lead from the grid socket of the L.F. valve holder which you suspect (generally the first), and place the grid leak (which should have a value of about quarter megohm) in series at this point. That is to say that one end of the new "grid leak" should be connected to the grid, and the other end should be connected to all the other apparatus which was previously connected to the grid socket of the valve holder. It will then function as an H.F. stopper.

TRANSFORMER CONNECTIONS.

"SECUNNY" (Cardiff).—"It is an American low-frequency transformer, and I should like to try it, but I am a bit uncertain about the connections as instead of being marked "primary," "secondary," or "plate," etc., it is simply marked A, B, C and G. What do these letters mean?"

A and B are the primary terminals. A is connected to the plate of the valve (anode) and B being connected to H.T. positive which, in America, is called "B-battery" positive.

C and G are the secondary terminals, C being connected to grid bias negative. In America the grid bias battery is called the "C-battery." The remaining terminal, "G," is taken to the grid of the valve.

VOLTMETER CONNECTIONS.

B. A. G. (Hartlepool).—"In order to keep a watch on quality I want to fit up a voltmeter, so that I can check the exact voltage on any valve whilst the set is operating. I have a suitable voltmeter and I could easily modify the set a little if you could tell me the connections for this. What I should like is a flexible lead with a plug or else a switch arm and socket. Something cheap and easily manipulated, and not too difficult to fix."

You can very easily check up the individual voltages by means of the voltmeter in this way, and we recommend the use of a plug and five sockets, and a flexible lead. When the voltmeter is put in a convenient position all you have to do is to connect up as follows. Join its negative terminal to L.T. negative permanently. Join its positive terminal to a plug by means of a flexible lead.

Then join one socket to the positive leg of each valve holder. Another socket to the positive L.T. terminal, and finally one dummy socket into which you can place the plug when the meter is not in use. In order to check either the L.T. battery voltage or the voltage across the various valves, all that is necessary is to place the plug in the appropriate socket and depress the voltmeter key.

"A GRADUAL WEAKNESS AND FALLING OFF."

G. F. N. (Hartlepool).—"All I want to know is what is the cause of the gradual falling off in the strength of the signals?"

This trouble's cause largely depends upon the set which is being used, to which you do not refer. In a simple *crystal* set, for instance, a general falling off in signal strength may be caused by the crystal becoming insensitive, or by the cat's-whisker needing replacement.

Another likely cause is rust inside the telephone diaphragms, and for this reason it is advisable gently to wipe telephones which are worn for long periods.

In a *valve* receiver such falling off can often be traced to the aerial-earth system: but, failing this, it is almost certainly due to dirty contacts or to the valve giving out owing to having been "over-run." The cause of this latter fault is the application of too much filament voltage.

Another cause may be battery deterioration. If either the low-tension or the high-tension battery fails to supply sufficient voltage to the set, reception is bound to suffer. (Sometimes the fault shows itself only in the falling off in strength of reception, but generally battery deterioration shows itself more positively by causing howling and instability or by a series of crackles which ruins reception.)

TROUBLE FROM TUNED ANODE.

T. I. T. (Chichester).—"It is a two-valve set, the H.F. valve being on the tuned-anode principle. But what I cannot make out is that it is extremely unstable and the set *will* oscillate as soon as the tuning seems to be in step. What would be the cause of that in a simple tuned anode?"

The cause of the trouble is really the fact that the H.F. valve is provided with a grid and anode circuit tuned to the same wave-length, and the interelectrode capacity of the valve is sufficient to cause the set to oscillate violently. In a great many of the old-fashioned simple tuned-anode sets the aerial and earth were connected straight across the grid circuit of the high-frequency valve, and with such connections the damping of a fair-sized aerial would be quite sufficient to "hold the set down."

If, however, one or other of the various forms of loose coupling the aerial are employed, or a small aerial is used, or a freely oscillating valve, it is quite possible for the set to oscillate without the use of reaction, even when the circuits are not exactly in tune with one another. The simplest method of effecting a cure is by the use of a potentiometer, which can be fitted as follows:

Examine the grid of the first valve. You will see that it is connected to one side of a coil and one side of a variable condenser. The other sides of these two components are joined together and connected either to earth or to the filament circuit.

Disconnect the wire making this connection and, instead, still keeping the condenser joined to the coil, take a lead to the centre or moving arm of potentiometer. The remaining two contacts on the latter must now be connected across the filament terminals of the H.F. valve holder.

If the set now tends to howl or oscillate, it may be stabilised by moving the potentiometer arm towards the *positive* end. A point will be found where the set stops oscillating, and the best position for general reception is one such that the set has *just* ceased to oscillate.

CURING HOWLING.

W. B. G. (West Bromwich).—"When both the last valves are switched in I get a sort of L.F. howl. I know that this sometimes happens when two L.F. transformers are used, but I have been given to understand that in this particular design the trouble has been overcome. What do you think may be the cause of it and how shall I set about putting it right?"

We should first of all test the H.T. battery to make sure that it is in perfect condition. If large condensers

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(*Continued from page* 880.)

are easily available we should certainly shunt each positive tapping on the H.T. battery with a large condenser of several mfds. (The other sides of these condensers can be connected together and then to earth.)

Test the grid-bias battery and make sure that it shows its full voltage. Examine all joints and look for a point of high resistance in one of the leads. Clean the wander plugs and their sockets on the batteries.

It may be necessary to space out the L.F. transformers or to turn one of them so as to place its core at right angles to the other. In some cases an effective cure is to earth the case of the transformer. Finally, it may be advisable to reverse the two leads which go to the secondary of the last transformer.

Do not use valves with too high a magnification factor. As a last resource you can connect a resistance of about 100,000 ohms across one or both of the secondary windings. In extreme cases the only thing that one can do is to change one of the transformers for one of another type. This, however, should hardly be necessary in your case, as you say you are following a standard design, and we feel sure that one or other of the foregoing will prove effective.

KALUNDBORG CALLING!

H. P. (Derby).—"Since reading about it in 'P.W.' I have become interested in the Kalundborg Station in Denmark. What is the wave-length of this station, is it as powerful as our own 5 X X, and how can it be identified?"

The Kalundborg (Denmark) station, which is situated at an approximate distance from London of 540 miles, has a wave-length of 1,153·8 metres. Its power is 7·5 kw., which is less than one-third of Daventry's power.

The station uses three strokes of a gong both at the beginning and close of announcements, and as the Copenhagen station, which works on a wave-length of 337·4 metres (that is to say, upon ordinary wave-lengths), relays the Kalundborg programme, the opening and closing announcements always include the names of both these stations.

In effect the words used by the announcer are "Here are the Kalundborg and Copenhagen broadcasting stations," so that if close attention is paid to the call the two names, pronounced in the Danish fashion, are easily identified.

IS IT THE SET?

T. C. T. (Cardiff).—"I built up the loud speaker from the set of moving-coil parts, and although the results it gives are simply wonderful, there are still bits of distortion occurring which I cannot account for. I am told that this may be due to the set itself not being perfect, but I certainly never noticed this distortion on my other speaker. (Before the moving coil.) So I think that that is wrong.

"If, however, you think it is the set that is wrong, can I send you a diagram with the various values I have got, so that you can suggest whether I may be using the wrong part somewhere?"

Even although you never heard any distortion on your previous loud speaker, it is quite likely that after the moving-coil speaker is installed a number of faults will show up which were not audible before. The truth is that the reproduction from the moving-coil loud speaker is so good that it shows up faults in the set in a way that other loud speakers do not, and we should think that it is very likely that this is what is happening in your case—the set being the offender and not the speaker at all.

If you will forward to us a complete circuit diagram, showing the various values of all components, and if possible the different makes and types, particularly of the valves, we shall probably be able to suggest whether there is any fault in the circuit which would account for the distortion. (The charge for this service is 1s. 6d.)

THREE PAIRS OF TELEPHONES.

R. E. (Glasgow).—"The little set is so loud on one pair of telephones that I am convinced I should be able to work three pairs. Anyhow, I am going to put three pairs in, but what I do not know is whether to connect them in series or in parallel."

In nearly all cases it is better to connect 'phones in series with one another, so, as a rule, we recommend this. Nevertheless, as it is easily done, you can try connecting them in parallel if they are all of the same kind, as there are certain cases in which such a connection is an improvement.

But we should not bother to do this if one of the pairs of 'phones is of a lower resistance than the others, as in such cases connecting in parallel will rob the other two pairs of practically all their signals.

"NOT WORTH LISTENING TO."

C. G. L. (Birmingham).—"At first the set was everything I could wish for, and I used to really enjoy it. But now it is not worth listening to.

"I paid over eight pounds for it, apart from the aerial and all the trouble of putting it up, and I think it is a scandal for a set which costs so much money to go off like this. What can I do about it?"

You will be surprised to know, C. G. L., that we do not think your set has "gone off" in the slightest, since it is very, very seldom that a wireless set deteriorates as you suppose. What does happen is that the batteries run down, or some other small replacement is necessary.

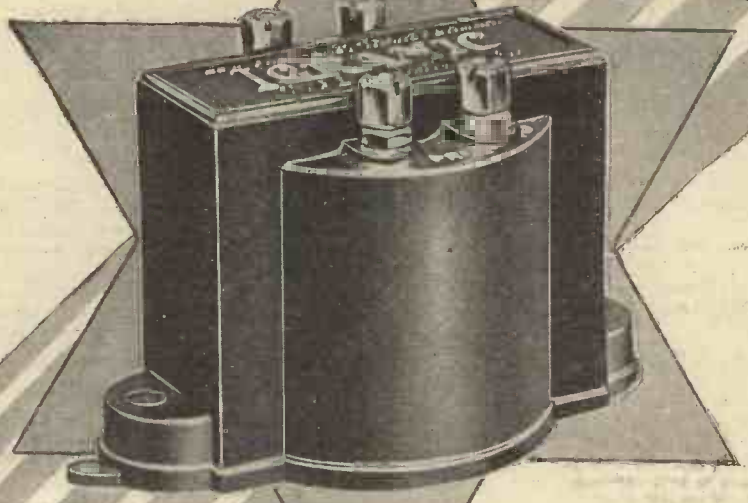
Apparently this is where you have failed to maintain the set and once you give it a good battery or whatever it is it needs you will find that the set itself is really in perfect condition, in all probability.

The commonest cause of poor results of the kind you mention is the H.T. battery running down, and

(*Continued on page* 884.)

A New Transformer by Igranic

Price 17/6



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The new iron circuit in the Igranic L.F. Transformer, Type " J," has the effect of giving a high primary inductance with a small winding, the interwinding capacity being therefore reduced to the minimum consistent with maximum coupling. The result is that the amplification of all notes between 100 and 9,000 cycles is practically constant, the low notes being reproduced with all their natural mellowness and the high notes with complete freedom from resonances.

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 882.)

this can be tested with a voltmeter by a dealer. Remember that hot weather is always somewhat against batteries, especially if they are exposed to sunlight, and consequently a type of battery which lasts two months in the summer may give service for three or even four months in the cooler part of the year.

LOOKING AFTER THE L.T. BATTERY.

O. F. C. (Dundee).—"I cannot afford to pay for an expensive voltmeter, and I am told that the cheap ones are no good. Is there not anything that I can buy to check the condition of my accumulator with? I do not want to spend more than a few shillings and I should like to be able to keep an eye on it."

Even a cheap voltmeter will give you good comparison between a battery which is well charged and one which is discharged, but unless you wish there is no need to use a voltmeter for such a test. The condition of the accumulator can be ascertained quite as accurately by means of a hydrometer, which costs only a few shillings.

One form of hydrometer is a graduated glass tube containing three floats into which the acid from the accumulator is drawn by means of a bulb, rather like a fountain-pen filler. The condition of the battery can be determined by which one of the three floats rises to the surface of the fluid, full instructions for the use of a hydrometer generally being given with each instrument.

This is a very reliable method for ascertaining the condition of an accumulator and is certainly to be recommended for use in your case.

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free, immediately. This application will place you under NO obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

HIGH-RESISTANCE VOLTMETER.

L. A. W. (Lincs.).—"What advantage has a high-resistance voltmeter over an equally good or equally expensive low-resistance meter?"

The advantage of a high-resistance instrument can best be explained in the following way. Any voltmeter, whatever the type, is an instrument for measuring the pressure or voltage across two particular points. In order to do this it has to be connected across these two points, and the thing to remember is that as soon as it is connected across the points in question the mere fact of joining it up is bound to alter the pressure there, because the voltmeter itself provides another path for the current to flow.

It will now readily be seen why a high-resistance voltmeter is better than a low-resistance one. The former passes but little current between the two points under test and does not materially affect the condition prevailing there. But one of low resistance will be taking a comparatively high current from the two points in question, and actually lowers the pressure which it is desired to measure, and thereby gives a fictitious and misleading reading.

WHY WOOD?

P. T. D. (Clifton, nr. Manchester).—"What is the object of the wooden plates used in an accumulator?"

Wooden sheets used in an accumulator are merely separators, to keep the metal plates at correct distances and properly isolated from each other. Being absorbent and resilient the wooden sheets can hold the plates securely in place and at the same time supply free access to the plates for the liquid electrolyte which not only permeates the wood itself but flows into the slots provided, down which it can penetrate freely.

An advantage of this type of separator is that by completely separating the negative from the positive plates it absolutely prevents little pieces of dislodged metal from one set of plates getting on the other, and thus setting up local action, which is such a great source of trouble in cells of this kind.

BLAMING THE VALVES.

T. T. (Stamford, Lincs.).—"I cannot blame the valves because I can clearly see the filament of each one, underneath the silver coating (by a bit of manœuvring), and in all cases they glow quite satisfactorily. What do you think would be the cause of these results?"

You say you cannot blame the valves, and we cannot blame you for saying so. But, nevertheless, it probably is one of the valves causing the trouble you describe.

Just because the filament is intact it does not necessarily mean that the valve is O.K. As you have had these a long time we should certainly get them tested for emission, etc., either by a qualified dealer or by sending them to the manufacturers for test.

CARE OF THE L.T. BATTERY.

A. H. R. (Sheffield).—"Not having had anything to do with electricity before I should be very glad of some hints on the care of the L.T. battery. What are the chief points to watch?"

If you are fortunate enough to know of a really good service station for L.T. batteries, your accumulator will be automatically kept in condition by this charging station. The actual condition of the whole battery and its separate cells should be checked there by experts who know just how to cure any little troubles that may arise.

The symptoms by which the condition of a cell are tested are the voltage and the specific gravity. The voltage is tested by means of a voltmeter, before, during, and after the charging, and also while the accumulator is discharging.

Similarly the specific gravity of the electrolyte is tested during the various stages of charging and discharging, and if the tests are scrupulously carried out the slightest disorder in the cells will be detected at its very beginning.

The chief points watched in a charging station, apart from the rates of charge, etc., are:

(*a*) "Topping up" the cells (distilled water is used to make up for any losses of the acid solution due to evaporation).

(*b*) Scrupulous cleanliness of the connections is essential. The connecting bars should be tight and well fitting, the terminals coated with petroleum jelly to prevent them being attacked by the acid, and in general the battery should be kept clean, cool and dry.

(*c*) The little filling plugs should always be placed back in position after the electrolyte has been tested or renewed, and it is important that the small holes in the plugs (arranged for allowing gasses, etc., to escape), should not become blocked up.

About every twelve months the old electrolyte should be poured away and replaced by new electrolyte of the correct specific gravity.

CRYSTAL-SET RESULTS.

"CRYSTAL" (Winslow, Bucks).—"What is the cause of weak results on my crystal set?"

It is very difficult to say what are the causes of weak results, unless details are given of the kind of reception that is now being experienced, and how it differs from the normal reception.

For instance, is your set always weak now, or is it only weak at times? Did the fault come on suddenly or had you noticed it falling off gradually? Unless some particulars are given it is impossible to make a guess at what may be the cause of the trouble.

Signals on a crystal set are very seldom weak on account of anything wrong in the receiver itself, for any serious trouble there will completely prevent reception altogether (see also the answer to "Cat Whisker," Claygate).

CARE OF A CRYSTAL SET.

"CAT WHISKER" (Claygate, Surrey).—"And I am so pleased with the little crystal set that I want to keep it in good condition.

(*Continued on page* 886.)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 884.)

What should I do? I know that there is no battery or anything to bother about, but I should be glad of any little help to keep it in good trim."

There is very little to go wrong with a crystal set, but nevertheless there are a few points about the maintenance of this class of receiver which are worth watching. For instance, the telephones themselves should not be worn for very long periods, and then put away without being wiped gently with a fine cloth, or otherwise moisture may collect in the diaphragms which will eventually rust the telephones and probably do a good deal of damage.

(Telephones are extremely sensitive instruments, so all wiping, etc., should be very carefully done).

It is especially important not to bend the diaphragms of the telephones in any way. Another important point is to keep the whole set free from dust. This is especially true of the crystal itself, which should be kept as clean as possible and not handled with dirty fingers.

If sensitive spots become difficult to find the crystal should be broken in order to get a new surface. The cat's-whisker itself also should not be neglected, and should be kept sharply pointed, the degree of pressure upon the crystal itself being varied according to the pressure which gives best results. The most important proviso of all is to keep contacts clean. If the set is kept covered over and free from dust and the foregoing precautions are taken the set will give continuous satisfactory service.

AERIAL FOR CRYSTAL SET.

S. T. (Handsworth, Birmingham).—"Will a crystal set give good results worked from a frame aerial six miles from a broadcasting station?"

No, a frame aerial is generally unsatisfactory when used in conjunction with a crystal set. If a good outdoor aerial is not practicable you should use an indoor aerial of the type which hangs under the ceiling. Failing that, a long wire wound round the picture rail will give better results than a frame aerial.

USING THE MAINS AS AN AERIAL.

"CITY DWELLER" (London, S.W.9).—"As I am placed at present I cannot erect an outdoor aerial, and I have been told that I can use the electric-light mains instead. Would these be an effective substitute, and would there be any danger from shock in such circumstances?"

The results obtainable with an aerial of this kind can only be ascertained by test, and they are sometimes remarkably good and sometimes disappointing. There is no danger from shock providing that ordinary care is used, and that one of the specially constructed connectors of reliable make is employed, the instructions given by the makers being very carefully followed when installing this.

TECHNICAL NOTES.

(Continued from page 866.)

In view of the difficulties and cost of a satisfactory low-frequency filtering system, attempts have been made to use an entirely acoustical filtering arrangement. You may remember that I mentioned something of this kind a year or more ago.

In the current number of "Q. S. T.", the official organ of the American Radio Relay League, is a very interesting article, entitled, "Acoustic Wave Filters and Audio-frequency Selectivity." This article deals with the acoustic arrangements referred to above, and although it is intended more particularly for transmitting experimenters, it is of interest and importance to receiving experimenters also.

Narrower Wave-Band.

Owing to the fact that the amateur transmitting bands in the States are to be narrowed down next year, it is of extreme importance that a method should be found for securing greater selectivity. The inherent principles of heterodyne reception are such as to produce interference in the telephones from signals within an audible frequency difference from the desired signal, and there appears to be no simple way of overcoming this fundamental difficulty by ordinary radio-frequency means. Electric band-pass filters may be used at intermediate or at audio frequencies to cut out unwanted signals. Their use at intermediate frequencies appears to be not without promise, but, of course, assumes the use of the super-heterodyne principle, whilst at audio-frequencies, as already mentioned, the electric filter is expensive, bulky and liable to give rise to considerable losses.

Resonators.

The acoustic filter consists of a series of metal "cans" serving the purpose of resonators, the dimensions being approximately 2¼ in. high by 1 3/16 in. in diameter. The canister is, of course, completely closed except for a tube passing from the centre of one end, this tube being about 1 in. long and 1/16 in. internal diameter.

Naturally, the dimensions of the can and the tube depend upon the acoustic wave-length to which the vessel is intended to resonate.

"Acoustic Inductance."

The resonator acts like an "acoustic inductance" in the neck and "acoustic capacity" in the closed cavity. You would expect such a system to oscillate (that is, the air to oscillate) when excited by a current of air blown across the mouth of the neck, and you would expect the natural frequency of the oscillations to be determined by the "inductance" of the neck and the "capacity" of the cavity, which is what is found in practice to be the case.

I have not the space to go into this matter in further detail, but any of my readers who are interested will find a full account in the August number of "Q.S.T."

(Continued on page 888.)

TECHNICAL NOTES.

(*Continued from page* 886.)

"Stepless" Resistances.

American manufacturers are largely advertising various components and devices intended to be used in connection with experimental television, although television is in much the same state in America as here. However, by the mass experiments of a large number of enthusiasts, it cannot be doubted that some progress will in due course be made.

A well-known firm of rheostat manufacturers have introduced a special power rheostat, which they describe as "stepless"—which presumably means that it works on the compressed carbon principle or by the movement of a slider over a *linear* resistance element (that is, not in the form of a *winding*). This power rheostat is recommended by the makers for controlling the speed of the motor which drives the scanning disc at the television receiving apparatus.

Distortion.

According to the makers, "One of the tricks in achieving television reception is the synchronisation of the receiving scanning disc with that of the transmitting end. This calls for an exceedingly accurate control of the speed of the motor; otherwise the image is distorted, much after the fashion of the image seen in the trick mirrors at amusement parks, or, worse still, there is no image at all. Whilst automatic control is possible, it is costly and complicated at the present time, and it is only adding confusion to the delicate work of getting strong images."

"Owing to the stepless control afforded by the above-mentioned device, it permits a variation of speed in fractions of a revolution per minute."

The Kino Lamp.

The same manufacturers recommend the use of the stepless rheostat in series with the kino lamp which carries the output of the television receiver. The kino lamp, or special luminous tube, translates television signals into varying light-intensities and operates in place of the usual loud speaker. It is connected into the circuit in a similar manner to the loud speaker, except that no blocking condenser is employed: the condenser is omitted because the kino lamp requires from 160 to 200 volts of direct current to maintain its normal glow. It is this glow which is modulated by the signals from the power valve. The glow increases or decreases in response to the impressed current, and it is these changes of brilliancy which, when seen through the holes of the revolving scanning disc, provide the luminous spots that are woven into the image.

THE GERMAN EXHIBITION.

ACCORDING to "The Times," the German Wireless Exhibition, which is to be held at Witzleben, Berlin, from August 31st to September 9th, will give many indications of the relationship cultivated in Germany between broadcasting and the speaking film. Dr. Stresemann, the German Foreign Minister, will address the guests at the inaugural banquet by means of a speaking film.

A short time ago, the Berlin broadcasting programme consisted one evening entirely of transmissions of the speaking part of the Tri-Ergon speaking films, prefaced by speeches by the Reichsrundfunk Kommissar and a director of the central German broadcasting organisation, in which attention was called to the possibility of an archive of broadcast transmissions. Generally speaking, the German technical Press is opposed to the idea of a "broadcasting archive," but, in view of the quality of the reproduction obtained, it is difficult to see how the objection to this interesting proposal could be upheld in the case of transmissions of exceptional or historic value.

Good Results.

Several Berlin wireless amateurs have recorded successful reception from Daventry of pictures transmitted on Captain Fulton's system. The receiving station of the "Berliner Tageblatt," which owns a "Fultograph," obtained in one day, in the trying conditions of summer, thirteen clear pictures, "only slightly disturbed by atmospherics." One of these pictures, of a horse's head, is published by the newspaper, and in view of the distance of the transmission the result must be considered interesting. In common with certain technical circles, the "Tageblatt" is inclined to criticise the official attitude to picture transmission. Utilitarian considerations—the lack of broadcasting time and special wave-lengths, and the possibility of improvements in the existing systems—have militated against the introduction of any kind of service, but its attraction in more favourable circumstances is not questioned.

"HELLO, AIRIDE—OVER TO YOU!"

THERE was much of interest in the recent aerial war apart from the spectacular aspect.

Wireless played quite a large part in the defence of London, and on the second evening of the war, on a wave-length of approximately 80 metres, the writer tuned in signals from several aeroplanes who were working with Croydon.

The signals were by no means easy to follow. For one thing, the exhaust noises from the 'plane engines rendered speech difficult to follow, and to make matters worse, atmospherics on the 80-metre band were particularly bad.

Bad Distortion.

Whether it is that Croydon badly overmodulates, or uses a poor microphone, I am not in a position to say, but as far as my results were concerned the speech from this station was badly distorted.

By rapid manipulation of the dials from Croydon to the 'planes it was possible to follow the conversations between them for the best part of an hour.

At one stage in the proceedings I felt quite hurt about it when I heard that a certain 'plane was not able to attack the invader, and I am now wondering if that was why the Air Ministry "went west"!

G. T. K.

R/R

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