ANOTHER GREAT COMPETITION THIS MONTH

WIRELESS & TELEVISION REVIEW

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1936

HEARING THE ELECTRON'S FOOTSTEPS

ZERO HOUR FOR TELEVISION

RADIO HUMOUR!

BROADCAST NEWS

EVERY MONTH 1/-

Armchair Control for HOME CONSTRUCTORS

See Inside!

Contents

As some of the arrangements and specialties described in this journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

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WIRELESS and TELEVISION REVIEW

Editor: G. V. DOWDING Assistant Editor: A. S. CLARK

Explaining Some Points Often Not Fully Appreciated

THERE are one or two items connected with radio—hardly technical items in the ordinary sense of the word—which closely concern all readers, but about which, at the same time, a good deal of misapprehension exists.

And those who happen to raise enquiries concerning these points with people who should know, often fail to get the definite replies they are after. So a few words of explanation here will probably be of value to a number of readers.

Two or three of the points concern questions of radio licences. First, there is the use of radio on a car. Is a licence necessary or not?

The answer to that is, it may be. It all depends on the type of receiver employed on the car.

If it is a genuine portable receiver, an additional licence is not needed to work it on a car any more than in other places. Of course, if you don't happen to have a radio for your home, you must take one out to cover the use of the portable.

An interesting point, often overlooked, concerning portable receivers, is that, legally, the licence should be carried by the person using the portable set.

Licence Should Be Kept in Car

But to return to car radios. If the installation is a special car outfit permanently fixed in place, then an additional licence apart from the one for the radio in your home is necessary. And this extra licence should always be kept on the car itself.

It will surprise many readers—and not a few servicemen—to learn that a special form of radio licence is also necessary for the use of a modulated oscillator. And even then the degree of radiation must be kept within certain limits.

It is really only natural that such a licence should be required, for, after all, a modulated oscillator is a miniature broadcasting station.

If the oscillator is entirely non-radiating, namely completely screened, and connected to the set by means of screened leads, the licence is not required. Other special circumstances may also exempt the user from having to buy a licence. The regulations concerning this special licence are very flexible, and anyone who is in doubt can obtain advice on the subject from the G.P.O., London.

The G.P.O. and Electrical Interference

Reference to the G.P.O. brings up the question of its work in connection with electrical interference. Most readers know that in cases of bad interference from man-made static they can call on the G.P.O., which works in close collaboration with the B.B.C., to give advice.

But few realise that even if the trouble is definitely traced to some particular piece of electrical gear, the G.P.O. (and anyone else for that matter) has not the power to force the owner to do anything about it. These powers will probably be granted one day, but at present the listener is entirely dependent on the goodwill of his neighbours, and may quite likely be expected to bear some of the expense incurred.

And now, the power of a broadcasting station. When a station is said to have a power of 50 kilowatts it does not mean that only 50 kilowatts of power are fed to the transmitting valves' anode circuits. The figure refers to the power in the aerial circuit, or "carrier power" as it were.

It thus provides a true comparison of the relative strengths of stations, whereas the power fed in may easily vary considerably in different cases for the same aerial power.

Finally, a word about screened downleads. Interference is mainly picked up on the downlead, not because it is in any way peculiarly different from the horizontal part of the aerial, but simply because it is more likely to come within the field of the interfering radiations. So don't expect a screened downlead to work wonders unless your aerial is fairly high and free from surrounding objects. **A. S. C.**

ERECTING AN OUTDOOR AERIAL

Those who like an efficient aerial will find the best method of erecting one clearly explained in this article.

An outdoor aerial should be as high as possible, and as far as possible not screened by surrounding buildings or trees.

There are several wires which are suitable to choose from; of these, 7/22 copper is probably as good as any.

A Point to Note

When selecting insulators, it should be remembered that one good insulator at each end is adequate. There are several insulators on the market which will serve quite adequately, but those of porcelain rely for their insulating properties upon the glaze, and if this is damaged in any way, the insulator is useless. It is possible to obtain glass insulators which have the advantage of being non-hygroscopic, and it would be well worth while to invest in a couple of these. Being almost transparent they are scarcely discernible when erected.

Assuming that a mast or tree is available, that a pulley has been fixed to it and a similar pulley or ring to the house, all that is needed before the job is begun is some binding wire—

THE DOWN-LEAD END

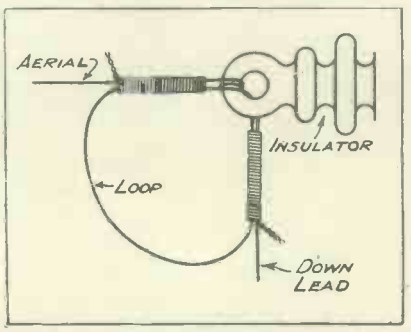


Fig. 2. The suggested method of arranging the down-lead.

a ¼-lb. reel of 22-gauge tinned copper, or a ½-lb. reel of 18-gauge tinned copper will be ample—and a double-pole, double-throw switch, preferably one that is mounted on porcelain and covered to protect it from weather.

The length of the aerial depends upon individual requirements; an aerial approximately 50 ft. long should be sufficient. The method of attaching the insulators is shown in Fig. 1. The end of the wire is passed twice through the hole in the insulator, laid back upon itself for a length of about a foot and bound (a). The end of the halyard used to hoist the aerial and keep it in position at the end farthest from the receiver is attached in a like fashion (b). The method used at the opposite end, i.e. for the lead-in, is somewhat different. The length of the aerial is determined and marked and sufficient wire left to reach down to the switch when the aerial is finally hoisted. This down-lead is threaded through the

JOINING-UP THE INSULATOR

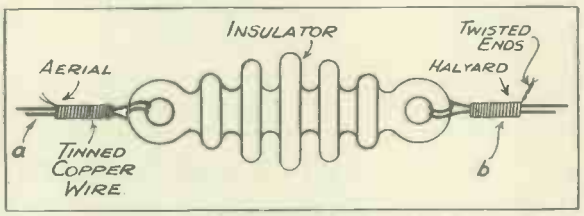


Fig. 1. How to fix the wire and halyard to the insulator.

insulator and pulled tight. It is then again threaded through in the same direction, but a loop approximately six inches in diameter is left. This is bound as illustrated in Fig. 2.

These bindings can then be covered with a small quantity of grease or pitch to protect them from weather. If this is done conscientiously there is no reason why the aerial should not last for several years provided it is lowered at intervals and the insulators cleaned. This point should particularly be observed in towns owing to the large proportion of soot in the atmosphere as compared with country districts. This end of the insulator nearest the receiver is attached by means of a rope similarly bound to the pulley or ring on the house. If possible, flexible steel wire should be used in preference to rope, the latter being apt to shrink with wet.

SWITCHING CONNECTIONS

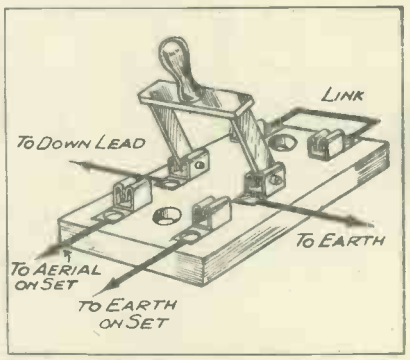


Fig. 3. The connections for the earthing switch.

Earthing Arrangements

If the listener desires to use one of the many patent lightning arrestors on the market, this should be fixed in position and the earth wire taken to one side. If this is done it will not be necessary to use a switch, but if a switch is preferred, this should be mounted in a position easily accessible. (See connections in Fig. 3.)

Although all this may sound rather involved the listener will be well repaid for the extra trouble taken.

A MULTI-MU TIP

Varying the grid bias of a multi-mu valve must not affect the voltages on the screen and anode. Here is some practical information on this point.

For entirely satisfactory volume control when using a multi-mu S.G. valve it is essential that the voltage applied to the screening grid and the anode remain constant when the bias voltage is varied.

With A.C. and D.C. mains type multi-mu valves the special resistance arrangements recommended by the valve makers should be used, and this will ensure good voltage regulation. With a battery-operated set the voltages will naturally remain constant providing normal values of H.F. decoupling resistances are used.

When using a battery set in conjunction with a mains H.T. unit difficulty may be experienced due to the S.G. voltage tapping of the eliminator not having sufficiently good regulation. In this case it is worth while connecting a 30,000 or 50,000 ohms potentiometer across the H.T.— and maximum H.T.+ tappings, the slider being connected to the screening-grid terminal.

The position of the potentiometer slider is then set with the volume control at maximum to give best results, and no appreciable screening-grid voltage change should occur when the volume control is operated.

C. R.

Zero Hour for Television

By
G. V. DOWDING,
Associate I.E.E.

What lines will the development of television take once a regular service has been established? It is not an easy question to answer, and in this article the author explores the various possibilities.

WITHIN three or four months from the time you read these words the B.B.C. television service will be inaugurated. No doubt there will be a grand opening day and the Postmaster-General, or some other eminent person, will deliver an oration.

One can almost predict the actual words which will be used. "New phase in home entertainment— immense possibilities—inevitable alliance of sight with sound," and so on.

Quite New Territory

But what is quite impossible to predict is exactly what will happen to television during the following two or three years.

With television we enter into quite new territory and there are no precedents to guide us.

First of all, let us speculate for a while on the technical aspects.

It is said that the London Alexandra Palace station will provide a service range of twenty-five miles radius. Now it is easy to predict with fair accuracy the range of a radio station operating on medium or long waves. Especially if a number of test reception measurements are taken at various distances in different directions from it.

We have two or three decades of world-wide experience of radio communications on such waves to help us to forecast the probable results given by any new station.

However, television is to employ the quite new ultra-short wavelengths which, comparatively, have very little history of practical application behind them.

Interesting Tests

The B.B.C. have been carrying out a number of tests and I hear that the results of these have proved most interesting. In some directions the twenty-five mile service range may be considerably exceeded, and, if rumours have any foundation, in others there may be slight difficulties.

And yet five-metre transmissions have crossed the Atlantic! One thing seems to be quite certain, and that is these ultra-short waves do not obey a "quasi-optical" law and that they do not confine their travel to rigidly straight beams as do light waves.

Which introduces further food for speculation. It has been advanced that there is a distinct possibility of ultra-shorts from other countries exhibiting awkward propensities to exceed their presumed short ranges of transmission, and coming over and causing interference with British television.

On the other hand, it seems unlikely that we shall be faced with serious interference from "man-made static."

Some pessimists have said that television will encounter very bad "jamming" from motor-car ignition systems and other such things, and that the reception of clean pictures will be impossible until all petrol engines are equipped with suppressors.

It seems, though, that this is likely to be a bogey which will not materialise; at least, to any troublesome extent. In any case, such interference will not affect the pictures as much as the sound. What might cause very bad interference with speech or music does not necessarily, it seems, create great disfiguring blots and splotches on television pictures. The interference is noticeable on a clear screen but tends to be absorbed into a picture.

Reducing Interference

Even so, there are methods of reducing interference by means of special aerial systems and so on.

I presume that manufacturers of television outfits will arrange that their apparatus can be tested in one's own home before one has to pay the money for it. I cannot see how otherwise big sales can be expected. After all, motor-car firms have always regarded "trial runs" as essential parts of their sales services.

The desirability of a "trial run" with a television outfit will be much greater than it is with a modern motor-car.

Of course, the home-constructor will be in a privileged position. He will be able to "knock up" a simple ultra-short-wave receiver at a cost of a pound or two and gauge for himself how well or otherwise the television transmissions come over to his own particular house.

The Sound Part

Certainly, the sound part of the programmes will be audible almost anywhere within a radius of thirty or even forty miles, or perhaps quite a long way farther off than that.

Which brings me to another point. Television services need not stand or fall entirely by their pictures. It is highly probable that for a long time very many more will merely listen to the London television programmes than will both look and listen.

At the lowest estimate the new B.B.C. television service will provide new British programme material for listening, and no doubt many of the items will be as complete for that purpose as the present ones.

OUR GRACIE'S BACK

A happy "snapshot" of Gracie Fields on her arrival a few weeks ago at Southampton from South Africa.

True, one wouldn't get much of a kick out of listening to the pattering of the feet of a dancer or the clicking of the heels at a mannequin parade which one couldn't see. But there will be variety and other items complete in themselves as sound entertainment.

So it may well be that the television boom will be headed by a spearpoint of home-constructors, building in their thousands inexpensive little sets and units for *listening* to the Alexandra Palace.

The Price Question

And later, these same constructors will doubtless nibble at the picture side and swell the ranks of "lookers." That is how I predict television will grow. It will not sweep into universal use almost overnight.

The probable prices of complete television outfits during the first few months will apply something of a brake. Everyone will be fully aware that prices must and will eventually come down, and only those with plenty of cash to spare will straightaway purchase complete outfits.

I do not think the erection of provincial television stations will be as long delayed as was visualised in the report of the television committee. As will be remembered, the more recent Ullswater Committee has recommended that television should at once be a *service*. This committee is not in favour of prolonging experimental phases.

It has also suggested methods of ensuring that television will not be hampered in its development through lack of money. There is more than the thought of social amenities behind these recommendations. At least, that is my opinion.

National Prestige

I believe the Committee had national prestige in mind. You see, Great Britain was right in the van of television progress a year or two ago. Then there were delays, while other countries, notably Germany and Soviet Russia, pressed ahead.

As television on a national basis is inevitable sooner or later, there is no reason why, having gone so far, Great Britain should not again resume the lead with a wide-scale national service and thereby gain considerable international kudos.

The fact that only this or that number of television outfits may be sold in London during the coming autumn should not be allowed to influence the development of television in the provinces, and if there are technical difficulties, these too should be met with a bold front.

And I think, particularly in view of the words of the Ullswater Report, that that is what we shall see. A kind of steam-roller advance. In this way, years will be knocked off the time between the day of inaugurating the London service and the time when television will be within the reach both technically and financially, of the majority of listeners.

And all the while there will be the home constructors busily building their little ultra-short-wave receivers and providing a mass of information about the action of these exciting new frequencies.

Maybe six or seven months may have to elapse before the magnitude of this television will begin to dawn upon the "man in the street." But one day, as certain as the sun will continue to rise, he will realise that an entirely new form of home entertainment has arrived, and one having boundless possibilities. And then there will in truth be a boom.

But what of the programmes? Well, television has an almost unlimited scope. It will undoubtedly receive its greatest impetus from the televising of spectacular events.

Such as the Coronation and other important and colourful State affairs. Those who are fortunate enough to possess television apparatus and are able to witness these things in their own homes will be the envy of all their friends.

Use of Films

And no doubt there will be television transmission of the tennis championship finals at Wimbledon and so on, for this is well within the power of the systems which the B.B.C. is to operate.

However, when all is said and done such items cannot in themselves justify a television service. There will have to be scheduled "sustaining" programmes.

But there will be no shortage of material. Film stock will undoubtedly be drawn upon to a considerable extent, and I can think of scores of suitable subjects.

Short comedy and "actuality" films, cartoons and travelogues.

Hundreds of film shorts are made every year which never manage to get into the bills of the big cinemas.

Not because they are not good, but because the super-cinemas must have "super" films in both length and cost of production.

Anyone who has visited a "news" cinema will agree that there is plenty of excellent material produced suitable for short television sessions which is not normally shown.

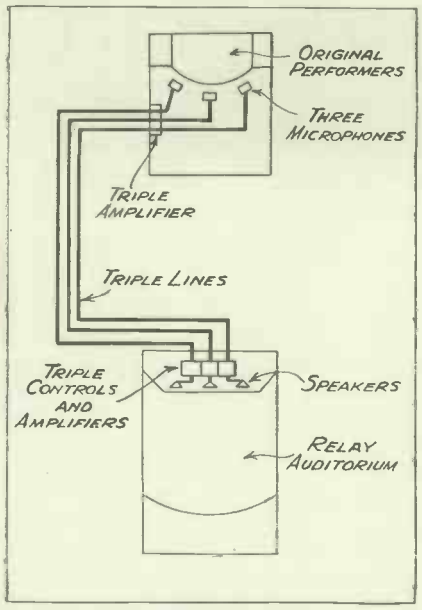
Difficulties Unlikely

But will it be available to the B.B.C.? A great deal has been said about the probable policies of the film companies towards television, but I believe the B.B.C. will be able to obtain as much film stock of good quality as they want; and I have an excellent reason for believing that, and most of you will realise what this is after you have thought around the matter for a little while.

STEAM-ROLLER ADVANCE

NORMAN, BILLY AND EKCO

***FIRM FAVOURITES!** Norman is a popular favourite with listeners, and Billy his dog, a "drop of the best" and his EKCO receiver are firm favourites with Norman Long.*



A schematic diagram showing the principle of the idea described in the article on this page.

BETTER THAN REAL

By K. BANFIELD

Details of a new system of reproduction, by means of three mikes and three speakers, which ensures perfect sound distribution.

THE radio enthusiast has from the earliest days of broadcasting been the butt of his musical counterpart.

"There's nothing like the real thing," says the highbrow, contending that the only way to listen is in the concert hall.

The grounds for this criticism are that the radio receiver cannot reproduce the full range of frequencies and upper harmonics, and that the acoustics of the average room are so different from those of the auditorium that the effect is poor.

A few years ago I remember going to the Queen's Hall with such an expert, and sitting at the rear of the balcony, facing the right-hand side of the platform.

Too Much Brass

I have never heard so much brass in an orchestral concert, before or since! For some reason this section of the orchestra produced a reverberation at that spot, and I hurried home to my set with the firm conviction that I should have enjoyed my evening at home much better.

Mind you, I won't pretend that a seat in the centre of the stalls or balcony front is not better than my set can ever hope to be, but alas! we cannot always be sure of such an ideal position.

Again, we all know many less famous halls in which effects such as I have mentioned are not confined to one spot, but occur over wide areas, especially if pillars and wide balconies exist, so that the "real thing" is less true than the artificial rendering by means of a microphone placed in a better position.

Working on problems such as these when undertaking the relay of music from one hall to another, engineers have found it possible to reproduce an orchestra at life-size volume with better distributed balance for the entire audience than on the site of the original performance itself!

The system is an extension of the well-known "binaural" relay, and uses three separate links, each consisting of microphone, amplifiers and one or more loudspeakers.

The "mikes" are placed at the left, centre and right front of the orchestra, and each connected through its own amplifiers and line to correspondingly placed speakers in the second hall. A special three-channel control panel gives the operator complete control of the volume, and high and low note response of each system, so that he is able to balance the reproduction in such a manner as to compensate for acoustic peculiarities of the second auditorium.

In addition, extra microphones for soloists could be switched in on their own channels, so that voices and single instruments could be brought up above the general level without having to drop the latter too far for the larger hall.

Future Possibilities

Operated and controlled under the guidance of a musical director, the results have been greeted by musicians as "better than the real thing."

Such a system is, of course, very costly, and is so far economically impracticable, but it has been tested experimentally, and now that ultra short waves are developing so rapidly we may yet see two or three adjacent channels set aside for binaural broadcasting.

What a wonderful new field for the experimenter that would be!

CAROLYN MARSH

This beautiful American singer, who has recently been heard on the radio in this country and who is at present appearing in "All Alight at Oxford Circus," has had an amazingly wide experience in theatre, broadcasting and film work, although she is only nineteen.

On her way to London she missed the boat she should have sailed on and eventually arrived without a passport, but was just in time for her show after a hectic run in a speed-boat to Southampton.

In America she is known as "The beautiful singer of beautiful songs," as true-to-life a description as one could wish for.

MISS BARBARA BURNHAM.

WOMEN at the B.B.C.

Do you know the word "Radiogenic"? Miss Barbara Burnham, in an interview with Alan Hunter, describes just exactly what is meant by this term.

SHOULD stage plays and novels be adapted to make microphone plays, or should synthetic radio plays—so-called "pure" radio drama—dominate the B.B.C. Drama Direction's schedule?

The Story All-Important

At the moment quite a controversy centres around that question. Mr. Val Gielgud, the B.B.C. Director of Drama, rightly contends that the story is the thing, not its source of origin. He cannot get enough good plays specially written for the microphone. He insists on good plays. And so, willy nilly, he is thrown back on adaptations of stories written in the first place for other media.

On his staff is Miss Barbara Burnham, who probably knows more about microphone adaptation than anyone else. For she has been with Mr. Gielgud almost since the time when, in the pioneer Savoy Hill days, he first took charge of broadcast drama.

Joining the B.B.C. to adapt plays for the microphone, Miss Burnham began by collaborating with various producers, but since those early days she has, of course, produced many successful plays herself.

Fascinating Work

When I went to see her in the Big House I found her sitting amidst the records of many past successes—and failures—of broadcast drama. For she was in the play library, where a decade or more of radio drama in all its forms is stored.

"I have always found the work fascinating," admitted Miss Burnham, "simply because there are no fixed rules to go by. One has to use one's judgment—or call it one's common sense, if you like—for each play, novel or story that presents itself for adaptation.

"One thing I have learned from my experience is that the initial choice of the material for a broadcast adaptation is of enormous importance. In fact, I would go so far as to say it is half the battle.

A Good Example

"We are rather fond of the word 'radiogenic' in the Drama department—used to describe, of course, anything that seems to us to have real broadcasting possibilities. Some stage plays and many novels are, by their nature, radiogenic, in that their essential charm can be conveyed through the microphone.

"Take J. B. Priestley's 'Eden End' as an example. Here is a stage play characterised by a quiet and sensitive atmosphere. Except for the cutting down of the play to a reasonable time length for the microphone and the linking together of the various scenes, very little need be done to it.

"Certainly it would be a crime to introduce all kinds of stunt sound effects into such a play. Stunts for their own sake do not appeal to me, anyway.

"In such plays we rely on the brilliance of the author's dialogue—which is naturally even more important in the radio version than in the original stage version, where to some extent the visual acting makes up for other deficiencies.

Character Delineation

"In passing, it is interesting to discover that, whereas on the stage the characters may assume a rather larger-than-life appearance, and actually gain thereby, it is quite another matter before the microphone, where such tactics simply detract from realism.

"As the real job of an adaptor is to get across, so to speak, with the story and its essential atmosphere, the character delineation has to be studied very closely in the only way it can be—through the spoken word.

"Narrators? I personally am against the idea, as such. Unless, of course, it is a story-telling kind of play, where the narrators are really characters. Otherwise, I think that with extra hard work and care it should be possible to write the scenes without the prop of a narrator.

"The future? Well, I for one have little sympathy with those who talk pretentiously of the special 'art form' of radio drama. I suppose that every intrinsically good piece of work does fit into its peculiar form—but I suspect a good deal of specious nonsense is talked about the 'art form' of broadcast plays.

"At the same time, it is possible that radio is evolving—however temporarily—a form of drama different from any other. Just as I suppose the silent film was a purer 'art form' than the modern talking picture, which tends to be more distinctly imitative of the stage than ever the silent film did.

The Effect of Television

"I imagine television, when finally it does come to the extent of affecting ordinary programmes, will have much the same effect on radio drama. I mean, radio drama with vision is bound to be less different from other forms of entertainment than it is now."

Meanwhile, Miss Burnham continues to seek out good stories and to adapt them for our delight. She is one of the "women at the B.B.C."—a charming though shy personality with some rather firm convictions about her work.

Armchair Control for Constructors

Put your set out of the way in a cupboard, out of sight in another room, anywhere you like. Choose your programme by the touch of a switch. Control the set and adjust volume without leaving your comfortable chair. In other words, build this unique receiver design.

By A. S. CLARK

WOULD you like your radio laid on like the electric mains? That without a doubt is the ideal in the minds of many constructors, and when examined more closely has much to recommend it.

Just push a switch down and the National programme is heard; close another switch and you change instantly to the Regional programme. And volume is immediately controllable while you sit in your chair by the fireside.

Amazing Simplicity

No set or batteries are visible, and even the loudspeaker can be hidden away or disguised if you like. That is a brief outline of what you can achieve with the set I am going to describe.

If you feel that such possibilities must involve extremely complicated apparatus entirely outside the bounds of your mechanical capabilities, let me add right away that the set is amazingly easy to construct, quite inexpensive, and the simplest thing in the world to install.

Readers who like to furnish their rooms on most modern lines, with little furniture, hidden lights, and so on will welcome this radio installation as just the right thing. If the loudspeaker is hidden or disguised and the switches arranged at one side of the fireplace, a truly ultra-modern effect can be conveyed.

But quite apart from this aspect the design has many attractions. In any circumstances where remote control is desired, say for a bedridden invalid, it is the ideal arrangement to adopt, and provides National or Regional programme without any tuning or adjustment of the set whatever.

A Real Time-Saver

Probably quite ninety per cent of listening is on one of these two programmes, and the time saved in tuning from one to the other is very welcome. Another welcome point in many circumstances is the fact that the receiver can be packed away right out of sight in the bottom of a cupboard or on top of a bookcase.

There are many ingenious points of design in the receiver which overcome what might at first appear insuperable difficulties. For instance, the question of the different volumes with which the Regional and National programmes are bound to be received in different parts of the country.

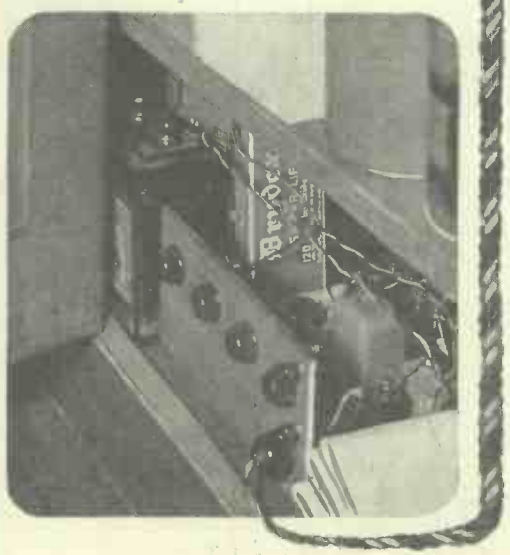
As I shall explain a little later, the circuit can be so adjusted that both programmes are received at equal strength, the volume control not requiring to be touched when switching from one to the other once the desired volume has been chosen.

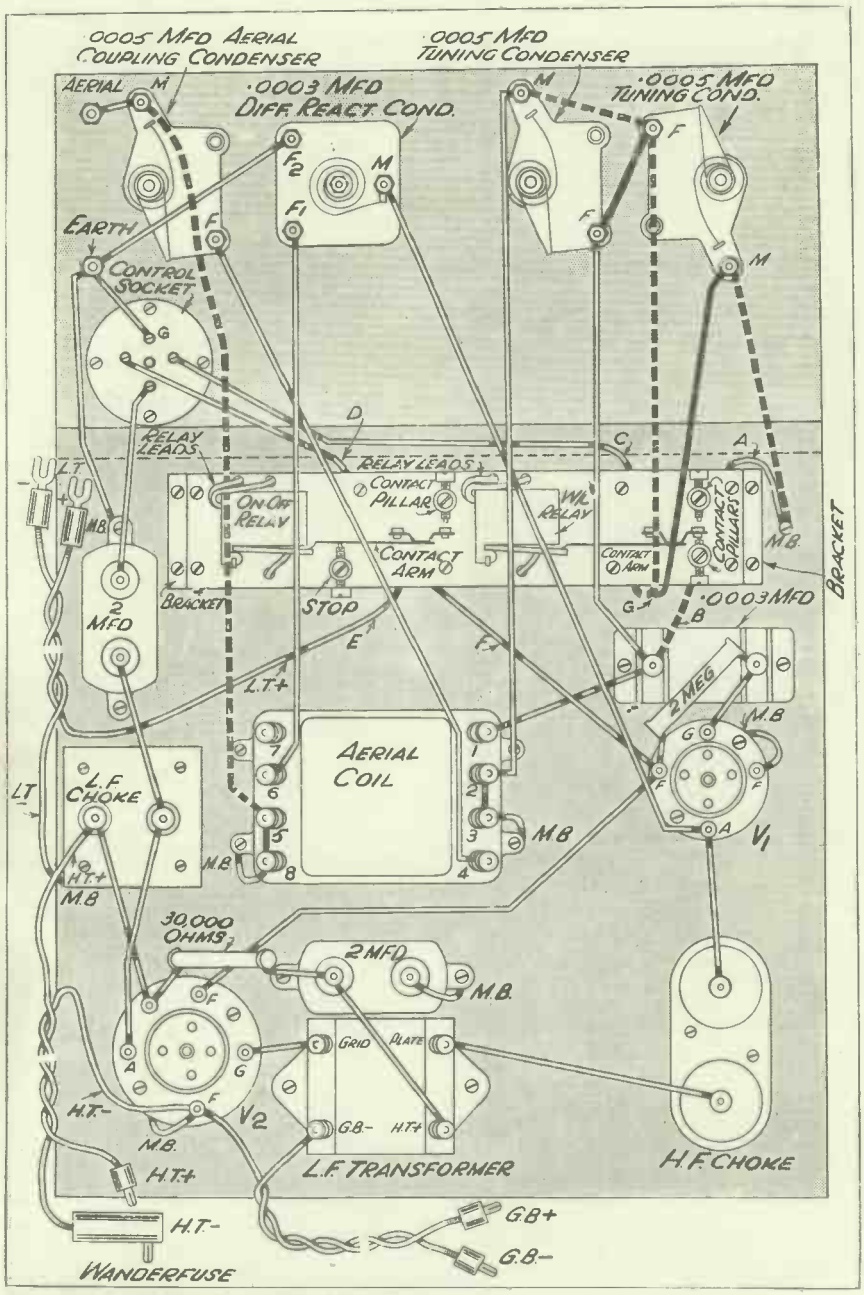
Then again, in some cases the National programme will be received on medium waves and in others on long waves. This is quickly allowed for in the receiver by the alteration of one or two wires. The balancing effect remains the same in either instance.

A large number of circuits had to be experimented with before a satisfactory solution to the various difficulties was eventually found. The final circuit is such that it can be guaranteed to be suitable for use in practically every locality and under practically any set of conditions.

Now I think we can be a little more specific from the technical point of view.

The set is pre-set to bring in two different wavelengths. On one the Regional programme is received and on the other the National. The Regional wavelength will always be





Insert all the double-line connections, and then add the dotted or solid ones as explained in the text. The points marked M.B. indicate connections to metallised baseboard.

on the medium waves, while, according to the way the set is wired, the National can be received on either long or medium waves.

The receiver can thus be set to receive on two wavelengths on the medium waves or one on the medium waves and one on the long waves. Two different methods of wiring are shown on the wiring plan.

Unless you are sure which, in your case, is the best wavelength on which to receive the National programme, the idea is to wire the set first one way and then the other to see which gives the best effect. The wires shown as double lines have to be connected for both cases.

Then, for the reception of two medium wavers, the connections indicated by the solid lines are inserted and the dotted ones ignored. When you wish to have one medium and one long-wave station, the dotted connections are added to the double lines and the solid leads ignored.

It will be seen that there are few solid and dotted connections, so you will appreciate that the changeover from one method to the other is quite a simple and quick matter. Also on this page you will see another diagram showing the connections underneath the relay strip.

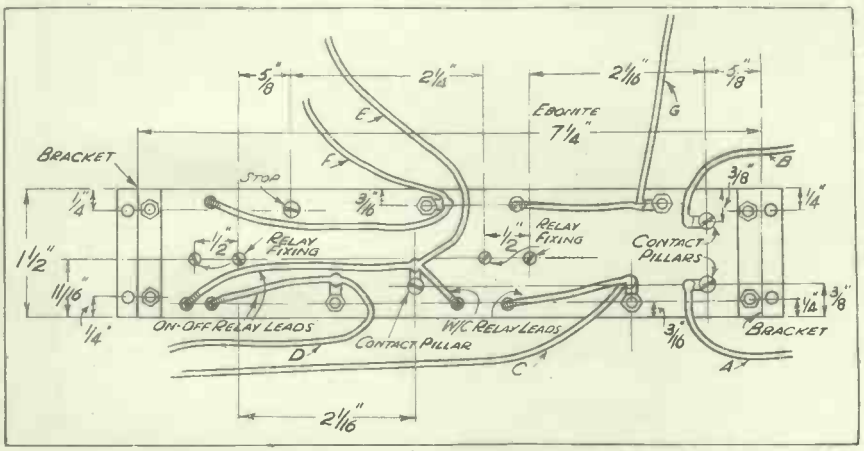
The leads going to this strip are lettered similarly in both diagrams for purposes of cross reference. Note should be taken, however, of the fact that all wires are shown as double lines in the small sketch. Use the main wiring plan as your guide when inserting the wires.

The Method of Control

Initially the stations are tuned-in on the four tuning knobs on the front of the panel. After this, the whole control is from the small switch panel that may be fixed at the side of the fireplace or anywhere else that is convenient.

The left-hand switch turns the receiver on, while the right-hand one decides whether the National or Regional programme shall be received. When it is in the "on" position, namely down, the Regional will come through.

Volume of reproduction is controlled by the potentiometer on the switch panel. Only four wires run from the set to the switch panel, and two of these continue on from the switch panel to the loudspeaker. A four-pin valve-base-type plug and socket are provided on the set's panel to connect up the leads to the switch panel.



This is the underneath of the relay strip seen in the wiring diagram above. Note that it is shown turned over from top to bottom and not from left to right.

Care must be taken to wire the switch panel and its leads exactly as indicated in its wiring diagram. Note that in this diagram you are looking at the top of the four-pin plug, and not at the side from which the pins project.

Commencing the Construction

Those who wish to understand the circuit arrangement can follow the scheme from the theoretical circuit diagram. In this case the alternative additional wiring which gives two "mediums," or one station on each band, is indicated by double and dotted lines. The double wires are those added for two medium wavers.

Although the connections are different in the two cases for the aerial input circuit, the series aerial condenser has the same effect in both cases in balancing up the volumes of the two programmes. The way it works will be dealt with later.

The first thing to tackle in the construction is the relay strip and the relay assembly. Apart from this job the construction is merely a matter of simple assembly and wiring. When the relay strip is completed it can be treated as an ordinary component requiring to be mounted on the baseboard and wired up.

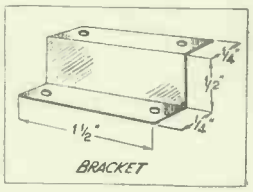
Commence by drilling the necessary holes in the ebonite, which should be $\frac{3}{16}$ in. thick. The sizes of the holes will be apparent from the screws which have to pass through them.

Any dimensions concerning the hole positions which are not given are of minor importance, approximate positions being enough. The two mounting brackets are made from sheet aluminium or other metal and are first bolted into position.

The relay parts, which are supplied by Messrs. A. F. Bulgin, Ltd. for 15s. the set, consist of two magnet and armature assemblies, and four contact pillars. The magnet and armature assemblies are identical, and are next fixed in place using the four screws provided.

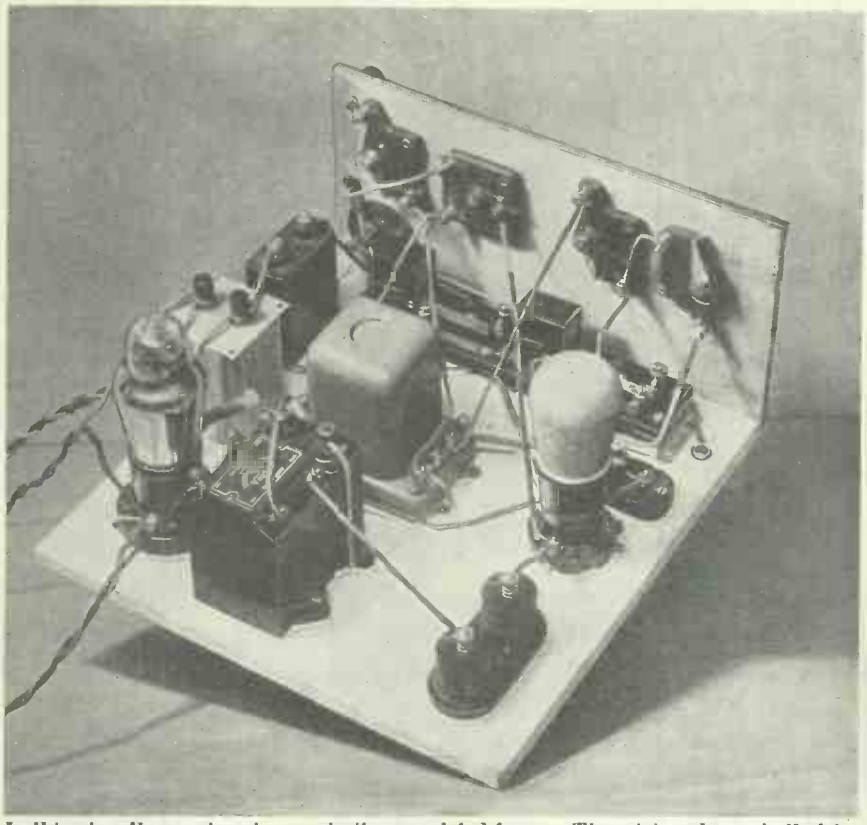
Now put on the four plain nuts and bolts which clamp the soldering tags

TWO ARE NEEDED



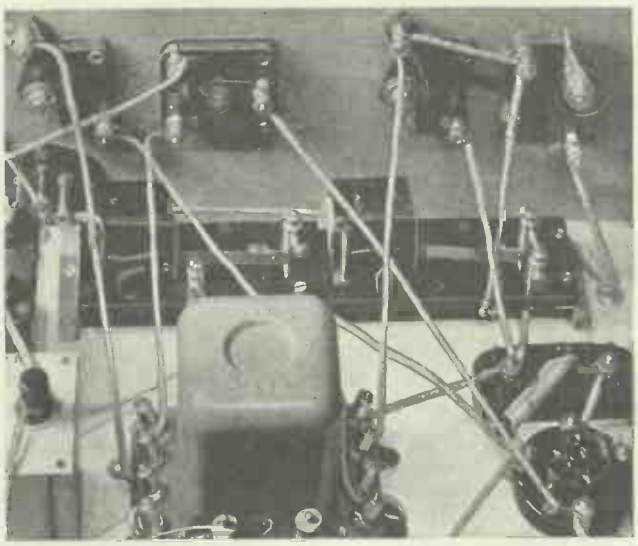
Details of the supports, one of which goes at each end of the relay strip.

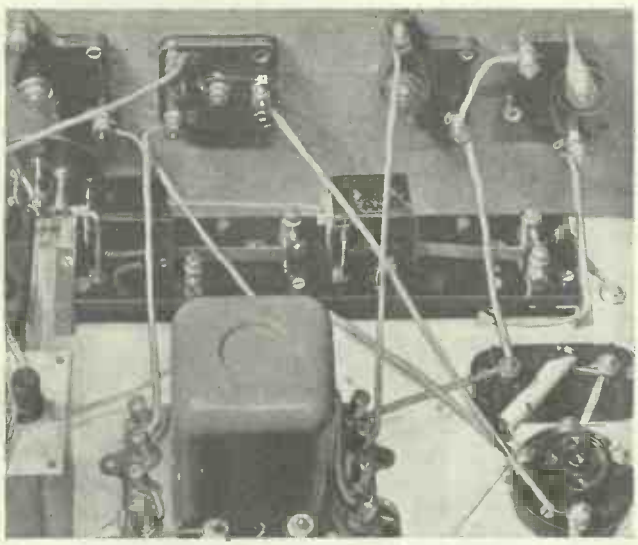
SIMPLE ENOUGH FOR ANYONE



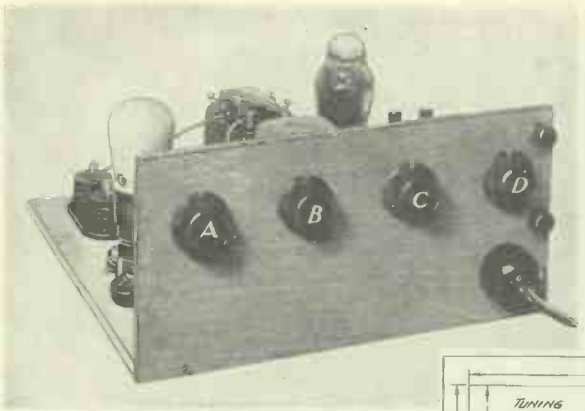
In this view the receiver is seen in its completed form. The wiring shown is that for the reception of two medium-wave transmissions.

THE TWO WIRING ARRANGEMENTS COMPARED





In the left-hand photograph the wires shown dotted in the wiring diagram on the opposite page are in position, while to the right the wiring is seen with the connections shown as solid lines in position.



The controls are lettered in the above photograph to facilitate the description of their adjustments.

in position. These act as anchoring points for wires coming from the bobbins or armatures.

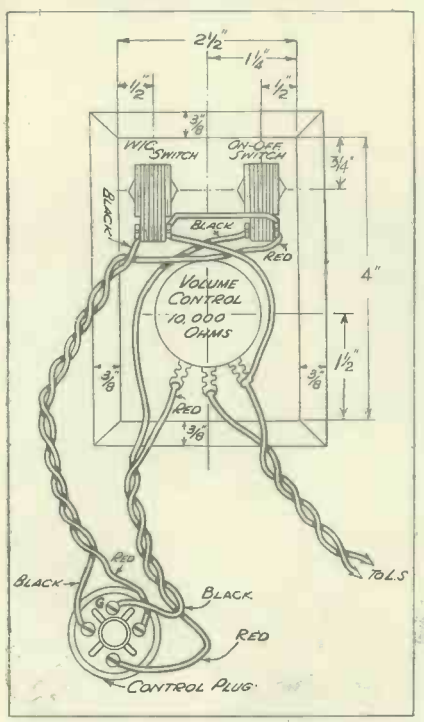
The four contact pillars come next, also with soldering tags, care being taken to see that their contact tips point in the right directions.

Two short flex leads have to be soldered at one end to the two armatures, threaded through the ebonite and soldered at their other ends to the appropriate soldering tags. When this has been done solder the ends of the bobbin windings to their tags.

The relay strip is now placed aside while all the other components are mounted on the panel and baseboard. You can now stand the relay strip in its appropriate position and cut the leads marked "A" to "G" to suitable lengths, cutting "G" for the dotted position. Mark these leads with strips of paper carrying the appropriate letters.

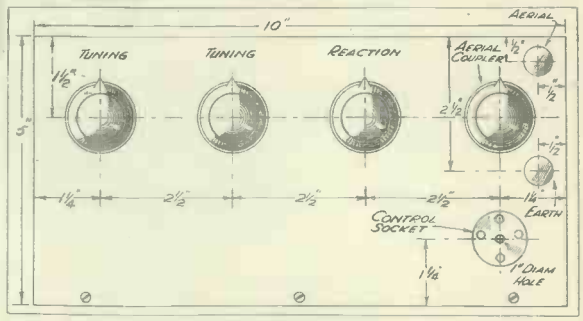
Remove the relay strip from the set and solder the prepared leads in place. Finally, fix the relay strip to the baseboard and wire up the whole receiver.

CONTROL WIRING



Dimensional and wiring details of the switch panel and control plug.

PANEL DETAILS



You can save the trouble of drilling your panel if you buy a kit of parts complete. The panel will then be supplied ready drilled.

The switch panel is made from a piece of $\frac{3}{16}$-in. plywood, $4\frac{3}{8}$ in. × $2\frac{7}{8}$ in., to which is fixed the $\frac{3}{8}$-in. fillets shown in the diagram. These should be $\frac{3}{4}$ in. deep and will project $\frac{3}{16}$ in. all round the panel. Their upper outer edges are rounded off.

When the switch panel is completed, plug it on to the set and connect up the batteries. The aerial, earth and loudspeaker are not necessary at this stage.

The relays are adjusted as follows: First slack off the locking screws on top of the contact pillars, one of which acts merely as a stop, and screw the contacts well back from the armatures.

Close the "on-off" switch, the left-hand one. If the "on-off" relay's armature does not move push it over with the finger. Screw up the contact-pillar—there is only one acting as a contact in the case of this relay—until it just touches the contact on the armature. Then give it another half-turn and lock in place.

Put the "on-off" switch in the "off" position and screw up the stop until there is about $\frac{1}{16}$ in. between the contact on the armature and the contact pillar. Then lock in position.

Now put both switches into the "on" position. Close the armature of the wavechange relay with the finger if necessary. Proceed to adjust the contact screw of this relay, which is nearer the panel, as described for the "on-off" relay.

Put the switches to the "off" position and adjust the fourth pillar to leave about $\frac{1}{16}$ in. play again. The set is now ready for the tuning to be adjusted.

Connect up the loudspeaker and attach the aerial and earth to their terminals. We will now consider the adjustments to be made, assuming the set is wired as suggested for two medium-wave transmissions.

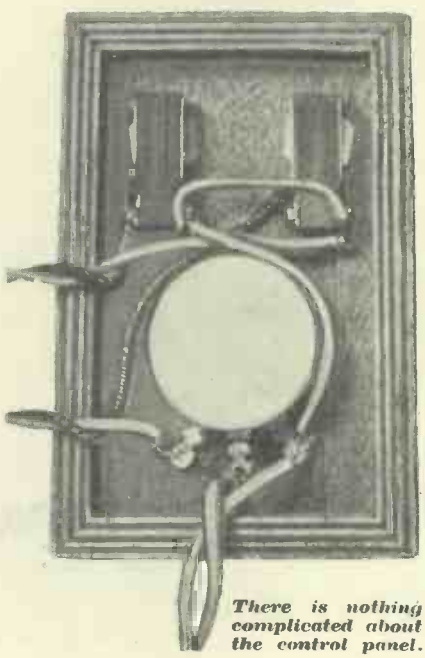
How to Tune

With this arrangement the scheme is first to tune-in the lower wave one in the ordinary way, then to add a second tuning condenser in parallel with the first by means of the wave-change relay, and to add the necessary capacity with the second tuning condenser to bring the wavelength up to that of the higher wave transmission.

The four condensers marked A, B, C and D on the front-of-panel photograph are used as follows: D for aerial coupling to balance the volume of the two stations; C for reaction; B for the initial tuning; and A for the added tuning capacity. Proceed as follows:—

Set D a little way from maximum. Put the "on-off" switch down and

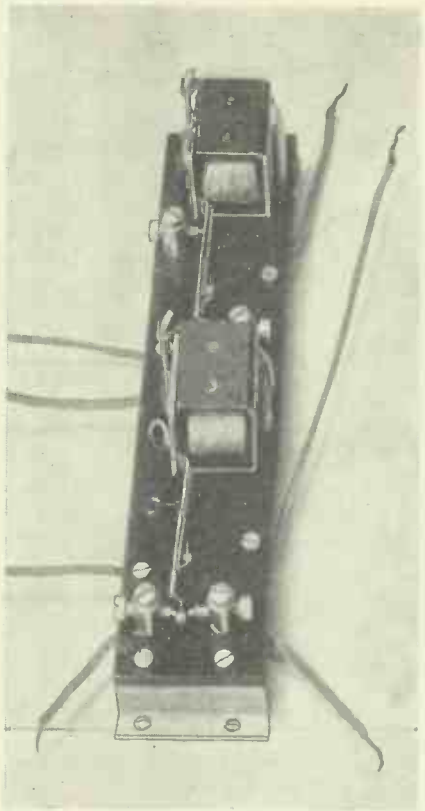
THE "INTERNALS"

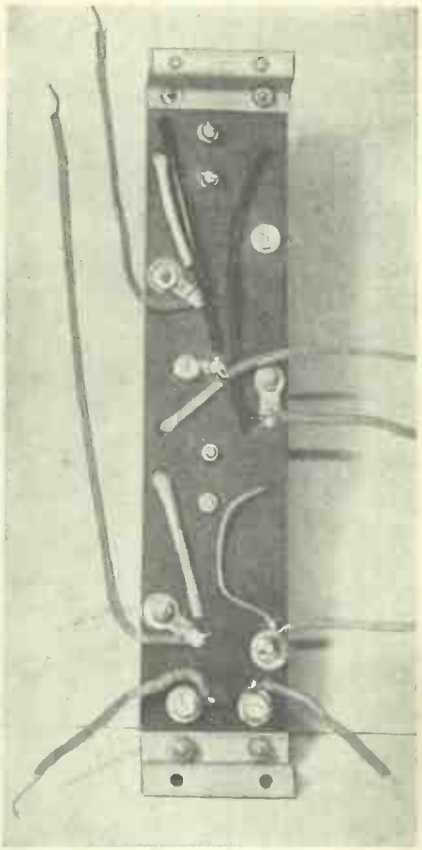


There is nothing complicated about the control panel.

THE ROBOT OPERATOR

These two photographs show clearly the relays employed and how they are mounted.





the wavechange switch up. Set the volume control to maximum. Using the reaction condenser C, tune-in the National programme on B to its loudest without overdoing reaction.

Now push the wavechange switch down and tune-in the Regional programme on A without touching B, C, or D. If the National is louder, decrease the capacity of D and go through the sequence of operations again. Should the Regional be louder, an increase in the capacity of D is indicated.

You will most likely soon find a position where both programmes come in at equal volume. If you should not succeed in this, however, remove the connections shown as solid lines in the wiring diagram, and wire up the dotted ones.

The receiver is then wired for reception of one medium and one long-wave transmission. The circuit arrangement is now as follows :—

C and D still perform the same functions, but the other two condensers are used independently to tune-in one station each. The wavechange relay instead of merely adding capacity in parallel acts as a changeover switch, shorting out either the medium or the long-wave tuned circuit, both of which are in series.

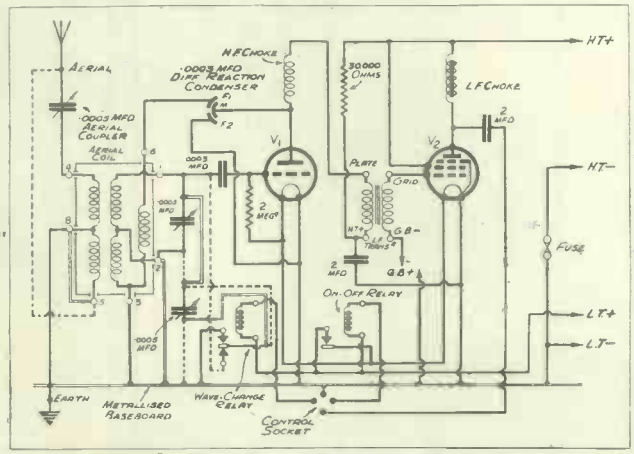
With the set switched on and the wavechange switch up, set the condenser D near its maximum again, and tune-in the National programme (Droitwich) on B as before, using reaction to bring the volume to maximum. Operate the wavechange switch and, also as before, tune-in the Regional on A without touching B, C, or D.

If the result is that the National is stronger than the Regional, decrease the capacity of D and repeat the sequence of operations. As in the case of two medium-wave stations, should the Regional be stronger, the capacity of D should be increased.

If you follow out the foregoing instructions carefully step by step, you will find the adjustments extremely simple. After these initial settings, the volume, wavechanging, and "on-off" switching are all controlled from the switch panel, which may be installed just where you fancy. Similarly, you can arrange your loudspeaker and set just where you like, for there is no limit so far as an ordinary house is concerned, to the length of the leads from set to switch panel and switch panel to speaker.

Incidentally, both relays together consume only about 200 milliamps from the L.T. accumulator and only 100 are used when on the National programme. Also it is impossible for the wavechange relay to stay "on" when the set is switched off.

NOT A COMPLICATED CIRCUIT



In spite of its novel capabilities there is nothing "terrifying" about the circuit scheme employed.

EVERYTHING YOU NEED

3 Polar ·0005-mfd. "Compax" tuning condensers.
1 Polar ·0003-mfd. differential reaction condenser.
1 W.B. 4-pin baseboard valve holder.
1 W.B. 5-pin baseboard valve holder.
1 B.T.S. Binocular Junior H.F. choke.
1 Varley L.F. transformer, Nicore II.
1 Bulgin L.F. choke, type L.F.20.
2 Dubilier 2-mfd. fixed condensers, type B.B.
1 Wearite "Unigen" coil, type "A."
1 Dubilier ·0003-mfd. fixed condenser, type 610.
1 Erie 2-meg. grid leak, 1-watt type.
1 Erie 30,000-ohm resistance, 1-watt type.
1 Clix 4-pin valve holder chassis-mounting type, with screw terminals.
1 Bulgin 4-pin cable plug, type P.9.
2 Belling & Lee indicating terminals, type R.
1 Peto-Scott "Metaplex" baseboard, 10 in. × 10 in. × ⅜ in.
1 Peto-Scott wood panel, 10 in. × 5 in. × ⅜ in.
1 Peto-Scott ebonite strip, 7½ in. × 1½ in. × ⅛ in.
2 Bulgin toggle switches, type S.80.
1 Polar 10,000-ohm volume control.
1 Bulgin relay kit.
1 Coil B.R.G. "Quikon" connecting wire.
2 Spade connectors for L.T. + and L.T. −.
3 Wander Plugs, H.T. +, G.B. +, G.B. −.
1 Wanderfuse for H.T. −.
Screws, flex, etc.

VALVES

V.1 Cossor 210H.F. V.2 Cossor 220H.P.T.

LOUDSPEAKER W.B. Stentorian.

BATTERIES

H.T. 120 volts. L.T. 2 volts. G.B. 4½ volts.

A characteristic portrait of Harry Roy, which will appeal to all his fans, especially those who have seen him on the stage.

This Month's Wireless Novelty Competition

How Many Words Can You Make From "TIGER RAG"?

HERE is your chance, all you dance-music enthusiasts! A chance to win twenty of the finest dance-band recordings of the day. Who would not treasure twenty ten-inch Parlophone records made by that master of hot rhythm and jazz—Harry Roy? *And* each record will be AUTOGRAPHED by the popular leader!

But that is not all we are offering as the first prize. There is also a silver cigarette lighter which will be inscribed with the winner's and Harry Roy's names. And even on top of this a large autographed photograph exactly similar to that reproduced on the opposite page.

That is the first prize. There are second and third prizes as well. These are set out at the bottom of this page. They also are such that any reader would highly prize them, for as in the case of the first prize, the records are again autographed.

Finally, there are the signed postcards of Harry Roy. One of the features of this competition is that there is something for every entrant. If you would like one of these postcards, all you have to do is simply to enclose 1½d. stamp for postage with your entry.

The competition itself is very simple, but at the same time really interesting and entertaining. All you have to do is to see how many different words you can make from the title of what is probably Harry Roy's most popular number—"Tiger Rag."

Any word with *two letters or more* counts. You must make use only of the letters in "Tiger Rag," and each individual letter can be used once only at a time. Thus, you can use two R's or two G's in any word, but only one I or one T, and so on. Here are some examples—IT, TRIGGER, RAT.

When you get down to it, you will be surprised how many different words can be discovered. Only English words to be found printed in heavy type in the general section of any modern standard dictionary will count. Names of people, etc., and plurals are thus debarred.

The coupon which appears below must also be attached to your list of words, and a 1½d. stamp pinned on if you want a Harry Roy postcard. Cross out the word "No" if you add the stamp.

Write all your words in a neat list on a card or sheet of paper, put the total of words in your list at the top of your entry, then your name and address in block letters (all in ink), and put a 1½d. stamp on the envelope in which you post them. Every entry must be accompanied by a coupon.

Address your entry to:

"TIGER RAG,"
Wireless and Television Review,
1, Tallis House,
John Carpenter Street,
London, E.C.4 (Comp.).

Closing Date: *Monday, June 1st*, 1936.

The Prizes will be awarded in order of merit for the longest lists of correct words submitted. In the event of ties, the prize list may be rearranged as the Editor thinks fit, and his decision must be taken as final and legally binding in all matters connected with the contest. No responsibility can be taken for delay or loss in transit, and no employees of The Amalgamated Press, Ltd. are permitted to enter.

A GIFT FOR EVERY ENTRANT

Everyone who enters for this competition, irrespective of whether he wins a prize or not, is entitled to an autographed postcard-size photograph of Harry Roy, if he sends 1½d. stamp with his entry to cover postage.

Five? Ten? Twenty? Have a try! Your list may

WIN TWENTY 10-INCH PARLOPHONE RECORDS MADE BY HARRY ROY

AND A SILVER CIGARETTE LIGHTER,

ALSO A LARGE AUTOGRAPHED PHOTO OF THIS POPULAR MASTER OF JAZZ

WIRELESS AND TELEVISION REVIEW
"TIGER RAG" COMPETITION

NAME .....

ADDRESS .....

.....

Do you want a postcard photograph of Harry Roy? YES / NO

(1½d. stamp must be enclosed by those desiring a photo.)

2nd PRIZE

Ten 10-inch Parlophone Records and A Fine Portrait—all autographed by Harry Roy.

3rd PRIZE

Five 10-inch Parlophone Harry Roy Records Together With a Personally Signed Souvenir Picture.

Short-Wave Conditions This Month

CONDITIONS during March and April have been so extraordinarily good that it is rather difficult to make a reliable forecast for the month of May. Although we have not yet reached the peak of the 11-year cycle, the shorter wavelengths have been behaving in quite abnormal fashion, and signals from remote parts of the world have persisted in coming through at times when, by all previous experience, they should not be heard at all.

It's "All Wrong"

By the middle of March it was generally accepted that the 20-metre amateur band was "all wrong." In previous years it has been possible, by about March 14th, to hear Americans as late as 10.30 p.m. when conditions have been good. This year, however, during the A.R.R.L. tests, which ran from March 14th to March 22nd, the Americans were coming in quite consistently until 2.30 a.m., or even later!

It seems quite possible that by the time you read these notes the 20-metre band will be "alive" all through the night, with the consequent possibility of hearing things that are not normally heard on that band at any time of the year.

The 16-metre band is "open" until 7 or 8 p.m., and the 19-metre band until 11 p.m; 25 and 31 metres goes on merrily all night; 49 metres "wakes up" just before midnight, and then goes on until after sunrise.

It is hard to predict what will be happening on 10 metres, but already it is distinctively lively as late as 8 p.m., so that it is possible that America will be heard until 10 p.m., or after during May.

Right Across America

Last month I predicted that the West Coast of the U.S.A. and Canada would be heard on "ten" in the early mornings. This has been so, but they have also been coming in—better, if anything—between 4 p.m. and 7 p.m., day after day.

The accompanying chart may be taken as a fairly conservative guide to the parts of the world that can be heard on the various bands throughout the day. When the magic letters "DX" appear, it implies that any long-distance stations that happen to be working at that particular time should be heard. This applies, naturally, more to the amateur bands than to the broadcast.

There are, of course, many parts of the world which can *only* be heard on the amateur bands, amateur stations being their sole representatives in the ether.

To take one or two instances, we may start with Australia. Australian stations may be heard on the 20-metre band in the mornings from 7 till 10, and again from 1 p.m. till 3 p.m. On the 40-metre band the most likely times are 7 a.m. to 9 a.m., and 5 p.m. to 8 p.m.

"Down Under"

On the 31-metre band we have only the two Australian transmissions, from V K 3 L R on weekday mornings, and from V K 2 M E on Sunday mornings and afternoons. If other Australian stations started working at all hours of the day we should probably hear them at almost *any* time on 31 metres.

Again, the 25-metre band has enormous DX possibilities between 4 p.m. and midnight, but very few stations outside America make use of the band. We may, however, see a regular Australian transmission on 25 metres before very long.

In May, less than at any other time, is there any necessity for intelligent listening. All the short-wave bands are alive at the hours when the average listener is at his dials, and whatever band he chooses he is likely to find something of interest.

W. L. S.

HOW TO LISTEN DURING MAY

	MIDNIGHT-0400	0400-0800	0800-1200	1200-1600	1600-2000	2000-2400
10-m (AMATEUR)	—	W. COAST U.S.A. AUSTRALIA	AUSTRALIA JAPAN INDIA	U.S.A. INDIA AFRICA	DX	?
13-m	—	—	—	AMERICA	AMERICA	—
16-m	—	—	—	AMERICA	AMERICA	—
19-m	—	—	EUROPE AMERICA	DX	DX	AMERICA
20m (AMATEUR)	U.S.A.	W. COAST U.S.A. HAWAII JAPAN	DX	DX	DX	DX
25m	AMERICA ASIA	—	—	AMERICA ASIA	DX	DX
31-m	AMERICA	—	AUSTRALIA ASIA	AUSTRALIA ASIA AMERICA	AMERICA ASIA	AMERICA
40-m (AMATEUR)	DX	DX	EUROPE	EUROPE	DX	DX
49-m	AMERICA	AMERICA	EUROPE ASIA	EUROPE ASIA	ASIA AFRICA	AMERICA

The method of using this "listening" table is fully described in the text.

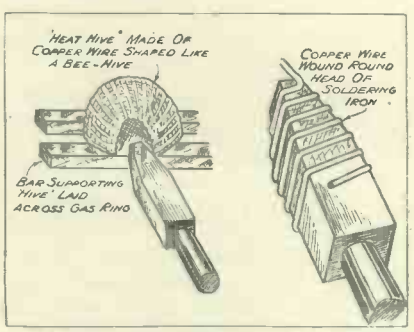
IDEAS FOR THOSE WHO SOLDER

TO those addicted to the soldering iron, especially to the ones who have no electric facilities at hand and have therefore either to heat their iron in the fire or over a gas ring, the following ideas may prove useful:

The left-hand sketch indicates what in the alchemist's lingo is a "heat hive"—an accessory used to concentrate heat given out over a wide surface. Its use over a soldering iron that is being warmed over a gas ring will be obvious; and if made up from useless ends of copper wire, will, when used, not only save an appreciable amount of gas, but also time and bad temper.

The second sketch illustrates an idea common to the jewellery trade where there is often need to use a very fine-nosed iron on work which necessitates the iron retaining its heat longer than the average fine-nosed iron will do.

An effective metal cement or "gum solder" that can be used for a variety of jobs in wireless building where it is impossible to use a soldering iron may be made up from 10 parts of iron dust and 2 parts each of sulphur and resin. These materials should be mixed into a warm plastic solution over a gas ring. **W. W.**



Both these schemes are commonly used in "the trade."

BROADCAST NEWS

Mr. Stuart Hibberd, the chief announcer in London reading the News Bulletin. With him is Mr. McGregor, another announcer.

ALANHUNTER describes how the B.B.C. News Bulletins are prepared, after an interview with John Coatman, Chief News Editor of the B.B.C.

As I was whisked up five floors of Broadcasting House to see John Coatman, I mused this way: "Here's an odd state of affairs—a News Editor without a newspaper! A coverage of something like half the population of the country and yet there is no circulation at all. What would the late Lord Northcliffe have thought of it all?"

And then I met John Coatman, Chief News Editor of the B.B.C. He is a bluff, almost jovial man—rather more reminiscent of the hard-hunting shires than the news-hunting Street. Yet in his twenty months' occupation of the editorial "chair" at Broadcasting House he has definitely put broadcast news on the map.

Strong and Impartial Editorial Staff

It is surely the highest possible compliment that the Ullswater Committee could find no fault with the B.B.C.'s news service—and what is perhaps equally gratifying to John Coatman and his staff is the prominence given to these findings by the newspapers themselves.

"It is evident," says the report, "that a copious supply of news is received from all parts of the world. The B.B.C., it is true, is dependent upon four commercial agencies which are primarily designed to cater for the Press. We regard it as vital that the B.B.C. should maintain a strong and impartial editorial staff. In the presentment of news simplicity is desirable, and the B.B.C. should be as impersonal as possible."

I reiterate this extract from the report because it has a bearing on what John Coatman told me. For he is the chief of that "strong and impartial editorial staff" which consists of himself, a Foreign Editor, a Home Editor, three sub-editors and two men entirely devoted to topical talks.

In addition to these key men there are, naturally, many more clerical assistants.

"Probably the most important difference between my job as Chief News Editor of the B.B.C. and the editor of a big daily newspaper," said Mr. Coatman, "is that I have no editorial policy to worry about!"

When one thinks of the partizanship exhibited in every newspaper to-day, this is indeed a striking difference. And it is, without doubt, the key to the respect that centres around broadcast news. People have come to realise that the B.B.C. has no axe to grind—that, as John Coatman says: "The B.B.C. aims to give a microphonic reflection of what is happening."

Curiously enough, listeners who buy a newspaper with an editorial bias very deeply resent any such deviation from "pure truth" in the broadcast news. While it is true that the B.B.C. relies upon the four leading news agencies for its news of foreign and home events, these agencies are not themselves tendentious—it is quite possible to select from the hundreds of yards of "tape" the *essential news*, as distinct from the inessential news.

"I give them the news as truly as I can," says John Coatman, "and I can assure you that complaints of partizanship and criticisms of partiality are getting increasingly rare." He believes very deeply in the enormous value and widespread demand for "straight" news. As Director of Public Relations in India, John Coatman has had plenty of experience in "delivering the goods."

A "News Conscious" Public

He believes that the more straight news the public gets the more it will crave for. Thus, in guiding the destinies of B.B.C. bulletins, he thinks that actually he is helping to make the public "news conscious," as he puts it. And that means they will want to read more newspapers.

John Coatman lit up one of his four pipes, after filling it with a very generous "shot" from a huge tin of 'baccy. "Yes, there are a lot of aspects of this job that will remind you of a newspaper office," he mused—and then begged my pardon when the inevitable 'phone bell tinkled.

"My subs do the first selection work—picking out items they consider might be suitable for the bulletins from the continuous supply from the tape machines," he went on. "Nothing gets through without the close and expert scrutiny of my Home and Foreign Editors, of course, while the final seal is set by me.

"In times of crisis such as we have been going through I do not have to consider which side of a controversy I am to take up. In that I differ from a newspaper editor. My job is to present *both* sides of the case as impartially as possible—and then it is up to the listener to form his own opinion."

A DAILY CONFERENCE

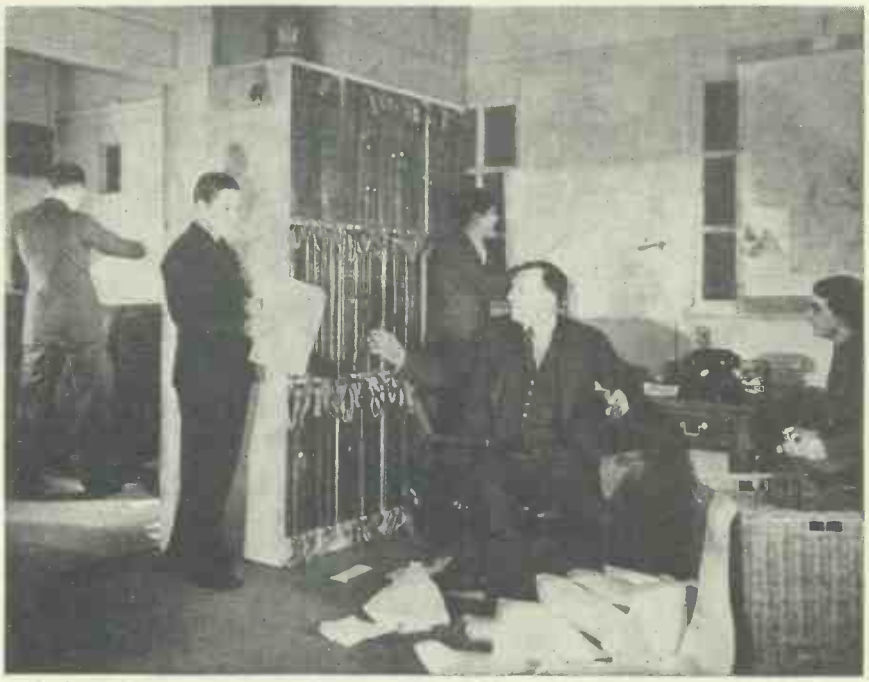
You will have noticed in recent months that, while the news bulletins have been free from "stunt" presentations, they have been to a great extent enlivened by short talks by experts—either through land-line tie-ups with foreign capitals, such as Paris or Geneva, or through the ever-increasing medium of the recorded programmes department.

"We believe these 'sound pictures' of news and events are very much appreciated," said Mr. Coatman. "But dramatisation of the news is not wanted—the straighter the presentation the better listeners like it. The recorded programme unit will, I think, play an increasing part in providing us with what corresponds to the illustrations of a newspaper—sound pictures of outstanding events being of great value when suitably edited.

"The order of presentation of the news gives us a lot to think about. At first, when we introduced the news talks, some listeners got a little worried, and wrote to us complaining that they held up the news too much.

"But we seem to have found the right formula now. Our policy in general is to keep any such talks for the end of the bulletins—unless they *are* the news. For instance, during the recent political crisis, the talk relayed from Paris was most appropriately inserted near the beginning of the bulletin."

"GOING TO PRESS" AT THE B.B.C.



John Coatman (seated) preparing one of the daily news bulletins broadcast from the B.B.C. Impartial and accurate presentation are characteristics of these bulletins.

Team of Experts on the Spot

It is in this expert commentating that the B.B.C.'s exclusive news is most vividly propagated. While it relies on a well-edited resumé of the agency news it does not necessarily stop there. It has its team of experts on the spot, rather like the special correspondents of a newspaper.

"By no means all my work revolves round the actual make-up of the news bulletins," emphasised Mr. Coatman. "The selection, rejection, writing up and arrangement of the news items is of course vitally important—but in an organisation like the B.B.C. there is also a great deal of liaison work to be done with other departments.

"In fact, I must confess to you that without the able assistance of officials in other departments my bulletins would never get out at all!"

Just as every big newspaper has its daily conference, so Mr. Coatman has *his*. Only in a rather different atmosphere, perhaps. The Controller of Programmes and the Director of Programme Planning both consult with Mr. Coatman. Upon the D. of P.P. (to drop into "Big House" mysticism!) depends whether the bulletins are to be cut down or expanded to meet the current situation.

Consultations With the Engineers

More and more these days, too, the chief of the recorded programme section comes into touch with the News Room. And as for the engineers—Mr. Coatman has almost daily consultations with them, fixing up land-line links for foreign news talks, and so on.

"Times of bulletins? Well, I can't say I have come across any really important criticisms," replied Mr. Coatman to a leading question. "The first general news is heard by the country listeners—farmers home for tea, for instance. Young people, too, are able to hear this news. True, town workers are on their way home—but they have an evening paper, anyway.

"It is the 9.30 bulletin the majority listens to. This is, I might say, our peak appeal. Even those who have read an evening paper like to hear this bulletin—especially just now when the international situation is so 'newsy.' When, I mean, new turns to the situation occur almost every hour."

A Steadying Influence

And so we went on. I believe that most of us tend to underestimate the enormous steadying influence of the B.B.C. in crisis times. Its ability to render a clear-cut view of the situation, its transparent impartiality, its essential *rightness*—all these attributes appeal to the average Englishman—who, if I may say so, likes to *think* he is thinking things out for himself. Even when someone else is. Yes, there is no doubt that the B.B.C. News Bulletin is of immense value to every one of us.

SHORT-WAVE DEVELOPMENTS

BY W.L.S.

OUR SHORT-WAVE EXPERT DESCRIBES AN ULTRA-SHORT-WAVE SET WITH FOUR H.F. STAGES AND NO COILS OR VARIABLE CONDENSERS, AND DEALS WITH OTHER INTERESTING S.W. SUBJECTS.

THE National Bureau of Standards, in the U.S.A., which is something like the counterpart of our own National Physical Laboratory, has always been very prominent in the field of radio. They have recently evolved an extremely interesting receiver for the really short waves—between 2 metres and 1 metre.

The amazing part of this is the fact that it uses four stages of H.F. amplification and is *not* a superhet! There are no coils and condensers, as one would expect at such frequencies, but a series of concentric quarter-wave transmission lines, which make the gear look more like a strange domestic utensil than a receiver.

Exceedingly Ingenious

This concentric-line business is tremendously ingenious, and strikes one, when it is explained, as being about the only logical way of doing the job. The outer conductors are earthed, and the free ends of the inner ones connected to the grids of the amplifiers. The H.T. is applied along an insulated wire running through the inner conductor, and the capacity between these two forms the coupling from one valve to the next.

A COMPLETE STAGE

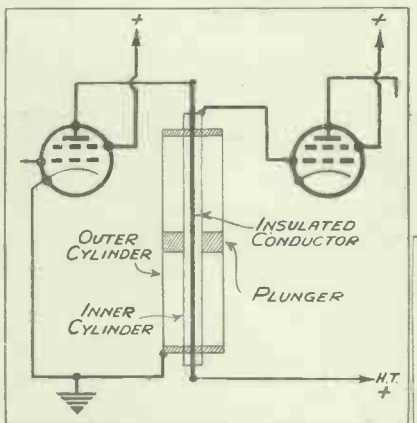


Fig. 1. This is a single stage in the new type of circuit described by W. L. S. in the text.

Metallic plungers, making contact with the inner conductor and capacity-coupled to the outer one, form the means of tuning. An overall gain of more than a million at 1.7 metres is the result!

Fig. 1 shows, in extremely simplified form, the schematic arrangement of two stages using this principle.

Descending to very much lower frequencies, but still remaining in the category of "ultra-short waves," it is interesting to note the radical changes in 5-metre technique that have taken place since last year.

At the beginning of last summer there was not the slightest reason to suppose that really long-distance work on 5 metres would ever be possible. Accordingly, most of the amateurs who were interested in that particular band concentrated on moderately "local" working, with a strong accent on the portability of the gear.

For this purpose the small self-excited transmitter and the equally compact super-regenerative receiver were excellent. The super-regen. was, in fact, the only type of receiver that would produce intelligible signals from some of the unstable, frequency-modulated transmissions on the air, by virtue of its tremendously broad tuning.

Ten Metres Improving

It also helped enormously to combat local man-made static, particularly ignition from cars, because of its well-known "A.V.C." characteristics.

Since last autumn the 10-metre band has become completely revolutionised, and is still improving, and the general opinion amongst those who are "in the know" is that it should be possible to receive signals from the U.S.A. on 5 metres this summer—but *not* on a "super-regen."

Transmitters and receivers, therefore, have both changed completely. Several amateurs are now using crystal-controlled transmitters with considerably higher power than was the fashion for short-distance work, and it seems to be agreed that the straight receiver or superhet must be used.

Five-Metre Converters

A 5-metre superhet can be extremely compact—even to the point of portability. A crystal-controlled transmitter, however, is another story. Owing to the multiplicity of valves, and the desirability of using fairly high power on the final stage, battery supply is not popular. It seems likely, therefore, that "fixed-station" working will be more popular this year, whatever happens on the receiving side.

FOR U.S.W. RECEPTION

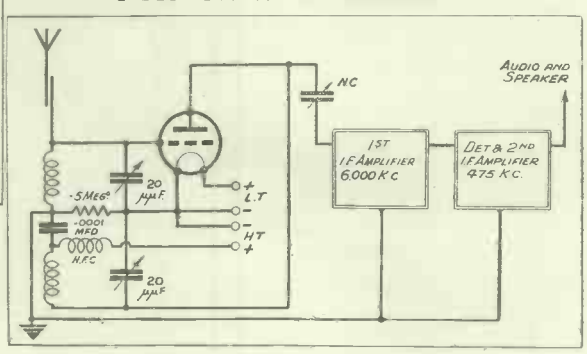


Fig. 2 (right). How an ultra-short-wave adaptor may be coupled to an ordinary short-wave superhet.

Since 5 metres correspond to a frequency of 60,000 kc., it is quite practicable to build up a 5-metre converter, not for use with a broadcast receiver, but to go in front of even a short-wave receiver, provided that the latter uses tuned H.F. or, perhaps, a superhet circuit. One particular scheme that I have met uses a 5-metre autodyne converter in

(*Please turn to page* 387.)

CRUISING WITH YOUR RADIO

Spending one's holiday in a liner cruising is as popular as ever. Why not take your radio with you? That it is quite "an idea" is proved in this article.

"I'M going for a cruise to Madeira in the 'Gigantic' next month. Can I take my wireless set in the ship with me?" This is a question which has been put to me many times during the last year or so.

Use a Battery Set

There are many to whom a holiday is never quite complete unless the wireless set can go too; though, let me hasten to add that in nine cases out of ten there is no reason why it shouldn't; only it must be remembered that there are snags to be met with at sea which are not encountered ashore. These can be overcome easily if you know the ropes, and the purpose of this article is to show, for the benefit of all those who intend going down to the sea in ships, that it is worth taking a radio set, and to explain how it should be rigged up on board.

It is almost essential to take a battery set. The average ship's power plant supplies D.C. for ship's lighting and, though it may be possible to use a set designed for D.C. mains, or one designed for D.C. and A.C., on the ship's supply, it is unlikely to be satisfactory, owing to the inevitably large amount of interference which will be experienced from the numerous electric fans and other machinery which are found in a liner.

Fixing the Aerial

So leave that super-radiogram at home and take a battery set with you. Any of the usual types now on the market will do, but, on the grounds of convenience alone, a portable set (or at least one with some form of carrying device) is most recommended.

Your accumulator will need recharging at intervals of course. Put a tactful query to one of the ship's officers and there will be no difficulty about getting this done.

A ship is made of iron and steel—an obvious remark, but one which has a great bearing on how you rig up your set on board. In the first place, as far as your cabin is concerned, it will form a complete screen, so that a set's self-contained aerial is of no use.

But the efficiency of modern sets is such that they do not need much in the way of an outdoor aerial. Here, again, have a word with one of the officers, and, depending on where your cabin is on the ship, he will show you just where you can run that length of insulated aerial wire. Just twenty to thirty feet is all that is required, running out of your porthole or skylight and up to some convenient stanchion.

Your earth could not be more handy, for though the whole ship be a gigantic screen, it is also a most effective earth. So just connect the earth terminal of your set to any part of the ship's structure where it can make good contact with bare metal; a porthole clip is usually most convenient.

I recommend asking the purser as soon as you arrive on board if there is any objection to using your set. I don't imagine that there will be; but it's as well to be on the safe side. The ship naturally has one or more powerful transmitters, and if you ran an aerial too close to the ship's aerial or its feeders your set might be severely damaged. This, however, is a matter which can be avoided if you take care to let the ship's officers know about your set: they'll make sure it comes to no harm.

Of course, your ship's transmitters will jam your reception; this is unavoidable. But you will find that under normal circumstances the transmissions are not so frequent as to be a serious consideration.

You can take either a short-wave set, or one designed only for the broadcast wavebands. The former will bring in more stations but the latter, in all the normal waters you are likely to be cruising in, will bring in plenty of stations. The medium wave stations can be heard a surprisingly long way off by night over the sea.

Plenty of Stations

For example, there should be little difficulty in receiving Droitwich and one or more of the Regionals as far away as Gibraltar. Again, while in foreign waters you will be able to receive many stations which you cannot receive in England.

You may be tempted to land your receiver in some foreign port. May I utter a word of warning about this. Some countries have rather stringent regulations, and it is unwise to fall foul of their Customs authorities or wireless licensing laws. So, if possible, inquire about this from your travel agents before you sail, and be sure to inquire what the charges will be.

G.M.B.

AN AIR MINISTRY MOBILE STATION

The importance of radio to aircraft increases with the expansion of flying. When a new station is proposed, tests are carried out over several months with a portable station in a motor "trailer," such as the Marconi equipment illustrated above. These trailers have been in use at Hull, Belfast and Portsmouth.

The Waves Go Round and Around

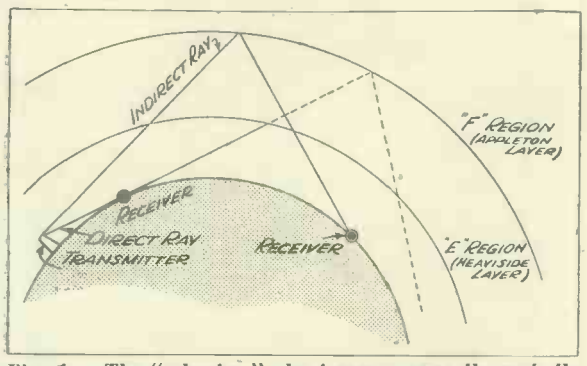


Fig. 1. The "shorter" short waves pass through the lower ionised layer and are reflected by the Appleton Layer.

Some of the peculiarities of short-wave propagation are described in this article in which radio echoes are also explained.

By W. L. S.

SHORT-WAVE receiver design has been a favourite theme of mine for several years, and at last we are beginning to feel that we have made some definite progress. Some of the modern receivers, both home-constructed and otherwise, are extremely efficient products, which could hardly be improved in the light of present-day knowledge.

An Uncontrolled Medium

The same may be said for the transmitters. Most of the high-powered short-wave broadcasting stations use the very last word in modern equipment, and are as far removed from the stations of five years ago as chalk is from cheese.

In between the two, however, comes the medium over which we have no control, and that is precisely what is leading us all up the garden at frequent intervals. Someone sends out a perfectly good signal; someone else has a perfectly good receiver all tuned-in and waiting for it; and nothing happens. And what can we do about it? Nothing, at present!

We are all acquainted with the theory of short-wave propagation, as it is held, at present, in the best technical circles. Assuming the ether to exist, and taking as a fact the existence of several ionised layers at various heights above the earth's surface, we can reconcile the fact that radio waves normally travel in straight lines with the other fact that they certainly do get half-way round the world—and even farther.

The Two Layers

These ionised regions have the power of reflecting and bending radio waves, and they change continually in their character under the influence of the sun's rays upon them.

It is assumed, at the present time, that the two most important regions are the Heaviside Layer or "E" region, about 60 miles above the earth's surface, and the Appleton Layer or "F" region, between 180 and 200 miles high (see Fig. 1.)

The "shorter" short waves (by which I mean anything below about twenty-five metres) have the property of passing through the "E" region, being reflected by the "F" region, passing through the "E" again on their way to earth. They may be reflected again at the earth's surface and repeat the process, so that a nineteen-metre transmission, for instance, between here and Australia, may be assumed to cover the distance in a series of "hops."

The shorter the wavelength, the less is lost at each transit through the lower layer; hence we find that for very long distances the shorter wavelengths are the more efficient.

THREE PATHS

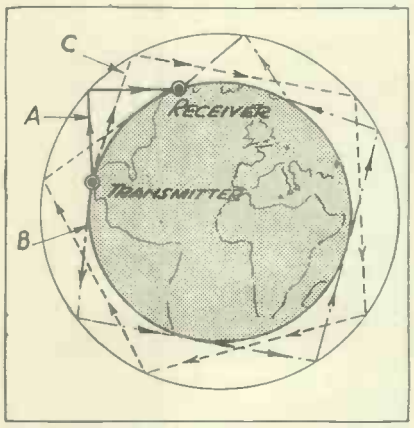


Fig. 2. Showing how signals may reach a receiver via a number of different paths.

The wavelength used is also tied up with another fact—the angle of reflection from the upper layer. It is not straightforward reflection with which we are dealing, but with a complicated combination of refraction and reflection, the waves passing into the layer, being bent and passing out again. When the wave is shorter than a certain length, it is believed to be completely absorbed by the layer, or, possibly, to pass right through it.

It is for this reason that for several years there have been no long-distance results on wavelengths below ten metres. With the eleven-year sunspot cycle, the height and character of the two layers are changing, and skip-distances are becoming completely altered in consequence.

Some Peculiar "Freaks"

I do not propose to go ahead and deal with short-wave propagation in detail, even if I were qualified to do so. Several of the world's greatest physicists are hard at work investigating the whole business, and the astronomical world is co-operating by observing all changes in the surface of the sun.

It will be interesting, however, to mention a few of the peculiar "freaks" to which the short waves are subject. As a straightforward instance, many listeners must have noticed that several of the commercial Morse stations sometimes have a pronounced "echo" on them; they often sound like someone whistling at the end of a long subway.

How the Echo is Formed

Fig. 2 shows how this effect can arise between two stations that are relatively close together on the earth's surface. "A," the wave taking the shortest path, arrives first, but is followed by "B", which has gone round the long way and has therefore covered more than half the circumference of the globe.

Since a radio wave takes roughly one-seventh of a second to travel round the world, there may be a lag of nearly one-tenth of a second between the arrival of the two. A "smudge"

with a much shorter duration than this would be easily noticeable, since many commercials using high-speed Morse send their dots at speeds of well over ten per second.

There may even be a third wave, "C" which has started off in the same direction as "A", and gone right round the world to the source of the transmission and *then* on to the receiver.

Another very common "freak" is the reception of stations at relatively short distances with very strong signals, at times when normally they would be inaudible or nearly so. Even on ultra-short waves, when, usually, nothing under about 3,000 miles would be heard, we sometimes strike days when other stations, perhaps even in our own country or very near, are quite strong.

ONE CAUSE OF "FREAKS"

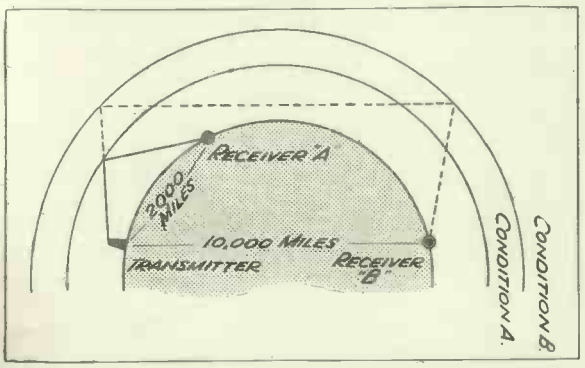


Fig. 3. Sometimes freak reception of ultra-short waves is caused by the lower layer temporarily reflecting them.

The theory usually held is that propagation is taking place, on these occasions, via the "E" region, which has, for various reasons, developed a reflecting lower stratum. The shorter waves, instead of passing through and being reflected by the "F" region, are reflected prematurely by the lower layer, and thus all our accepted ideas of "skip-distance" for the time being, go by the board. This is illustrated in Fig. 3.

Three Main "Rules"

To attempt to explain all the variations in short-wave conditions is impossible. Readers will have realised by now that we are dependent upon one, two, or more ionised layers which are completely beyond our control. These layers are moving and changing (a) according to the time of day, (b) according to the season of the year, and therefore the relative times of darkness and daylight, and (c) according to a long-period cycle of eleven years or so.

Quite apart from these three sets of variations, which may be taken as more or less regular, we have the sudden "flare-up" of great masses of hydrogen on the sun's surface, and the arrival, intermittently, of large sunspots, both of which cause magnetic disturbances on the earth's surface and, simultaneously, severe changes in short-wave conditions.

EFFECT OF SOLAR CONDITIONS

From this you will appreciate that all sorts of freak effects may be observed at various times, and unless we are perfectly familiar with the particular solar conditions prevailing at the time, we shall not be able to analyse the cause of the trouble.

The last-mentioned freak, i.e. the sudden reception of stations that normally come within the skip-distance and are not heard, is now being matched by the opposite state of affairs. By this I mean the reception, on ultra-short waves, of distant stations which, according to the theorists, should not be coming through.

Whereas the first freak is caused by a sudden change in ionisation, the latter is due to one of the long-period changes, and is therefore likely to stay with us for some years.

THE ELEVEN-YEAR CYCLE

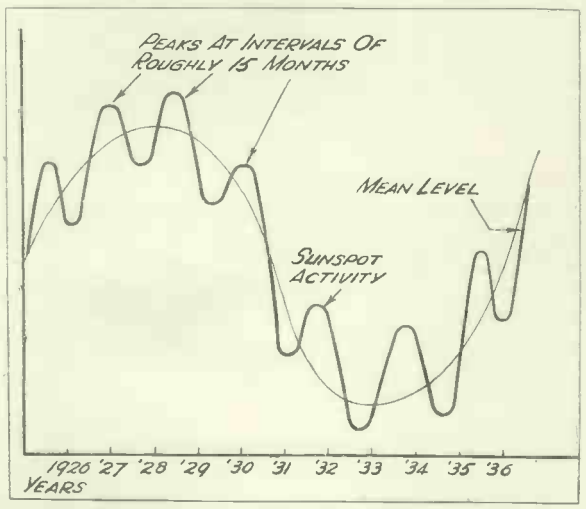


Fig. 4. How conditions vary over the years. Note the subsidiary cycle every 15 months approximately.

Another freak that all regular listeners must have noticed is a sudden fit of high-speed fading, affecting nearly every station on the short waves. The speed may be so high that the stations sound as if they have developed a particularly severe A.C. ripple, and in many cases they are quite unintelligible while it lasts. We are told that this is due to the influence of two conflicting forces in action on the ionised layers, which causes a rapid fluctuation of some kind. Frivolous amateurs talk about the Heaviside Layer being "corrugated" on these occasions!

It is usually found that when one of these attacks is noticed on the 31- and 49-metre stations, the 25- and 19-metre stations come in better, and up till a much later hour than usual.

Peculiar Reception "Grouping"

Yet another peculiar effect is frequently noticed. I refer to the occasions on which one particular part of the world is suddenly heard at tremendous strength, such as the recent evening when, although the 49-metre North Americans were poor, all the Colombian and Venezuelan stations were coming over at R8 or R9.

There was also a recent day on 10 metres when all the American amateurs heard were in the Third District—New Jersey and Pennsylvania—though there must have been hundreds of others on the air who were not more than 100 miles outside that region.

I have not come across any explanation of these particular conditions, unless it happens that the skip-distance becomes extremely sharply defined, for some reason, and that one set of stations happens to be the only one on the surface of the earth at that exact distance.

The experience of the B.B.C., I understand, is that conditions are far more reliable on paths running north and south than on east and west. The route from Daventry to South Africa, for instance, is far more reliable than that to Canada. This is believed to be due to the fact that the whole path from England to South Africa is in daylight at the time when the shorter wavelengths are being used.

At Night

As darkness approaches, the best-received wavelength becomes longer and longer. A few years ago, when sunspot activity was at its minimum, the B.B.C. found that

(*Please turn to page* 356.)

RADIO HUMOUR!

The radio operator, like the one above at his Marconi installation, might be thought to have a dry job. But that he has his amusing experiences is shown by the incidents related by

W. T. LOWE
and
A. TOMLINSON
(G 2Q N)

CAN you read Morse? If so, you will sometimes hear nautical expressions of humour, not always, we are afraid, fit for drawing-room conversation.

It was really funny, though, when a foreign ship once sent a distress signal to one of our coast radio stations. Try as he might, the landsman could not read the ship's Morse. He requested the marine operator to send better.

Impossible

"Send better!" replied the foreigner. "How the devil can I send better when she go bump, bump, bump on the bottom?"

On another occasion two Dutch vessels were experiencing difficulty in communicating with each other. The powerful signals of an adjacent land station were blotting them out.

One of the Hollanders got so exasperated that he lost control and snapped out: "Oh, dry up, you so-and-so Englishman," but immediately and profusely apologised.

Did the so-and-so Englishman care a damn? Not he! Instead, he commenced a spelling lesson. Told 'em how to correctly spell the unprintable word.

All very irregular, of course, but highly amusing when we heard this little bit of back chat. Yes, you can get a bit of fun out of this sort of thing if you can follow the ump-tiddy-umptys of the air.

Sailing in Ireland

What about this course for a modern liner! A station was heard to transmit, "Well, don't place too much reliability upon my bearing, old man. To tell you the truth, according to my calibration, you are sailing in the middle of Ireland!"

Ships approaching the coast make known to the nearest radio station their position, bearing and details of traffic to be communicated. This information is tabulated for Lloyd's Register.

A high standard of operating is maintained by the coast station operators, recruited in the main from the Inland Telegraph Service.

The stations are always open and a continuous watch maintained for the interception of distress signals and commercial traffic. In addition, navigational warnings, danger signals and weather forecasts are transmitted at frequent intervals.

Combining the tact of a diplomat with valuable linguistic qualifications, embracing every language under the sun, coast telegraphists are actually the policemen of the air, ensuring strict observance of all International Regulations.

In some cases the operating is simply vile, and various operators from European countries dictate to the shades of Samuel Morse how his code should be composed and signalled! This no doubt accounts for a well-known amateur terminating a contact with the terse comment, "All O.K., old boy. Your Morse sounds like you had a key nailed to the ceiling and you were using your left foot for sending."

Too Bad!

In amateur circles the signal tone is denoted by a system of figures from one to nine indicating respectively, gruff, harsh, raw A.C. note to a crystal clear, bell-like signal readable through a high noise level. One French station was highly indignant when a facetious Englishman reported on his signals as having a very beautiful raspberry tone.

Not all the humorous incidents are connected with ships' radio, though. Quite a lot have been indirectly accounted for by the B.B.C.

Imagine a gentleman entering a Post Office flourishing a pound note. He keeps repeating "I want a . . . "I want a . . ."

When the clerk asked if he wanted a Money Order, he replied: "No, I've been ill and can't remember things. I want a—— You press a button and music comes. What's that?"

He got his wireless licence all right.

Expert Detection

Speaking of licences, a detector van once halted outside a small pub in Wales and the occupant was requested to produce the necessary slip of paper. The proprietor couldn't find it, however, and said so, remarking that his son had taken it out.

With a solemn expression on his face the engineer asked the innkeeper to look in the pocket of his son's blue coat. Sure enough the licence was there.

"How did you know that?" the engineer was asked.

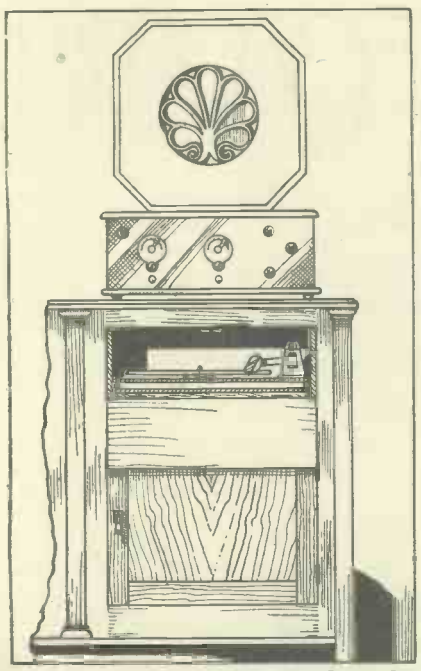
"Oh," he replied, pointing to the van, "that's the detector van. We discover things with that."

But learning later that his son had previously met the engineer and told

(*Please turn to page* 387.)

A Sideboard RADIOGRAM

How a sideboard drawer may be utilised to house a turntable and pick-up for the set above it.



The set and loudspeaker stand on the sideboard immediately above the turntable as seen in this sketch.

THIS is a description of how the use of an ordinary sideboard was extended beyond that of merely acting as a set support into that of a complete radio-gramophone cabinet.

In common with most "constructors" I reached that stage where the latest set design included a socket at the back, for the insertion of a plug connected to a gramophone pick-up.

Being already in possession of a clockwork-driven gramophone, and curious to know how the set would perform when reproducing records, I invested in a pick-up. There was room for it on the motorboard without disturbing the ordinary tone-arm, and when "tried out" the results were excellent.

Solving the Problem

The gramophone was one of those hefty table grand models, and to use the pick-up meant carrying it from another room, and providing a small table to stand it on, as near as possible to the set. This was very inconvenient, and after a while the pick-up fell into disuse, so I thought something must be done about it.

The set, with speaker on top, stands on a small sideboard, the mains unit and other gadgets being behind it, out of sight, yet easily get-at-able. As the sideboard served its purpose so well, I did not want to build the set into a radiogram cabinet. In the sideboard and directly under the set there is a roomy drawer, inside measurements 17½ in. wide, 14¼ in. back to front, and 6 in. deep, and I decided that here was the solution of the problem. I would fit the gramophone apparatus in the drawer.

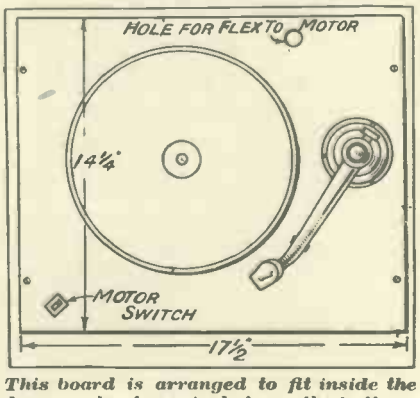
I obtained a Simpson Electric Turntable, because of the small amount of space it requires vertically, for only about 1 in. projects below the motorboard. At first I thought of using the drawer just as it was, pulling it out to use the "gram.", but on second thoughts I decided to take the front out of the drawer and hinge it at the bottom, thus forming a drop-down flap.

Constructional Details

The joints of the front were so secure that to take them apart without damage was out of the question, so with a fine-toothed saw I cut right through sides and bottom close up to the front.

I might say here, that "she" viewed this operation with no little concern, and a "What's he going to spoil now?" expression.

THE MOTORBOARD



This board is arranged to fit inside the drawer about one inch from the bottom.

The parts where the cut was made I smoothed up with sandpaper, fitted hinges to the "flap," and a ball-catch on the top edge. Next I obtained a piece of ⅜-in. plywood for the motorboard; this I made an easy fit in the drawer, and resting on two rails cut from 1 in. by ⅝ in. section wood, fastened to the sides, and allowing about 1 in. clearance underneath. Four small holes were drilled in the board so that it could be screwed to the rails.

The turntable, switch, pick-up, and rest were then mounted on the board in the positions shown on the plan. When the drilling and fitting were completed, the parts were removed from the board, which was then smoothed up with fine sandpaper, stained, and varnished. When dry the parts were again assembled, the wiring to switch and turntable carried out, and the lead from these passed up through a hole in the board.

Arranging the Leads

Two holes were drilled in the back of the sideboard for the leads to pass through and over the top, one to the wall switch, and one to the pick-up socket. In arranging these leads from the drawer they were kept well apart for obvious reasons.

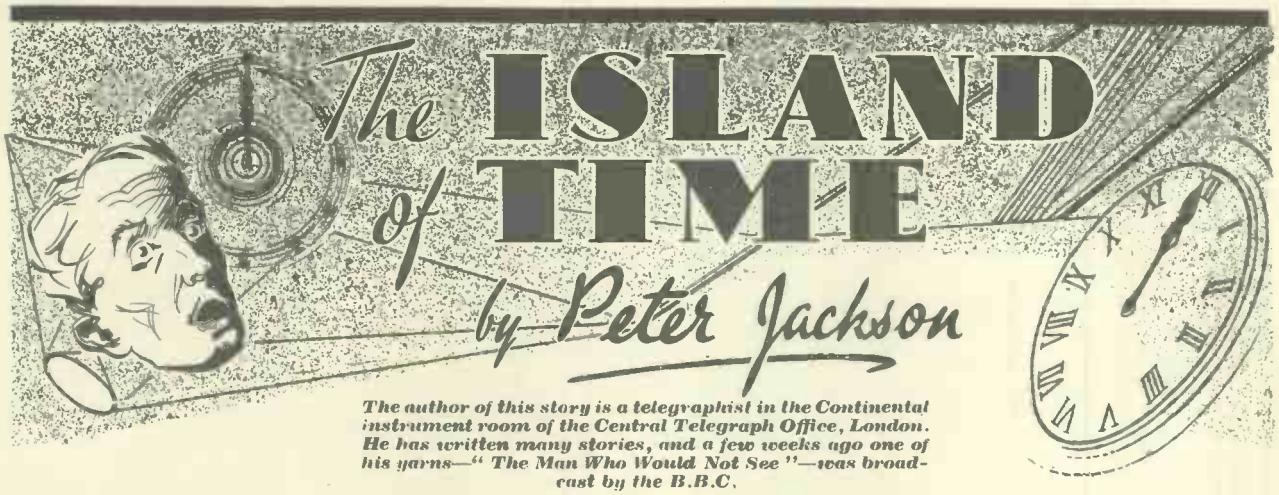
When the outfit was slid into place there proved to be ample "head-room" for changing records and manipulating the pick-up, without pulling the drawer forward.

The job proved a complete success, especially as the "operator" can remain seated, the records being conveniently at hand in a cupboard beneath the drawer.

A Useful Refinement

A useful addition will be made in the near future. A small bulb worked from a dry battery will be fitted for lighting the recess, and it is proposed to arrange the switching of this so that when the door is pulled open the light comes on, and is switched off when the door is closed.

J. W. C.



The ISLAND of TIME

by Peter Jackson

The author of this story is a telegraphist in the Continental instrument room of the Central Telegraph Office, London. He has written many stories, and a few weeks ago one of his yarns—" The Man Who Would Not See "—was broadcast by the B.B.C.

THOMPSON had been making experiments at home for years, but someone was always dropping into his laboratory and interfering.

So to escape meddlesome people he rented an office over a shop in Cheapside, and put " Consulting Engineer " on the door. There were two rooms, and he engaged a very unattractive secretary to sit in the first. Her duties were to chase away anyone who called. Thompson had plenty of money, and he used the inner room just to carry on with his experiments, undisturbed.

He was a rather clever chap, very good at figures and mathematics, but he had a bee in his bonnet. His ambition was to mix rays—light, heat, and sound rays, for example.

As far as I could understand he reasoned like this : If you have two wireless frequencies overlapping or mixed, instead of hearing two voices talking you get a whistle. Or if you mix two colours, say blue and yellow, you have a new colour—green. Thompson said that what he was aiming at was a complete change, such as takes place when the two gases hydrogen and oxygen are mixed, the resultant being, of course, water.

So he thought that if he could induce two or more rays to unite in a new combination he might discover something new.

Thompson had a bee in his bonnet. His ambition was to mix rays—light, heat and sound rays, for instance. And he succeeded, with the most amazing results recounted in this story.

Well, he did. One morning he had an elaborate paraphernalia laid out in his office. He had split the light from an ordinary 100-watt electric bulb into the spectrum by means of three prisms, extracted the violet and concentrated it on a white asbestos screen. He had an X-ray and an infra-red projector focused on the same spot. There was also a variable buzzer, upon which he was using a high *g* note.

He was head down to the experiment when the door between the two rooms opened and Miss Scott—she was the secretary—appeared, dressed in her hat and coat. She had one glove on, and was pulling on the other. She said, " I'm going to lunch, sir."

Thompson glanced at the clock, which showed about half a minute to twelve. He said, " Good gracious ! Twelve o'clock already ! The morning's gone quickly. All right, Miss Scott. You go."

She closed the door and Thompson heard her cross the outer office and shut the other door.

The clock was an old-fashioned one that he had brought from home. It struck the four quarters, and he decided to go to lunch himself. He gathered up some scraps of paper, together with a piece of magnesium wire, and flung them into the fire. The paper flared, the magnesium blazed, and as the clock was beating the tenth stroke of the hour he switched off the buzzer.

Thompson told me that as he was thrown sideways he had the sensation of trying to walk up an incline so steep that he was obliged to fall backward. At the same time he realised that he could see through the walls of his office. As he fell, Cheapside slanted upward like the arm of a giant crane. Even while trying to recover his balance he noticed that while the mass of St. Paul's blocked the upper end, the Royal Exchange could be seen plainly down below. When it came to rest Cheapside sloped at about 15 degrees from the perpendicular. The traffic spun along this impossible incline at normal speed, without any apparent abnormal changing of gears or additional braking.

Thompson, meantime, was groping about on his hands and knees, trying to find his balance. Try as he would, he could not stand upright. The surface was as slippery as ice, and seemed covered with a thick oil. He slithered about frantically. He says he slid miles before he managed to stand, and then only like a novice on an ice-rink. The new buildings of banks and insurance companies stood silhouetted, askew, against space.

Then he realised the silence. It was weird in its intensity. There was no sound from the traffic above. The effect was unearthly. He had the impression of void rather than silence. There was an emptiness, a hollowness, that seemed to call for an echo. But there was no echo.

Then he saw the shapes.

The most startling thing about them was that they were all alike—cylindrical. But in size they varied, from very small ones that he crushed under his feet to gigantic things that towered over his head.

There were no other shapes—nothing but cylinders. Slowly they all turned on their axes with peculiar, jerky movements. Each cylinder had an army of satellites mechanically circling around it. There seemed to be an air of inevitableness about the whole circling system.

For system it was. Thompson recognised that instinctively. As far as he could judge, each cylinder turned in a set of balls on the slippery, grey surface, while at the upper end sprouted a kind of funnel. Just below the funnel ran a complete ring of what looked like oblong windows. They might have been observation holes for someone to watch through from inside. They glowed dully. Later

NOT A SOUND FROM ANYWHERE

he was to learn that they were not windows. They were eyes.

From the sides of the cylinders sliding arms moved out, continuously searching in a vague, purposeless sort of way. For a time, owing to the unfamiliar light, Thompson did not see what they were doing. But eventually he noticed a smaller cylinder would rush towards the end of an arm belonging to a bigger one. It would stick on the end—for there was nothing like a hand on these tentacles—and the arm would raise it until it hung over the funnel at the top, where it appeared to struggle for a moment before being dropped inside.

Thompson saw that all these cylinders were behaving in the same way—the bigger ones consuming the smaller.

And everywhere that ceaseless revolving. Round and round it went on—everything turning awkwardly, jerkily, relentlessly.

Over all a silvery, greyish light shed its cold gloom. There was no warmth or feeling in anything. The fantastic scene was dreary in its monotony. An atmosphere of doom overhung it all.

Once a cylinder of enormous size rolled near Thompson. The eyes glowed red and dull, like church windows at night, while its tentacles must have been as thick as a man's thigh. To Thompson the fact that the monster made no noise in turning seemed impossible; but the air, if air there was, remained silent. Suddenly, as if it was quite close, the huge thing burst, as if a charge of dynamite had exploded inside it. Yet there was no sound.

Thompson was already badly scared, but when the area around him was filled with millions of tiny cylinders his terror grew. The creature seemed to have sub-divided itself into millions of tiny parts.

Horror seized him, horror of the slime and gloom and soullessness of the place. Was he mad?

Then he became conscious of danger. He noticed a big cylinder approaching the spot where he balanced precariously. Even a long way off there seemed something sinister in the sliding manner in which it drew near him, and he seemed to recognise a particularly evil glare from its rectangular eyes. The thing seemed to be watching him as eye by eye the windows came round while it turned. He *knew* it was examining him, and a wild fear gripped him.

Thompson says he felt like a rabbit hypnotised by a stoat. He was drawn like a needle to a magnet. He had the sensation of being impelled or drawn towards the end of the arm that was reaching, reaching out for him.

He imagined himself stuck on the end of the arm, hoisted slowly into the air, held, squirming over the funnel, like a worm on a hook, to be finally dropped remorselessly inside.

"If only I could get out of this," he thought in his terror, and straining, mentally and physically, he made a frantic leap. The distance was unthinkably great, but here nothing seemed impossible.

It was as though he had jumped from death to life. He was sitting in his office again, mixing rays.

For a brief moment he could not accustom himself to the situation. He had a conviction that this had happened before.

The door opened and Miss Scott stood in the room, dressed for going out. She was wearing one glove and pulling on the other. She said: "I'm going to lunch, sir."

Thompson looked at the clock in amazement. It showed half-a-minute to midday.

He wanted to shout at the woman. He wanted to scream "You've been to lunch once!"

But instead, he just said, "Good gracious! Twelve o'clock already. The morning's gone quickly. All right, Miss Scott. You go."

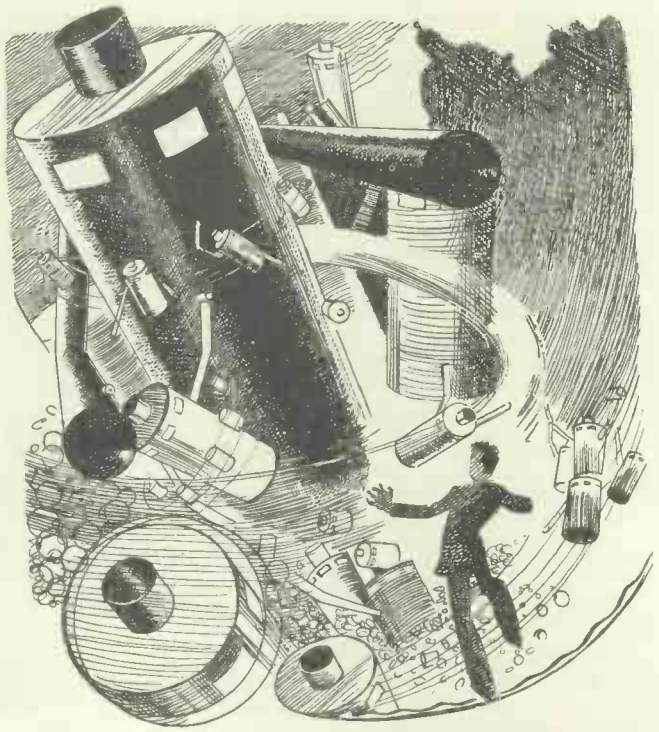
He watched her shut the door. He could hear her crossing the outer office, opening the other door, then closing it. His hair felt like jumping out of its roots.

Then the clock began to strike. Through the long four quarters it trailed on. The number of the hours began to sound. Thompson picked up the same scraps of paper and the same piece of magnesium wire and threw them on the fire. There was a blaze, and as he switched off the buzzer he was thrown back and began to fall.

The horror of his situation came to Thompson in a flash. He had spent many years in careful research, and he realised at once the significance of his position. He had become involved in a time-cycle and was going round and round in it. Surrounded by an ocean of life and space he was alone, marooned on this tiny island of time. The spectacle of Cheapside slanting upward shrank into unimportance in comparison with his own fate. Was he to be condemned to circle round for ever in this brief period? What an eternity! Perhaps three-quarters of a minute.

The creatures of the other world were revolving after their own fashion. Thompson slithered on the glass-like surface, made more slippery by the grease from the bodies he crushed under his feet.

Again the monster that was to attempt to trap him came round. Its magnetic tentacles reached out, and he jumped.



THOMPSON NOTICED A BIG CYLINDER APPROACHING THE SPOT WHERE HE BALANCED PRECARIOUSLY. THERE SEEMED SOMETHING SINISTER IN THE SLIDING MANNER IN WHICH IT DREW NEAR HIM

It was the moment for which Thompson had waited. He was back again in his office. The door opened and Miss Scott came in. Mentally Thompson wept with rage and fear. He tried to raise his hands in supplication to her, to plead with her to save him. Her severe, Spartan face had never seemed so homely.

But all that he could do was to tell her to go to lunch.

UPSETTING THE TIME CYCLE

How many times this awful cycle continued Thompson can't say—it must have been thousands, so many times that he noted even the smallest details. With constant repetition he reached an uncanny stage of proficiency. He could judge the exact distance he fell, select with care each slimy mass of creatures upon which to place his feet, and dodge, with the science of a lightweight boxer, the murderous creature that was out to destroy him.

The jump back to his office became the mere playful skip of a mountain goat.

He grew to look forward to Miss Scott's appearance as a sort of visit. She was the one human being he was privileged to see periodically every three-quarters of a minute. She became necessary to him. He would have liked to rise to his feet and bow, murmuring some commonplace phrase about being pleased to see her, or something like that. He tried to smile, but apparently she did not notice, for her behaviour was always precisely similar, politely correct, with the same intimation that she was going to lunch. After a few hundred times, Thompson says this was maddening.

A sort of boredom began to settle on him. There was nothing to do but go round and round. He knew everything that could happen to him to the least detail. The unalterable rhythm of the cycle weighed upon his soul. Change! If only something would change! Faster! If only he could go faster!

He was a great experimenter was Thompson. Even in this mad situation he tried to experiment. He began by trying to jump off earlier, and after a hundred times or so he was amazed at his success. Originally he was about four yards from the big cylinder when he jumped. By continuous effort he found that he could jump when the thing was quite seven yards distant.

His scientific mind longed for exact figures. He told me he would have given anything for a stop-watch so that he might check the exact time, but he could only rely on his judgment. He thinks that he shortened the time of the cycle by at least ten seconds, and his enemy was just coming into sight at that period.

A peculiar thing, however, had happened. The shapes had taken on an elliptical form. They continued to turn as before, but with an unequal, undulating motion, as though overweighted on one side.

As soon as Thompson noticed this he became so interested that he forgot about trying to get away sooner and his efforts relaxed. Each time that he came back to this strange world he observed this extraordinary change with the care of the research worker. Big and little cylinders were affected alike. They were all the same—elliptical, all turning with the same wobbly, overweighted motion. And then he saw that they were all returning to their circular shape. The reversion to what he called normal took some time. He reckons that he made the cycle about five hundred times before they were the same cylinders that he had come to know so familiarly.

But while he had been watching this transformation, Thompson had failed to see something else. His enemy had also come back to normal. More. It was nearer than it had ever been. The attraction was growing enormously stronger, too. Thompson has tried to explain the scientific rules to me—very complicated. But he seems to understand perfectly—I remember one phrase he used—something about the force increasing inversely as the square of the distance.

He tried to leap off earlier, as he had done previously, but he found that he couldn't. The attraction was too strong.

His enemy was terrifying now. His jumps back to the office were as convulsive as the movements of a galvanic frog. He tried to calculate how many more times he would have to go round before he would have to give up. For he suddenly realised that in the end he would have to give up.

In fact, he did come to a point when he knew that this was the last time. The thing knew it too. Thompson swears it did. Its eyes glowed with a sort of feverish triumph. The tentacle stretched out for him. He tried to jump. He couldn't. It was too late.

He says the speed with which he rushed on to the arm was fearful. He was raised slowly, lifted up in jerks that almost shook him to pieces. He hung over the funnel, kicking feebly.

That was when the explosion came.

Thompson says that when he came to himself he was walking across his office to Miss Scott's room. He opened the door and picked up the telephone which was ringing. He said, "Hello! Who's there?"

And a woman's voice asked if Miss Scott was ready to come out to lunch.

"Lunch!" yelled Thompson. "Lunch! Why, she's just been—a hundred thousand times."

He dropped the receiver and flopped down into a chair. He says he sat for twenty minutes, immobile, thankful for the joy of listening to the clock snipping seconds off his life. It was a wonderful sensation—to be allowed to go on living.

He has a theory about how the cycle was broken. When he contracted the time by jumping off earlier, some law of compensation came into play, forcing the cycle to expand in the same ratio. The time was thus longer and the telephone-bell rang during the cycle. Thompson believes the bell set up an extra vibration which cut across the combination of his own rays. Certainly, he found the prisms he had been using shattered into small pieces lying all over the office floor.

Of course, an adventure like this couldn't stop a man like Thompson from making experiments. Only he doesn't mix rays any more.

The last time I saw him he was doing something with goldfish.

HOWARD BAKER

A portrait of the leader of a new dance band on the air. Howard Baker was heard on the radio with his orchestra for the first time early in April.

A Simple Aerial Scheme

Many commercial all-electric receivers incorporate an arrangement for employing the mains as an aerial. Here is a method which can be used in those cases where the usual mains aerial attachment is not fitted.

MANY of the commercial mains sets now on the market incorporate a mains aerial arrangement which can be used quite satisfactorily for the reception of the more powerful stations.

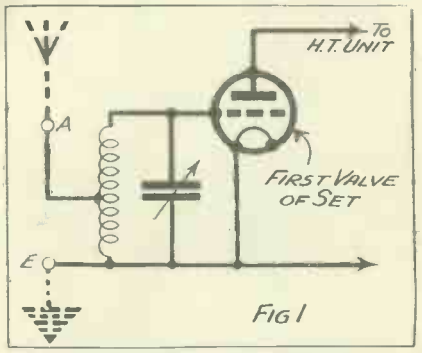
This is a decidedly useful addition because it releases the set from being tied up, so to speak, to the lead-in of an external aerial, and it can be moved about to other rooms. In cases of sickness it is a great drawback if a receiver cannot be shifted from its accustomed position.

The Method Used

Owners of all-mains sets which do not incorporate such a device, or those having receivers taking L.T. from accumulators but using a mains H.T. unit, can obtain the same facilities in the following simple manner which does not necessitate any wiring alterations or additions to the mains end of the set.

The aerial lead-in and earth wire (Fig. 1) should first be disconnected. The earth wire is now connected to the aerial terminal of the set via a 1-mfd. fixed condenser. The earth terminal of the set is left unconnected. (Fig. 2.)

REMOVING CONNECTIONS



The existing aerial and earth wires are completely removed from the set.

This plan will work on A.C. or D.C. mains supplies.

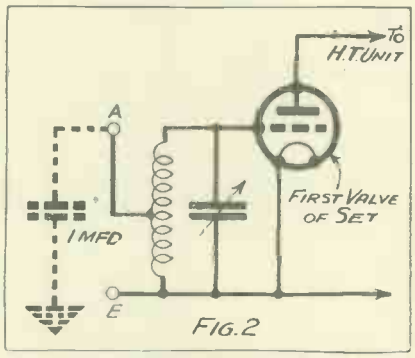
It will be found that the tuning condenser positions are slightly altered, and the reaction control will probably need advancing a little.

Signal strength is appreciably less than with a normal external aerial, but for local station reception, within, say, a 25-mile radius, loudspeaker volume is ample enough for an ordinary living-room, even when employing only a simple two-valve receiver in conjunction with this scheme. Tuning is sharper than with the conventional aerial.

When the set is required in a bedroom or in a room away from the usual aerial, the only connection needed beyond the mains plug is an earthing point, which may be a water pipe or radiator. If the plug point is of the three pin variety, the third pin, i.e. the one connected to an earthing point on the wiring conduit, may be used as the earth for the set.

It will be seen that, by this upside-down input arrangement, the filament of the first valve is not directly earthed and may only be connected to earth through the mains.

ONE ADDITIONAL COMPONENT



The aerial terminal is connected to earth via a 1-mfd. condenser, while the earth terminal has no connection made to it. No other components are required.

Condenser Value Not Critical

The tuning coil, therefore, is included in the aerial circuit which is formed by the earth wire, coil and mains. The inductance of this circuit is mostly concentrated in the coil, and when the circuit is tuned to a station signals develop across the coil and consequently across grid and filament of the first valve as with the usual arrangement.

The only point to watch is that a good quality fixed condenser must be used in the earth lead, one which has been tested at about double the mains voltage.

The value of this condenser is not critical, and if one of 2-mfd. capacity is on hand it can be used with equally good results. If the component has to be bought, there is really no need to get one any larger than 1 mfd., which is slightly cheaper.

How I was Converted to Radio

By ARTHUR TOSCANINI in an interview with MICHAEL LORANT

"FOR quite a long time I had an antipathy to radio. I shall try to explain. Everybody knows that before any of my performances I hold long and arduous rehearsals—as a matter of fact, a series of them. Once in the course of my activities, for instance, I was compelled to cancel a musical performance of mine, as the guest lady singer on that occasion, in spite of numerous rehearsals, was unable to master her part as thoroughly as I considered essential in order to give a satisfactory performance of the musical piece we were going to produce.

In short, I have always made the utmost efforts to give of my best to the audience. That is why I have always been in doubt as to whether an only half completed performance could be regarded as an entirely completed one over the radio. Why? Because radio itself, for various technical and mechanical reasons, has in the past detracted from that completeness as well.

Have a glance round now and see whether wireless transmission has reached the highest standard possible for it to achieve. I am inclined to say that it has. Wireless transmission has greatly improved during the course of the last few years, and a comparatively perfect broadcast of a musical performance can now be made. This is without doubt a great accomplishment, but its success is not merely a technical one.

It has been made possible by the collaboration of the musician. I myself have had a vast experience of broadcasting music, and in my opinion it is the most difficult problem of radio. In the course of my work I have discovered that wireless has really done its best to give as faithful a reproduction of music as technical science permits of to-day.

But there is another question. Even supposing an absolutely perfect broadcast of a concert can be carried out, will the receiving sets of listeners be

(*Please turn to page* 388.)

Television To-day

THE LATEST NEWS AND VIEWS ABOUT TELEVISION AT HOME AND ABROAD

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

TELEVISION societies are now rapidly springing up in different parts of the country. It is interesting to note that the idea of the Television Society was first suggested about nine years ago when the British Association held its meeting in Leeds.

This fact was recalled by Mr. J. L. Baird, the famous television inventor, when he attended a meeting recently of the Yorkshire Television Association which was held in Leeds, Mr. Baird being the guest of honour. The Yorkshire Television Association is making arrangements to set up and operate a television transmitter to work on 10 metres.

Co-axial Cables

Talking about television arrangements in Yorkshire, the Post Office is arranging to run a high-frequency co-axial cable to Leeds, this to be a branch from the London to Birmingham cable. The cable to Leeds (as the one from London to Birmingham) is not primarily intended for carrying television frequencies, but these co-axial cables have lately been developed for the purpose of carrying high-frequency impulses generally, and have been found extremely valuable for telephonic purposes.

For Television?

It is more than probable that, although this is their primary function, the Post Office engineers at the same time have one eye on the use of such co-axial cables before long for television transmissions as well.

Mr. Baird was also recently a guest of the radio trade at Manchester when he gave a lecture on television. Amongst other things Mr. Baird said that it was very much to be regretted that the radio trade, or at any rate a certain section of it, had done their utmost to stay the coming of television, in the mistaken belief that it would damage their business in regular radio receivers.

Mr. Baird stated, and most people will agree with him, that, so far from restricting business, television, when it really gets going, cannot help increasing business very greatly and therefore any attempt to place obstacles in the way of the development of television is a very short-sighted policy. At any rate, it can fairly be said that the attitude of even the section of the radio trade concerned has changed noticeably in the past few months and I think most people now look forward to the coming of popular television receiving sets and will welcome them when they arrive.

Many people want to know whether the building and operating of a television receiver will be more or less along the same lines as in the case of a radio receiver. There are a number of different opinions on this subject, some people saying that the ordinary amateur, who is quite well able to construct a straightforward radio set, will be out of his depth when he comes to making up a television set.

Some people, on the other hand, say that a really skilful and experienced set-maker should find no difficulty in a television receiver. There is another section of opinion again which believes that a good deal of technical knowledge and experience will be required even to operate a television set, owing to the number of different controls and to special features, such as the high voltages which are used, and so on.

No Serious Difficulty

Personally, I think that when television sets are available on the market, there will be no very serious difficulty in operating them, I mean as compared with a wireless set to-day. After all, if you want a radio set with a really comprehensive range you must have or acquire some kind of experience in handling it.

Nobody has yet succeeded in giving us a really press-button receiver which will get all the stations you want on the Continent of Europe, for instance. I do not think that a television receiver will call for much more skill than the normal long-range receiver, and anyhow doesn't the existence of scope for individual experience make it all that much more interesting?

Novelty Appeal

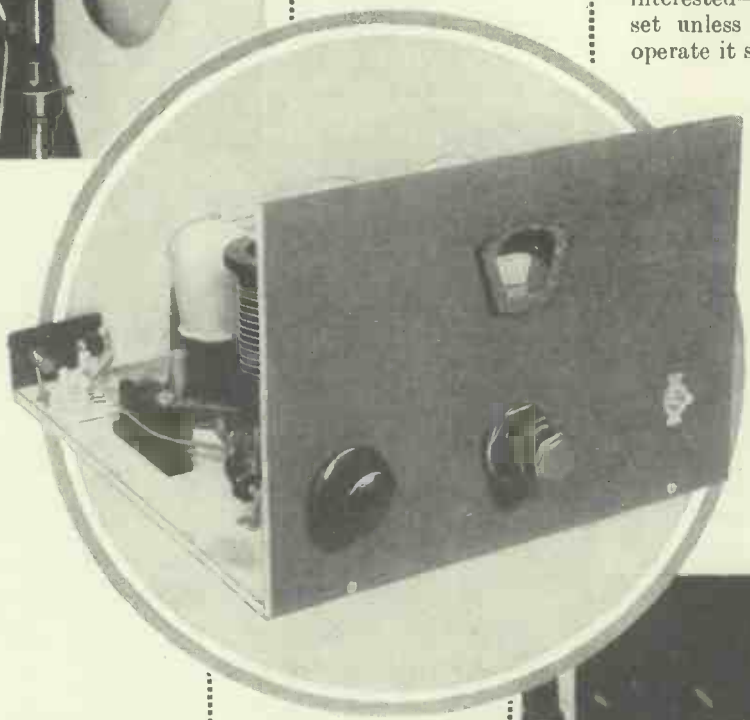
One has to remember that in the early sets, at least, one of the principal attractions of television will be its novelty, because it is fairly well agreed that, owing to the smallness of the picture and other factors, it cannot compete as an entertainment with the cinema or the theatre—or even, as some people think, with a good home cinematograph. Its

AT THE G.E.C. RESEARCH LABORATORIES

Some of the apparatus used in the Wembley Research Laboratories for the development of cathode-ray tubes. Note the cylindrical shields which are placed over the tubes while they are being exhausted.

THE SHORT-WAVE LISTENER SCORES

He only needs a simple two- or three-valve set, such as that illustrated in the centre of this page, and the whole world is his to roam in via the ether; and remember, those attractive programmes on the American N.B.C. network are easily received on the short waves. Stars such as Lois Ranel (top left), who has been on the air 1,000 times, can be heard every day. And what can beat the American sports commentaries? The short-wave listener can hear Hal Totten and Clem McCarthy, seen to the right, who are considered the best sports reporters in the U.S.A. Yes, the S.-W. listener always scores.



novelty value and the fascination of working it will be greatly increased or extended if the picture reproduction which is obtained depends to a large extent on the skill and experience of the operator.

You would very soon get tired of simply switching on and seeing the pictures, if it was quite beyond your control to improve the reproduction by twiddling the controls. So on that aspect of the matter I don't think there is much to worry about.

On the other hand, when it comes to those amateurs and constructors who take a great delight in the actual making of their own receivers, I do think that here they will be tackling a much bigger job with a television set than with an ordinary radio receiver, even a fairly complicated one. Bear in mind that the television set has to include not only the actual picture reproducer, but also the ultra-short-wave receiver for sound and vision.

Greater Complications

The circuit is much more complicated, and the number of components, especially valves, is enormously greater, and the number of controls, of course, is much greater too. But here again the interest involved in the work is all that much greater and personally—although I know several people who do not agree with me—I predict something in the nature of a boom in the home construction of television sets when the B.B.C. service gets moving.

Simple Operation

But before leaving the subject, let me make one point perfectly clear, and that is that those of you who want to go in for a commercially-made television set need have no qualms as to whether you will be able to operate the same or not, because manufacturers are already getting down to the question of simplifying the operation so that any ordinary person reasonably interested—and no one would buy a set unless he were—will be able to operate it satisfactorily.

* * *

The French engineers at the Eiffel Tower certainly made a bit of history when they designed and completed the 180-line transmitter there in about a couple of months. Not only was it necessary to make the arrangements at the Eiffel Tower itself, but special broadcast arrangements had to be made at the broadcasting studios in another part of Paris, and a high-frequency cable had to be fixed between the two.

(*Please turn to page* 385.)

HEARING THE ELECTRON'S FOOTSTEPS

How the noise produced by the flow of current limits H.F. amplification on ultra-short waves is explained.

By CARDEN SHEILS

IN the future we may expect to be particularly interested in the ultra-short waves, below the 10-metre mark, which have already been marked out for the transmission of high-definition pictures and sound.

Here we shall be facing conditions which are still largely a matter of speculation. In the first place the reach of the 6-metre wave, on which we are to make a start, is said to be limited to the so-called optical range. In other words, unless the transmitting aerial is within sight of the point of reception, we are told that we cannot expect either to see or hear the programmes. That, however, seems a long way short of the full truth, because experience has already shown that it is possible to get good reception thousands of miles beyond the "visible" range. And to do so it is not necessary to use intensive H.F. amplification.

"Tube Noise"

Another new factor is the relatively small power which can be radiated through the ether on 6 metres. Compared with the 100 and more kilowatts we are accustomed to in ordinary broadcasting, we shall have to do the best we can with ten or twenty kilowatts at first. This will mean in many localities intensive amplification on the receiving side.

In medium or long-wave working, the use of H.F. amplification is limited by the background of static "noise." This is magnified up with the distant signal until it finally "swamps" the latter.

Below the 10-metre mark there is, fortunately, very little natural static. But a second source of trouble called "tube noise" comes into play, and this, in the limit, also wipes out the desired signal. "Tube noise" includes a number of minor disturbances which, when added together, become a formidable source of annoyance whenever H.F. amplification is pushed to the extreme.

Variations in Current

The first source of disturbance is due to tiny variations in the current flowing through the wire circuits. In a sense it may be compared with the rustle or babble of a stream of water flowing over stones. An electric current, as we know, heats up the wire through which it flows, and heat is just another word for molecular agitation.

For instance, when a gas is heated up inside a closed vessel, the molecules hurl themselves faster and faster against the walls, thus increasing the internal pressure until finally the whole thing may blow up. Even in the case of a liquid, heat increases the agitation of the internal molecules, as can be proved by observing the so-called Brownian movements of small particles held in suspension. And the same holds good with the stream of electrons which go to form the electric current in a wire.

Instead of flowing smoothly and regularly, the electrons share in the agitation of the molecules, and so move forward in tiny jerks and rushes. In the ordinary way this is "averaged out" into a steady current, but if the circuit includes several high-gain amplifiers the irregular movements are greatly emphasised and begin to form a background of noise. This kind of thing is, of course, particularly likely to occur in fine-wire high-resistance couplings and in grid leaks.

Irregular Stream

A second and still more troublesome effect is created inside the valve itself. In the first place, the electrons emitted from the heated filament come away from the wire, not as an absolutely steady stream, but more or less in random fashion. One can compare it to a stream of bullets fired from a machine gun, and for this reason it is often called the "shot effect."

Once we realise that the discharge stream flowing inside the valve is really made up of countless numbers of individual electrons, it is clear that they will strike against the plate of the valve more like the pitter-patter of falling rain than the steady flow of an absolutely uniform current. As before, the effect is too small to make itself felt in the ordinary way. But with intensive amplification it definitely helps to swell "tube noise."

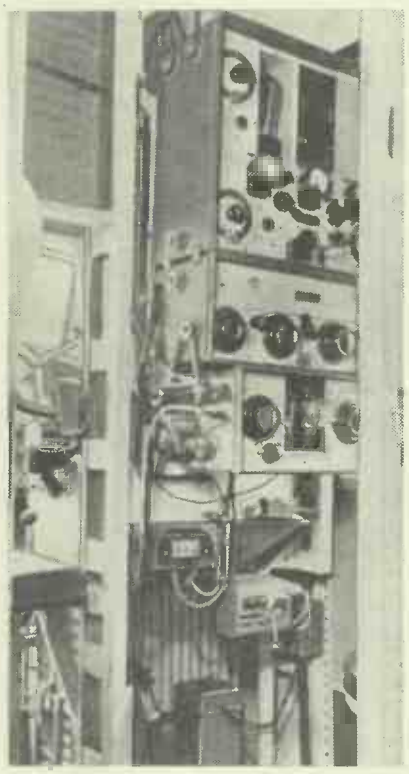
When using oxide-coated filaments, a third form of fluctuation superposes itself on the true "shot" effect, due to sudden changes in the condition of the sensitive layer on the surface of the wire. This is called "flicker," probably by analogy with the behaviour of a flickering candle.

Secondary Emission

Again, we know that electrons passing on their way from filament to plate travel at a considerable speed, particularly towards the end of their journey. During this time they may strike against molecules of free gas—of which even a highly evacuated tube must contain a certain number. The secondary electrons so set free are drawn towards the plate, and produce

(*Please turn to page* 385.)

AIRCRAFT RADIO



The Marconi transmitting and receiving equipment, complete with "homing" device, which has been in use for some months on the Junkers aircraft used by South African Airways.

VIVIENNE BROOKS, one of the popular vocalists who sing with Henry Hall and the B.B.C. Dance Orchestra.

VIVIENNE BROOKS and THE THREE SISTERS

Introduced by
KENNETH BAILY

VIVIENNE BROOKS' grandmother had an ambition for her granddaughter. Sitting listening to Kitty Masters or Phyllis Robins singing to Henry Hall's band, she would say to Vivienne: "There now—why can't you do what she's doing?"

At that time Vivienne was a pianist. She sang as a side-line. Grandma knew different—she wanted things the other way about!

Now she's got them that way, and Vivienne, at 20, is launched on the Road to Big Things.

Jet-black hair, dark brown eyes, red earrings, red and black costume, the deep attractive voice of a "blues" singer—these are the things which this striking young woman's vivid personality etched on my memory. She was easy to talk to, and also easy to listen to.

"As far as I can remember, I was learning the piano when I was six," she told me. "Then I went to school at a convent. There I took part in plays, choruses, concerts—anything where I could act and sing!"

The nuns took an interest in her musical leanings.

When she left the convent school she took up millinery. But the piano called and she then began playing in night clubs.

Her Voice "Broke"

It is not often that a girl's voice can be said to "break." But Vivienne's, at that time a high-pitched soprano, did "break," and she found herself with a "blues" singer's tone.

"I sung odd bits at the piano, and a friend at one night club said she would take me to Henry Hall," recalled Vivienne. "I was terribly nervous when I sang to Mr. Hall and he, realising it, asked me to come again. The second time I was calmer and he gave me the contract."

The time drew near for her first broadcast. Her grandparents, with whom she lives, were full of pride.

Two days before the broadcast her grandfather died.

Though we didn't know as we listened, Vivienne sang that first broadcast with a heavy heart.

When I bid her good-bye she was rushing off to have a game of Snooker with "the boys" in the band. She wants to be amateur Snooker champion. She's a champion swimmer. Holds seven medals. She rides horseback. A bit of a "tom-boy" of a girl, Vivienne Brooks! She'll get there.

* * *

Molly from a Kent village, Marie from Swansea, and Mary from Bournemouth are "The Three Sisters."

In Henry's Film

Molly and Mary were both among Cochran's Young Ladies. Marie, who is a trained dancer as well as a singer, has understudied Ivy St. Helier, Mary Ellis and Adele Dixon.

Molly met Marie and Mary in the chorus of a Drury Lane show. After the show they stuck together and did film work. One day they found themselves in a chorus scene for Henry Hall's film "Music Hath Charms." Henry Hall heard them sing. He said nothing but remembered—and found out where he could get into touch with them if need be. They *were* needed and you know the rest.

Vocal Accompaniments

Molly, brunette, writes poetry, and playing the piano is a hobby as well as work; she finds her sport in the swimming pools. Mary, blonde, delights in gardening, and plays golf. She has understudied Elizabeth Welch. Marie, brunette, is a home-girl; needlework and domestic science make her recreation.

"The Three Sisters" bring a new "tone colour" on to the air. Molly explained: "As well as singing in a trio in the usual way," she said. "Mr. Hall has found that our voices have a remarkable blend, which makes it possible to use them as an *accompaniment* to other singers in much the same way as instruments. We each sing as solo artists from time to time as well."

Molly, Marie and Mary, thank the day when Henry Hall heard them in the film studio—and remembered.

THE WAVES GO ROUND AND AROUND

—continued from page 346

their 49-metre wave was not *long* enough for reliable transmission to Canada, when the whole path was in darkness. Sir Noel Ashbridge expresses the opinion that a wave of about 80 metres would have been of great value, had its use been possible.

At the present stage of the sunspot cycle, wavelengths of 19 metres and below may be regarded as daylight waves, and of 31 metres and above, night waves. From this it follows that the most suitable wavelength for transmission over a path which is partly in daylight and partly in darkness will be in between the two.

Hence the use of 25 metres for transmissions to Australia and New Zealand. Obviously the path to the Antipodes can never be entirely in daylight or in darkness.

The Ninth "Harmonic"

Now that we have had a full eleven years of really serious short-wave work, we are beginning to feel that we know quite a lot about the eleven-year sunspot cycle; but even that has a strong ninth "harmonic" which causes marked variations over a shorter period of roughly fifteen months.

Fig. 4 shows this in very rough form. Observations are being made daily, in all parts of the world, with the idea of making short waves completely reliable at all times.

Making Television Visible

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

Some notes on the nature of the materials employed for the making of Television Screens.

There is sufficient "active substance" in this piece of natural zinc silicate ore to make several hundred fluorescent screens for television viewing.

IT is a rather fortunate fact that some well-known materials possess the remarkable property of emitting light under the influence of cathode rays, for, indeed, if it were not for this peculiar behaviour of these substances, cathode-ray television would be quite impossible.

The First Discovered

Materials, as the reader no doubt will be well aware, which give out light under the influence of cathode rays, X-rays and other forms of radiation, are usually termed *fluorescent*, the name being given to them in consequence of one of the earliest discovered fluorescent substances, namely the mineral *Fluorspar*.

In a cathode-ray television receiver, the "screen" of the cathode-ray tube merely consists of a disc of glass formed by the end of the tube which is coated with a layer of finely ground fluorescent material. When a pencil of cathode rays impinges upon any part of this fluorescent screen, the active material of the screen immediately lights up and its glow persists as long as it is under the influence of the rays.

After-Glow

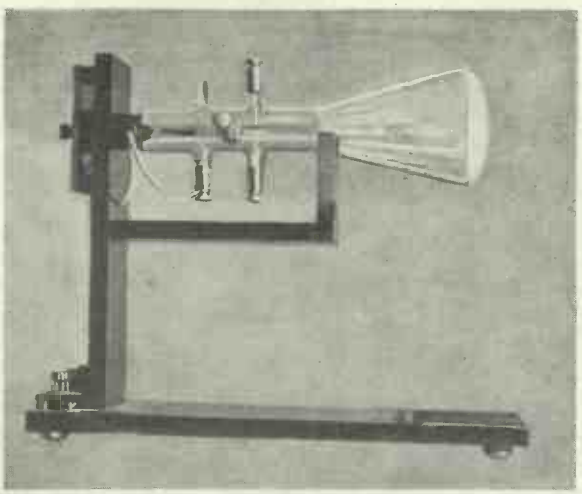
Sometimes, also, the glow of the fluorescent material persists a little longer than the time during which it is acted upon by the cathode rays, a property which, as we shall understand later, can be a very decided advantage and, also, an unmitigated nuisance.

The long search for fluorescent materials began chiefly about the time when X-rays were discovered. It was found that X-rays caused certain crystals and various types of glass to glow brilliantly under their influence, and so scientists actively went a-hunting among innumerable chemical substances in an endeavour to hit upon one or more cheaply made materials in which this property of fluorescence should be exhibited to a maximum degree.

The famous Thomas A. Edison, it is said, personally experimented with several thousand different chemical materials in an endeavour to bring to light a more active fluorescent material. Strange chemical compounds were investigated, compounds such as *magnesium platinocyanide* and *barium platinocyanide* which, it was found, fluoresced very satisfactorily under X-ray influence. Owing, however, to the fact that such chemicals contained the exceedingly high-priced platinum, a search was continued for cheaper materials.

Nowadays, the cathode-ray television screen maker has the choice of

A TYPICAL TUBE



The "fluorescent" coating can be seen as a white surface on the end of this cathode-ray tube.

but a small handful of materials, figuratively speaking, for the construction of his fluorescent screen. Unfortunately, many excellent fluorescent materials suffer from the property of "after-glow." That is to say, they go on glowing after the cathode-ray excitation has passed.

Now, owing to the extreme velocity with which the moving pencil of cathode rays traverses the screen, any very appreciable after-glow cannot be allowed, for if it were present it would simply ruin the sharpness and definition of the received images.

A *very* slight degree of after-glow, however, may be permitted. Indeed a trace of this property of after-glow is a rather desirable feature of a fluorescent material, because it keeps the material glowing for a mere fraction of a second after the cathode-ray excitation has passed along, and thus it aids the phenomenon of persistence of vision and so renders a more flickerless and a clearer image possible on the screen.

Certain naturally occurring compounds of zinc, such as *zinc sulphide* fluoresce brilliantly under the influence of cathode rays. Unfortunately, however, some of these materials, when used alone, have a very decided after-glow and therefore they cannot be employed solely for cathode-ray screen making, or, at least, for television cathode-ray screen construction.

Various Colours

Of all the zinc compounds used for screen construction, *zinc phosphate* gives the most persistent after-glow, whilst *zinc silicate*—which is found naturally in the form of the mineral, "Willemite"—gives about the least amount of after-glow. Thus, if to a screen material containing a fairly large proportion of zinc silicate a trace of zinc phosphate is added, it is possible to control to an appreciable extent the precise degree of after-glow shown by the finished screen.

Most electrical experimenters are familiar with the red crystals of *potassium bichromate*. This material has been brought into use by cathode-ray screen makers. It fluoresces well, but its fluorescence is of an orange-red hue and is, therefore, most unsuitable for comfortable and satisfactory cathode-ray viewing.

The zinc compounds usually fluoresce a greenish colour, which, whilst being better for viewing purposes than an orange or orange-red coloration, is still not very satisfactory for comfortable screen viewing.

There are still, however, two other well-known materials which are actively fluorescent under cathode-ray influence and in whose fluorescence the phenomenon of after-glow is more or less at a minimum. These are *calcium tungstate* and *cadmium tungstate*—compounds containing calcium, tungsten and oxygen, and cadmium, tungsten and oxygen respectively.

Nearly-White Glow

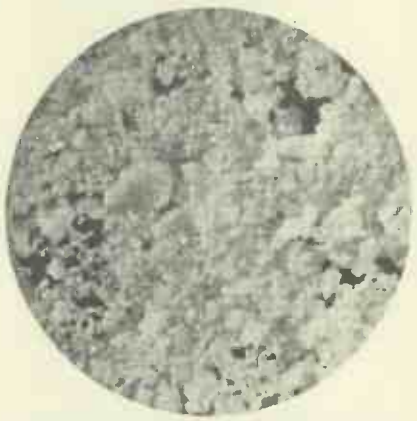
These twin materials give rise to a bluish fluorescence, and for a long period cathode-ray tube workers were satisfied with the peculiar greenish-blue light given by a cathode-ray screen made up of a mixture of these materials and zinc compounds.

With the coming of modern television, however, times have changed and a fluorescent screen material which will give black-and-white images is demanded. Truth to tell, the ideal fluorescent screen mixture for this purpose has not yet been evolved. Even the best screen materials fluoresce with a perceptibly bluish or greenish tint. Nevertheless, great advances are being made in the formulation of fluorescent screen materials and, at the present time, nearly black-and-white images are possible.

MATERIALS FINELY GROUND

A screen-coating preparation, for instance, containing a mixture of cadmium tungstate, zinc phosphate and traces of zinc sulphide and/or calcium tungstate produces a cathode-ray picture which is only one or two degrees removed from a pure black-and-white image. Thus there is no doubt of the fact that, in the course of time, the ideal black-and-white image of the cinema screen will also be made possible on the cathode-ray television screen.

A PHOTOMICROGRAPH



A small area of the screen of a cathode-ray tube as seen under the microscope.

In the process of cathode-ray screen construction, the active materials are ground together in the correct proportions, the grinding being done mechanically in order to effect a thorough mixture of the ingredients. From time to time the mixed materials are then carefully "screened," *i.e.* passed through a sieve in order to ensure the component particles being of more or less unit size.

Spraying the Tube

The grinding is slowly carried out so as not to raise the temperature of the material unduly, it being found that fluorescent materials can have their properties altered by changes in temperature. Finally, the finely ground and intimately mixed particles of active material are incorporated into a "binder," which usually takes the form of a light varnish serving to hold the particles together and to the inner surface of the glass of the cathode-ray tube.

In the earlier cathode-ray tubes the mixture was painted on to the glass surface. Nowadays, experiments have been successful in the spraying of the varnish mixture on to the glass surface and in thereby effecting a more even coating.

THE TRANSFORMER MAKER

I THINK I can safely assume that the amateur who keeps in touch with radio progress has no fears for any modern wireless component. He is in a much happier position than many amateurs five years ago. To them a transformer was a "delicate article made up of very special material," and, by Jove, didn't they glory in its mystery! Well, we must be thankful that no such "superstitions" now exist.

The Preliminaries

You know what a transformer is. It consists of a primary winding and a secondary, or secondaries in the case of mains transformers. Let us think of the component parts necessary to make a mains transformer. Wire, yes (and plenty of it), former, stampings, insulation material, case, sundry bolts and nuts.

The technical man has calculated the exact number of turns of wire, the various gauges of wire for the different windings, the space they will take up, and other important matters such as "copper loss," "iron loss," percentage efficiency, magnetising current, etc. The practical matters he gives to the foreman of the transformer department, and then the wheels of production are put in motion.

The automatic coil winders are geared up to wind precisely to "so many turns of wire per inch," this, of course, depending upon the gauge of wire. But before the winding is commenced, you will be interested to know that the wire is also tested.

Enamel wire is most commonly used in this work, and as insulation factor is of paramount importance in mains transformers, the enamel insulation must be tested for "cracks" and "chippings." How is it done? It's very interesting, I'll say! Here you see a large reel of enamelled wire just come in from the makers. They have placed it on a spindle and are running the end off. Hallo, where are they taking that end of wire?

The tank into which this end of wire is taken is full of mercury, the end is then brought out at the other side of the tank and connected to a drum or reel. The reel is then placed in a winding machine and wire is wound on this reel and wound off the makers' reel, whilst every inch of wire passes through the mercury tank.

Checking Insulation

Well, the reel is now empty. The foreman utters a sigh of relief. Why, you ask? Well, the wire is perfect throughout the whole length. Then you, in your natural curiosity, ask the foreman what is the idea of the mercury tank. He explains to you that if the enamel has chipped off the wire the copper wire will make an electrical connection with the mercury.

Various methods of "tell tale" are adopted. One is to operate a neon lamp as soon as contact is established, but the one I prefer is where a relay is

(*Please turn to page* 384.)

"I Don't Like GIRL CROONERS"

Says Billy Cotton, in an Interview with Marjorie Roberts

BILLY COTTON, whose band is always popular on the stage or over the air.

"WELL," said Billy Cotton, strolling round the room, hands deep in mackintosh pockets, "and what can I do for you?"

"Just talk to begin with," I replied encouragingly, and gave him a start by asking what he thought about having girls in a band.

"I like to keep business and pleasure apart," came his crisp retort.

"But not even *one*, not just a crooner?" I persisted.

"No, not even one," he replied firmly. He contended that it was too difficult for a girl to be among the band boys and yet not actually one of them. To begin with, a girl had to be considered in so many ways that a man had not. Besides, in his opinion beauty and brains never went together. If a girl had brains she generally looked a mess, and if she looked all right her head was usually empty, and no argument that I could use would make him budge an inch from this view.

"More Nuisance Than Worth"

Of course, Billy Cotton has had girl crooners, but he says that he always has to give them up, as, in the long run, they're more nuisance than they're worth. If they're all up-stage and county they don't get on with the boys. If they're matey and pleasant they get taken around and given a good time, "and then the nonsense starts. I know, because I've done it myself!" Well, after that crack I thought I'd better call it a day on that subject and try something else.

Of course, you all know what Billy Cotton looks like. Apart from listening to his broadcasts you must have seen him when he was playing at the Astoria or the Locarno or Ciro's, to mention but a few places.

A Practical Joker

To me he looks like anything but a dance-band leader. Tall and broad he weighs only a paltry fourteen stone. Straight, fair hair crowns a full, smiling face, and behind horn-rim spectacles his eyes twinkle merrily. Not surprising this, for he is an inveterate practical joker, and the complaint seems to have spread to all his boys, who never let a day pass without perpetrating some sort of atrocity!

I don't think I can imagine anything more like real hard work than trying to get Billy Cotton to talk about himself. While I was making the attempt, his manager was present in the room, and every few moments Billy would turn to him and say, "Now why don't you take this girl out and give her some lunch and talk to her nicely?"

Off at a Tangent

Mr. Gadsby would smile, Billy would wander round the room again, pausing to glance out of the window for a second, and I, having taken a deep breath, would renew the attack.

"Now, what else do you want to know?" demanded Billy, ceasing his peregrinations round the room and settling himself, hands still in pockets, in a chair. Before I could answer, however, he was off at a tangent, talking about something which was quite interesting, but which bore no relation whatsoever to himself.

She Was Unlucky

It reminded me of a story I had heard about a journalist who once interviewed him. Apparently she was a very meek and mild little person—"Ought to have had on a cap and apron," was Billy's description of her. She sat and listened while Billy talked of this and of that—in fact of everything but himself. At length she screwed up enough courage to say, "But you haven't really told me anything about yourself yet." "Oh, haven't I?" replied Billy. "Well, I'm sorry, but I have to go now," and go he did, leaving the poor unfortunate creature no better off than before she had seen him.

I had barely mentioned his early days, when Billy cut in, "Oh, those. They've all been written up over and over again."

Not Much Choice

"Yes, I know," I replied patiently, "but if you *won't* talk about yourself and *won't* give me any new stuff, you don't leave me much choice, do you?"

"Sorry," he grinned, "but now just let Gadsby take you out to lunch, and he'll tell you all you want to know." He turned to Gadsby. "Be careful, though," he admonished him, "don't let me in for any trouble." This sounded promising, so I sat up and began to take notice, only to be reminded very forcibly of the meek and mild little journalist, for Billy blew his nose, cleared his throat, and announced, "I'm afraid I must go now, because I have to get down to Chatham in time for the show!"

ALL IN A FOG

Our contributor describes two puzzling faults and explains how complete cures were eventually found.

RECENTLY a rather uncommon trouble in a home-constructed 2 H.F. receiver cropped up. It worked excellently on the medium waves, but when the 3-gang condenser was correctly ganged oscillated wildly on the long waves up to 1,600 metres. Wavechange was by means of a 4-pole shorting switch. A little skirmishing around showed that by removing the switch lead to the second anode coil (coupled to detector), the oscillation at once vanished. Instability set up by capacity across the switch.

A change of switch only made matters worse. While still grappling with the problem of a cure, which didn't involve reconstructing the set, I had a bit of a brainwave. What about my copy of the "Book of Practical Radio?" Here was a first-rate chance to test its merits.

A Simple Cure

Sure enough, on page 264, the actual point was dealt with complete with diagram. At first it was a shattering blow to read "There is unfortunately no cure." Mercifully a few lines farther on came a welcome reprieve. Simply by taking the lead to a separate switch all would be well.

I hastened to try this out. Re-rimmed the condenser, and found the set perfectly docile and with volume and quality improved out of all recognition. Needless to say this set was not a "Wireless" design, or for that matter from any of the recognised wireless journals.

The Elusive Whistle

Trouble No. 2 had quite a humorous touch about it. This was an S.G. 4 portable of 1930 vintage. It developed the most appalling instability. The fault was traced to a defective choke which was apparently urging on the H.F. currents with might and main, instead of acting as a traffic policeman and politely diverting them to earth. This fault rectified, the set gave normal results, and was duly anchored in its box.

Next day, on switching on, it was my horror to find a thin reedy whistle mingled with the programme. Detuned the condensers and brought the reaction to zero, and still the shrill note persisted unaltered in volume. Out the unfortunate set had to come again, only to find the whistle had flown. Not a trace of instability anywhere.

Then a brainwave arrived.

Carefully I raised one end of the set a mere fraction of an inch. The whistle vanished. Lowered it, and the whistle back again. On removing the set the cause of all the bother was visible.

In the course of years the metal supports had dug depressions in the leathery material. After a few hours the chassis settled down and the under baseboard wiring including the leak were firmly pressed against the bottom of the box. Absurdly simple, wasn't it?

E. O.'M.

RAY NOBLE—MUSICAL PARADOX

RAY NOBLE, who broadcasts on the American Columbia Broadcasting System, which can be heard at times in this country on short waves, is the conductor of their "Refreshment Time" broadcasts, and has had a career filled with striking paradoxes.

The son of a famous English surgeon, he was trained as a writer of classic music, but came to fame as a popular composer.

An English composer, his popular music has achieved a wide following in the United States, rivalling the tunes of Tin Pan Alley.

Until he went to New York he was the only band leader in the world without a band!

The latter distinction came to him when "Ray Noble's New Mayfair Orchestra" had its identity only on gramophone records. Whenever Noble had an engagement or made a new record he simply assembled the best musicians available, rehearsed them, conducted them, and disbanded them, creating another group when the next opportunity arose.

To-day he presents his distinctive "Refreshment Time" programmes with Connie Boswell and Al Bowlly over the American nation-wide C B S network every Wednesday evening.

Astonished at His Success

Noble is mildly and quite sincerely astonished at his own success. Yet he came by it naturally. His father and mother were excellent amateur musicians. Moreover, much of Ray's sensitivity and intuition in music probably can be traced to his father, a specialist in nervous diseases, who contributed pioneer service for the British Government during the War in the diagnosis and treatment of shell-shock.

When Ray Noble was fourteen, he decided he had had enough of playing other people's music on the piano. His parents placed him with a very able musician in London, Benjamin Dale, and with him Noble went through most of his formal musical training.

One of Noble's first attempts in arranging almost cost him his job. A band leader had a grandiose conception of a work arranged for sixteen 'celli and eight harps.

"I Nearly Lost My Job"

And, as Noble says: "You know how even one 'cello, unless it's in the hands of a master, can sound alone. And, of course, this band leader didn't know that the harp is one of the most difficult instruments to write for, just as it is one of the most difficult instruments to play. Well, I did the best I could. When the budding maestro tried my arrangement he said it sounded terrible. I knew it would. It had to. And I nearly lost my job over it."

Noble doesn't add that the entire arranging staff of his publishing house went to the manager and insisted that the task was an impossible one to begin with, but that Noble's results were excellent.

Later, Noble's friends insisted he try out in a contest for arrangers sponsored by a new magazine for musicians. He won the first prize of £50. The weekly offered a second prize—and Ray won that. The publication offered a third prize. Ray won that, too.

Meeting the Demand for Records

Then he became arranger for Jack Payne—at the B.B.C.—and soon joined The Gramophone Co. (H.M.V.), and, at twenty-six, finally became its general musical director. While there, Ray demonstrated his ability to work well and to work fast. As he states his problem:

"When a new tune came out, we rushed to make a recording, say, on a Tuesday. The last pressing was done on Friday. And the record was on the market the following Monday. We had to work like that to meet the demand. I remember many a time taking a stack of new records—a stack about two feet high—down to the director's office, playing them off, and getting out a new list of a dozen or more new records every two weeks."

SIDELIGHTS: Spends much of his spare time watching hockey games or inventing new parlour games. Is a hard worker, often tearing up the first and second drafts of new arrangements. Insists most of his occur to him while in the showerbath. Has an excellent library on astronomy. Is an enthusiastic collector of first editions. His wife, active in London Society, is an amateur painter of unusual talent.

An early picture of the "Air-Do-Wells," showing a farewell presentation to Eve Becke, whose place was taken by Marjorie Stedeford.

Two of the "AIR-DO-WELLS"

Marjorie Roberts visits Effie Atherton and Marjorie Stedeford in their homes, and tells readers something about their personal likes and dislikes.

WE had arranged to lunch at the Bolivar, but when we met there it was so crowded and so noisy that Miss Stedeford, the Australian singer, coming from a hard morning's rehearsal at the B.B.C., decided to go back to Hamilton House instead. "You don't mind, do you?" she asked. "It will take only a few minutes in a taxi."

Tall and fair, of athletic build, Marjorie Stedeford is naturally keen on sports. "Riding in Australia," she told me, "is looked upon more as a means of locomotion than a sport; but, even so, it's the ride that matters. Over here people seem to pay more attention to their outfits, and seem to be more concerned about their appearance than their riding."

"Struck Oil" Immediately

Besides riding, Miss Stedeford is very fond of skating. Her golf, she confessed, "was rather weak," but she likes the game. Squash she is just starting, as she complains that exercise is so difficult to get in London. In her spare time, which isn't much, Miss Stedeford reads as much as possible.

Miss Stedeford joined the "Air-Do-Wells" almost immediately she arrived in England, taking Eve Becke's place, as the latter was going into a stage show. So soon did she strike oil that she did not even have to present her letters of introduction to the B.B.C.

For a girl Miss Stedeford has a most unusual voice—light baritone. This enables her when singing with a band to read the music as it stands, without the necessity of transposing it.

The theatre is one of Miss Stedeford's weaknesses, and she prefers straight plays to anything else. "When one's job concerns the lighter side of things I think one automatically turns to the more serious side for one's amusements," she told me. Bridge is another of her relaxations, but dancing is what she likes best of all. Not just shuffling round the floor somewhere in the West End, but real dancing. Before she ever went on the air she danced professionally for about a year with Charles Scrimshaw, demonstrating with him while in Australia.

At present Miss Stedeford is confining herself to broadcasting and recording, but later on, "When I am ready for it," she hopes to go on the films. She has no stage ambitions because she prefers to concentrate on one thing at a time. "It's impossible to do both," she told me, "because then you give of your best to neither. That's why I hate an audience at a broadcast. If you consider them in any way you immediately detract from your performance before the microphone, and surely the millions of unseen listeners are more important than the mere handful present." There are never any studio audiences in Australia.

* * *

With Effie Atherton

"Sherry?" asked Leslie Landau, as I sank into the depths of a comfy chair at the invitation of his wife, Effie Atherton. Miss Atherton sat on the sofa and talked to me, while her husband played patience with her doctor, who was giving her injections on account of the alarming rapidity with which she had been losing weight.

Things are never what you expect them to be. I had heard so much about Miss Atherton's blue and white flat that I must confess I entered the door with some trepidation, fully expecting to be disappointed. For once in my life, however, I was not, because it was so completely different from what I had imagined. Creamy white was the predominating note, embracing walls, woodwork, furniture with one or two exceptions, and grand piano in alcove. Blue provided the contrasting note, forming the curtains and upholstering the sofa and chairs. The material was a rather unusual check, the shiny side alternating with the dull. In one corner stood a standard lamp of blue looking-glass, matching a small table in the centre.

From Charlot to Radio

Effie Atherton was "discovered" in one of Charlot's revues. She was given the chance of burlesquing a number, and proved so brilliant that her future was assured. "Would you like to go back to the stage?" I inquired. "No, I don't think so," came the reply; "at any rate, not unless I got a really worth-while part. Broadcasting suits me and keeps me pretty busy."

Miss Atherton had numerous offers to go into variety before she went to The States recently, but they did not induce her to forsake her present occupation. What with rehearsals and shows she works very hard indeed, her husband being a keen critic of her work. She regrets that she has not more leisure, for she loves both entertaining and going out. The theatre is one of her favourite pastimes, while she also likes cabaret

(*Please turn to page* 387.)

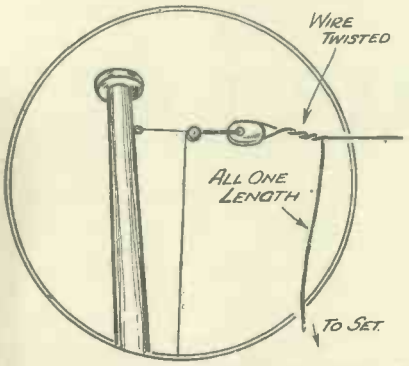
PRACTICAL INFORMATION

ONE-PIECE AERIALS

IT is a great advantage to be able to erect an aerial all in one piece. Twisted joints are never satisfactory, and soldering out-of-doors is not an easy job especially with the small irons we are used to handling.

Now if the aerial is arranged in the form of an inverted letter L, having it all in one piece is a comparatively easy matter. All that is necessary is

GOOD CONTINUITY



Bad joint can be completely avoided in this simple way.

to thread an insulator along the wire until there is sufficient for a down lead, and then put a few twists in it to stop the wire slipping.

If you arrange your aerial in this manner it will save any amount of trouble, for there is nothing like a jointed aerial to introduce "atmospherics" into a set.

F. B.

FOR CABINET MAKERS

BEGIN your mortice joints by drilling two or three holes, in wood to be cut out, with a "keen cutter" bit of the same diameter as the width of the mortice, this will save much work and prevent the chisel from jamming. When the mortice is to go right through the timber, do not let the bit break through the other side, but when its point appears reverse the wood and cut out the remainder. Tenons passing right through should be about $\frac{1}{2}$ in. longer than the depth of the mortice; this extra length permits of the extremity of the tenon being chamfered to facilitate insertion and safeguards against bruising the edges of the mortice. The extra lengths or "horns" are sawn off after gluing up.

Dowels should also be chamfered. If they are not made with a small trench to allow for glue displacement, it is preferable to make provision of this nature by planing a small flat side on them before assembly.

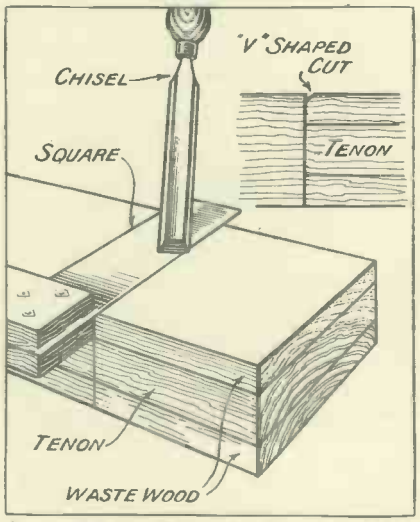
Gluing and Assembling

The glue should be of about the same consistency as linseed oil. No time should be wasted in getting the work in the cramps, and the less glue that is splashed about the job the simpler will be the work of cleaning up later. Place the work on a true, flat surface for cramping, this will prevent the tendency of the work to twist. Small blocks of wood placed between the feet of the cramps and the faces of the timber will overcome bruising possibilities.

The Finishing Touches

After allowing the woodwork to remain in the cramps for about twelve hours and the glue squeezed out of the

MARKING OUT



Tenon joints should be deeply marked with a chisel as shown here.

joints has been removed, the woodwork can be lightly sandpapered.

If a stain and polish or clear varnish finish is intended, then use only fine sandpaper, and remember that every scratch across the grain will show up in the finish. Using lacquer or enamel does not require so much care in the papering, although any plane marks, bruises, scratches or other irregularities in the surface of the wood become more apparent in the glossy finish of an enamel. By wrapping the sandpaper around a piece of cork about 4 in. × 3 in. × 1 in. the rubbing is more effective.

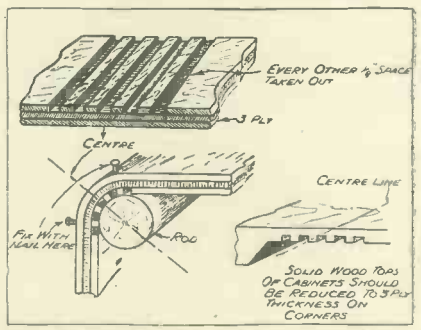
Finally, the amateur should be careful not to use too much force when doing work of this nature. It will be found that handling the tools properly and carefully will result in very satisfactory results; accuracy and good fitting joints are assured and the result will be an article which his radio friends will envy him.

A. J. S.

TURNING THE CORNER

THE top and sides of many modern radio cabinets appear to be of one piece of wood; but few are the amateur cabinet-workers who do not know that this illusion is created with veneer.

CUTTING THE WOOD



Both ply-wood and plain wood may be treated in this way for rounding corners.

Veneer is awkward material to use, and, knowing this, many who find it easier to work in solid wood forsake the modern round corner, believing it out of the question without a joint showing.

But this is not necessary, for a corner can be turned in solid wood almost as easily as it can be done in veneer by the amateur who has few tools and little experience with which to work. Moreover, by the method suggested below, thin plywood can often be brought into cabinet-work where, in lieu of the round corner idea, it could not be used without endless trouble.

The tools necessary to turn a corner in thin plywood are a penknife and a rod of some material whose diameter is approximately equal to that of the

FOR THE CONSTRUCTOR

corner were it continued into a complete circle. The sketch will make this point clear.

Having found the position in the straight piece of wood where it is wanted to put the corner, scribe on a centre line. On each side of this scribe on another at a distance of approximately one-eighth of the circumference of the rod being used.

Divide the space between the outside lines into eighths of an inch, then take out the underneath ply (one thickness) of every other division.

It is now only necessary to fix the piece of plywood in position on the rod with two tacks put through the centre line, which should, of course, be carried over to the face side of the wood for this purpose. Wet or steam the face side of the material over where the corner is to bend round, then fix it round the rod with a couple more tacks and let it stand like this overnight.

Solid wood is worked in the same way but for the difference that in the position where the rounded corner is to be, the back side wood is taken out to leave only the thickness of three-ply, which is treated as before.

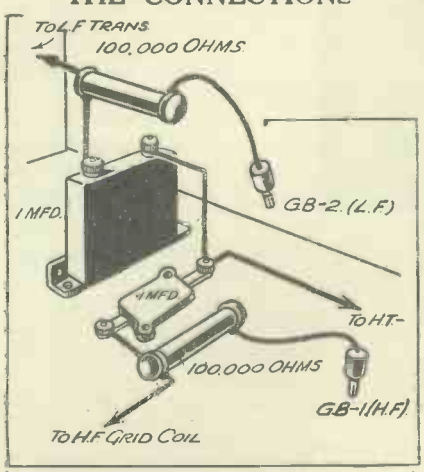
In both instances it is advisable, although not always possible, to leave the rod in the cabinet as a fixture.

W. W.

GRID-BIAS DECOUPLING

IN receivers which use a common grid bias battery for two or three stages, instability may be occasionally experienced.

THE CONNECTIONS



Different component values are used for H.F. and L.F. stages.

If the provision for adequate decoupling in the anode circuits does not remedy the instability it is worth while trying the effect of decoupling one or more of the grid-bias negative leads. To do this it is only necessary to insert a grid leak of 50,000 to 100,000 ohms resistance in series with the particular grid bias lead.

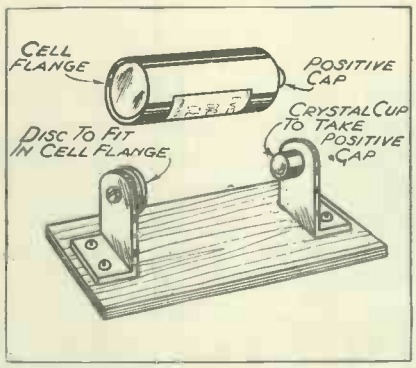
A fixed condenser should be connected between the end of this resistance which is connected to the L.F. transformer or other component and the H.T. – terminal. For L.F. stages this condenser should be 1 or 2 mfd., but for H.F. stages a non-inductive ·1-mfd. condenser is suitable.

C. R.

A NOVEL HOLDER

THE idea of using one cell from a flashlamp battery to supply grid-bias current for a valve of the screened-grid type often fails mechanically for the want of an efficient holder.

SIMPLE TO ARRANGE



Inserting a fresh cell is but the work of a moment.

In view of the fact that many experimenters use cells from partly worn-out batteries, and have thus to replace the one being worked at very frequent intervals, the holder needed must be strong with, preferably, contacts to connect the cell efficiently but temporarily. An old crystal detector frame surely fills this want.

The alterations necessary, if any, are generally easy to make. For instance: If the frame is too short to allow the battery cell to be clipped in grid-leak fashion, either the clips of the frame can be mounted on a new three-ply base, or, where the original base allows, new terminal holes may be drilled wider apart.

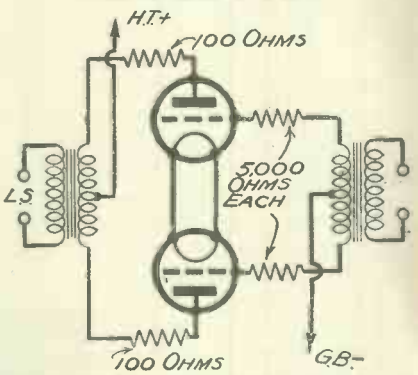
The screw-on cup should be dispensed with, leaving the socket to receive the positive cap of the battery. At the opposite end the cat's-whisker arm should be replaced with a circle of metal capable of fitting easily into the average cell's bottom flange. This metal circle can be fixed to the holder clip with a small nut and bolt.

W. W.

CONCERNING PUSH-PULL

HAVE you ever experienced trouble with push-pull amplifiers? I am referring to a fairly common fault with this type of outfit, parasitic oscillations in the output stage.

FOR PARASITICS



The resistances shown in this circuit will stop distortion due to parasitic oscillation.

With modern high-efficiency valves and systematic layouts, the tendency to oscillate is more marked than of old. But, fortunately, the difficulty is fairly easy to overcome.

The first precaution to take is to see that the two push-pull valves are really a pair—that is, they must be matched. If you cannot obtain such a pair of valves, an alternative is to see that each one takes the same amount of anode current. This can be achieved by arranging for separate grid bias to each grid.

The second tip, and one which will generally cure all but the very worst cases of instability, is to connect a resistance in each anode lead, and also one in each grid lead. The anode resistances should have a value of about 100 ohms, and those in the grid circuits somewhere around 5,000 ohms.

F. B.

FOREIGN DIRECTOR of the B.B.C.

Miss I. D. Benzie, who is Foreign Director of the B.B.C., explains her job in an interview with Alan Hunter. It is no easy position for, as she says: "My work touches the work of every other department."

SHE has a job that would intimidate many a man. A job of diplomacy that would be difficult to carry out but for a lengthy experience with most phases of the broadcasting organisation. She came to the B.B.C. eight years ago as Major Atkinson's secretary, rising soon to the position of Assistant. And then, when Major Atkinson retired from the Foreign Directorship two years ago to take up other work, she was made Foreign Director.

Hard to Define

What precisely does that mean? Miss Benzie found it hard to define her job—because by its very diffuse nature it is indefinable. "My work touches the work of every other department," she said. "It is my business to know as much about everything as possible."

She has under her especial care the management of non-technical foreign relations. As is well known, the B.B.C. keeps in very close touch with the International Broadcasting Union.

"Rapprochement"

Senior members of its staff are delegates to the council and the various committees of the I.B.U. For example, the Controller of Programmes, Mr. Graves, is a member of the council, and the Chief Engineer—or Controller of Engineering, as Sir Noel Ashbridge is now known—is the delegate to the I.B.U. technical committee. Mr. L. W. Hayes, of the Overseas and Engineering Information Department, is a member of the I.B.U. relay committee. Major Atkinson still serves the B.B.C. on the I.B.U. legal committee. It is with that part of the Union's work coming under the heading of the non-translatable word "rapprochement" that Miss Benzie is naturally rather intimately connected. Call it cultural relations, if you like, but there are many programmes and more general matters included as well.

"The scope of my department increases as the B.B.C.'s activities increase," explained Miss Benzie. "In practically every development there is a foreign angle to be looked after."

The vast growth in international communications has also added to her work. When she started in the department there had been only one land line relay. Now, of course, a great use is made of the network of land lines linking up the principal cities of Europe, and also of the radio-telephone services connecting England with overseas countries.

She has to do a great deal of listening to foreign stations. Partly, the idea is to see whether any of the programmes will make suitable relays by the B.B.C. She has a receiver at home—but, as she pointed out, it is better to listen at the B.B.C. itself, because then she has the advantage of reception via Tatsfield from stations that are often difficult or impossible to obtain on an ordinary home set. It is her job to follow the development of all foreign broadcasting organisations. She keeps in her department records from which can be extracted at a moment's notice the answer to any question likely to arise over broadcasting in other countries. Another side-line is the reception—in person, of course!—of foreign visitors to the B.B.C.—and there are a great many.

Vast Correspondence

Then, too, she has to carry on a vast correspondence with broadcasters in all parts of the world. Hers is the central office for all foreign correspondence, in fact, excepting, as she explained, anything of a technical nature. Miss Benzie looked into her date book. She told me that during the following week she expected visitors from Iceland, Manchuria and Norway!

A NEW H.M.V. STAR ORCHESTRA

Roy Fox and his orchestra making their first records for the H.M.V. Company.

THE S.T. HEXOVERTER

The Editor, WIRELESS.

Dear Sir,—I enclose a list of stations which I have received on Mr. John Scott-Taggart's famous Hexoverter (Vol. 2, No. 7, June, 1935), used with the S.T.600. The results are wonderful. All stations were received on Marconiphone 190 A.C. Mains, 200 volts moving-coil speaker. I am also using an Atlas 25 m/a output eliminator, using it for the Hexoverter and the "600," and using no extra batteries except L.T. and 16-volt bias-battery. I also manage to keep two L.T. batteries charged.

I cannot help but pity some people who stick to earphones. I have a pair myself, but I only use them on a weak station, and then fetch it out on the speaker. Also, I do not have to sit up in the early hours to listen to them. All parts, except the coils, were bought at Peto-Scott's in dribs and drabs. The coils are home-made; three pairs, 5 turns, 7 turns, and 16 turns. I have also tried 25 turns and 30 turns. It is surprising what you can listen to.

I should mention the aerial length with lead-in is 25 feet of Lewcos 7/22 enamelled copper wire. Earth goes to mains earth in next room, with 2·2-mfd. across the mains leads owing to being at the top of a three-storey house. I would have written before, but I have been out of work now for nine weeks, but hope to get a kick-off again this week.

Wishing you and your paper every success. Also "S.-T."

Yours faithfully, H. TYNE.

8, Walham Avenue, Fulham, S.W.6.

The list of stations enclosed was too long to print. This letter wins the ten-shilling prize offered last month

Designing SMALL MAINS TRANSFORMERS

A practical article describing a branch of radio construction that is within the capabilities of almost all set builders

By F. STERRY.

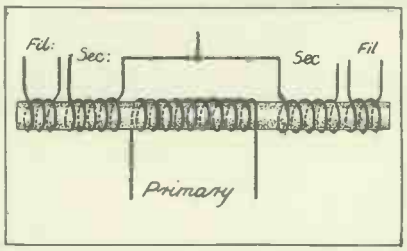


Fig. 1. The diagram of connections of a typical mains transformer.

As most readers are aware, the mains transformer is one of the most important components in the power pack of an A.C. mains set. This device is used to "step up" or "step down" the supply pressure, to one more suitable to the immediate requirements. The purpose of this article is to show readers how a mains transformer is designed, and thus enable any reader having some electrical knowledge to design a transformer to his particular requirements by inserting the figures applicable to his case, and doing some simple arithmetic.

The Fundamentals

The circuit diagram of the usual mains transformer is shown in Fig. 1. From this we see it consists of an iron core around which is wound four windings. The primary is connected to the source of supply, and the secondary to its respective outputs. Due to the current passing through the primary, the core is magnetised and a flux set up; this flux cuts the secondary turns and a voltage is induced in them, the value of which is determined by the ratio of the primary to the secondary turns. When the load is applied there will be a drop in voltage equal to the resistance times the current. This drop in voltage is known as the regulation, and we must compensate for the primary and secondary drop in our design by adding more turns to the secondary side.

A Typical Case

We will assume we require a transformer suitable for a four-valve all-mains set to run off an A.C. supply of 220 volts 50 cycles, the output required being:

Total Anode supply: 100 m/a. at 250 volts	25 watts
Total Heater supply for four valves: 4 at 1 amp. each 4 volts	16 watts
Total Heater supply for rectifier: 4 volts at 2 amp.	8 watts
Total	49 watts

We must allow for losses, so we will assume our transformer to have an efficiency of 80%, therefore the input must be:

$$49 \times \frac{100}{80} = 61{\cdot}3 \text{ watts; say 62 watts}$$

The formula connecting flux area of core, volts (in primary or secondary), and number of turns is:

$$V = \frac{B \times A \times \sim \times T}{10^8}$$

Where V: volts in primary or secondary.
„ B: flux in lines per sq. cm.
„ A: area of core in sq. inches.
„ T: number of turns.
„ ∼: frequency of supply.

This formula can be modified to a simpler form, and is equal to:

$$\frac{V}{T} = \frac{B \times A \times \sim}{3{\cdot}9 \times 10^6}$$

Where $\frac{V}{T}$: volts per turn in primary or secondary.
„ B: flux per sq. cm.
„ A: area in sq. inches.
„ ∼: frequency of supply.

From these formulæ we see that we have three unknowns, viz. the flux, area, and turns. For a transformer of this size a safe value for the flux is 8,000 lines per sq. cm. Assuming we use "Stalloy" transformer iron. This can be obtained from Messrs. Jos. Sankey & Sons, Bilston, Staffs., who have a number of stock sizes of

THE IRON CORE

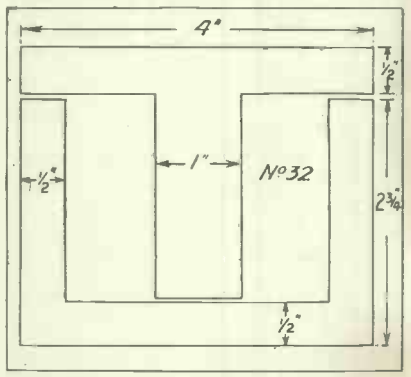


Fig. 2. The core of the component is shaped like this, two sets of stampings being used

small stampings suitable for transformers and chokes. In this instance we shall weave a design around one of their No. 32 stampings, dimensions of which are shown in Fig. 2.

A TABLE OF THIS NATURE IS ESSENTIAL WHEN DESIGNING THE TRANSFORMER

Size S.W.G.	Diameter in Inches Bare	Diam. covered D.C.C.	Diam. covered Enamel	Sectional Area of Copper	Weight in lbs. per 1,000 yds. (approx.) Bare	Weight in lbs. per 1,000 yds. (approx.) D.C.C.	Weight in lbs. per 1,000 yds. (approx.) Enamel	Resistance per 1,000 yds. Ohms.	Current Rating at 1,100 amps per sq. inch
16	·064	·074	—	·003217	37·2	39·0	—	7·463	3·515
18	·048	·058	—	·0018096	20·93	22·28	—	13·27	2·0
20	·036	·046	—	·001018	11·77	12·8	—	23·6	1·1
22	·028	·038	·030	·0006158	7·12	7·95	7·76	38·99	·675
24	·022	·032	·0240	·000380	4·39	5·0	4·8	63·16	·42
26	·018	·0288	·0198	·0002545	2·94	3·5	3·3	94·35	·28
28	·0148	·0248	·0164	·000172	1·99	2·43	2·05	139·5	·19
30	·0124	·0224	·0138	·0001207	1·4	1·81	1·433	198·8	·132
32	·0108	·62	·0121	·0000916	1·06	1·4	1·09	262·1	·101
34	·0092	·0192	·0103	·0000664	·768	1·084	·8	361·2	·073
36	·0076	·0156	·0086	·0000453	·524	·75	·544	529·2	·05

We will assume a core dimension of one sq. inch, therefore we have :

$$\frac{V}{T} = \frac{8{,}000 \times 1 \times 50}{3{\cdot}9 \times 10^6} = 9{\cdot}8 \text{ turns}$$

per volt; say 10 T/V.

We can now calculate the turns, size, and quantity of wire required on the primary windings.

The supply voltage is 220, so number of turns required is 2,200 turns.

The primary current :

$$\frac{\text{Watts}}{\text{Volts}} = \frac{62}{220} = 0{\cdot}282 \text{ amps.}$$

In order to find the size of copper we must decide at what "current density" we will run the copper; current density : $\frac{\text{Current.}}{\text{Area}}$ A safe value for small transformers is 1,100 amps. per sq. inch.

$$\text{So size of copper} = \frac{0{\cdot}282}{1{,}100} = 0{\cdot}000256.$$

Table I shows a number of standard sizes of copper wire, with all particulars required for design purposes. From this we see the nearest size is number 26 s.w.g., for this size of wire enamel covering is quite suitable.

Wire Required

We must now calculate the quantity of wire required. It is proposed to wind a flat type of coil, and from the dimensions given in Fig. 2 we see that there is 1 inch between the outer and inner legs of the core, and allowing 20% for tape and thin fullerboard or cardboard between the coils and core, paper between layers, uneven winding, etc., we have a winding space of 0·8 in.

The primary has 2,200 turns of 26 s.w.g., from the table the diameter covered is 0·0198 in. Therefore the number of layers we can wind :

$$\frac{0{\cdot}8}{0{\cdot}0198} = 40 \text{ layers.}$$

Number of turns per layer :

$$\frac{2{,}200}{40} = 55.$$

And the width of the coil :

$$55 \times 0{\cdot}0198 = 1{\cdot}1 \text{ in.}$$

Mean Turn

The next step is to estimate the length of a mean turn of wire, see Fig. 3. We will call this 7·42 inches, so the quantity of wire required is: $\frac{2{,}200 \times 7{\cdot}42 \text{ yds.}}{36} = 450$ yds.

And from the table 26 s.w.g. has a weight covered of 3·3 lb. per 1000 yards.

So weight of wire required :

$$\frac{450 \times 3{\cdot}3}{1{,}000} = 1{\cdot}5 \text{ lb.}$$

We can find the volts drop in the primary as follows :

THE HEATER CURRENT

The resistance of 26 s.w.g. is 94·35 ohms per 1,000 yards, so resistance of coil : $\frac{450 \times 94{\cdot}35}{1{,}000} = 42{\cdot}5$ ohms.

Now volts drop : current × res. = $0{\cdot}282 \times 42{\cdot}5 = 12$ volts.

It was mentioned previously that in designing the secondary winding allowance must be made for the drop in volts from no load to full load, assuming this amounts to 6%. We must allow 6% more turns on all the secondary windings. The voltage of the secondary at no load will be :

Anode voltage : 250 × 6% = 265 volts.

Heater voltages : 4 × 6% = 4·24 volts.

The total current taken by the heater circuit of the valves in the set is 4 × 1 = 4 amps. At 10 turns per volt we require : 4·24 × 10 = 42·4 turns, say 43 turns.

Size of wire required :

$$\frac{4}{1{,}100} = 0{\cdot}00364 \text{ sq. in., or No. 16 s.w.g.}$$

The best covering for this size is d.c.c., and the diameter covered is 0·074 in. Therefore in a 0·8 winding space we can wind $\frac{0{\cdot}8}{0{\cdot}074} = 10{\cdot}8$ say, 11 layers.

We shall require : $\frac{43}{11} = 4$ turns per layer, i.e. total turns equals 44. Width of coil : $4 \times 0{\cdot}074 = {\cdot}296$ in. The mean length of turn will be the same for all coils, so length of wire is :

$$\frac{44 \times 7{\cdot}42}{36} = 9{\cdot}1 \text{ yards.}$$

Weight of wire : $\frac{9{\cdot}1 \times 39}{1{,}000} = 0{\cdot}36$ lb.

The current required for the heater of the rectifier valve is two amps, or half the current of the valves in the set. For this winding we could use 18 s.w.g. with the same number of turns, but to save getting too many

(Please turn to page 386.)

BINDING THE WINDINGS

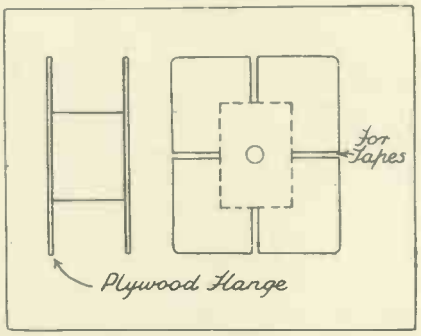


Fig. 4. The formers should be made like this, with places for tapes so that the windings can be fixed.

HOW THE TRANSFORMER IS ASSEMBLED

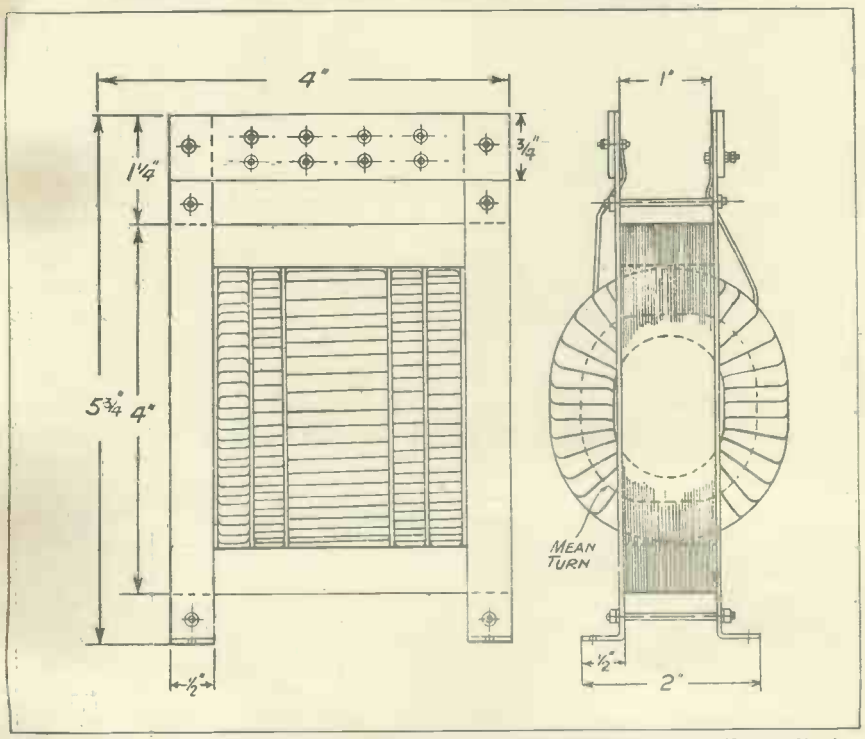


Fig. 3. The general outline of the transformer is seen here and also the method of clamping the stampings of the core. Note that the clamping bolts are well clear of the core.

Some Café Colette Personalities

By

RUTH MASCHWITZ

—who describes some of the conductors and compères who have helped this "happy combination" to success.

IT was the night of the first broadcast of a feature, and the telephone bell at Broadcasting House rang continuously, and time after time came the question, "Can you tell me where the Café Colette is?" Listeners were so enchanted by the gay Continental music that scores of them were eager to rush to the café to spend a pleasant evening.

Other stories are told of those who were convinced that a relay was being broadcast from some Parisian haunt, and many combed the Montmartre and Montparnasse districts in search of the restaurant. Eric Maschwitz and Walford Hyden, the instigators of the hoax, were delighted by the success of their plan.

Few people realise the immense amount of work behind a programme of this type, for its success depends not only on the conductor and orchestra, but also on the compère and his supporters. To produce spontaneous nonsense with conviction through the microphone is not an easy task.

Many and picturesque have been the personalities who have taken part in this feature, and first and foremost of course is Walford Hyden himself. A master technician and lover of serious music he has written ballets, suites, songs, and a one-act opera, all of which have been heard on the wireless. Besides that of the Café Colette he conducts at least four other orchestras.

Unaffected

Downright and unaffected, there is no nonsense about him, and it is typical of his lack of feeling for convention that he strongly objects to conducting a studio orchestra in evening dress.

Born in Staffordshire, he studied the piano in Manchester, and made his first concert tour at the age of twelve. After winning a scholarship he went to London and studied at the Academy of Music where he attained his degree. Then a thing happened which influenced the whole of his life—he was engaged as rehearsal pianist to Pavlova. This resulted in a long association with the dancer, and he toured with her in many parts of the world.

About five years before her death Pavlova produced a season of her Ballet in Paris. One day, while taking a 'busman's holiday, she strolled into a theatre and was greatly struck by a young Russian girl who was dancing in the true Russian tradition. Anna approached the girl after the performance, asking her if she would care to join her corps de ballet. The girl, Cleo Nordi, expressed her delight, and forthwith became a member. By this time Walford Hyden had been promoted to the leadership of the orchestra, and during the subsequent world tour he and Anna's new recruit fell in love, and were married in Australia.

Mr. Hyden tells some amusing incidents about his time with Pavlova. When he first joined the company, during a rehearsal he was overcome by a splitting headache. The dancer vanished and re-appeared with a glass full of a colourless liquid which he took to be water and swallowed at a gulp. Unfortunately it was vodka, and Mr. Hyden cannot recollect very clearly what happened to him for quite a time after that!

On another occasion during a performance at a small town in Germany the lights suddenly went out both on the stage and in the orchestra, and so for two minutes Mr. Hyden had to whistle the music while the dance continued on the stage. To his fevered imagination it seemed more like two hours, but fortunately the lights were quickly put in order again.

Mr. and Mrs. Hyden have a charming flat in Bloomsbury, and in it is housed a collection of musical instruments of every description from an Arabian flute to a Chinese drum—and a variety of old and foreign weapons.

The "Leader"

The fictitious leader of the Café Colette, who puts his life and soul into conducting it, has been played at various times by Dino Galvani, Leo von Pokorny and Dimitri Vetter, who has now returned to the cast. His is a type of humour which is particularly suited to this programme, and Mr. Hyden finds him an eager and efficient collaborator. When the Café became a variety turn and toured the provinces Mr. Vetter was the first to

(*Please turn to page* 386.)

WALFORD HYDEN AND THE ORCHESTRA

Walford Hyden conducting the original Café Colette orchestra, which, together with Eric Maschwitz, he helped to originate.

An original type neon lamp such as was once used for television reception.

THE NATURE OF NEON

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

What is neon? Where does it come from? How is it obtained? These and other questions concerning this useful element are described below.

A CHEMICAL curiosity, a plaything of scientists and laboratory workers well within the lifetime of almost any reader of this paper. To-day, a commodity of first-rate importance, not only for scientific uses, but in the industrial world as well.

Such is the record of the chemical element neon! You have got to look long and far to beat such a career.

In neon you have a gaseous material which is capable of responding *instantly* to changes in transmitted current impulses, and, also, which will produce a light which is exactly governed by the actual intensity of those transmitted impulses. Early television workers, indeed, could hardly have wished for a more suitable material than neon.

There is a good deal of neon about out city streets these days, or rather, these nights. The use of neon signs has struck a new and attractive note in modern display-advertising. That branch of neon's usefulness does not concern us here. I merely mention it in order to direct your attention to the fact that neon, the rare element of not many years back, has attained a remarkable prominence in modern times.

A Simple Story

What is neon? you may ask. Where does it come from? How is it made? These and other questions concerning this remarkable commodity are bound to occur to the mind of many an interested beginner of to-day.

Well, neon has a very simple story, and not a very long one either. It belongs to a group of gases known to chemists as "The Rare Gases of the Atmosphere." There are five of them—argon, helium, neon, krypton, xenon—all discovered by the late Sir William Ramsay, a famous chemist, in the '90's of the last century. They are all present to a very small extent in the earth's atmosphere, the five of them making up a total of about one per cent of ordinary air.

Individually, however, these gases are only present in very small amounts in air. Neon, for instance, the only one of the group which concerns us at present, forms no more than about 0.00086 per cent by weight of ordinary air. Or, by another measurement, there is one volume of neon present in every 80,790 volumes of air.

Not Very Common

Not a very common element, therefore, this neon—"The New One"—as its discoverer, Sir William Ramsay, called it! As a matter of fact, however, neon is more abundant than one might suppose at first, and it is, of course, owing to this relative abundancy of the "Rare Gases of the Atmosphere" that the neon lamps, signs and other devices of the present day are possible.

It has been worked out, for example, that each square mile of the earth's surface supports about 800,000,000 lb. of the "rare" gases. Hence, one is hardly inclined to predict a neon shortage. Rather the opposite, in fact!

All the neon used for commercial purposes is obtained from liquid air. Large volumes of air are liquefied, and the liquid air is then fractionally distilled. Which means to say that a rough separation is made between the "rare gases of the atmosphere" and the oxygen and nitrogen which make up the main bulk of the air.

Separating the Gas

The process of fractional distillation is repeated until it becomes possible to separate a helium-neon mixture from the remainder of the liquefied gases.

This mixture of helium and neon—in the liquefied state—is then poured into a vessel surrounded by liquid hydrogen, which freezes the neon to a white waxy solid. The helium is pumped off, and thus neon in a high state of purity is obtained. It is then allowed to gasify and is finally pumped into small steel cylinders in which it is sold.

Low Temperatures

All the above fractional distillations, separations, and so forth are carried out at very low temperatures indeed, as is evidenced by the use of liquid hydrogen for the final solidification of the separated neon. Frozen neon melts at a temperature of 253 degrees below the freezing point of water—approximately two and a half times as much below water's freezing point as boiling water is above it.

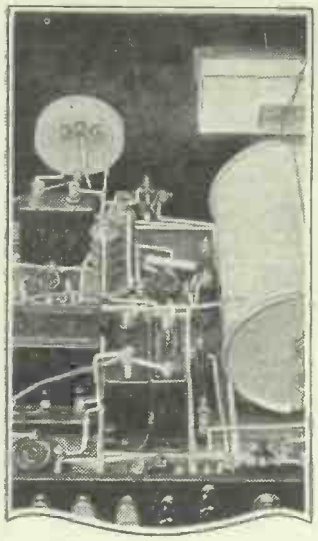
Neon is found, also, in the gases which are exhaled by certain hot springs. For instance, some of the springs at Bath contain quite an appreciable percentage of neon. However, in view of the relative abundance of atmospheric neon, this source is never likely to be brought into use.

Completely Inert

A curious property possessed by neon, in common with its associated gases, is that it is completely inert and inactive. It will not combine with any other element. Hence the title of "Inert Gases of the Atmosphere," which has been more properly given to this curious family of gases.

Neon gas is colourless, odourless, tasteless—chemically quite dead and inactive. But it possesses latent electrical properties which make up in interest for all its chemical and physical inertness.

Neon always glows a deep red when an electrical potential is applied to it. Advertising signs giving other colours employ different gases.



RADIOGRAM SWITCHING

The great and still growing popularity of the electrical reproduction of gramophone records on radio receivers calls for a variety of switching arrangements according to the set used. Here are some excellent suggestions, and a wealth of practical information on successful radiogram working, set out in easy-to-follow fashion.

By W. R. GERRARD

THERE are a good many ways of arranging the wireless set to make it capable of reproducing gramophone records by means of the pick-up. In the present article I am going to work up from the simplest of wiring and switching systems to others of a more elaborate nature which incorporate various refinements and add considerably to one's pleasure when using the apparatus either as a wireless set or as a gramophone.

Detector Modifications

Generally speaking, two low-frequency stages supply all the amplification that is required for ordinary household use for working with the average modern pick-up. The only important exception concerns the use of a Class B low-frequency amplifier, and to this we shall come in a moment.

Where there is only one low-frequency stage it is necessary to turn the detector into a low-frequency amplifying valve when the switch is turned over to the gramophone position. The way in which this is done is shown in Fig. 1.

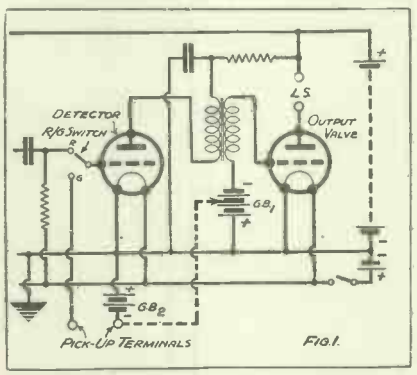
The switch required is the standard radiogram single-pole change-over pattern. The grid of the detector is connected to the moving contact of the switch. The grid leak and grid condenser are connected to the "Radio" fixed contact and one of the pick-up terminals to the "Gram." contact.

Arranging for G.B.

The second pick-up terminal goes either to the negative of a special grid-bias battery (G.B.2 in Fig. 1) or by means of a flex lead and a wander plug to a suitable tapping on G.B.1, as indicated by the dotted lines. The volume control, a potentiometer whose windings have a resistance of from 20,000 to 250,000 ohms, according to the pick-up employed, may be placed outside the set as indicated in Fig. 3, or inside it as shown in Fig. 4.

There are still numerous three-valvers in use consisting of a detector

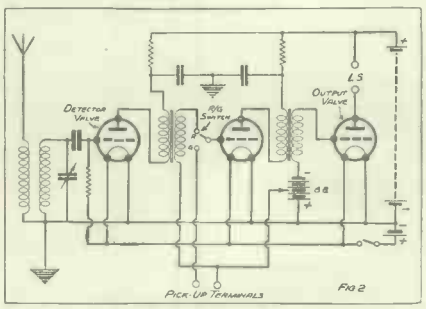
FOR "ONE L.F." SETS



This arrangement uses the detector as an L.F. amplifier for gramophone work.

and two low-frequency stages. In such a set only the low-frequency valves are required for gramophone working, and the necessary switching is shown in Fig. 2. The gramophone

ANOTHER ARRANGEMENT



A "Det. and Two L.F." class of receiver with the radiogram switch in the first L.F. valve's grid circuit.

volume-control arrangements are as previously described.

When we come to the set with Class B amplification matters are rather different, for the driver and the output valve should really be regarded as forming together one low-frequency amplifying stage. We must, therefore, make use of these two valves and of the detector as well. The simplest kind of switching is indicated in Fig. 3.

Importance of Decoupling

Here again it is not, of course, necessary to have a separate grid battery for biasing the detector when the pick-up is in use; a tapping on G.B.1 can be made use of, as indicated in Fig. 1.

Note that in all of the diagrams accompanying this article each valve, except the last, is shown fully decoupled by means of a resistance and condenser connected to earth. Decoupling is of great importance in any set used for gramophone record reproduction, for without it instability is likely to occur.

Even if the set works quite satisfactorily for wireless reception without complete decoupling, it will most likely pay handsomely to make the addition before it is used for the reproduction of records. Though there may be no actual howling, parasitic oscillation frequently spoils the quality in a set that is not adequately decoupled.

Need for Screened Leads

Another cause of instability is to be found in the fact that, since the radiogram switch must be on the panel in order to be handy, rather long leads inside the set to it and to the pick-up terminals are sometimes unavoidable.

The use of armoured leads from the grid of the first valve to the moving contact of the switch, and from the gramophone contact of the switch to the pick-up terminal to which it is connected, may be found desirable on this account. External leads between the pick-up terminals and the pick-up itself should generally be kept as short as is conveniently possible.

Radio and Gramophone

Fig. 4 shows a method of dealing with a very popular type of set, viz., that containing a high-frequency valve, a detector and an output valve. In the diagram the high-frequency valve V_1 is a variable-mu screen-grid, the wireless volume control being the potentiometer to whose moving contact the grid return of this valve is taken.

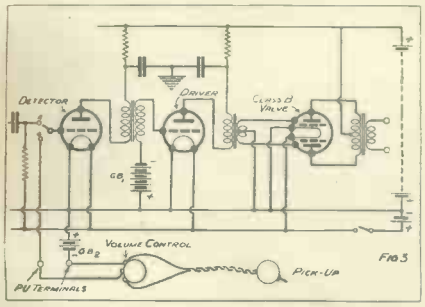
The gramophone volume control is also a potentiometer, though usually with windings of a higher resistance value. The two can be ganged, which means that one and the same knob controls the volume whether the apparatus is being used for wireless reception or for the reproduction of a record.

With the radiogram switch in the "Radio" position, the gramophone volume control goes automatically out of action, and the same thing happens to the radio volume control when the switch is turned over to the "Gram" position.

An Additional Advantage

The use of the arrangement, suggested in Fig. 4, brings another advantage in its train—it is possible to "fade" from wireless to gramophone and vice versa. The procedure is this: If you are listening to wireless reproduction and wish to change over to a record, begin by turning the volume control rather slowly towards the minimum setting. On reaching this, move the radiogram switch over to the "Gram" position; then advance

FOR CLASS B



The arrangement referred to by Mr. Gerrard, using an external volume control.

MAKING USE OF FEWER SWITCHES

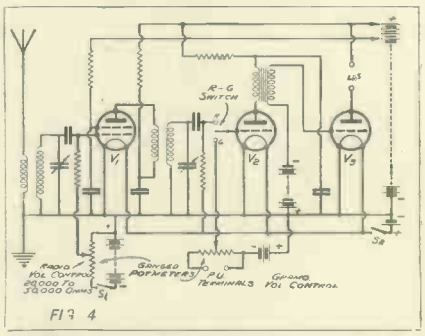
the volume control. The effect is that the wireless item "fades out" and that the gramophone record "fades in." This is a very much pleasanter business than abruptly switching off a wireless item in full blast with an accompanying click from the loudspeaker, then making another click and bringing in a record suddenly at big volume.

Conserving Batteries

The simple switching so far described has one serious defect: it leaves the high-frequency stages (or the detector in the case of detector and 2 L.F. sets) still switched on. Though, by means of the radiogram switch, the connection between the preceding valve or valves and those that are in use for gramophone amplifying purposes is broken, it is not infrequently found that if the set is tuned to a local station there is a certain amount of wireless breakthrough.

Another disadvantage, of particular importance in battery-operated sets,

A GANGING IDEA



In this S.G., det. and L.F. circuit the multi-mu and radiogram volume control are ganged together.

is that both the filament accumulator and the high-tension battery are supplying (and therefore wasting) current to the valves that are not in use. A way of using a four-pole change-over switch to give automatic cut-out of valves that are not required is shown in Fig. 5. The connections are quite straightforward, and switches of this kind are available.

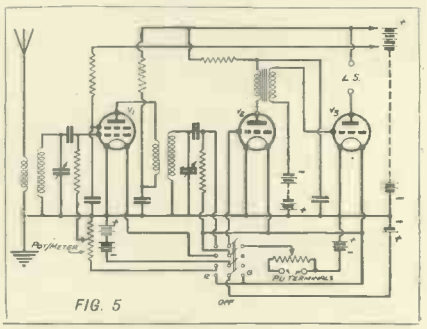
Simplified Change-Over

Here the whole set is controlled by means of one switch. This is of the four-pole change-over pattern with a central "off" position.

Trace out the circuit and see what happens when the switch is turned to the gramophone position. The filaments of the last two valves are connected to the source of heating current; the grid of the first valve, used as low-frequency amplifier (V_2), is taken to the sliding contact of the potentiometer which acts as gramophone volume control; the high-frequency valve is cut out.

When its knob is turned to the "mid" position all of the valves are switched off, and the grid-biasing

CONTROLLING ALL VALVES



By means of this circuit the whole set can be controlled with a single switch.

battery for wireless volume control is put out of action.

When the switch is turned to the "Radio" position the filaments of all valves receive heating current. The high-frequency volume control G.B. battery is connected to its potentiometer, and the grid of V_2 is taken to the grid condenser and grid leak.

A single switch thus provides complete control. The panel switch knobs are reduced to one.

"Fading In" Programmes

Further, the desirable fading out of a gramophone record followed by the fading in of a wireless transmission can be accomplished with the utmost ease. To do this the single knob controlling the ganged potentiometers is turned slowly counter-clockwise until the loudspeaker volume is reduced to nothing at all, or to as nearly nothing as makes no matter. Then the knob of the switch is moved through the central "off" position to the "Radio" position.

A clockwise movement of the volume control knob now brings in the wireless transmission.

IN TOWN TO-NIGHT

Some amusing incidents connected with the production of this popular broadcast described

By RUTH MASCHWITZ

IN the old days radio was a source of entertainment for a select few, and only well-known artists were heard over the air, but now things are very different. Everyone from a prince to a poor man owns a wireless set, and the range of broadcasters has correspondingly increased. Tinker, tailor, soldier, sailor—each one may have his chance to be heard on the radio if he has some parlour trick or interesting experience to recount.

LEON CORTEZ and his band of COSTER PALS show how musicians may be found in most unexpected places. One sold oysters, another bananas, and a third jellied eels.

Variety

The B.B.C. scouts are continually on the search for talent, and programmes are produced which are of particular local interest. For instance, every Saturday evening we may hear a diversity of personalities in "In Town To-night"; Northern Regional has a feature of local interest called "Owt Abaht Owt"; and the "Microphone at Play" is the Midland speciality.

I was talking to Bill Hanson, the producer of "Saturday Magazine" the other day, and he told me that he had just been holding an audition for which eighteen people of different professions had appeared.

"As a rule," he told me, "we try to use about three in a programme who can sing or play an instrument, and some of the people who have turned up are remarkably good.

"This time I picked out six. There were two accordionists, one a tailor's assistant who works in Chelsea and presses clothes for theatrical celebrities, and the other a postman.

Inexperienced Broadcasters

"A professional footballer who plays for Luton and a restaurant keeper in Regent Street both had good tenor voices, while a master mariner who now drives a taxi is a fine baritone. The sixth is a blind man from Brighton who imitates a brass band and tells stories, some of which I am afraid may be rather broad for the radio."

Dealing with inexperienced broadcasters is often a problem, for they may react in a most unexpected manner when actually faced by the microphone. Some are so overcome by nerves that they can hardly speak, others talk too loudly or too fast, and one or two have been known to give a performance quite different from the one intended.

Most disconcerting was the behaviour of a hedgehog who made his radio debut a few weeks ago. His master was a tramp who played the harp, and as a rule the hedgehog accompanied him by coughs, sneezes and cooing noises. Unfortunately, some kindly person presented him with a bowl of bread and milk on his arrival, with the result that he curled up, went to sleep, and refused to be disturbed!

Scripts for personalities who appear in "In Town To-night" are prepared beforehand. The broadcaster tells his story, which is taken down verbatim in shorthand. It is then cut and pulled into shape, and questions inserted for the interviewer to make.

There are several rehearsals, and for the actual performance as a rule two or three more studios are used, which means that sometimes an interviewer has to dash from one to another at top speed. More than once the performers have been unable to read, which has made it very disconcerting when they have forgotten their parts.

Unrehearsed

Occasionally at the last moment a broadcaster has failed to turn up, and a hectic last-minute search has had to be made. One night a man walking past the B.B.C. headquarters was astonished by the question "Would you like to broadcast?" which was addressed to him by a dishevelled individual who had shot out of the door like a rocket.

With great presence of mind he said "Yes" and was hurried into the building. One of the "In Town To-night" team had failed to materialise, so a script was swiftly written and he was led to the microphone without more ado.

Some of the performers have shown such a flair for broadcasting that they have been used in other programmes. Ernest Dixon, who drives a taxi from a rank near Broadcasting House, is one of these. He has an inexhaustible fund of stories and first attracted the notice of a B.B.C. official who was one of his fares.

Interval for Tea!

The B.B.C. is not always regarded with veneration by those who are invited to broadcast. A chimney sweep who was approached was more than indignant.

"I am a master chimney sweep and employ a boy," was his statement, "and won't be made a clown of by Sir John Reith and the B.B.C. for anybody!"

Another man, discovered in a remote Lancashire village, who was rehearsing the violin in preparation for his performance with an octet, showed a similar disinterest in the B.B.C.'s arrangements. Quite suddenly he got up, left the studio, and the surprised producer found him donning his hat and coat in the hall.

"You can't go now. The rehearsal isn't over!"

"Aye, I know, but tha sees, I allus has my tea at four o'clock!" was the response.

The Heterodyne Problem

A simple non-technical explanation of the problem of the crowded ether to which at present there seems no solution.

By J. R. Wheatley

UNDER present broadcasting conditions where an increasing number of countries are operating stations using higher power than hitherto, and where the "waveband" available is limited, there is a growing tendency for a point to be reached where these stations overlap. Also if two stations are relatively close in wavelength, but widely separated geographically, if the initial output from the transmitters is increased, the resultant effect is similar. For example, an American transmitter might, if its power were sufficiently high, cause interference with European transmitters.

Over certain parts of both the medium and the long waves this state of affairs has already been reached. In other words, certain stations, although keeping to the wavelength allotted to them, are so close together that there is not sufficient clear space between them to prevent a "brushing" of the sideband fringes or a definite overlap. As in the case of a line or "band" of people standing closely together in a trench of limited length sooner or later two people must brush against one another.

Effect of Overlap

This is similar in many respects to transmissions from wireless stations. Obviously the more people there are in the limited length of the trench, the greater the tendency there is for this to take place.

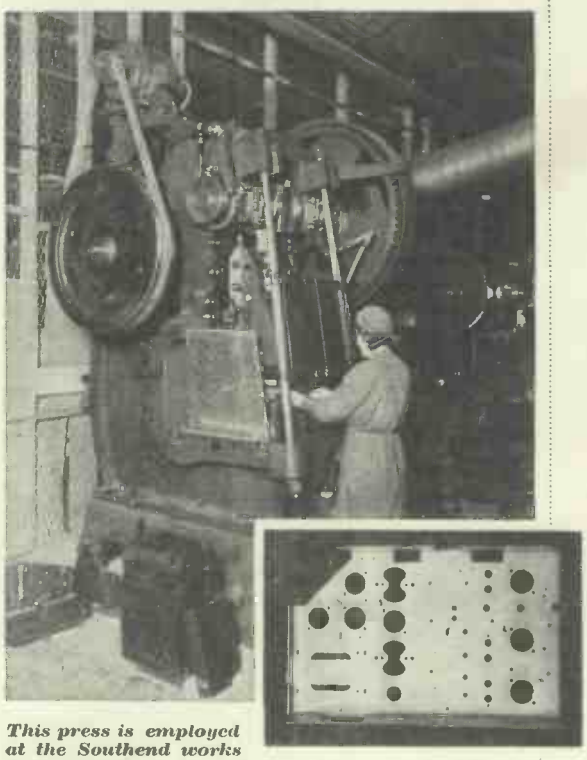
In the case of wireless transmissions, however, this brushing or intermixing at the fringes, as in the case of the people, may result in overlap. This overlap resolves itself in the case of wireless transmissions into what is known as a heterodyne.

It makes itself heard in your loudspeaker or telephones in the form of a whistle. Where only "brushing" takes place the resultant noise is more in the nature of a quacking sound, or mush.

It will be appreciated that until one of these stations moves its wavelength, or, in the case of our analogy, until some of the people move, the difficulty remains. But here, again, there is danger that in moving, in the same trench, they will come into contact with a further person; in the case of the wireless transmission there will then be overlap with some other station.

The main point to be considered is, is there any means of preventing this overlap? Since the heterodyne is in the nature of a high-pitched whistle, it can often be cured by suppression, by adding something to the receiver so that the set is incapable of responding to this frequency.

STAMPING EKCO CHASSIS



This press is employed at the Southend works of Messrs. E. K. Cole, Ltd. for making the chassis of receivers. The inset photo shows how the chassis appears after leaving the machine.

It must be remembered, however, that the set is incapable of differentiating between a whistle caused by a heterodyne and a musical note which may be of similar frequency. So that if we insert some device which prevents us hearing the heterodyne, we must also in some respects affect the high note output from the loudspeaker when reproducing music and speech.

What Increased Selectivity Does

In the case of mere "brushing" at the fringes, increased selectivity of the receiver may improve reception, but it must be borne in mind that these sidebands, as they are called, are part and parcel of the transmission, and any cutting or elimination of same must seriously affect the resultant quality output from your receiver.

TUNING BY YOUR BREATH!

A point to watch when you are making a critical adjustment.

YOU may one day tune your receiver by blowing on it!

This conclusion was reached by a recent experiment performed in the writer's laboratory. The receiver was a short-wave superhet, and the dial was set a degree or so below the spot where the German and Empire stations come in on the 31-metre band.

By the simple expedient of breathing upon the condensers it was possible to tune-in both the Empire and German stations. The same results could, of course, be obtained on any other group of stations.

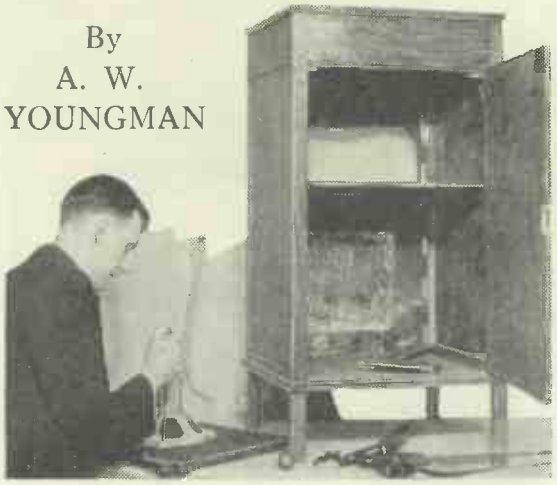
A Capacity Change

The secret? Well, it depends upon nothing more or less than the change of capacity brought about by the film of moisture which was deposited on the condenser vanes. This film increases in thickness with each breath, and the effect is the same as if the condenser had been turned in a little way. The effect is to add to the condenser's capacity.

So one of these days you may wake up to find all the old tuning systems scrapped, tuning being done by the device which caused the Three Little Pigs such a lot of worry!

Seriously, though, watch out for your breath when adjusting trimmers. You may laugh at this, but you must remember that a very slight change in capacity can make a whole heap of difference, and be very misleading. **W.N.**

By
A. W.
YOUNGMAN



DESIGNING A WIRELESS CABINET

Here are some excellent and really practical suggestions for the handyman who is up against the problem of housing his radio set and accessories. The designs are all of the class that will appeal to the lover of beautiful furniture.

THE completion of a home-built wireless receiver sometimes leaves the constructor almost sorry he has finished it, even when the results prove well up to standard as regards sensitivity and quality. The actual building was a pleasure, which he is loath to relinquish.

Question of Taste

He may be almost tempted to build a second set in the hopes of getting something better still, but, without the aid of a complete spares box, such an addition is entirely out of the question.

Such circumstances, however, need not leave a practical-minded constructor entirely at a loss for something to do. In fact, there is nearly always some improvement he can make, and a very interesting one lies in the designing of a cabinet to accommodate the completed set.

If the receiver is considered a really good one, it most certainly deserves a good cabinet, especially if it is intended to remain a semi-permanent fixture, and in this respect a great deal of time can be spent in designing one of a suitable type.

Practically speaking, individual opinion differs considerably as regards the design of a cabinet. Some people prefer an ultra-futuristic type, whereas others are quite satisfied with an old-fashioned appearance or something conventional. In any case, the actual design is for the constructor to decide for himself according to taste, but a few suggestions regarding the underlying principles would no doubt prove helpful, and for this reason the following are given:

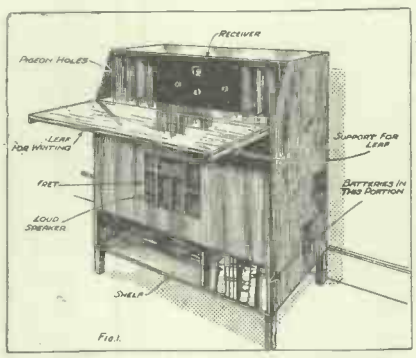
Anticipating Trouble

In most cases it will be found necessary to design the cabinet in accordance with the specified baseboard and panel dimensions of the receiver, and in view of this fact the foremost point to be remembered by the designer is that of servicing. No receiver, however good it may be, can be regarded as immune from developing a fault, and to retain the set's efficiency the valves will require a periodical (if infrequent) replacement.

With this in mind, then, the space allotted to take the radio should be such that no serious difficulty will be encountered when occasion arises in the event of trouble to test out the various components.

Similarly, in the case of a battery model, the space required for the batteries must not be underestimated, because considerable damage is possible if the accumulator acid is spilled when the cell is being withdrawn for recharging.

THE BUREAU TYPE



In addition to housing the radio, this type of cabinet provides a writing desk.

Choosing a Design

There are several very pleasing designs for the constructor to choose from—or originate—as the case may be, and, provided one too difficult is not chosen, the veriest amateur could undertake to make a satisfactory piece of furniture without fear of disappointment if sufficient care and forethought are exercised.

The bureau type of cabinet, as shown in Fig. 1, is not a difficult task, and with this particular design the cabinet serves the dual purpose of a writing desk as well as a means of housing the radio.

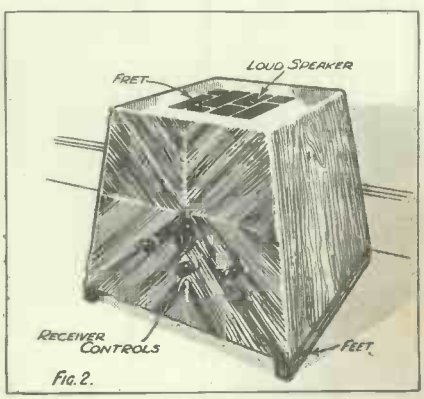
Additional Fitments

If so desired, a book rack can be included in the bottom below the loudspeaker, and pigeon-holes either side of the panel, as illustrated. Additions such as these, of course, are quite optional and depend entirely upon what the designer has in mind.

A hinged-leaf is provided, which when lowered can be used quite comfortably for writing purposes, and when closed acts as a complete cover for the wireless panel. Ample space can be arranged in the bottom to incorporate the H.T. and L.T. batteries, whilst the loudspeaker fits conveniently to a baffle-board against the front.

Another type of cabinet can be constructed in the form of a dummy fireside stool, as illustrated in Fig. 2. This type has an advantage in the fact that owing to its compactness it

A FIRESIDE STOOL



A compact design very suitable for a three-valver. Note the unusual position for the loudspeaker.

can be designed with an ultra-futuristic appearance, and is very suitable for a modern receiver employing only two or three operating controls.

By referring to the diagram it will be seen that the loudspeaker is attached to a small baffle-board fitted in the top.

Accommodating Batteries

If both radio and gramophone entertainment are desired the speaker can quite easily be installed external to the cabinet, and the motor-board, together with a motor and turntable, sunk in the top in place of the loudspeaker.

As with the bureau type, the cabinet, for convenience and neatness, should be a self-contained arrangement, although in this instance it is not essential that both H.T. and L.T. batteries should be kept in the bottom. If preferred, a small shelf can be built just above the receiver to take one of them. The size of the loudspeaker, of course, will determine which is the most suitable for the position.

For Large Receivers

A further example in the pattern of a sideboard is shown in Fig. 3. The size of this cabinet enables the constructor to fit a fairly large receiver of the type requiring super-capacity batteries, and furthermore permits the incorporation of a gramophone motor.

Only a portion of the cabinet is utilised for the receiver and accessories; but as the remaining space can quite easily be filled with miscellaneous articles there is no reason why it should be left idle. When the lid and doors are closed the cabinet is to all appearances only a sideboard—the radio portion being completely enclosed.

The Finishing Touch

If the designer is artistically-minded, a final touch can be given by the inclusion of a small mirror or clock in the back, the latter being of the electric type if the set is mains driven.

A cabinet similar to the above, however, requires a certain amount of skill in woodcraft, and is a pattern which will no doubt appeal to the more experienced cabinet-maker.

The three designs given here are only examples as a guide to the constructor, but whichever type is decided upon, whether it is in the shape of a bookcase, smoking cabinet, or coffee table, it must be remembered that the controls should always be in the most convenient place for ease of operation.

Before concluding it would be advisable to explain that a great assistance to constructional work is made manifest in the fact that the wood required can, in most cases, be obtained already cut to the various sizes. Furthermore, it is obtainable with oak, walnut, and other veneered facings, so there is no reason why the finished cabinet should not prove a satisfactory match to other pieces of furniture in the room where the set is to be installed.

A SIDEBOARD FOR SET AND LOUDSPEAKER

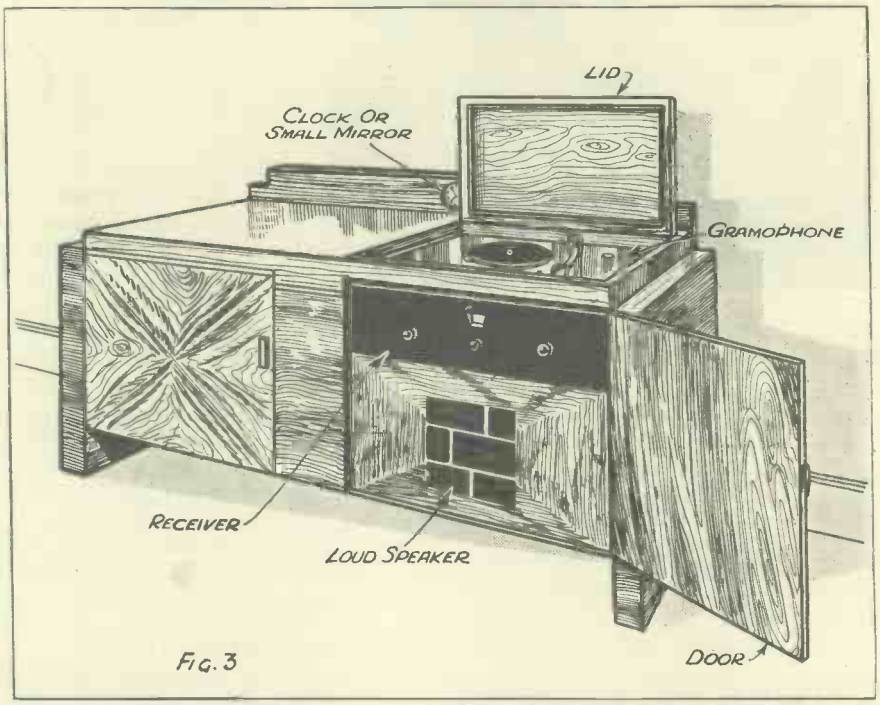


FIG. 3

This ambitious design allows for a record turntable as well as for an electric clock, and part of it can be used as a sideboard in the ordinary way.

CONTACT!

Showing how a very simple fault can cause a lot of trouble.

A RATHER amusing experience occurred the other day, in connection with a Class B set. The set was much below par, signals being wheezy and distorted. The valve was new and worked efficiently in another set, so the fault was in the receiver. After applying numerous known tests, and getting no farther, things began to be a little worrying. Off came the loudspeaker leads, and another speaker was attached. Still the same miserable output. Fortunately at this stage the fog began to clear a little. A test with H.T. and one anode of the Class B valve across the speaker gave quite clear and reasonably loud signals. The second anode gave out nothing but a faint wheezing sound. Distinctly warmer. Probably a plate lead disconnection.

Tested from plate to valve holder. Everything O.K. Then a shudder ran through my frame. Could it be ? Yes, a proper booby trap. Shamefacedly, I checked up the contact between the valve holder and valve pin. It was true. One of the springy V contacts against which the valve pins rested had got pressed too far out. Result—no contact. An hour on a job that should have taken at most 15 seconds.

E. O'M.

THE HARRIES VALVE

Dear Sir,

As the designer of the Harries valve, made by Hivac, which was specified by Mr. Scott-Taggart in the S.T.100 reflex receiver described in your March issue, I should like to comment on the use of the valve for simultaneous amplification of H.F. and L.F. in the way in which Mr. Scott-Taggart uses it.

In the amplification of broadcasting it is necessary that a power output valve should amplify several different notes or frequencies without distorting them or causing them mutually to distort each other. That is, it should amplify all the notes equally without mutual interference.

The critical distance principle of the new valve enables this to be done. Obviously, therefore, the valve will be particularly efficient in reflex receivers like the S.T.100 when it is amplifying both L.F. and H.F. simultaneously.

Reflex receivers were particularly in my mind when designing the valve.

Yours faithfully, for and on behalf of HARRIES & THERMIONICS, LTD.,

J. H. OWEN HARRIES Director

HOW TO LISTEN

By E. S. LANCASTER

To get the best out of radio; to secure maximum results; to really enjoy the best of the programmes, is the ultimate aim of every listener.

A first-class sensitive receiver will provide practically unlimited entertainment every day. By simply turning a knob we have at our command the pick of the world's artists from practically every country in the world.

Select Your Items

Although nearly all of us appreciate the theatre or cinema, very few would enjoy sitting in one continually every day; we should very soon be bored and desire some other form of recreation.

Nevertheless, when we do go to a place of entertainment we usually take it seriously. We desire all disturbing sounds excluded so that we might concentrate upon the scene before us. In these forms of amusement we employ the senses of sight and hearing. Where radio is concerned it is only the sense of hearing which is employed—until television comes; yet, strangely enough, we concentrate less upon the matter being broadcast, often utilising our wireless set to provide us with a background of music whilst conversing, when obviously no one can really appreciate the item being broadcast.

Broadcasting would provide greater enjoyment if only we selected those items in the programmes which appealed to us, and made it a definite rule to listen and appreciate those items to the exclusion of everything else.

Perfection

We all seek the perfect programme, the perfect receiver, the perfect car, but has anyone yet discovered the perfect listener. Although perfection is not yet attainable, the few suggestions which follow may be of value to some of that vast army of listeners who are striving to secure more enjoyment from the broadcast fare provided.

These suggestions are based, not only upon common sense, but upon some of the recent discoveries about the complicated processes of the human ear to different types of sound, and some upon the psychology of the senses.

We know that students and thinkers prefer quiet rooms, so that no distracting sounds may intrude. Persons experienced in appreciating music are likely to listen with eyes closed. That is why the psychologist insists that one of the rules for proper listening is that light in the surroundings should be reasonably dim; no bright light at all should shine into the eyes.

This article tells you how to get better enjoyment from your radio set without extra expense. It deals with the "art of listening."

Acoustic Considerations

Passing to the question of surroundings, let us consider some of the lessons which the science of acoustics has taught us. Here is number one. Soft hangings in the room, soft carpets or rugs, furniture, books in a bookcase, all tend to absorb or break up the sound waves so that echo effects are less pronounced.

Another acoustic rule: Sit directly in front of the loudspeaker, if possible. The majority of loudspeakers do not emit sound waves in a perfect sphere, but send them out in more or less of a beam or cone.

A common mistake is that of operating the receiver at too loud a volume. Too great loudness means too much reverberation in the room and usually distortion, for the musical sounds of different pitches are not reflected by ordinary walls in the same manner or to the same degree.

The results obtainable from any loudspeaker depend to some extent upon the room in which it is placed, the amount of furniture which it contains, etc., so that it is difficult to lay down any hard and fast rule regarding the most suitable place for the speaker to be situated.

Talking Destroys Illusion

No one would think of attending a cinema or theatre and talking through the whole of the programme. With radio listening it is a very bad habit which should not be tolerated, as conversation tends to destroy the element of illusion which cinema, theatre or radio broadcasting seeks to create.

The mental reactions of individuals to various colours is probably different. The influence of walls of various colours may have very different effects upon different people. Some people even associate sound with colour. Minds may be confused if, for example, a certain musical item being broadcast has the colour blue associated with it in the listener's mind; whilst the mural decorations of the room are a vivid red.

Colour

It may be possible for science eventually to evolve a colour scheme for a room in which some sort of kaleidoscopic arrangement is devised enabling the colours to vary in harmony with the music being broadcast.

What would happen under these circumstances when a modern "hot" number was being broadcast or a crooner was "on the air" is an interesting subject for speculation.

But the question of colour is, nevertheless, one well worth consideration.

RECORDING AT THE H.M.V. STUDIOS

The band seen here is the London Palladium Orchestra. When this photograph was taken they were making a record at the London studios of "His Master's Voice."

Crook Pictures by Radio

A KILLER was at large. His fast car darted through New York's mazes, seeking a way out. He laughed at the police general-alarm. Hadn't he changed his car, and its licence number; even his own clothing? Confidently he approached the entrance to the tunnel that led under the river to New Jersey.

"Look at the dumb cop!" he chuckled. "Well, let him try and pick me out."

"Put 'em Up!"

He joined the line of cars nearing the entry, then stopped with a jerk. The handsome limousine ahead of him had suddenly been halted by the traffic policeman. Arguing with him, its occupants alighted. They moved rearward. Suddenly, they closed in on the killer's car. He saw drawn revolvers, heard a voice roar:

"Put 'em up—quick!"

One of the men strode forward.

"Now, let's have a good look at you!" he said.

A glance at what he held in his hand, and the killer quaked. It was a picture, etched in odd-looking rusty brown, but beyond doubt, an exact likeness of him, the killer.

"Where did you get that?" he gasped.

The detective grinned.

"Outa the air, fella; outa the air," he replied.

Again he stretched out his hand. It held handcuffs.

That exact scene has not, to be sure, been enacted—yet. Nor yet has a criminal been caught red-handed through the flashing of his picture by radio to a specially equipped police car. But that the flashing of pictures and more to such cars is no idle dream was demonstrated on a recent night, in New York's Central Park, to the satisfaction of expert witnesses.

Pictures While You Wait

A police radio-car cruised slowly up and down the Mall, as if waiting for something. Its five occupants peered frequently at their watches, then at a peculiar apparatus something like the old-fashioned phonograph cylinder, attached to the running-board. Suddenly, from this apparatus sounded a piercing whistle. The car stopped, drew to one side. Then slowly, the cylinder began to turn. It unrolled a piece of paper, marked in the reddish-brown of iodine. When it stopped, one of the men tore it off, dried it, and held it up.

"Know him?" he asked.

It was a readily recognisable picture of Edward P. Mulrooney, Police Commissioner of New York City. Once more the cylinder turned. This time the photographed face it transmitted was of a different cast, and on the paper strip a stylus pen plainly wrote these words:

ARREST AND HOLD FOR MURDER: FATS McCARTHY. FACSIMILE OF HIS SIGNATURE FOLLOWS.

Followed a perfect reproduction of the autograph of the notorious gangster, who has since been punished.

The men in the automobile were Inspector Joseph A. Donovan, Head of the Bureau of Identification of the New York Police Department; Superintendent William Allen and Assistant-Superintendent G. S. Morris of the police telegraph and radio system; and Chief Engineer Thomas W. Rochester; together with the inventor of the apparatus that is Science's newest aid to the police of the world, in their war upon criminals.

Practical Possibility

Before they started out, Inspector Donovan had supplied the inventor with specimen photographs and data from Police Headquarters. These the inventor had taken to a broadcasting station in uptown New York, specially equipped to put them on the air. This, he had arranged, should be done under conditions agreed upon. Then, with the police experts, he had entered the car equipped with his own special receiving apparatus, driven to Central Park, and awaited the preconcerted moment for the test.

That test had shown that broadcasting to police headquarters, stations, even to cruising radio-equipped cars, of photographs of criminals, of their handwriting, and of written messages describing them, is already a practical possibility requiring only a little more perfecting; which is now being given it.

That means a great change in police methods, particularly in the chase of some desperate criminal immediately after a crime from which he is trying to flee. For instance, at this moment there are cruising about New York 270 police and detective cars, and 50 more in reserve, equipped with radio-receiving apparatus. These cars receive and act upon 75 to 100 emergency calls a night, but the instructions are entirely conveyed by loudspeakers in the car roofs.

Future Developments

But suppose, to these loudspeakers, were added the new cylinder that can receive photographs, autographs, written messages! If this equipment were possessed not only by all these cars, but by all police-stations, bridges, tunnels, roads leading out of the city, then, not only the description but the photograph of every criminal trying to escape could be sent to these points.

When finger-prints can be sent this way, possibilities will be even more startling.

FOR FARMS

An ingenious American receiver that has been designed for the use of farmers. The power is supplied by a windmill, as shown, which presumably charges an accumulator.

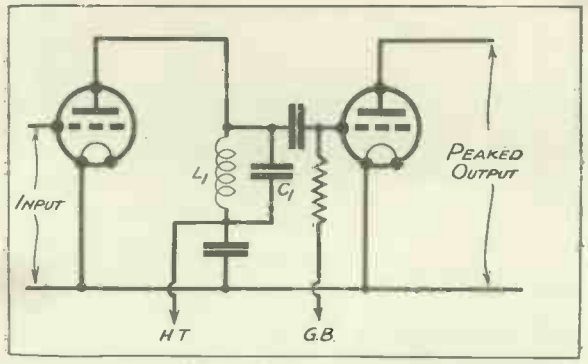


Fig. 1. The fundamental low-frequency arrangement for obtaining a peaked output. L_1, C_1 is tuned to the particular frequency to which it is desired to give greater amplification.

PEAKED AMPLIFIERS

An interesting description of a method of improving the readability of C.W. transmissions.

By W. S. ELLIOTT.

RECENTLY there has been a considerable growth of interest in amateur and commercial C.W. transmissions. It is not generally realised that the readability of these signals may be greatly improved by the use of special low-frequency amplifiers designed to give a maximum response to a musical note of a predetermined frequency.

Reducing Interference

With the conventional arrangements, both wanted and unwanted signals receive the same treatment. Using an amplifier with a peaked characteristic, much greater amplification is given to notes of a definite audio-frequency than to any other notes. Thus by tuning the detector valve until the required audio beat is produced the sensitivity of the receiver to the wanted carrier reaches a maximum value, whilst there is only a weak response to interfering signals and to static.

The fundamental low-frequency coupling arrangement is as shown in Fig. 1.

DUAL-PURPOSE SCHEME

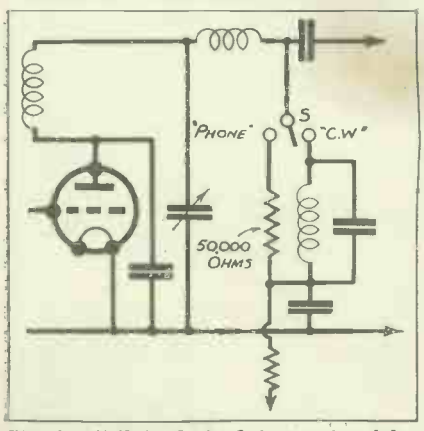


Fig. 4. If it is desired to receive telephony as well as C.W., the L.F. side of the circuit should be modified as shown above.

It will be seen that a circuit tuned to, say, 800 c.p.s. is connected in the anode circuit of the L.F. or detector valve. This circuit offers a low impedance to all frequencies but those in the neighbourhood of 800 c.p.s. Signals of this frequency build up a high alternating voltage across the tuned circuit, and this voltage is applied via a small condenser to the grid of the next valve.

The inductance may be the secondary of a low-frequency transformer, with the core removed, provided that it can be tuned to the desired audio-frequency, using a reasonable value of capacity. Suitable capacities are those between 0·005 and 0·05 mfd. Capacities between these values should be tried in order to obtain the most suitable frequency.

If it is desired to wind a special inductance the writer recommends that shown in Fig. 2.

The wire used should be No. 38 S.W.G., enamelled. The 1-in. diameter former may be a 1¼-in. length of ebonite or paxoline tube. The cheeks are ebonite circles 2½ inches in diameter, held in place by a threaded brass rod passing through the centre; 5,000 turns are wound on to the former or the winding continued until the diameter reaches 2 inches.

Flexible leads are soldered to the ends of the fine wire and brought through holes at A and B. The joints should be wrapped with small pieces of impregnated paper. A layer of impregnated paper should be wound over the whole coil. The appearance of the coil may be improved by a final wrapping of passe partout. Fixing brackets are held by the central brass rod.

THE RECOMMENDED COIL

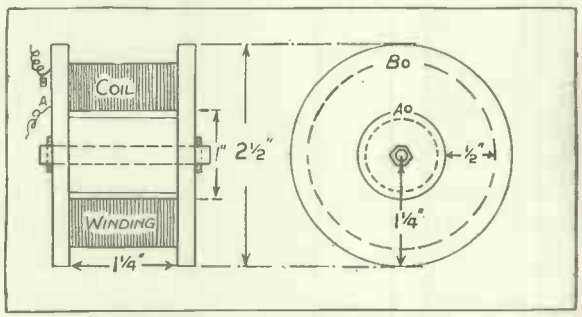


Fig. 2. This is the special inductance recommended by the author. No. 38 S.W.G. enamelled wire is used, 5,000 turns giving the required value.

The complete circuit of the receiver used is seen in Fig. 3. The H.F.

(Please turn to next page.)

A THREE-VALVE CIRCUIT WITH TUNED L.F.

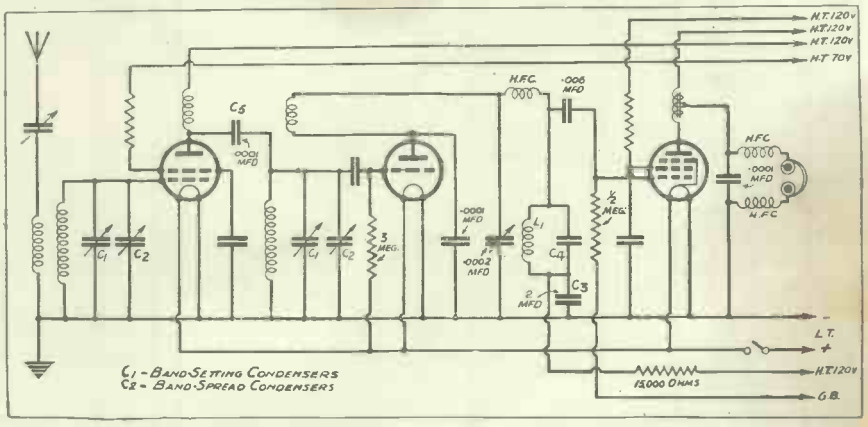


Fig. 3. Here is the complete circuit of the receiver. The H.F. side is quite conventional and normal component values are employed.

H.F. CURRENTS AND INSTABILITY

Some Hints on Overcoming a Common Trouble.

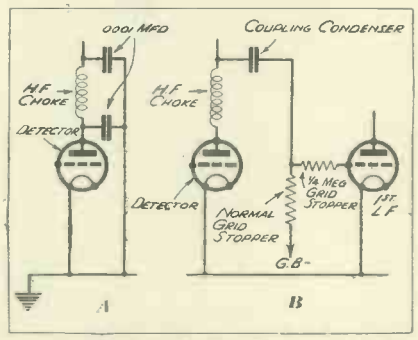
By A. W. YOUNGMAN

PERHAPS one of the most common troubles experienced in newly built receivers where H.F. amplification is employed is instability due to capacity coupling between the H.F. tuned circuits.

When the more orthodox methods have been tried, such as decoupling the various circuits concerned, and screening the anode and grid leads, etc., it is very often that voltage reduction is resorted to, or, as a last resource in the case where an H.F. multi-mu is incorporated, the biasing is increased. Unfortunately both methods reduce the efficiency of the circuit, and in this way are entirely unsatisfactory.

Where such so-called cures are necessary the constructor should turn his attention elsewhere, because it very often happens that H.F. currents in the amplifier circuit are mistaken for instability. In both cases the symptoms are similar by introducing a state of uncontrollable oscillation, although there is one outstanding difference. In the event of H.F. currents in the amplifier being responsible the state of oscillation is definitely more pronounced on the upper waveband, whereas in the case of instability such oscillation exists more on the higher frequencies or lower wavebands.

WORTH TRYING



Two methods of improving the stability of a circuit. The second scheme (B) is only applicable to resistance-capacity-coupled amplifiers.

Stopping Devices

In the normal course H.F. should not be permitted beyond the rectifier or demodulator, and must definitely not be allowed to pass the anode of the detector. As a remedy when your trouble points to H.F. currents in the amplifier circuit two small fixed condensers having values of approximately ·0001-mfd. should be connected from either side of the H.F. choke, as illustrated at A. This will usually prove extremely effective, but in the event of failure a resistance of about 250,000 ohms must be joined in series with the grid lead of the first L.F. valve, i.e. between the G. terminal of the L.F. transformer and the G terminal of the valve holder.

Where resistance capacity coupling is employed in preference to the transformer method, the connections must be shown at B, where the grid stopper is on the grid side of the grid leak.

PEAKED AMPLIFIERS

—continued from previous page.

part of the set is conventional in every way, and the usual component values are employed.

Fig. 4 shows the modification required when it is desired to receive both telephony and C.W. stations.

With the switch S in the "phone" position the coupling is of the straightforward resistance-capacity type. With S in the "C.W." position the peaked coupling unit is used.

Other Schemes

At the writer's station this receiver has been in use for some time. Numerous two-way contacts have been effected, which would have been impossible using a straight receiver, on account of the low signal-to-noise ratio of the distant transmission.

For those interested in experimental work, it is suggested that the circuits shown in Fig. 5 should be tried. With all these circuits greater audio selectivity is obtained, and hence greater signal-to-noise ratio. The actual amplification will, however, be less. In Fig. 5a an anode tap is used. In Fig. 5b the effective capacity of the condensers C_1 and C_2 in series should be kept constant (effective cap. equals $\frac{C_1 C_2}{C_1 + C_2}$). The ratio $\frac{C_1}{C_2}$ should be varied in order to obtain the required degree of audio selectivity.

In Fig. 5c two stages of peaked L.F. amplification are used. The anode taps may be made near the earth end of the coils and a high degree of selectivity obtained. The strength of the wanted signal will be slightly greater than with a conventional one-stage amplifier, but the selectivity will be better.

THREE SUGGESTED METHODS FOR EXPERIMENTERS

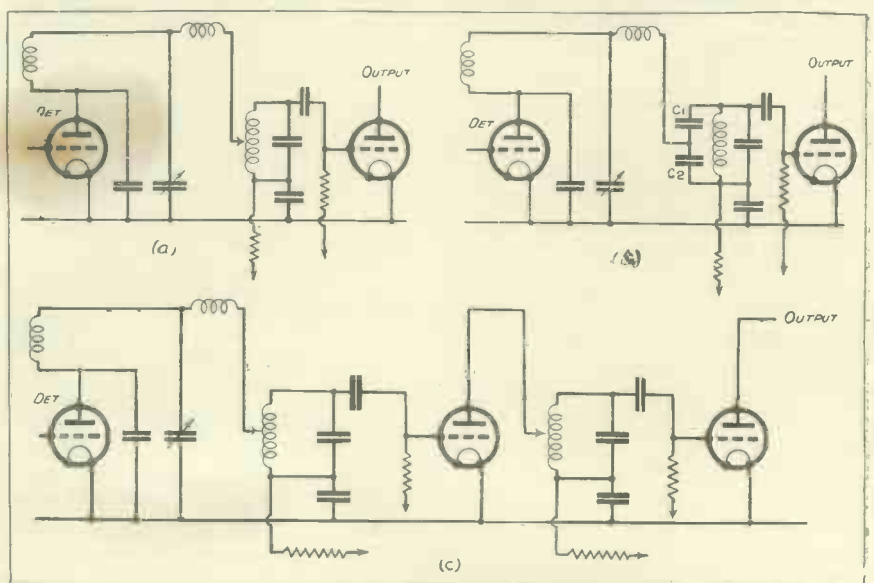


Fig. 5. These circuits are especially suitable for experimenters. Although greater audio-selectivity is obtainable with these arrangements, the signal strength in the case of (a) and (b) will be slightly less.

ON THE RECORD

The home of canned foods, America is rapidly taking canned music and speech to her heart. The gramophone record is used extensively by all classes for domestic, political and business purposes. Read this interesting article on the subject.

By Willis Werner

"PUT it on a record!" describes in a sentence the craze which is sweeping America to-day.

To-day, microphones connected to whirling turntables hang in many stores. They are patronised by the person who wants his voice, his canaries, or his musical ability engraved everlastingly in aluminium.

In fact, some progressive recording technicians such as Louis G. Blanken, of San Diego, California, will even drive their equipment to your door and record a wedding ceremony—or a family fight as evidence in a divorce case.

In the Law Courts

The other day, a woman who had just imported several German roller canaries brought them into Blanken's studio. "Make a record of their songs," she told him. "I want to use it to teach some young domestic canaries to sing."

Blanken, whose boast is that he will "record anything, anywhere, anytime," found it was necessary to leave the birds in the studio for a day to accustom them to their surroundings, after which they warbled quite happily—with the microphone picking up the sounds for recording.

A system is now being worked out whereby a judge may install recording equipment in his court room during complicated cases. At night, the jurist would take home the day's recordings, and in the silence and privacy of his study would play them over.

By the emphasis placed on the answers to questions by witnesses, he would be able to discern accurately which questions and topics aroused the most vocal inflection in the witnesses and thus judge their importance.

This is a clue which cannot be obtained from a court reporter's transcription of the case. There is also the question of accuracy, for in a recent case in which ten reporters took down the proceedings, as many as four variations in statements as transcribed were found.

With the vogue for amateur hours now sweeping the radio and picture theatres of America, scores of eager aspirants have taken to recording their efforts. But individuals have also put the expensive machinery to more personal use.

Blanken has quite a number of clients who bring in their infants each month as they learn to talk. Their libraries contain the actual record of the first "da-das" and "goo-goos" of their offspring and the first spoken words.

The records are of the type which play back instantly the recording is made. Preachers have found this a helpful feature. When they have some special point they wish to drive home in their Sunday sermon, they read it into the microphone and then sit back to hear themselves talk. Noting carefully any weaknesses, the clergyman has only to reword his talk or change his voice inflexions to achieve the desired effect.

Salesmen Clients

"Salesmen are trying this now, too," smiled Blanken," and after listening to themselves they sometimes wonder how they ever manage to sell anything! When they leave the studio, they're pretty well posted on what's wrong—and then pity the poor prospect!"

Blanken usually manages to record most of the important programmes which come over the national networks. He also makes a speciality of creating recorded features for radio stations.

When President Franklin D. Roosevelt spoke in the San Diego stadium, when one of the nation's largest aircraft factories was dedicated at Lindbergh Field, Blanken was on the job, and can now run off the events any time anyone wants to hear what happened. The latter instance is interesting in that the microphone even picked up the roar of aeroplanes overhead, backgrounding the speeches, and the clanging of a bell on a switch engine nearly a street away!

Metal Discs

Two kinds of recordings are made. One is cut into a disc made of an aluminium-copper alloy and is permanent, but must be played by means of non-metallic needles.

The other blanks are aluminium coated with a cellulose solution into which a thread is cut by the recording needle. This type of record may be played with a steel needle, but is good for only a few playings and is favoured for radio use where records are to be played only once or twice.

Copies can be made by re-recording.

LISTENING TO THE BIRDS

Louis G. Blanken, who has built up a huge recording business in San Diego, California. In this photograph he is recording some roller canaries so that their song can be used to train other canaries.

The Art of Getting There

Algernon was determined to broadcast. The B.B.C. seemed just as determined he should not. But you can't keep a good man down and—but that's all part of the story.

WHEN Algernon Stikkit left school his headmaster told him, among other things, that he was certain he'd get there in the end. I know that because Algernon told me. Of course, had it been said to me I should have kept it dark unless the "Old Man" had explained exactly where he'd meant by "there." One never knows with headmasters.

Anyway, it pleased Algernon, and from thenceforth his life was full of purpose. Every time I met him he was bent on getting somewhere else, and he invariably succeeded. So I suppose the Head knew what he was doing.

One-Man Band

"I'm going to broadcast," he announced one day when we met at the club.

"You don't say so!" I exclaimed, my faith in the good judgment of the B.B.C. somewhat shaken. "They aren't letting you sing, are they?" I inquired anxiously.

"I'm hoping they'll let me," said Algernon modestly. "You see, it's like this, old man." He led me to a settee. "I've written a poem and I'm making up a clever little accompaniment to it, to be played on two drums and a piano, all of which I shall do myself, using hands for piano and feet for drums. You see the idea? I shall, of course, sing the words myself," he added.

I drew a deep breath.

"Good luck, old chap," I said, "and may the best man win. If there's a chance of my being in at the death—the performance, I mean—you might remember your old friend who loves you and take me along, too." I got up hastily.

Attack On All Sides

"The words go like this," cried Algernon, laying a detaining hand on my arm.

"I'm sorry, engagement," I muttered hastily, and went too.

Of course the B.B.C. didn't accept Algernon's offer. It overcame them, I think, but when I saw him two days after they politely refused his ensemble, he was surprisingly jubilant.

"I've just sent up a novel I wrote when I was ten," he said. "It's about two boys and a Red Indian. I think it would do well for the serial story in the Saturday Magazine, if they'd let me read it dramatically. It's quite unique."

"Splendid," I said hastily. "Let me know when it comes on and I'll cheer with the rest of Britain. I might even send you a letter of appreciation."

"Yes, it might even come to that," said Algernon thoughtfully. "One never knows."

But I was saved my stamp.

When I ran into Algernon next time it was in Regent Street, Oxford Circus end. He was undaunted.

"It's neck or nothing. I'm determined to broadcast," he cried. "You can't keep a good man down, and a bird in the hand is worth——"

"I know, I know," I interrupted soothingly, for he seemed strangely excited.

"I'm launching an attack on all sides," he continued, falling into step beside me. "You mark my words. Before a month is up, I'll have broadcast. Now listen. I've offered a talk on Little Watnott revisited—the series that famous people are doing, you know. I'm not famous yet but I shall be when I've broadcast. I've sent in a tale about fairies for the Children's Hour, and a screaming thing on mother-in-laws for Variety. I'd do it, of course. I've offered a whole series of talks called "Chatty Cheer-ups for Breakfast Time." I don't think they'd mind broadcasting a bit earlier if the idea caught on, do you? And——"

We'd reached Piccadilly Circus by that time and I had to say good-bye, rather reluctantly, I must confess, for he assured me he had a round dozen irons in the fire, including suggesting a tin whistle solo in one of Bach's pieces. He'd get there, he said.

"Success" at Last

I was doubtful, but I needn't have been. I might have known.

I was listening-in one night to a most attractive outside programme, including a solo on a hurdy-gurdy in a London street. Suddenly "Love's Old Sweet Song" was shattered by a most ear-piercing yell. My blood ran cold. It was downright murder. Then followed a glowing sentence from apparently the same lips that even the hurdy-gurdy could not drown. My ears still tingle with horror when I think of what I heard. I blushed with shame and stretched out my hand to switch off the loudspeaker. To think that the B.B.C. should come to this!

I was on the way to the Post Office next day, to tell the Postmaster I should not renew my licence, and my knees were still trembling with the shock of it all, when I met Algernon, his head covered in bandages, but with the light of triumph in his eye.

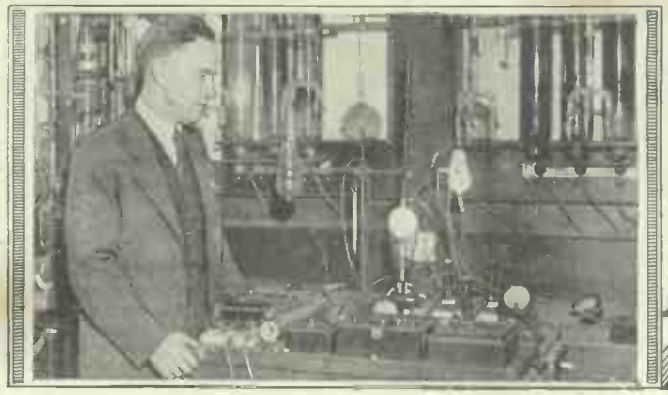
"Did you hear me broadcast last night?" he inquired. Then, not pausing for an answer. "I saw the mike by a theatre queue—got too near and the monkey took a dislike to me and positively attacked me. I'm a sight under the bandages, old fellow. I got in a few words though," he added. "I knew I'd get there all right, somehow."

"You most certainly will," I said severely.

A.B.

SPRING-CLEANING

Radio masts need an overhaul in the Spring just like the home. But painting the masts, four or five hundred feet above the ground, is a "he-man's" job, and if it's very windy—! The workman seen here is at work on the Warsaw station.



GAS DISCHARGE TUBES

A lucid explanation of how the mysterious phenomenon of ionisation is put to practical use in the well-known gas-discharge lamps. Also how these lamps may be utilised by the wireless enthusiast in pursuit of his hobby.

By J. PERRY

MOST wireless enthusiasts are familiar with the term "ionisation."

Although ionisation is not fully understood, it plays quite a large part in radio engineering, and it is perhaps not out of place to discuss it briefly here.

Under certain conditions gases become ionised—that is, a percentage of the atoms of the gas break up into positively and negatively charged particles called ions, and the particular gas then becomes capable of conducting electricity.

Effects of Ionisation

Thus, for example, if we increase the electrical potential between two points of air, a pressure will be finally reached when the air in between ionises, or, as we commonly say, breaks down, and a spark ensues.

In certain upper layers of the atmosphere the gases exist under such specific conditions that they are in a state of ionisation.

A sphere of ionised gas is thus formed round the earth and is, as one would imagine, connected with certain electrical and radio phenomena.

In some ways this layer is a friend, whilst in others it is not.

Thus whilst, for example, it makes possible long-distance short-wave transmissions, it is also the cause of fading.

Some rare gases such as neon are more easily ionised and prove better conductors than others, and such gases are employed in gas discharge tubes.

A typical discharge tube is shown in Fig. 1.

A bulb which is of glass contains a gas such as neon at a very low pressure.

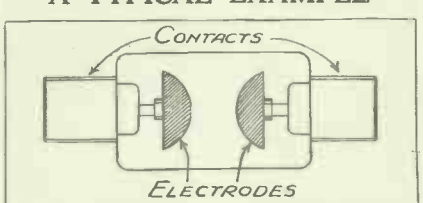
The electrodes are hemispherical in shape and are spaced according to the operating voltage of the tube.

Various modifications of these gas tubes are made, from the high voltage neon sign to the small night-light.

In these tubes, however, the gas does not conduct until a certain electrical potential is obtained between the electrodes, when the gas ionises and current flows.

The voltages at which the gas ionises and becomes a conductor is called the "breakdown voltage."

A TYPICAL EXAMPLE



SECTION OF TYPICAL RARE GAS DISCHARGE TUBE (OR CARTRIDGE) FIG. 1.

A simple gas discharge tube consisting of two electrodes inside a glass bulb filled with a gas, such as neon, at a very low pressure.

Voltage Overlap

Once current has commenced to flow, however, the voltage must be lowered considerably before it will cease.

Taking the case of a tube in my possession, current begins to flow at 120 volts, but does not cease until the pressure across the tube is lowered to 70 volts.

In referring to this tube we should say that its "breakdown voltage" was 120 and its "extinguishing voltage" was 70.

This is caused by the fact that, once started, ionisation persists, maintained by current flow until a considerably lower voltage is reached.

These tubes can therefore be used for protecting any systems from over-voltage, so that as soon as a certain pressure obtains, a discharge takes place until normal conditions are restored.

This principle is used in some aerial protective devices to dissipate static charges, and is also applied to some overhead telephony work for a similar reason.

Rapid Light Change

These tubes have what we might call a low "light inertia" compared with metal filament lamps.

By this I mean that there is no appreciable lag between any changes in voltage and changes in the brightness of the light given out, whereas a heavy metal filament takes a considerable time to attain incandescence or to cease from glowing.

Such tubes are therefore applicable to television where rapid changes in light intensity are required, and in fact some tubes can follow changes in voltage which occur at frequencies far above audio frequency.

Owing to the peculiar properties mentioned above, a neon tube is capable of producing oscillations if a

AN OSCILLATOR CIRCUIT

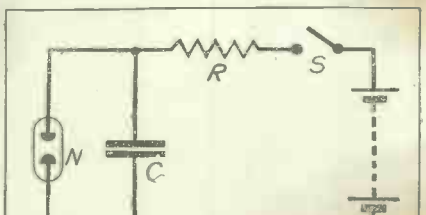


FIG. 2.

An ordinary neon lamp can, when set up in this circuit, be employed as a generator of electrical oscillations.

particular though simple circuit is employed.

Consider the circuit in Fig. 2.

C is a condenser of, say, a fairly large capacity ; R is a high resistance, and they are connected as shown through the switch S to a D.C. supply, the voltage of which is above the breakdown voltage of the neon tube N.

Consider when the switch is closed : the supply will charge the condenser, but because of the high value of the resistance this will take some time ; it may be a matter of seconds.

Regulating the Rate

Finally, however, the breakdown voltage of the tube will be obtained across the condenser and a discharge will take place, ceasing again only when the voltage across the condenser is equal to the extinguishing voltage of the tube.

The same process of building up and discharging will then take place again and again indefinitely.

The rate of these discharges can be regulated by varying the capacity of the condenser or the value of the resistance.

Thus, by reducing the value of the condenser or of the resistance, the frequency will be increased and vice versa.

If we connect up the circuit, as in Fig. 3 or 4, we shall get a note in the phones or loudspeaker, which can be varied at will.

Wide Band Covered

Such an arrangement would prove very useful in an amateur's workshop, as quite a large band of frequencies could be covered by selecting the right values of capacity and resistance.

It will be seen that the frequency obtained will depend to a certain extent on the voltage of supply, and also on the breakdown and extinguishing voltages of the tube.

However, using an ordinary neon 5-watt night-light in conjunction with a capacity of ·01 mfd. and a resistance of 4 megohms. I obtained a frequency of 5 periods per second, the supply being 220 volts.

By cutting the resistance down to 400,000 ohms, a frequency of 50 p.p.s. could be obtained.

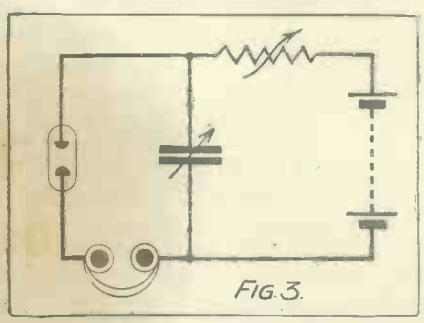
This frequency could also be obtained by decreasing the value of the condenser to ·001 mfd.

The former method would increase the current flow, while in the latter case it would remain the same.

As the frequency is increased a point will be reached at which ionisation persists to such an extent that one continuous discharge takes place.

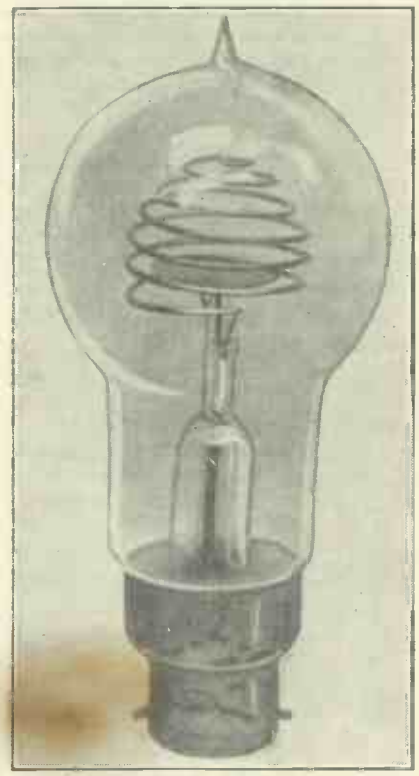
The only remedy, then, is to use a higher value resistance and a lower value condenser to obtain the same frequency.

VARYING THE PITCH



By varying the resistance, the "note" heard in the phones will alter in pitch over a useful range.

FOR THE EXPERIMENTER



This gas discharge tube may be purchased at any electrician's and has many uses for the amateur radio experimenter.

This will reduce the R.M.S. value of current flowing and will therefore reduce the persistence of ionisation.

If you are experimenting with an ordinary 5-watt night-light, it is advisable to remove the resistance from the base of the lamp ; there will thus be no unnecessary resistance between the lamp and the condenser.

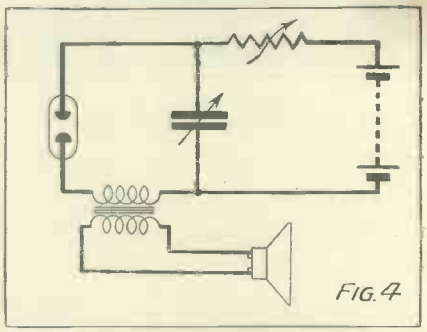
It is advisable not to connect any tube directly across supply mains without at least some resistance in circuit, say, 1,000 ohms or so.

Inverse Variation

I do not think there is any formula applicable to this circuit which connects frequency with resistance and capacity, but it can be safely assumed that the frequency varies inversely as the capacity or the resistance.

This arrangement provides a cheap and convenient method of checking

AT L.S. STRENGTH



The oscillations generated by the neon lamp can be made audible in the loudspeaker.

or testing by substitution high resistances and large condensers, providing that the frequency is low enough to be counted correctly and the D.C. supply is of reasonably constant voltage.

The question might now be raised as to the length of life of a gas tube, and it might be suggested that as the conductor is an unbreakable, elastic medium, that the tube would have an indefinite useful life.

Loss of Vacuum

This, however, is not the case, as will be seen by the following : When a discharge takes place, the anode is subjected to a bombardment of electrons. In the case of a tube on A.C. each electrode would receive a bombardment in turn.

This bombardment reduces the surface of the electrode to such a condition that it becomes capable, in scientific language, of occluding the gas. In other words, the gas combines with the metal similarly to the amalgamation of zinc and mercury.

Owing to this the vacuum of the tube increases until a point is reached when the tube becomes too "hard" to conduct.

SUPER SOUND-WAVES

This is the story of a "death-ray." But, unlike most other death-ray stories, there is nothing imaginary about it, and its inventor does not claim that it will do anything more harmful than kill bacteria, insects, worms, frogs and other small creatures.

WE have all heard, from time to time, of various forms of "death-rays." Usually these exist only in the imagination of the fiction writer. Here, however, are details of an apparatus to which the term death-ray may truly be applied.

A radio-oscillating circuit working on a 115-volt power input forms the basis of this very ingenious device, the purpose of the radio-oscillator being to provide sound vibrations of extreme intensity. Before going further with our description of the apparatus, however, let us, for a moment take stock of a few salient facts regarding the nature of sound.

The Effect on the Ear

Sound waves, as we all know, are really rapid vibrations in air, water, or in some other material substance. These vibrations, when they reach the ear, set the drum of that organ into sympathetic vibration. This vibration in some way or other travels up the auditory nerves to the hearing centre of the brain, giving rise to the physical sensation which we know as sound.

The pitch of any sound is governed by the number of vibrations which creates the sound. The faster the vibration speed, the higher the pitch of the sound.

Sound vibrations, also, all possess their own energy factor. You may have two sets of sound waves of equal pitch, but one sound may be hardly audible owing to the very small energy content of its vibrations. Conversely, the vibration energy of the other sound may be so great that a distinctly unpleasant feeling in the ears may be experienced by anyone coming within the range of such sound.

What Research has Revealed

Now an American scientist, Professor Newton Gaines, Professor of Physics in the Texas Christian University, has closely studied this latter type of sound. "High-intensity sound," we may call it. Professor Gaines has hit upon a method of producing ordinary sound waves of such high energy content that it becomes at times a matter of real discomfort to remain in the neighbourhood of his apparatus whilst it is working.

Professor Gaines' apparatus is simple enough in its essentials. He has a nickel tube three-quarters of an inch in diameter and about ten inches long. The upper end of the tube is immersed in water, its lower end being placed within the influence of a very powerful electro-magnet which is included in a radio-oscillator circuit. By this means the nickel tube is caused to vibrate at the rate of about 9,000 times per second, thereby emitting a high-pitched note.

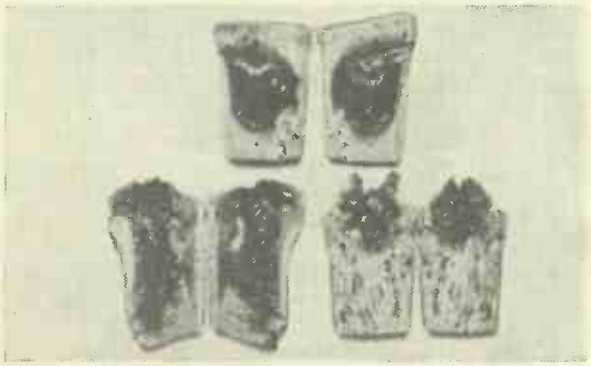
Waves of High Intensity

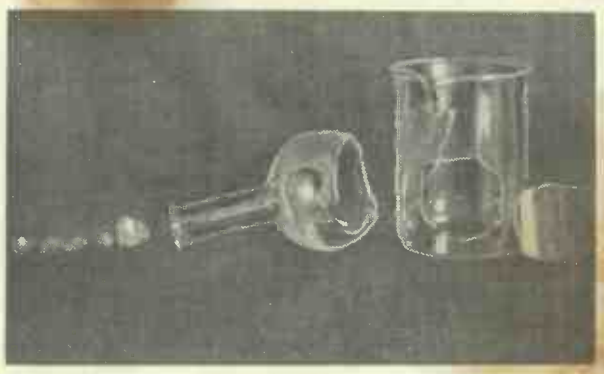
This vibrational period, of course, is not an exceptionally high one when we bear in mind the fact that totally inaudible "sound" vibrations of as many as 2,000,000 per second have been obtained and studied by other scientists. The great thing, however, about the sound vibrations obtained by Professor Newton Gaines is their *energy content*. Never, previously, have sound waves of so great an intensity been obtained.

For instance, if, instead of submerging the nickel tube above mentioned in water, it is allowed to vibrate in air, it very quickly breaks

(*Continued on next page.*)

SOUND VIBRATIONS HAVE BURNED AND SHATTERED THESE OBJECTS





Here are two interesting photographs. The one on the left shows a number of corks which have split open and become charred by exposure to the influence of intense sound vibrations. On the right are two glass vessels, shattered by the super sound waves.

SUPER SOUND-WAVES

—continued from previous page.

across the middle, owing to the intense vibrational energy. Hence, it is partially submerged in water in order to damp down the vibrations and to maintain them under better control.

Even so, however, the tube's vibrations exert a remarkable effect, the water being forced up in the form of a small fountain. When the upper end of the nickel tube, for instance, is about half an inch below the water surface, the fountain thus created attains a height of more than three inches.

Enormous Vibrational Energy

This fountain effect is due to the pumping action of the vibrating tube. The tube, you will recollect, is vibrating up and down at the rate of 9,000 vibrations per second, and it is this rapid up-and-down movement of the tube which jerks the water up into a fountain. The vibrational energy of the tube is so great that before long the upper end of the tube becomes covered over with a series of indentations, due to tiny grains of the metal having been hammered out by the water particles.

Such are the fundamental principles of Professor Gaines' apparatus for producing sound waves of super intensity. Now let us see the results which have been obtained by it:

First of all, if a flask of water containing small creatures—infusoria, water-fleas and other minute organisms—is placed a little above the upper end of the vibrating nickel tube, an intense disturbance is set up in the flask. Within an incredibly short time the inmates of the flask are all killed, owing to the intense disruptive effect of the sound energy on their bodies.

If, for instance, a water flea is placed in the flask and submitted to the influence of the death-dealing sound waves, it simply explodes, the disintegration of its body being so rapid. Large tadpoles survive for little more than ten seconds, whilst a good-sized frog will not live for more than half a minute within range of the super-sound energy.

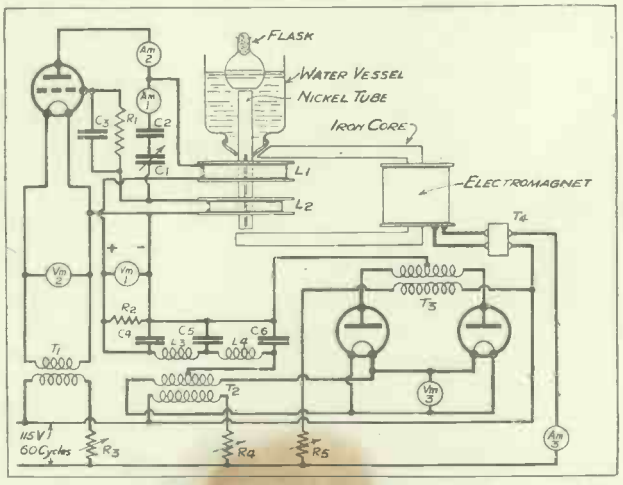
"All very interesting," you may perhaps be inclined to remark; "but what is the use of it all?"

Well, here is one very salient use to which Professor Gaines has already applied his radio-oscillator super-sound apparatus. If a bottle full of bacteria is placed within close range of the super-sound generating apparatus, all the bacteria are almost immediately completely destroyed. This observation has now been made use of for sterilising milk. In a modified "super-sound apparatus" a slow stream of milk is made to flow over vibrating nickel tubes. When the milk emerges from the apparatus it is completely free from any living germs.

Other applications of the apparatus will, doubtless, be forthcoming in the future.

Instance, for example, the fact that glass bottles and flasks will completely fracture when they are placed for any length of time in the path of the super-sound waves. Even solid metal articles are cracked when they are exposed to the super-sound path for any appreciable period.

HOW THE WAVES ARE PRODUCED



The circuit arrangement used in Professor Gaines' experiments with super sound waves.

Super-sound energy, it is found, can exercise very powerful heating effects. If a finger is placed *just above* the upper end of the vibrating nickel tube of Professor Gaines' apparatus—not actually in contact with it—it will, within less than a minute, be burned severely. The effect is due, in part, to the heating properties of the sound waves and also to some of the flesh cells of the finger being completely eroded, disrupted and destroyed.

A cork driven into the upper end of the vibrating nickel tube, even although it may be under water, quickly explodes! The vibrational energy of the sound waves heats up the centre portion of the cork. It becomes red-hot. Within twenty-five seconds the gases generated by the charring of the cork's centre force their way out, thus giving rise to a sharp, although miniature, explosion.

Vast Potentialities

The death-dealing properties of the super-sound apparatus when applied to small creatures are due, of course, to the intense sound vibrations which force the soft bodies of such creatures first in one direction and then in the opposite direction. Hence, ultimately, and within a very short period of time, their bodies become completely disorganised and disrupted.

That, of course, is what a small super-sound apparatus will do. Made on a much larger scale and operating upon a greatly increased power input, there is, as yet, no telling the practical results which might be obtained.

THE TRANSFORMER MAKER

—continued from page 358.

actuated and the winding machine stopped. Did you ever realise such careful testing went on?

Here are the automatic winders: the wire is on a reel at the top of the machine, whilst a roll of specially impregnated paper is on another reel. The machine is started. Wire winds on evenly, and as soon as one layer of wire is wound on, the paper literally "shoots out," and just winds once round the layer; then another layer of wire is wound on, and the same applies again to the paper. The automatic winders are almost human.

Careful Testing

The transformer is wound, and now the stampings have to be put in. This is sometimes done by machine and sometimes by hand. Rather uninteresting, I think. And now for some tests before assembly: First, we apply the mains to the primary winding. The voltages given out by the secondaries under "no load" are then checked. A load is then applied and the voltages checked again. Very little difference should be noticed or else the "regulation" of the transformer is poor.

And now for an exacting test: Here we have 10,000 volts, and we are going to test the insulation of the transformer with it. Of course, this test is applied between windings, and any weakness will show up in a very short time. Good, the transformer passes all tests.

R. E. B.

TELEVISION TO-DAY

—*continued from page 354.*

A very interesting television transmitter was shown a little time ago before the Royal Institute of Dutch Inventors, this system being the product of the Philips Laboratories—Philips the famous valve and lamp and radio manufacturers of Holland. The machine uses a tube of the Iconoscope type, and the modulation frequency is 3 megacycles.

As you know, the Iconoscope enables direct scenes to be transmitted, as distinct from the transmission of films, and this use of the Iconoscope (which incidentally was also made in the Philips works) was demonstrated, the transmission being on 7 metres. So far as I know, this is the first news that has been received of the commercial manufacture of the Iconoscope tube outside of the United States. I understand the Philips people are expecting to get a big share of the market in cathode-ray tubes, and so on, for television purposes throughout Europe.

Helping Aircraft

Arrangements are being made between the Air Ministry and the National Physical Laboratory for experimental work to be carried out with a view to the installation of suitable television receivers in aeroplanes. The idea is that in bad weather, or at night-time, the pilot of an aeroplane would be able to see a plan of the aerodrome at which he was to land shown up on a small screen, an elaboration of the system being to throw a spot on the screen indicating his own position over the aerodrome.

All he has to do then is to imagine himself to be represented by the spot and to manoeuvre his machine so that the spot on the screen comes towards the right place on the picture of the aerodrome which is before him.

If it could all be carried out just like this it would be a very wonderful thing, and no doubt it will come in time, but I should imagine that a lot of work must still remain to be done before such an ideal system could be achieved so simply.

Those of you who are experimenting with the Kerr-cell light-valve will be interested to know that the Kodak people have lately introduced a new type of gelatine filter which cuts out polarised light in much the same way as a Nicol prism, that is to say, a pair of these filters can be " crossed " like a pair of Nicol prisms. Full information can be obtained from the Kodak people direct.

When the television station at Alexandra Palace is in full swing it is estimated that the number of people on the staff there will be about sixty. The first people, of course, will be the engineering staff who will take charge of all the technical arrangements. Until these arrangements are more or less complete, there is no point in bringing in the dramatic or production people, and the inevitable executive staff.

Recently the B.B.C. advertised for applicants for the various posts on the production staff and received an enormous number of replies. More than a hundred people were anxious to undertake the duties of producer, a similar number for stage manager, and again for the position of music director. Very large numbers of applications were received for posts as male and female announcers, but I understand that, notwithstanding the large number of applicants, the qualifications required for the posts of television announcers are so stringent that the Corporation are not likely to find it easy to make their choice.

* * *

The new mast on the top of one of the towers of Alexandra Palace is nearing completion at the time I write these Notes. It has been made in parts and is to be fitted together so as not to require the usual stay wires which are invariably used with high radio masts.

The cable from the Palace to Broadcasting House will permit of programmes from the studios in the West End to be sent on ultra high frequency to the transmitter at the Palace. It is expected that this will enable much better quality to be obtained, and it has the incidental advantage that when television is not being sent out the transmitter is available for sending out sound programmes.

Avoiding Duplication

Just how this cable will function and, in fact, how all the arrangements will work out in practice, remains to be seen, but it is the hope of the Post Office and B.B.C. engineers that the high-frequency cable may enable all the studio work to be done at the B.B.C. studios in the West End, using the apparatus at Alexandra Palace purely for the purposes of transmissions.

This would be the most satisfactory arrangement, as it would avoid the necessity for duplicating a lot of studio arrangements at the Palace, and would mean that artists could attend in the West End of London instead of having to make the journey to the suburbs.

HEARING THE ELECTRON'S FOOTSTEPS

—*continued from page 355.*

uneven pulses of current. The corresponding positively charged ions, on the other hand, plunge back towards the filament and there set up a further disturbance.

Finally, a considerable amount of secondary emission will occur, particularly in the modern multi-grid valve, as the main discharge stream strikes against one or other of the electrodes, on its way to the plate. The additional electrons so freed add their quota to the total volume of disturbance produced by intensive H.F. amplification.

Tube noise is only heard as a slight " rustle " under ordinary conditions, but as amplification is pushed up the rustle changes into a high-pitched " hiss." This finally increases in intensity until it becomes a full-throated " roar," which acts as an effective barrier to the reception of the distant signal.

DESIGNING SMALL MAINS TRANSFORMERS

—*continued from page* 366

different sizes of wire, we will use 16 s.w.g. and wind a similar coil to the one above.

The H.T. Winding

For full wave rectification we shall require a centre tapped winding, each section carrying one half the total current. So we must wind two similar coils each to carry 50 m.a. to the following particulars:

At 10 turns per volt we require $265 \times 10 = 2{,}650$ turns. The size of wire at 1,100 amps per sq. in. =

$$\frac{0{\cdot}050}{1{,}100} = 0{\cdot}000045 \text{ sq. in.}$$

From the wire table number 36 s.w.g. enamelled is the most suitable size. The diameter of this insulated is 0·0086.

Therefore number of layers:

$$\frac{0{\cdot}8}{0{\cdot}0086} = 93 \text{ layers.}$$

Turns per layer: $\frac{2{,}650}{93} = 29$ turns.

Width of coil: $29 \times 0{\cdot}0086 = 0{\cdot}25$ in.

Length of wire:

$$\frac{2{,}697 \times 7{\cdot}42}{36} = 555 \text{ yards.}$$

Weight: $\frac{555 \times 0{\cdot}544}{1{,}000} = 0{\cdot}3$ lb.

Two coils will be required to the above particulars.

The above completes the electrical design of the transformer, and most readers who intend building a transformer have their own ideas as to the mechanical details and construction of same; a few hints may not be out of place, however. If the constructor intends winding his own coils it will be necessary to construct a simple former of the type and size shown in Fig. 4, which is self-explanatory. The side cheeks can be cut from three-ply wood, and three sizes of centre pieces will be required. One 1·1 in. wide for the primary, two 0·3 in. wide for the heater windings, and two 0·25 in. wide for the H.T. secondary. The object of the four tapes is to tie the coil after winding, and so facilitate easy removal of the former. Before commencing winding a layer of Empire cloth should be wound round the centre piece, and as each layer is wound a strip of thin paper should be run on; this, besides serving as insulation will help to keep the winding more even. It is hardly necessary to say that all the coils should be wound in the same direction. When winding the H.T. secondary lengths of thicker wire, say 26 s.w.g., should be wound on to the coil to act as leads, the soldered joint being carefully insulated. If any taps are required on the primary or centre taps on the heater windings these should be made at the appropriate point in the winding. Upon completing the windings, each coil should be bound with a layer or two of cotton tape, given a coat of shellac varnish and placed in an oven to dry.

Mounting the Coils

In order to simplify core building, and at the same time protect the coils from the core, a thin fullerboard tube of the required section should be made, and the coils mounted on this. The primary in the centre, the H.T. secondary on each side, and the heater coils one at each end, all windings being in the same direction.

The core is built by passing the "T" stampings through the centre of the coil from alternate sides, and interleaving with the "U" stampings. Care must be taken that the insulated side of the stampings is placed next to an uninsulated side. It only remains to fit clamping plates and terminal boards, and these are left to the ingenuity of the constructor, one method of construction being shown in Fig. 3. The clamping studs should be well clear of the core.

SOME CAFÉ COLETTE PERSONALITIES

—*continued from page* 367.

act as compère. He is an Englishman but was called Dimitri because he was born in Moscow. His family were acrobats, and father, mother, and three children formed a variety act. On one occasion there was nearly a tragedy, for when Dimitri was in the middle of a complicated trick the rope on which he was swinging broke! Fortunately he landed on his feet, and the audience applauded loudly at the brilliance of the trick.

Remarkable Versatility

Mr. Vetter's versatility is remarkable, for he has had experience in almost every branch of the entertainment world—in circus, cabaret, musical comedy, drama, variety, pantomime, films, radio, television, and has designed scenery and costumes. "Film work is apt to be very trying at times," he told me. "Once I suffered from indigestion and a sore face for a week—after one day's work. We had eight re-takes of an early morning scene, and each time I had to shave and eat breakfast!"

Leo von Pokorny, who compèred the Café at its first reappearance, is an Austrian, born of English and Austrian parentage. It was not until 1925 that he took to the stage for a career, though he had always had it in his blood, his mother being a well-known dramatic actress who appeared in the 'nineties with Henry Irving.

Mr. von Pokorny claims to be the one person who was able to "dry up" Sir Herbert Tree. At an early age he was taken by his mother to see Shakespeare's "The Tempest," in which Tree was playing Caliban. In the course of the play the latter had to gnaw a bone, whereupon young Leo leant across the front of the box and loudly informed his parent, "Look, mummy, he's having his breakfast!"

Most of Mr. von Pokorny's early years were spent in the War, and he tells a dramatic story of how, when war was declared, he found himself in Germany. He and a young American who were on a walking tour together decided to escape as quickly as possible.

They entered a train in which was a contingent of German reserve troops. Mr. von Pokorny, in fear and trembling that his friend might be addressed and the fact discovered that he spoke no German, informed a suspicious official that he was under the influence of alcohol and did not understand anything that was said to him. Later, Mr. von Pokorny was asked to show his papers. Having none, he fumbled in his pocket and pulled out a cycling licence which he had borrowed from a young Austrian Hussar. The official pounced on it and took it for granted that he was the man mentioned on it.

A Difficult Task

In Munich they got American passports from the Embassy, and while travelling to the frontier Mr. von Pokorny, who spoke German like a native, found it very difficult to pretend that he was an American who did not understand a word of what was going on around him.

After the Armistice was signed, Mr. von Pokorny went with the Army of Occupation to the Rhine, where he stayed for six years. Afterwards an experiment in banking proved unsuccessful and he at last turned to the stage for a career, since when he has played every type of character part, specialising in foreign rôles.

TWO OF THE "AIR-DO-WELLS"

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shows—and, naturally enough, the cinema, since her husband is a director in the Fox Film Company. She entertains as much as possible, giving chiefly cocktail parties " because they can last till any time, and you can ask all sorts of people."

Her hobbies are many. In addition to those already mentioned, she reads and walks, does tap dancing, and is very keen indeed on ballroom dancing. Tennis is her favourite summer game. " I'd love to have a dog," she said, " but I don't think it's fair to keep one in a London flat."

I asked for her views on dress. She told me that she loved clothes, and designs many of her own herself. " Every woman ought to be interested in clothes," she said, " quite apart from the value they are in your job." Women, she contended, do dress to please men, but only up to a certain point.

" Isn't it very tiring and monotonous to be interviewed frequently ? " I asked Miss Atherton. " Oh no," she replied, " you get used to it. Besides, everyone who interviews you is different, and generally I find out more about the person who is interviewing me than the other way round."

RADIO HUMOUR!

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him where the licence could be found, detector vans (and incidentally engineers) considerably dropped in the old gent's estimation.

The world's different local times cause some measure of confusion in marine signalling. As witness this priceless exchange of comments between a foreign tramp and a crack ocean greyhound.

Freighter's operator calling liner with, " I say, mister, is it Summer Time in America ? " got a snappy " Repeat."

In broken English he laboriously repeated his question. No sooner had he " signed-off " than back came his answer, " No such luck, old man. It's winter in America and it's a bally cold one at that ! "

Then we have the case of the radio inspector, or maybe some junior operator, testing a ship's gear in the neighbourhood of a busy northern harbour, his powerful signal continually blotting out adjacent transmissions. A nearby coast station switching on full power slowly spelled out, " Tester, stop transmitting. Say, who are you ? " was quickly silenced by an unsigned reply, " Me ? Why I'm Barnacle Bill the Sailor. Hands across the sea ! "

The ship's name was " Gogovale," but after calling the nearest coast station the junior operator had the utmost difficulty in getting beyond the initial letter of his vessel's name. He rubbed out and commenced again, " Go—Go——" Rub out. " Go—go——" Rub out. " Go——" when a long dash from the distant station interrupted his efforts.

Hastily tuning his receiver he intercepted the coast station's cryptic signal—" Go to hell yourself ! "

SHORT-WAVE DEVELOPMENTS

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front of a short-wave superhet. The tuned circuits of the latter are set at about 50 metres (6,000 kc.), so that the whole arrangement works as a double superhet with conversions from 60,000 kc. to 5,000 kc., and again to 475 kc. The overall gain is colossal.

Fig. 2 shows a rough schematic arrangement for such an ultra-short-wave superhet. The 5-metre autodyne unit is extremely small and cheap to construct, and may be used separately or with a quenching stage if desired.

Incidentally, in the States the 10-metre converter is also very popular. Over there many short-wave enthusiasts own very sensitive commercial superhets which do not go below 13 metres or so. Rather than build a complete set of coils for 10 metres (which would be a monumental task in the case of some of the big sets) it is becoming the fashion to use a separate converter, and to tune the short-waver to something between 60 and 80 metres.

Super-Regen. Experiments

I have recently been testing out a 5-metre super-regen. on 10 metres, by simply substituting a new pair of coils. It is interesting to note that only the very strongest of the American phones can be heard on it. Any signal that is less than about R 4 on my ordinary straight receiver is quite swamped by the mush on the super-regenerator. Anything that is R 5 or R 6 on the straight set immediately becomes R 9 plus on the " super " —but that just proves the point that the super-regen. is going to be of little or no use for serious D X work.

BROADCASTING IN BRITAIN

By A Visitor to England

DURING the last ten years my job has taken me into four continents and very many countries. The experience has also kept me in hospital for the last three months. During the whole of this time my interests and, latterly, my enforced idleness, have brought me into touch with broadcasting under many varying conditions.

The B.B.C. Service

It has been amusing visiting the world's finest record library in Uruguay, watching amateur broadcasters in Mexico and Milan, hearing world-renowned stars in the U.S.A., and, greatest surprise of all, finding South African stations closing *every* night with "God Save the King." But it is refreshing to come to England and find that the service provided by the B.B.C. can well hold its own in comparison with any of the overseas organisations.

The hospital where I have reluctantly spent my recent weeks was equipped with headphones. Only the Regional programme was received, but this was sufficient to relieve many weary hours of boredom and pain. The results of this concentrated listening, on the "carrier wave" of my foreign experiences, are very interesting.

The outstanding point which strikes a visitor is the absence of organised criticism in this country. While the technical writers and a few independent professional critics do their best to express their own views, the listeners, as a whole, seem to have no public outlet for their opinions. The correspondence received by the B.B.C. must be enormous; but it is all kept very secret, and its actual effect on policy is probably very small indeed.

Advisory Bodies

Power seems to be held almost exclusively by advisory bodies who are in no sense representative of the average listener. The consequence is that the B.B.C. discloses only those criticisms which suit its purpose. Independently published complaints are often maldirected and woefully misinformed. Too much smoke seems to be put up by very minor matters—crooners, variety at 8 p.m., and what not. The larger questions are successfully hidden in the haze.

There is, for instance, this policy of so-called decentralisation. I gather that this has acquired popularity during the last year or so. It seems to the rabid Englishmen I have met to mean the encouragement of nationalistically-minded groups on their borders (and even in their midst) to impose their views or, at any rate, their tongues, on the average listener in their district. Scottish, Welsh, Northern and Western stations all claim to seek freedom from "Southern influence," whatever that may mean. This matter of foremost importance is becoming hopelessly involved with the over-publicised question of "alternative programmes."

In this country this business of alternatives has been carried much too far. In no other country is there such an uneconomic, extravagant wastage of valuable programme material. In no other country has such consideration been given to the user of cheap receivers. It seems illogical that the whole B.B.C. policy should be moulded by the habits and preferences of those who lately were satisfied with their one distant cinema. This, mark you, to the detriment of those who live in more civilised parts or who have provided themselves with reasonably modern sets.

Fewer Alternatives

My plea would be for fewer alternatives and not more. Only a small percentage of licence-holders are listening at any one time. A good programme can afford to be repeated by the same station for three or four days before doing a tour of the other regionals. At present, once a programme is missed for any reason, it is gone for a year or two, if not for ever. That makes me mad; until I *had* to listen I did not realise the good stuff [illegible] times that I had been missing. Given a run of a reasonable period, the professional critic and the wireless Press can then come into their own. No longer must they confine their efforts to the attempt to "pick the winners" from the night's programme. In what other branch of artistic criticism is judgment passed on an event before its occurrence?

On this subject of criticism comes a suggestion from my hospital experience. In the hospitals is a ready-made collection of average persons. With time on their hands and a magnified critical sense they can provide an index to programme success. Let the B.B.C. supply critic cards to the patients of a test hospital in London and give the best reporter a prize daily. And they can keep it private if they want.

I repeat that, to a visitor, it seems that the B.B.C. are doing their job as well as a public organisation can do it. But for that reason it is essential that listeners should retain their rights of public criticism. Correspondence is not enough. To an independent observer it seems that discussion of the affairs of the Corporation should be much more freely ventilated. Let us hope that in the consideration of the renewal of the B.B.C. Charter this vital question will receive the attention it deserves.

"HOW I WAS CONVERTED TO RADIO"

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capable of adequately reproducing such a broadcast? This is a problem which will never be fully solved, though a really good music conductor should always know what sort of a reception listeners accorded his performance.

I myself do not, as a rule, listen-in very frequently, though just lately I have switched on the radio more often than usual. To be quite candid, I must say that the quality of reproduction in radio sets is advancing more and more towards complete perfection, especially as regards instrumental music.

Here we can ask how the standard of a wireless concert may be improved. The standard of our wireless entertainment depends not only on the clearness of the reception but on the quality of the reproduction itself. We must realise that the radio listeners of to-day do not desire to tune-in to so many foreign stations as was formerly the case.

Musical Perfection

What they chiefly want is to obtain perfect reception of a perfect concert, aided as far as possible by technical and scientific facilities.

So the improvement in wireless reception of a musical piece depends not only on the stations and various transmitters but on listeners' requirements as well. That is why I believe that in the end wireless will really be able to transmit a perfect musical performance as far as it is humanly possible to achieve perfection."

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