

# SPECIAL SHORT-WAVE FEATURES

# Popular & Wireless & TELEVISION TIMES

CATHODE-RAY  
SCREENS FOR  
TELEVISION

EVERY  
WEDNESDAY  
PRICE

# 3<sup>D</sup>

No. 775.  
Vol. XXXI.  
April 10th, 1937



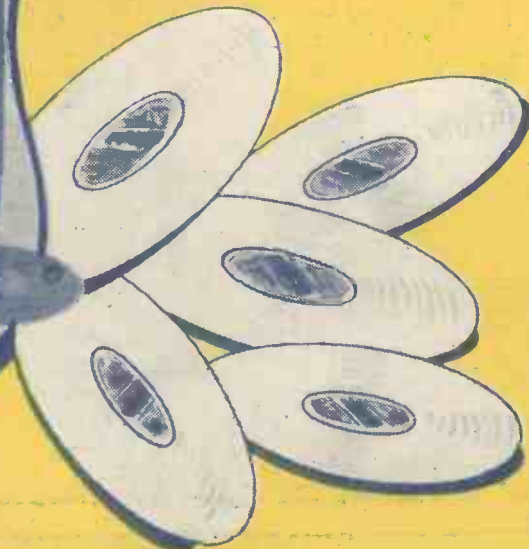
*Also This Week :*

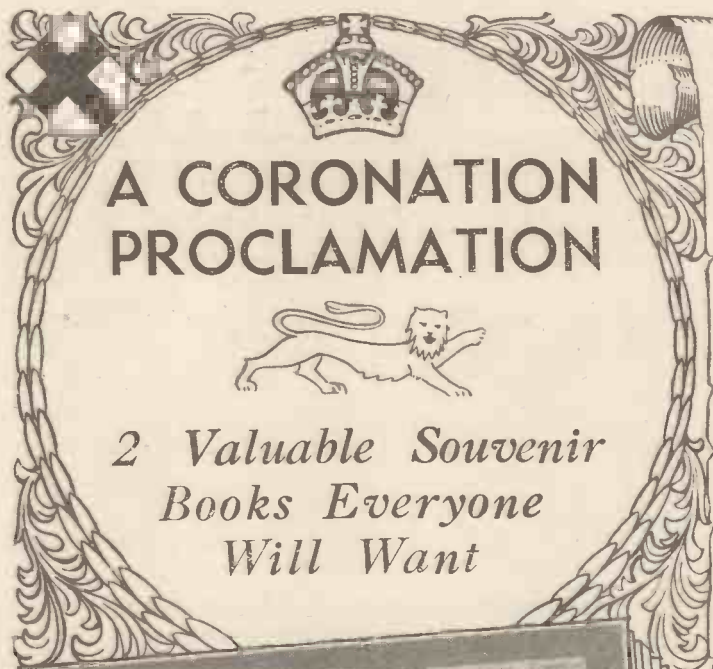
**ADDING A PICK-UP  
TO YOUR SET**

★ ★

**REPRODUCING  
RECORDS**

Our cover photograph shows Miss Sally O'Neil, well-known film star, selecting some records to play over on her Marconiphone Universal Radiogramophone, model 392.





**A CORONATION  
PROCLAMATION**



*2 Valuable Souvenir  
Books Everyone  
Will Want*



**For KING and  
EMPIRE**

This fascinating book is an inspiring and permanent souvenir. In its 66 photogravure pages will be found a host of absorbing features and 190 marvellous illustrations that will help you to understand Britain's just rule over millions.

*A few of the contents :*

- A MONARCH IN THE MAKING**
- MEN WHO RUN THE EMPIRE**
- THE ROYAL FAMILY ON THE THRONE**
- EMPIRE PEOPLES OF EVERY RACE**
- HOW WE HOLD THE EMPIRE**
- A CRUISE ROUND THE EMPIRE**
- SYMBOLS OF KINGSHIP**
- CORONATION SOUVENIRS**
- THEIR MAJESTIES KING GEORGE VI  
AND QUEEN ELIZABETH**
- THE BRITISH CROWN : KEYSTONE  
OF THE EMPIRE**

*Souvenir*

**CORONATION  
SONG BOOK**

The perfect musical souvenir. Contains all the national favourites that British people love to hear. Words and music of 46 grand old airs, with an impressive Ceremonial March, specially composed by A. Morris-Gilbert.

*Contents include :*

- ALL THROUGH THE NIGHT**
- ANNIE LAURIE**
- CHARLIE IS MY DARLING**
- DRINK TO ME ONLY WITH THINE  
EYES**
- HARP THAT ONCE THRO' TARA'S  
HALLS**
- HERE'S A HEALTH UNTO HIS MAJESTY**
- HOME, SWEET HOME**
- LAND OF MY FATHERS**
- LONDONDERRY AIR**
- MAPLE LEAF FOR EVER**
- THE MARCH OF THE MEN OF  
HARLECH**
- MEETING OF THE WATERS**

*On Sale at all Newsagents and  
Bookstalls.*





Editor: G. V. Dowding

Asst. Editors: A. Johnson-Randall, A. S. Clark

**SOCIETY NOTE**  
**AIR SAFETY**  
**HENRY HALL**

## RADIO NOTES & NEWS

**THEY SAID IT**  
**CONSEQUENCES**  
**WAR IN THE AIR**

### Serenade in the Night

THAT "Romeo" chap has been writing me again. He cheers me with twin meeds of praise, one being coupled with the name of Dr. Roberts, whose Technical Jottings "Romeo" greatly admires. But oh, what a mess they have landed him in! This is "Romeo's" own account:

"Notify the doctor that I took his advice a few months back and bought an electric alarm. Result perfection, till this 3 a.m., when the blighted thing got buzzhooting *ad continuum*; put it under pillow, shoved it down bottom of bed, laid on it (to consternation of solar plexus), knocked it on table, walloped it on back, shook it dizzy, smacked it on top, tried to pull its gizzard out, but nary the slightest dim of its infernal row."

After rousing next door, also people opposite, windows opening everywhere, and all that, the good "Romeo" surprisingly says "Give my salaams to the doctor." This I gladly do, for 'tis the perfect example of the proverbial bygone having gone by unmolested!

### Society Note

THE International DX'ers Alliance has just commenced publication of a new journal, "Ama-Touring," which is supplied free to all interested members. "Ama-Touring" is unique, being devoted entirely to amateur news, compiled from the regular reports of members all over the globe.

The London Chapter of the DX'ers Alliance holds informal monthly meetings at the Chequers Restaurant, Essex Street, Strand, W.C.2, and visitors and prospective members should get into touch with Mr. J. Knight (2AA), 6, Fleetwood Street, London, N.16.

(NOTE: In hospitality London Chapter is well Verscd.)

### The Parliamentary Touch

JOSH BILLINGS once said, right out, that he was not a politician, and his other habits were good. (Crafty and subtle guy, old Josh.) What I was going to

say was that some of these Broadcasting House boys ought to be politicians. Ask 'em a question and you get an answer all right; but it may not be the answer to your question.

### ON OTHER PAGES

The Dial Revolves	-	Page 104
Practical Pointers	-	Page 105
Seen on the Air	-	Page 112
Television Topics	-	Page 115

As the arithmetic examiners say: "Give an Example." Example herewith:

There was recently a rumour that the North-East Regional would not be on the air this autumn, as expected, but might stick around till Christmas. So the question was put to the B.B.C.: "Will North-East transmitter be ready in autumn?"

### PIONEERS OF BRITISH RADIO



Mr. Leslie McMichael (seated) and Mr. R. H. Klein, joint managing directors of McMichael Radio, Ltd. This firm recently announced a profit for the past year of £29,731.

The reply was that owing to shortage of skilled labour, etc., there was a certain amount of delay, but the new short-wave transmitter at Daventry was practically certain to be ready for the

Coronation. You see, the real Parliamentary touch.

### Safety in the Clouds

ANOTHER step towards safer flying has been taken by the Air Ministry. They have instructed R.A.F. pilots who encounter ice-forming conditions to notify their bases at once by wireless, giving all possible details of the danger-zone. This information will then be passed on to the Air Ministry Meteorological Office, which in turn will arrange for an immediate notification by wireless phone from our old friend Borough Hill, the Daventry long-wave station.

### Here's to the Next Time

SO Henry Hall, soon after celebrating his fifth "birthday," on the air, is going to leave the B.B.C. in the autumn, and take the boys with him on a tour of the halls. At Henry's own wish the Dance Orchestra's engagement will cease on September 25th, taking with it a record of over 2,000 hours of car-cheer.

Hold back your tears long enough to realise that this is no final cut-off, for when its engagements permit the band will frequently broadcast. But all the same, this is a wrench—as the hold-up man said to the garage-hand when he cracked him on the head with one!

They say that back in 1922 Henry was playing the piano at a Brighton cinema. That is, he was playing it till the manager heard his new pianist at the first matinée, after which he promptly fired Henry, with an earnest admonition to take up a career in which no music was required.

I've never had the gall to mention the incident to Henry, but I hope it's true for the sake of the come-back. Oh, boy, what a come-back, when you remember that Henry can now claim over a quarter of a million letters of appreciation of his music!

(Continued overleaf.)

**NEXT WEEK: SPECIAL PUBLIC ADDRESS NUMBER**

# TELLING THE BROADCASTER WHAT THE LISTENER THINKS

## Problems of Domesticity

WHEN I told you not long ago of the Problem Hour of one of the U.S. stations, in which real domestic problems are aired (under suitable pseudonyms) I little dreamed of the dramatic heights to which this feature would ascend.



The broadcasts became increasingly popular as the problems got person-aller and person-aller, until at last high-water mark was reached by a married man. His problem, which he assured listeners was wrecking his married life, was the sort of problem that pre-marital prudence could not guard against—**HE HAD MARRIED A WOMAN WITH ICE-COLD FEET!**

While she slept soundly, happy in the knowledge that she had a loving husband, her wretched partner lay awake half the night, nervously dreading any sleepy movement that might bring the South Pole from her side of the bed, and wondering to himself should he tell, or should he abdicate?

He implored his listeners to suggest some way to save the wreck of his marriage, but up to the time of writing nobody has come forward with a guaranteed cure for wifely cold feet.

## They Said It

IN a recent broadcast: "Practice always seems to be ahead of theory in wireless matters."—Professor E. V. Appleton.

"The B.B.C. is preparing a questionnaire for regular television viewers.

"Why not take them both out to lunch?"—"Era."

"The (interference) situation is becoming more and more alarming."—The International Broadcasting Union, in an official statement.

## Laugh, Clown, Laugh!

LAUGHTER raised by the radio comedian has never been so well described as by the late Dave Freedman, whose death I reported recently.



Dave said that one kind of laugh, dignified and refined, was usually operated by a light irritation of the tonsils. He called that kind of laugh the titta-ma-titta, or laugh of refinement, because if you are in evening clothes it is guaranteed not to wrinkle your high collar.

The other kind of laugh reaches from Adam's apple to waistline, massages your body, wilts your collar, wrinkles your frock coat and de-blues your whole horizon. Dave called it the yoktcha-da-boktcha.

There are no in-between laughs, said Dave; every radio witticism that leaves the loudspeaker is either a titta-ma-titta or a yoktcha-da-boktcha.

## Consequences

HERE'S a thing, and a very funny thing, and who d'you think told me of this very funny thing? Well, I'll tell you.

I got a letter from a Yorkshire matey who has been reading these Notes of mine for nine solid years; and he reminds me that when the Yuletide spirit was thick upon him he sent me a Christmas card, which I (always the Little Lord Fauntleroy) duly acknowledged in print.

## BROADCASTING BREVITIES

A BARRIE PLAY: National, May 10th.

On the Monday of Coronation week, a play by Sir James Barrie will be broadcast in the National programme. The play selected for this first opportunity listeners have had of hearing over the microphone any of the great dramatist's works is "Dear Brutus." First produced at Wyndham's Theatre in 1917 with the late Sir Gerald du Maurier in the leading rôle, it met with instantaneous favour and has since been frequently revived. The broadcast version will be produced by Val Gielgud, and a distinguished cast is being assembled.

## "IN TOWN TO-NIGHT."

Five continents will be represented by interesting and picturesque personalities who will come to the microphone during the Coronation week broadcasts of "In Town To-night."

Europe, Africa, Asia, America and Oceania will be represented on successive nights from Monday till Saturday (with the exception of Coronation night). Chosen from the multitude of visitors to the Metropolis for this historic and memorable week, they will bring to listeners a unique picture of life in all parts of the world. Who they will be, however, must remain a secret until a moment before they broadcast.

Time marches on, as indicated by the dots . . . . . Well, one day my Yorkshire matey visited his optician in a neighbouring city. They talked of this and that, eyestrain, do-you-read-much and such, and lightly touching on wireless subjects in general they came down to POPULAR WIRELESS. Finding themselves to be brother readers, the optical gentleman said to my matey: "Did you see that somebody in your burg sent ole 'Ariel' a card at Christmas?" and my matey delightedly said "That was me!" So there they were up in Yorkshire, practically strangers, but suddenly made almost blood bredder'n by your humble scribe, who has never seen either of them.

You can call it the Long Arm of Co-incidence, if you like, but I call it Great Fun—to make friends on paper, who make friends in Yorkshire!

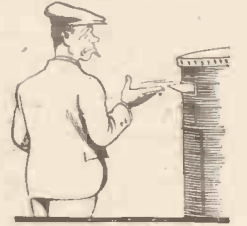
## Eiffel Tower's Latest

HOW many times I have had to record the activities of the Eiffel Tower radio station in these Notes I should not like to say; but it has been making radio history in various ways nearly as long as Marconi has.

Now comes the news that Eiffel Tower has ordered itself a commercial television broadcasting station—a 30-kilowatter—which will be the most powerful in the world. Moreover, the Eiffel Tower aerial is to be 1,100 feet above the ground.

## Aluminium Aerial Equipment

FLATTERINGLY beginning his letter with the remark, "You are a deep customer, 'Ariel,' a Sheffield reader of 'P.W.'" deceives me only momentarily; for I perceive that the real reason of his letter is not the complimentary bestowal of bouquets, but a good old Yorkshire thirst for information. He wants to know all I can tell him about the use of aluminium for aerial masts.



Well, not being in the aluminium trade myself, my aluminium information is by no means recondite. I remember that there was talk some years ago of the good results given by an aluminium mast at the Naval Station at Lakehurst, New Jersey (Lakehurst is the airship Hindenburg's terminal port, so perhaps aluminium is regarded there in much the same way that your Novocastrian regards a lump of coal).

If I add that I remember that the Yanks always pronounce the word as "a-loom-in-um" I shall have made a clean breast of my information on a subject which not even Sheffield United shall persuade me to return to.

## War in the Air

SEVERAL kindly readers have written to tell me of this mystery station on about 29 metres which has been broadcasting Communist propaganda in German.

It announced itself as "the transmitter of the Communist Party in Germany," and its broadcasts were certainly not likely to be mistaken for a relay of a meeting of enthusiastic Hitler Youth.

So do not be surprised if you tune-in to a lot of rudery and jamming on 29 metres and thereabouts. There is, alas, nothing like a civil war for the promotion of incivility.

## The Radio Back-Answer

GLORY, laud and honour to Dr. Neil Monroe Hopkins, electrical inventor, who has developed apparatus which will indicate, in the studio, what the radio audience thinks of a turn being broadcast from there.

The device, easily attached to the receiving set, enables any listener to signify his approval or disapproval of what he is hearing. This news is the best tonic that John Listener has had for many a full moon.

In the sure and certain hope that the device will be improved by fitting to it at the studio end a shot-gun, tomahawk, mailed fist and bomb-thrower, I acclaim it as an invention of rich promise.



ARIEL

# CATHODE-RAY SCREENS FOR TELEVISION

By Dr. J. H. T. Roberts

Although a great deal has been published about the circuits and electrical arrangements for television, very little has been said about the cathode-ray screen, which is the "eye" of the receiver. Our Scientific Adviser here tells you something of this fascinating subject.

IT needs no words to emphasise the importance of the fluorescent screen in television (and in cathode-ray work generally), and you can readily appreciate that a very great deal of research work has been carried out—intensified in the last two or three years with the impending advent of television—to study the properties, characteristics and behaviour of different types of material of which such screens may be made up.

## How the Screen is Made

You probably know that the screen is made by depositing on the inner surface of the glass a layer of finely-ground material, usually a crystalline mineral which, under the impact of the cathode rays, will give out light, or "fluoresce" as it is called. One of the commonest substances used up to recently was willemite, a natural crystalline mineral, and this was ground up into very fine powder—looking very like fine brown sand—and then made into a rough suspension in alcohol and flooded over the surface, the alcohol evaporating and leaving the powder clinging to the surface.

It is most important to distinguish between fluorescence and phosphorescence, terms which are often used indiscriminately by technical writers but which, to be exact, represent two quite distinct phenomena. Fluorescence is the emission of light by a suitable substance due to the influence of cathode rays, X-rays, or some other short-wave radiation, whilst such influence is actually in operation. Phosphorescence, on the other hand, is the emission of light by such a substance, due to the same influence, after the exciting influence has ceased.

Phosphorescence is sometimes referred to as the "fluorescent lag," because for practical purposes it is equivalent to the light not "shutting off" the moment the exciting cause is removed. Different substances exhibit great differences in the amount of phosphorescent lag: in some cases it amounts to a small fraction of a second, whilst in other cases it will continue for many seconds or even for many minutes.

## The Lag Must be Small

For television purposes it is very important that the phosphorescent lag shall be very small: some people say that there should be no phosphorescence at all and that the luminosity of the screen should cease the instant the exciting cause is removed, whilst other people say that a very slight amount of phosphorescent lag lends continuity to the picture and reduces the sensation of flicker. If the scanning spot in a television receiver is moving comparatively slowly, a certain degree of phosphorescence in the screen will not be so important as if it is moving comparatively quickly.

A good deal of research work has, therefore, been devoted to the subject of phosphorescence, with the object of reducing the phosphorescence to a minimum. Some idea of the duration of phosphorescence in a few of the principal fluorescent substances used for cathode-ray screens is given by the table on the next page.

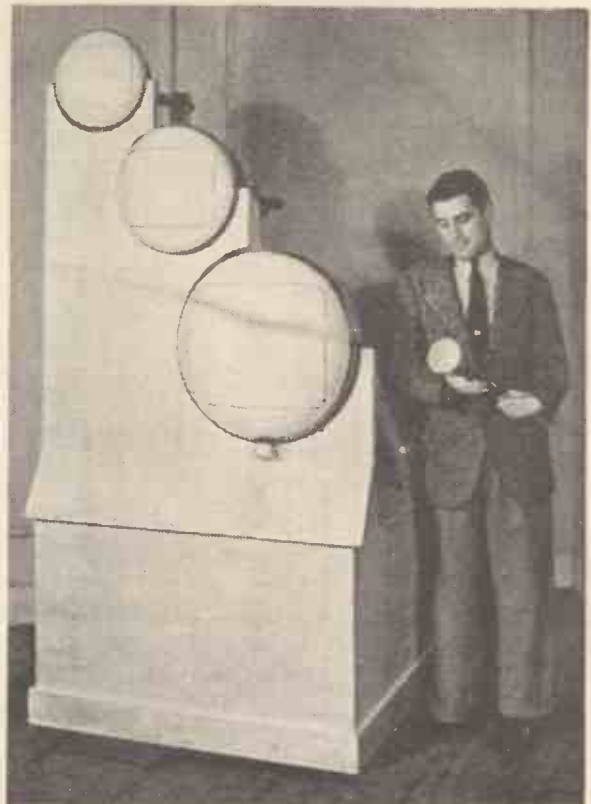
The production of luminescent substances is now a specialised branch of inorganic chemistry. The substances most commonly employed are those shown in the table, and extraordinary precautions are necessary in order to obtain the best results. The materials must be as free as possible from every trace of certain foreign substances, notably of certain metals, which seem to act as "poisons" and greatly diminish the intensity of the light emitted. The amount of impurity which is prejudicial is in some cases so small that the materials have to be prepared under what might almost be called "aseptic" conditions, similar to those necessary in a bacteriological laboratory, in order to ensure the absence of the slightest trace of impurity.

## Using an Activator

Some substances, such as calcium tungstate and cadmium tungstate, give their maximum luminescence when they are prepared pure; but in other materials, notably zinc sulphide and zinc silicate, there is very little luminescence until an activator is introduced.

This activator is called a "phosphorogen." The amount of phosphorogen required is very small, usually one part in 10,000 to 100,000 parts. Most luminescent substances develop their special properties best when in crystalline form. Accordingly they are prepared in very pure condition, the necessary phosphorogen, if any, is added and the preparation then heated to a sufficiently high temperature, with or without flux, in order to induce the material to crystallise, after which it is ground up into suitably fine form. This, naturally, is a highly skilled operation.

In some substances, such as the platinumocyanides, the substance is soluble in water and so can be crystallised out from the solution. Such substances are, however, destroyed by heating, and inasmuch as a cathode-ray tube has to be subjected to fairly high temperatures in the process of manufacture, the platinumocyanide type of



William Taynton, the first man ever to be televised (by Mr. J. L. Baird in 1926), holding a small laboratory-type cathode-ray tube. On the stand are 12, 15 and 22-inch Baird "Cathovisor" tubes.

fluorescent screen is not in general suitable for this purpose.

I have said something about the undesirability of any pronounced degree of phosphorescence—that is, "after-lag." It has lately been discovered that if zinc sulphide is used for the screen, and a very minute trace of nickel is suitably introduced, the phosphorescence is practically eliminated. The amount of nickel required is less than one part in two million and nickel appears to be the only substance which acts in the required manner. The nickel is referred to as the "killer." This discovery (made by Levy and West) is already having a very important influence on the manufacture of X-ray and television screens.

## Substances Employed

Now as to the different types of substances used:

(1) *Natural willemite* is not commonly employed, the usual material being *synthetic willemite*, which is artificially-produced zinc silicate. This displays green fluorescence and some phosphorescence under cathode-ray bombardment, and is specially sensitive to low-speed electrons, corresponding to voltages of 250 to 300

(2) *Calcium tungstate*. This gives a blue-violet coloured emission, and has been for many years past employed for the manufacture of intensifying-screens for X-ray apparatus.

(3) *Cadmium tungstate*. This gives a very pale blue colour, and is useful for

(Continued overleaf.)

## CATHODE-RAY SCREENS FOR TELEVISION

(Continued from previous page.)

television purposes, because the picture appears to be substantially black-and-white. It has the practical drawback that high voltages have to be employed in order to produce a picture of sufficient brilliancy.

(4) *Zinc phosphate.* Zinc phosphate gives a red fluorescence and also a red phosphorescence. It finds application in those cases where a visible residual trace is required after the exciting beam has ceased to act on the screen.

(5) *Zinc sulphide.* Different varieties of zinc sulphide preparations are by far the most suitable fluorescent substances so far developed for cathode-ray tubes. The brilliancy of fluorescence produced by these substances with a given voltage far exceeds that obtainable with any other luminescent chemical.

The illumination of screens in cathode-ray tubes for television is of paramount importance, and it is essential to obtain the maximum brilliancy with the minimum voltage, owing to the fact that the cost of receivers increases rapidly with increase of voltage.

The illumination of the screen at the surface which faces the electron stream and at the surface against the glass are not the same. The difference will depend upon the thickness of the fluorescent screen, the transparency of the fluorescent material, its grain-size and the nature of the adhesive medium employed for fixing it against the glass. Obviously the surface which faces the rays will be brighter than the surface next to the glass, which is the one the observer looks at. All these points have to be kept in mind in the choice of a fluorescent material and in the method of its preparation.

### The Question of Colour

The colour of the fluorescence is of great importance in television. Brilliantly coloured images do not seem to make a general appeal. An image which is black-and-white, or nearly so, is preferred for general purposes. A very slight amount of "warm" tone, such as pink or sepia, or even of yellow, is not objectionable, but a greenish white tint does not seem to be acceptable to most people, as it gives the picture a very "cold" appearance.

What you would call the colour of the picture, by the way, is the colour of the parts at low intensity, since the very bright portions always seem more or less white. It is interesting to note that zinc sulphide and zinc-cadmium sulphide can now be prepared so as to emit fluorescent light of practically any colour, this being brought about by varying the phosphorogen employed, and also the relative proportions of zinc sulphide and zinc-cadmium sulphide. Preparations displaying white fluorescence can be obtained by mixing together two

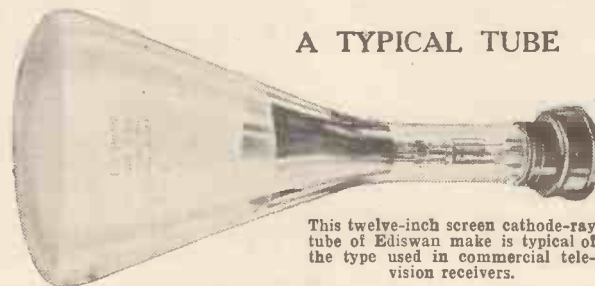
or more fluorescent substances displaying highly coloured fluorescence, the colours being selected so as to make up white; for example, blue and reddish orange will so combine.

The question of the *grain* of the powder is quite important, as you will see. The scanning spot over a normal picture 8 inches high will be about 0.5 millimetres in diameter and, generally speaking, therefore the particle size of the fluorescent substance is immaterial from this point of view, as it is always far less than this: usually the particle size is much less than 0.1 millimetre.

In spite of this, however, a fine particle size is important, as it facilitates the production of a screen which is uniformly coated, and which therefore exhibits a uniform degree of illumination over the whole of its surface. Very fine particles also, being lighter in weight, require less adhesive material to fix them on the glass than coarse particles.

As regards the application of the powdered substance to the glass, a method has been developed in which the glass is coated with a suitable adhesive, the fluorescent powder being then blown on to the sticky surface so that a more or less uniform amount sticks on and the rest falls off. This method has several advantages, one of which is that in general the particles only touch the sticky substance at the side against the glass, and do not get coated—that is they remain naked—on the side facing the rays.

As regards the application of the powdered substance to the glass, a method has been developed in which the glass is coated with a suitable adhesive, the fluorescent powder being then blown on to the sticky surface so that a more or less uniform amount sticks on and the rest falls off. This method has several advantages, one of which is that in general the particles only touch the sticky substance at the side against the glass, and do not get coated—that is they remain naked—on the side facing the rays.



A TYPICAL TUBE

This twelve-inch screen cathode-ray tube of Ediswan make is typical of the type used in commercial television receivers.

Research on luminescent materials during the past two or three years has resulted in the production of luminous sulphides suitable for cathode-ray tubes, the efficiency of which is at least three times as great as the highest values previously obtainable. The maximum amount of light now obtainable amounts to between four and five per cent. of the energy input. It is impossible to say whether this figure will be materially increased in future, but there is still ample scope for development.

In particular, the production of luminescent substances specially sensitive to *low-speed electrons* should lead to important further improvements, because it would open the field for television apparatus involving only comparatively *low voltages*. It is evident that we have only touched the fringe of the possibilities of luminescent materials, and it seems highly probable that the future of television developments

will be bound up very closely with developments in this particular sphere.

My space is at an end, but those of you who would like further and more detailed information should consult the most interesting paper of Dr. Levy and Mr. West in the Journal of the Institution of Electrical Engineers, read before the Wireless Section in March last year, from which much of the foregoing information is extracted.

## THE G.E.C. ALL-WAVE SIX

Exceptionally good quality and remarkably high sensitivity are two of the features of this attractive design.

THIS is a magnificent example of 1937 all-wave radio in which the short-wave and ordinary broadcast bands vie with each other in efficiency and ease of handling. There are still many short-wave fans who consider that a separate and special receiver is essential for the effective reception of the higher frequencies, but this G.E.C. set finally disproves this theory. It does more: it brings within reach of the listener who knows nothing of Q.S.L. cards, band-spread and other such things all the interest, entertainment and thrills that are to be found on short waves.

A few evenings spent with this set provide a revelation of the enormous potentialities of world-wide entertainment. Broadcasting stations in America, Japan and other distant quarters of the globe are as easily tuned-in as the continentals. Whereas the owner of any ordinary set can switch over to the recorded advertising programmes operating across the Channel on Sundays, anyone with the aptly named G.E.C. All-Wave Six has six continents at his disposal.

### Like the Local

On a recent Sunday evening we listened uninterruptedly to "Opera Auditions of the Air," a "Grand Hotel" play, and a Thatcher Colt detective mystery episode coming over from W 2 X A D of Schenectady, New York, on 19 metres, with the clarity and quality of a local station; the A.V.C. of this fine G.E.C.

set being so good that the effects of fading were entirely eliminated.

The alert visual tuning indicator revealed, by its wide fluctuations of illumination, that the fading was worse than usual; but it had no effect on the programme, which maintained a wonderful constancy of volume.

W I X A L, on 25 metres, with its "newscasts" and other interesting features, was likewise receivable at any volume up to a deafening roar. Also were W 2 X A F and W I X K (America) and Havana and Cuba on the 31-metre band.

And, as we have said, these and many other short-wave stations can be tuned-in with supreme ease. You merely rotate the one tuning control slowly, and they will roll in one after the other.

There is a "micro-tuning" pointer that bears the same kind of relation to the

(Please turn to page 120.)

# ON THE SHORT WAVES



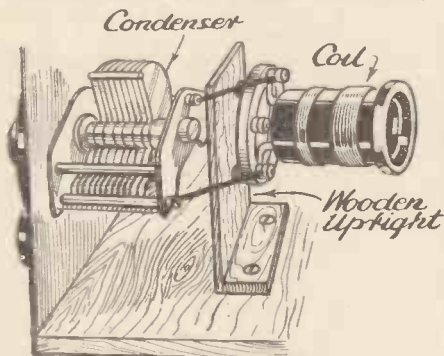
## SOME READERS' IDEAS

W. L. S. discusses several of the suggestions sent in by short-wave enthusiasts.

**N**OW and then, strange as it may seem, I pick up a few ideas from my readers, instead of having to cudgel my brains to give readers something new. And this week, being imbued—for no reason except that the sun is shining—with the holiday spirit, I have decided to give myself a rest and to let readers do the work.

If the rest of you prefer this, and think that this feature has been improved thereby, please send in as many brainwaves as you can, and I shall be able to retire on pension, just acting as a kind of readers' secretary for the rest of my life.

### CONVENIENT FOR WIRING



A reader suggests mounting the coils on a little pillar fixed behind the tuning condenser.

First let me clear off the sketches on this page. They come from the same reader, who says that he is thoroughly fed up with these conventional lay-outs of panel and baseboard. He wants something striking—never mind whether it works or not!—but its got to be different.

So he proceeds to show me how to be different, by mounting the coils on a little pillar that sticks up behind the tuning condenser; and, next, by affixing the coil holder to the tuning condenser itself.

#### For Easy Coil Changing

All very good from the wiring point of view; but it seems to me that it's going to be beastly inconvenient for coil-changing when one has to dive behind the panel and pull the things out away from one; so to speak.

This reader, however, thinks of everything, and also puts forward a suggestion that short-wave sets should be housed in cabinets and made to look good nowadays. Since no one will want to open up a cabinet and do a lot of coil-changing, says he, arrange the coils so that their top rims protrude through a hole in the panel. This

idea was used a while ago in a "Popular Wireless" set design.

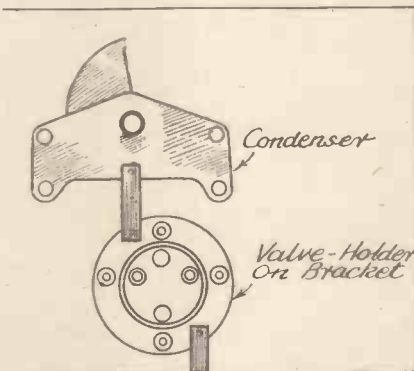
One of the snags of modern short-wave design, of course, is that really efficient sets have more than one tuned circuit. A super-set with four tuned circuits is going to be a real handful for coil-changing, until manufacturers bring out some "coil-blocks" comprising four matched and screened coils, all in one unit, which plug-in in one operation.

The Americans have them; the receiver I am thinking of has a kind of "slab" with a handle at each end; this contains four complete sets of coils and plugs into the front of the panel.

On the other hand, some of the American commercial short-wave sets have wave-change switching throughout—and very efficient they appear to be.

Next reader, please! Right—here's one with an extremely long letter on the subject of our new Certificate, which is to replace the present "Verified All Continents" affair after April 30th. He suggests (a) that we make it necessary for claimants to have heard all continents on each band; or (b) that we divide up the world into "zones"

### AN ALTERNATIVE SCHEME



Another brainwave from the same reader is to support the coil holder on brackets attached to the baseboard and condenser, as shown here.

(about twenty-five of them) and make it necessary for claimants to produce "veri's" from, say, twenty-three of them.

To let the cat out of the bag, I was thinking of a scheme very much like the latter one. The Heard All Continents on All Bands is all very well, but can it be done? I know it can, on the amateur bands, but we mustn't tie the whole thing down to amateur transmissions.

Now many people have heard all continents on 25 metres, 31 metres and 49

metres, for a start? A possibility would be to divide the short waves up into groups, and to award a certificate to anyone who produces evidence of receiving all six continents on (1) 10-15 metres; (2) 15-30 metres; and (3) 30-50 metres. Ten-metre reception would thus be a necessity, and each group would include one amateur band. I wouldn't mind betting, though, that there are very few readers who could claim a certificate under these circumstances, sending in a complete set of eighteen verifications.

#### Call-book Wanted

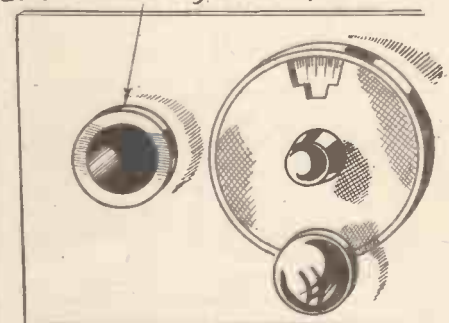
Here's an "idea" of a different kind: R.D.L. (nr. Manchester) suggests that some reader with a 1936 Amateur Call-Book might possibly like to exchange it for a large number of back copies of "P.W." This business of exchanges between readers is all to the good, and I have had several letters thanking me for putting someone in touch with someone else, as they have got together and solved each other's difficulties. By the way, the full address of the reader mentioned above is: R. D. Lewis, 9, Douglas Road, Worsley, nr. Manchester.

C. W. (Exeter) raises a strong protest about the fashion prevalent among amateurs of using the names of towns or countries to denote their call-letters. SM5YU, in Sweden, for instance, calls himself "SM5YU—Yokohama University"—which is misleading, to say the least of it.

Personally, I'm all against it—but what can you do. It calls for a little care on

### CHANGED FROM OUTSIDE

Coil Protruding Through Panel



For those who object to delving inside the set to change the coil there is this scheme.

the part of listeners—some of them get mixed up between the actual Q R A of the station and the call-letters—but otherwise it seems to have come to stay, and we've got to put up with it.

ON THE SHORT WAVES—Page 2.

## POINTS from the POST-BAG

### W. L. S. Replies to Correspondents

N. H. C. (Mansfield) reports receiving a station describing himself as the Royal Training College of Sweden, working somewhere between 24 and 29 metres. He would like full particulars about this station, if anyone happens to have them, as he missed the call-sign and address, if they were given.

W. R. E. (S.E.26) would like a full layout of an H.F. stage for putting in front of his single, or, alternatively, a few words of explanation. I had better give the latter, as I can't make rash promises about the "full layout." The tuned coil between aerial and earth of the first stage, i.e., between grid and filament of the H.F. valve, should be a duplicate of that used in the detector circuit for the same waveband.

If a loose-coupled aerial is used, the coil can still be the same four-pin type as is used for the detector; the reaction winding now becomes the aerial coil, and the grid winding, of course, is still the grid coil.

#### Connecting Batteries

Echoes of the past! In the issue of June 27th, 1936 (before the Flood!), I showed a sketchy layout sent in by W. S. (Brighton). Now here is a letter from C. R. W. (Peterborough), asking how the batteries are connected to the said layout. Well, the L.T. is connected straight across the filament terminals of the valve-holder—with an L.T. switch inserted in one of the leads if one needs it—and the H.T. positive goes, via the headphones, to the vacant terminal on the H.F. choke, the H.T. negative being connected to L.T. negative.

Take warning, also, that no grid leak was shown in the circuit. This would go from the grid terminal of the detector valve-holder to the L.T. positive terminal next door to it. The filament lead that goes to "E" is the L.T. negative.

P. K. (Colindale) notes that I am usually enthusiastic about resistance-capacity coupling, rather than transformer coupling, in short-wave sets, and asks how to arrive at the correct value of coupling condenser.

Bearing in mind the fact that the average small short-waver uses a lot of reaction, which tends to make it selective enough to cut the "top" appreciably, I think a value of about .002 generally turns out best. I almost invariably use this size of grid condenser, with a grid leak of  $\frac{1}{2}$ -megohm, and an anode resistance for the preceding valve of 50,000 or 100,000 ohms.

J. C. (Golders Green) is having a rush against time for that DX Certificate. He has all the cards necessary except the second one from Australasia, and anxiously asks me to reserve him a certificate in case his

card is late in coming. Suppose it never comes? He mentions, in his recent "bags," VU2CQ and VU7FY on phone on 20 metres. This shows that India can be bagged on phone—in spite of what some of the Dismal Jimmies say about it. He also mentions VP9R's fine phone transmission, which I was listening to myself a couple of nights ago.

Several readers are demanding a reprint of the coil windings recommended for the "Simplex" Two. I really can't do this again—it's been done three or four times—but I may as well mention that the windings used are the same as those of the standard four-pin Eddystone coils—and of other makes which also have the same pin arrangement.

#### Difficulty With a Di-pole

C. W. H. (Golborne) has put up a di-pole aerial with two nice quarter-waves (for 19-20 metres) and beautifully spaced cross-feeder blocks for the lead-in, and all that. So far, so good, but he finds that it works far better as an ordinary "T" aerial—with the feeders connected together and tapped straight on to the set—than when a proper coupling coil is used.

## THE R.S.G.B. SLOW MORSE PRACTICE TRANSMISSIONS

The following table gives the times, call-signs and wavelengths of the special slow transmissions put out by members of R.S.G.B. for the benefit of those who want to improve their Morse. The matter transmitted is taken from the T. & R. Bulletin, and the page number and month of issue are quoted at the end of each transmission. Telephony announcements are given out at the beginning of each test, except for G6UA, who begins with a long series of dots.

Day	G.M.T.	Frequency Kc.	Call-sign
Wednesday	23.00	1775	G6ZQ
Wednesday	23.15	1741	G16XS
Thursday	22.00	7184	G6UA
Friday	23.15	1852	G5DY
Saturday	23.00	7145	G15OX
Sunday	09.15	1775	G6ZQ
Sunday	09.45	7155	G15UR
Sunday	10.00	7260	G5JL
Sunday	10.15	1825	G5SU
Sunday	13.30	7180	G2YV
Monday	23.00	1741	G16XS
Tuesday	22.00	7184	G6UA

In other words, his di-pole probably isn't working as a di-pole at all; he may have the lengths wrong. My experience with di-pole is that one either puts up any old length of wire and hopes that it will work as an "all-wave" aerial, or else one measures the thing out properly and finds that it works only on one "spot-frequency."

B. H. G. (N.1) brings up that queer query about receiving London National and London Regional all round the dial on the "Simplex" Two. But he goes on to add that he has dispensed with the neutralising condenser in the aerial circuit—which makes it less odd. I can't see how the set can have any selectivity at all with the aerial slammed right on to the top of the grid coil. Just you put in that condenser, B. H. G. ! You'll never get real short-wave results without it—and as for the dealer who told you that the whole circuit was wrong—you can tell him to supply you with the said condenser, and then go back and laugh at him when all is O.K.

## Short-Wave News

INTEREST seems to be mainly centred on the shorter wavelengths, for which conditions are holding up extremely well. Several readers report fine reception of the U.S. relay W9XAZ (11.35 metres), and a few report good results on W1XKA (about 8 metres).

It is well known now that the Alexandra Palace sound and vision signals are being received in the States; and several of my acquaintances have been logging a huge variety of strange signals between 9 and 5 metres, some of which have the authentic "DX ring" about them.

I have succeeded in getting my single-signal job down to 5 metres, and if there's anything exciting to hear there, I imagine that this receiver is capable of getting it; so if I happen to be at the controls at the

right time on the right day—which is somewhat doubtful, with the limited time I have for listening these days—I hope to bag something.

My recent "community" test of several receivers over the same period has brought in a crop of letters from readers who say they want to be in on the next one.

#### Three Hours' Listening

M. S., of Harlow, has a "Simplex" Two, and H. J. B., of Manchester, has something hot in the small line. We will rake in a few of the heavy brigade and see what a three hours' listening period brings forth.

By the way, as a "follow-up" of my remarks on Morse, I have printed in the table on this page the details of the R.S.G.B. Slow Morse Practice Transmissions.

They are accurate until April 20th and probably for a further month, but some changes may take place after the 20th. Note that every day of the week is covered, and that the transmissions take place on the 160-metre and 40-metre bands. The stations' frequencies are given.

Conditions during the A.R.R.L. Phone DX Contest were fine, and crops of letters have been coming in ever since, many of them containing unbelievably long lists of calls heard. The fact of the matter is that Americans are now "locals"—and it's hardly worth sending QSL-cards to them, as many readers are finding out for themselves. If you keep your cards down to the more distant and the weaker stations, then you can expect a decent percentage of replies; if you don't, you'll certainly get a poor show.

Regulations for R.S.G.B.'s National Field Day are now published. This takes place on June 5th and 6th, starting and finishing at 19.00 B.S.T. Each district will be allowed to run four stations (instead of two) this year—one on each band between 20 and 160 metres.

W. L. S.



FROM OUR READERS

# HOW S.W. REPORTS SHOULD BE MADE

The Editor, POPULAR WIRELESS.

Dear Sir,—May I be permitted to say a few words on the subject of QSL collecting? I have had some three years' experience of short-wave reception and transmission, during which time I have collected over two hundred verifications, mostly from amateurs, and I have finally evolved the following set of rules in connection with the sending of reports:

1. Note the *strength* of the transmission you wish to report. If the signals are coming in at colossal strength and the station is obviously making itself heard all over the globe, then for goodness' sake withhold your report, *however* far away the transmitter may be, unless, of course, reports are actually requested.

## A GUINEA FOR YOU

We welcome letters from readers on all radio subjects. Long ones, short ones, humorous ones, practical ones, literary ones—we like 'em all. And each week a guinea is sent to the reader who sends the letter which is best in the opinion of the Editor. So post yours right away! The winner this week is Mr. J. Francombe.

2. Note who your "quarry" is *working*. Even if the strength of a transmission is quite moderate, the ham is not likely to value your report if he is getting several reports first-hand from European contacts.

3. Listen to what an amateur is saying to the other fellow. If he mentions that his antenna or transmitter is new, or his power low, then he is more likely to value a report than if he were using a well-tested, high-power outfit. I have saved myself several pence in postage by hearing hams telling one another that they "can't be bothered" with S.W.L. reports!

4. Make your report *detailed*. Reports like "ur sigs heard here last Monday, please verify," are of no use to anyone. My idea of an ideal report is as follows: R. T. QSA. QSB. QRM. MOD. QUAL. WKG. RX. ANT. WX., together with time, band and date. Round the whole thing off with best wishes and a polite request for a card. Let all reports be true and accurate and do *not* try to flatter a chap into replying.

This last rule can only be obeyed if an accurate log of all stations heard is kept. My own log is entered in a stiff-covered exercise book, the pages of which are divided into six columns, headed respectively: Call, Date, Time, Strength, Working, Type. In the last-named column such entries as "T8 14 mc. CW" etc., appear. Such items as QSB or QRM, if abnormal, are entered in the "strength" column, while "weather" and "receiver" are too obvious to note down, as most of my reports are written almost immediately after hearing the station. Promptness, incidentally, is an important point to watch when reporting.

There are exceptions to every rule, and this certainly applies to some extent to the above.

However, I think that if carried out along the lines suggested, QSL collecting would become more useful and more profitable. I hasten to add that I claim no originality for the "system," but have merely noted down facts which become obvious to anyone who makes a careful study of short-wave technique.

Yours faithfully,  
J. FRANCOMBE (2 B R F.)

2, Park Way, Ruislip, Middlesex.

## TRY TO HELP THE STATION

The Editor,  
"Popular Wireless."

Dear Sir,—Having seen in a recent issue of "P.W." letters re QSL-card collecting, I thought my own experiences and method of reporting might help other readers, so here goes: Being a member of the British Short-Wave League, I was particularly interested in the letters of two fellow members—W. Bigley and "Onda Cortá," and I heartily agree with most of their remarks.

I also agree with J. J. Maling (G 5 J L), if I were a transmitting amateur I would certainly not QSL some of the reports I have heard of. Now, for my own veri's, I cannot claim to have hundreds, but I have a good many. N. and S. America, Cuba, Australia, Iceland, Japan, S. Africa, Siam, etc., all figure in my collection.

The only reports I have lost so far are: 1 to America, 2 to Newfoundland and Canada, 1 to West Indies, 1 to South Africa, 1 to Spain, and 2 to Dutch East Indies—the latter, I believe, has now stopped sending QSL-cards, so I have not lost many. The remarks on the cards show that my reports have been appreciated, and many ask for further reports and thank me for my very full reports.

Now for my method of reporting: I try to help the station as much as possible, and therefore give as much data as I can; this consists of the sig. strength, etc., weather, humidity, barometer readings and temperature, the lat. and long. of receiving station, whether situated in the open country, and the approx. distance from the station, and many other details I think will be useful.

After the time and trouble taken in writing one of these reports, I certainly expect a verl of some sort. I may say I hardly ever send

Further letters engendered by our QSL-card discussion deal with the correct attitude that should be adopted in furnishing reports on reception

postage as I think a good report is worth the return postage. Being a member of the B.S.-W.L. also helps a great deal, and I would urge all readers of "P.W." who are real S.W. fans to join the B.S.-W.L. or to write to H.Q. for a copy of our "Review." All members will receive the Review monthly. Hoping above will be of some interest and help to readers of "P.W."

Yours faithfully,  
E. A. MONK,  
B.S.-W.L., 402.  
Main Lodge, Trent Park, Cockfosters,  
New Barnet, Herts.

## READ WITH PLEASURE

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with pleasure the last few articles by Leslie Orton entitled "The Dial Revolves." They are both helpful and entertaining, providing information in a thoroughly readable style.

I am looking forward to further articles by this writer, and in conclusion I should like to wish your paper the best of luck.

Yours faithfully,  
LEONARD G. BERRY.  
"Nyella," 24, Alieyn Park, Norwood Green,  
Southall, Middlesex.

## INTERESTING AND HELPFUL

The Editor, "Popular Wireless."

Dear Sir,—I have enjoyed reading your new articles about short-wave stations by Leslie W. Orton. I find them very interesting and helpful, and I am looking forward to reading many more of his articles in future issues of "Popular Wireless."

Yours,  
I. M. RAWLING.  
2, Raise Bungalows,  
Alston, Cumberland.

## TALENT ON THE DOORSTEP



Robert Lipson, a C.B.S. page, who, after being given an audition, was put on the air by Major Bowes, who is seen with him and who runs the C.B.S. Radio Playhouse.

## "MY APPRECIATION"

The Editor, POPULAR WIRELESS.  
Dear Sir,—May I express my appreciation of the article in your paper by Leslie Orton?

He has a good knowledge of his subject and I am anticipating reading his further contributions.

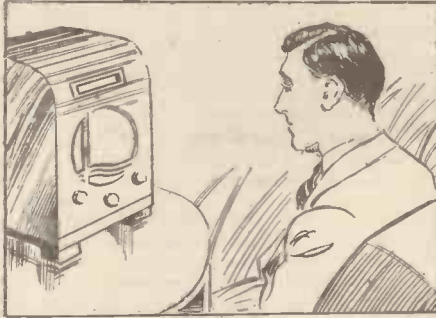
Yours truly,  
E. JOHNSON.  
10, Gregory Springs,  
Granny Lane,  
Mirfield, Yorkshire.

## A NOVEL HOBBY

The Editor, "Popular Wireless."  
Dear Sir,—This may interest readers, or it may not. I wonder if others have the same hobby—that is, collecting old sets.

I have done this for some years now, and among my collection is a B.S.A. 3-valver; it must be years out of date. Having cleaned it up, it works O.K., although it only receives the two stations, Midland Reg. and the National, and the most interesting (Please turn to cover iii.)





Place the loudspeaker, or set if the speaker is built in, at ear level if you want to get the best effect.

### PLACING YOUR LOUDSPEAKER

WHEN someone is speaking to you you look in his direction, and if you hear a sudden and unexpected noise you will probably quite automatically turn in the direction from which it comes.

Sight and sound are, as it were, natural allies. Therefore, you will find your radio listening easier if you arrange your loudspeaker so that, without twisting your head, you can rest your eyes on it.

It should also be at "ear level," because certain of the notes are emitted by the average loudspeaker in a directional manner—like a somewhat broadening beam from a searchlight.

### LABELLING ACCUMULATORS

CELLULOID accumulator cases are apt to be difficult to label satisfactorily. About the best method of overcoming this difficulty consists in attaching an ordinary gummed label to the side of the accumulator



A gummed label protected with two or three coats of celluloid varnish, forms a good permanent means of identification.

and then brushing over it three or four coats of fairly thick celluloid varnish, allowing each varnish coat to dry before the succeeding one is applied.

Suitable celluloid varnish may be prepared by dissolving scrap celluloid in amyl acetate, or, more easily still, it may be made in small quantity by thinning down any of the nowadays many proprietary brands of "pear-drop" celluloid cements with amyl acetate or acetone.

An accumulator label so varnished over will actually be protected by several layers of clear celluloid. Hence it will not be liable to be affected by acid splashes, and it will not become detached by any ordinary handling. For accumulators of the celluloid-case type which regularly leave their owners'

# PRACTICAL POINTERS

## HINTS AND TIPS OF INTEREST TO ALL CONSTRUCTORS

hands for recharging purposes, such a safe and reliable method of labelling the articles is much to be recommended.

### THOSE CONNECTING LEADS

ALWAYS join up the battery leads of a set so that the live ends of the leads are never loose. That is to say, the wire should be connected to the set first and to the batteries last.

Do not employ cheap cotton-covered leads, but obtain a high-grade rubber-covered flex.

A two-volt accumulator cell may look a harmless enough article, but it is able to provide as much power and more than is needed to run a bright ceiling light.

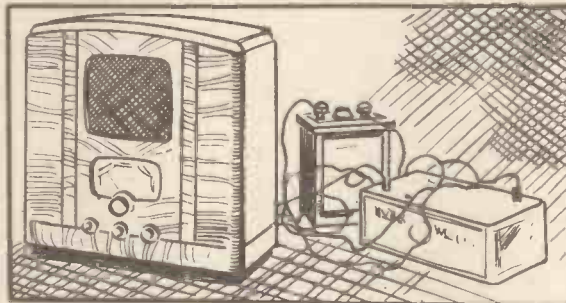
If you have difficulty in separating two or more programmes with a portable these directional qualities can be used with great advantage.

You should aim not so much at the greatest power from the desired station as the obtaining of the weakest "pick-up" from the station or stations which are not desired.

Many portables are fitted with turntables, so that the set can be orientated into the position giving maximum results from the desired programme and the minimum of interference. Portables of the suit-case type have no turntable but can readily be moved into the most advantageous position owing to their light weight and the ease with which they may be picked up and turned into a new position.

Listeners sometimes neglect this aspect of portable reception, forgetting entirely the directional and selective properties of the self-contained frame aerial. A point which is not always appreciated is the desirability of keeping the frame aerial as far away from metal objects, ordinary aerials, and stray wiring, as possible. The presence of conductors such as these often robs the portable of its directional properties.

### BATTERY USERS PLEASE NOTE!



Untidy battery leads may cause short-circuits, so don't take chances. Never have any loose ends lying about.

True, its voltage is very low, but it can supply plenty of current, and it is current which melts wires.

If the two L.T. leads come into contact with each other a dangerous fire could quite easily be started, because an L.T. short-circuit can result in even thick wires glowing white with heat.

Indeed, the L.T. battery is possibly more dangerous than the H.T. battery from the conflagration point of view.

If the L.T. and H.T. leads are mixed, the valves may get burnt out. This would happen if by accident the H.T. battery leads were connected to the L.T. terminals.

In any case, untidy leads do not make for "better radio." The least that is likely to happen is that distortion might follow from a confusion of loudspeaker, battery and other leads.

Aim at making all the wires as short as possible, and keep them well separated. There is nothing against combination battery cords; indeed, they make for tidiness and ensure that the battery feeds are well away from the aerial and loudspeaker wires.

### SELECTIVITY WITH A PORTABLE

THE position of a portable determines its sensitivity to a particular station, because frame-aerials (and these figure in the true portable) have highly directional qualities.

### AN IMPROVED CRAMP

WHEN gluing together articles of cabinet woodwork, the need for a

variety of suitable cramps is often felt by the busy amateur. For cramping up "small" work, an ordinary pair of pliers, as shown in the illustration, may often be brought into service.

Merely slip a strong indiarubber band around the grips of the pliers after having inserted the glued-up work in the jaws of the pliers. The tension of the indiarubber band will be sufficient to keep the jaws of the pliers firmly closed, with the result

### HELD BY A RUBBER BAND



Pliers are useful for holding pieces of wood in position for gluing, if arranged like this.

that the glue of the woodwork will set without disturbance or strain.

A suitable indiarubber band for use with a pair of pliers consists of a section cut from a disused cycle or motor-cycle tyre inner tube. Such an article will maintain the jaws of the pliers in firm compression. The tension of the grip can very conveniently be varied simply by using two or more bands on top of one another.

(Continued overleaf.)

## PRACTICAL POINTERS

(Continued from previous page.)

### TESTING H.T. VOLTAGES

**A** VOLTMETER tests the difference of potential, the degree of electrical pressure, existing between two points.

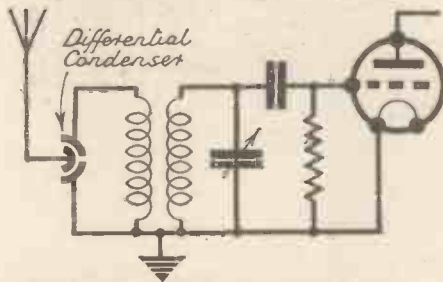
But when you use a voltmeter you should be careful you do not apply a voltage difference to two parts of your body!

You would not feel an L.T. and G.B. voltage, but quite a hefty shock can be given by a large H.T. battery or a mains unit—particularly the latter.

Some of you may be able to stand as much and more voltage than is present, but on others the effects might be rather noticeable.

Also 'ware shocks when connecting up a mains set. This won't happen, of course, unless you are careless.

### QUITE EASILY FITTED



Here is a good method of volume controlling for owners of small sets.

### VOLUME CONTROL FOR SMALL SETS

**M**ODERN sets with H.F. amplification incorporate a multi-mu H.F. valve so that volume controlling offers no difficulties, a potentiometer to adjust the grid potential on the H.F. valve being all that is needed. But the small set which has no H.F. stage is not so easy to deal with in so far as volume controlling before detection is concerned. The usual scheme in these cases is to connect a potentiometer across the L.F. transformer secondary and this is effective on most programmes except perhaps the local, this proviso applying specially when the listener is only a few miles from one of the Regional transmitters.

When "swamp area" conditions exist the detector is liable to be overloaded, thus causing distortion, which no amount of L.F. volume adjustment can remedy.

A simple method of obviating this trouble is to join a .0005 or .0003-mfd. differential condenser across the aerial winding of the tuning coil. The two sets of fixed vanes are joined directly across the winding, and the aerial lead is connected to the moving vanes, as shown in the diagram.

When the moving vanes are fully meshed with the fixed vanes that are joined to the top of the aerial winding, all the input goes through the coil and volume is at maximum, as the condenser is turned, more and more of the input is by-passed to the earthed set of fixed vanes.

### PLANING BASEBOARD EDGES

**W**HEN planing the edges of baseboards, cabinet sides, and other similar articles of woodwork, it is not always easy to avoid splintering fragments of wood off the extreme corners of the board. Particularly is this so in the case of thin baseboards.

A helpful dodge for the purpose of overcoming this difficulty may be seen illustrated in this column. Merely place in the vice along with the baseboard whose edge is to be planed, another board of approximately equal thickness. Clamp the two rigidly together, end to end, as shown, and then proceed with the planing of the baseboard edge. Under these conditions it will be found that the corners of the baseboard will not be so liable to be chipped off by the plane iron, and that by this simple procedure even the thinnest of baseboards can be given perfectly "square corners" with very little difficulty.

### SOME TIPS ON TUNING

**T**HERE are many receivers which are so designed that the reaction control can be used as freely as desired, without fear of causing interference to neighbours. In general, these are sets having screened-grid H.F. valves.

Where there is no H.F. amplification at all, it is fairly certain that every time the reaction is overworked squeals are generated in neighbouring installations. This must not be allowed to happen, since it contravenes the conditions under which a broadcasting licence is issued.

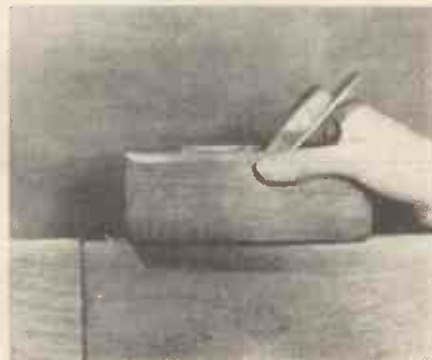
If, however, reaction is applied to the detector stage of a set with H.F. amplification, it can be used more freely because it is not likely to cause interference to neighbouring sets. In these instances the following hints may be useful:

The first thing a listener should learn is how to locate the "silent point" of a station.

This lies between two points on the dial where, when reaction is over-applied, there will be squeals.

Supposing the reaction control is "well in." You turn the tuning dial slowly, very slowly, until you hear a high-pitched squeal. Continuing to rotate the dial extremely slowly, the pitch of the squeal falls until it becomes a mere grunt. Then it vanishes altogether, though a further slight dial movement, still in the same direction, brings back the grunt which rises to a

### ENSURES SQUARE CORNERS



Baseboards can be planed without danger of damaging the corners if a second piece of wood is clamped in the vice, as shown.

squeal, higher, higher and higher in pitch until it disappears.

The fact that you have passed a point where there is no squeal must not mislead you into thinking that the set stops oscillating. What happens is that the reaction is feeding energy back at the same frequency as the station itself; in short, you are dead in tune.

A slight movement of the tuning dial in either direction results in a discrepancy between your oscillation and that of the radio station, and the difference is exactly represented by the pitch of the squeal you hear.

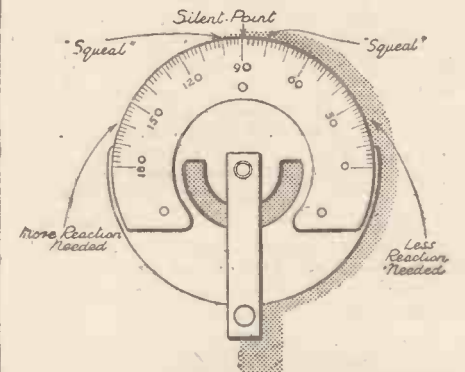
If the station has a wavelength of 300 metres, that equals a frequency of 1,000,000. Should your set be tuned to a frequency of either 999,000 or 1,001,000, you will hear a squeal having a frequency of 1,000.

It is bad practice to "sit" on the silent point because, though your set's sensitivity is very great, there is bound to be distortion. But a knowledge of how to find the condition is very useful for rapid station-searching with S.G. sets. On the short waves it is almost indispensable.

But ease the reaction back until the set stops oscillating, and when doing this it may be necessary very slightly to alter the tuning, for reaction generally affects the tuning to a small degree.

Most sets oscillate more easily on the lower dial readings, so, as our diagram illustrates, it might be necessary to apply more reaction for the longer-wave stations.

### USING REACTION



This diagram should be used in conjunction with the "tuning tips" on this page. Note that more reaction is often needed on the longer wavelengths and less reaction on stations at the lower end of the waveband.

### METAL BASEBOARDS

**T**HE metal (or metallised) baseboard is a commonplace item in set construction these days. The reason, of course, is the fact that it enables the wiring to be simplified, as well as providing effective screening between certain components, viz. those above the baseboard and those which are mounted below.

There are certain points which constructors should bear in mind in connection with the wiring. A metal baseboard forms an excellent conductor for earthed points, such as L.T. negative and H.T. negative.

The metallising also forms an excellent means of earthing-coil and H.F. choke screens.

Short-wave fans should note this: Don't use a metal baseboard for connecting from the moving vanes of the tuning condenser to the "earthed" side of the tuning coil. Always use an insulated lead between these two points and keep the lead short.

# RANDOM RADIO REFLECTIONS

By Victor King

THE BEST TIME TO SELL AN INVENTION :: LISTENERS WHO USE RADIO FOR SHORTHAND PRACTICE :: YOU CAN STILL BUY CRYSTALS

## NEW IDEAS NOT WANTED

ONE might reasonably think that all this frenzied rearmament would bring with it a welcome for new ideas. But apparently not. I have had shown to me a letter received from one of the largest makers of aircraft.

A quite well-known engineer has developed something new in connection with aircraft construction. He wrote to this big British firm and asked them if they would like to examine his idea. Much to his astonishment he was informed that they were so busy on contract work that they were regretfully unable to give attention to any new ideas!

To be quite honest, I was not surprised. The best time to sell an invention is during an industrial slump. Prosperity doesn't create a demand for inventive talent.

You see, it's this way. When an industry is meeting with bad times competition is tremendously keen. Each firm is doing every darned thing it can to stimulate sales. And a man with something new will be welcomed with open arms. If his idea will give its purchaser a lead over his rivals, if it will ginger up the market, then the inventor will have the red carpet laid down for him.

But when an industry is working all out to cope with the demands made on it, either by the public or by Government contracts, well, why should it pause in its stride to glance at the models and blue prints and patent specifications of an inventor?

## IT MAY BE GOOD-BYE

I HAVE had an offer made to me which may mean that I shall have to close down on these weekly "P.W." jottings. I think I shall have to take up this offer because it's so mightily attractive from every point of view. But I shall hate giving up this page.

However, the decision does not have to be made immediately, and in due course I'll tell you all about my new job—if I take it. Should I do so it will be my first sacrifice of freedom in years.

## RADI-OCCASIONALS

THE radio programmes may or may not be your idea of a good evening's entertainment, but they have other uses, you know. For instance, a considerable number of people listen to the talks and news without caring a hang for the talks and news. They sit listening to them with pencils flying over paper—polishing up their shorthand.

You can even start from scratch and learn shorthand with no other aid than that of a textbook and a radio set.

The clearly read news announcements are absolutely made for the purpose. And you can graduate from these to the talks as your skill progresses. Then, when you are able to take down and transcribe the words of a couple of cross-talk comedians you can reckon you're well on the road to being an expert.

No doubt lots of you who are reading this are sniffing in a superior kind of way. Shorthand! Who wants to learn that except stenographers?

But a knowledge of shorthand is a mighty useful accomplishment. And if you can't see a hundred and one possible uses for it, then you deserve to stay on the bottom rung.

I wonder what Pitman used to do with his shorthand besides making a fortune out of it?

Going from the outline to the musical, another way some of you might use the radio programmes is to learn to play a musical instrument. For example, you could let the B.B.C. turn you into a Larry Adler. It's very simple. The first thing you do is to purchase a harmonica—one of the chromatic type with a slide for preference.

You then acquaint yourself with the arrangement of the notes and proceed to accompany Sir Adriaan Boult and Henry Hall. They won't mind. At first you'll struggle along behind and hit about one right note in six. Later, you'll find yourself almost keeping pace. Eventually, you'll be applying to the B.B.C. for an audition!

Other instruments you can tackle are such things as flutes, tin whistles, one-stringed fiddles, jew's-harps, and triangles. Or your ambitions might soar in the higher reaches. That's up to you. I'm thinking of the neighbours!

Voice production? You can, of course, acquire an Oxford or Cambridge accent by fastening on to an appropriate announcer, even if your income doesn't allow you to purchase your SUCKS and TAYS in BUND Street.

Or you can cultivate a croon by oscillating your tonsils in parallel with a B.B.C. crooner.

But you want to stand up for that. Don't try to grab at the top notes while draped over an armchair. Take a bold stance on the hearthrug, keep your tummy in, throw out your chest—and let it go. And not through the teeth, either. Open wide!

Heavens! What a caterwauling there'd be if every other listener started in to do this sort of thing!



The new "Empire Eight" baby grand luxury receiver made by Philco. An all-wave set for A.C. mains, it costs 29 guineas.

Perhaps you'd better stick to shorthand or just listening.

## WANTED—A CATSWHISKER

A FRIEND asked me the other day where he could get a catswhisker. Apparently there is an old lady who lives alone and obtains all her pleasure from a small crystal set of 1924 vintage. Friends buy her wireless licence.

One tragic day she lost her catswhisker. It fell off and vanished. The old lady's little radio was silenced and her only source of entertainment was denied to her.

I'd liked to have had a catswhisker. To think that so much depends on a tiny spiral of wire. However, a local radio shop was able to supply a brand new catswhisker and crystal for fourpence-ha'penny.

Said that they still had quite a demand for such things. Just found it necessary to order further supplies.

Apparently quite a large number of crystal sets are still in use.

## WHERE PICK-UPS PACK UP

MET a very disgruntled gentleman the other day. He is on D.C. mains, and has just bought the Universal model of a well-known make and type of set. Didn't notice until he had paid out his money and got the set installed that it had no pick-up terminals on it, though they figure in the specification that is given in full for the A.C. version.

So now I'm passing the word on to all those whose houses are served by D.C. mains, that pick-up terminals on D.C. and "Universal" sets are as rare as gooseberries in apple-pie. When you do meet 'em, they are the exceptions that prove the rule. Most makers of radio sets don't fit pick-up terminals to any of their sets for D.C. mains.

Why? They don't want any direct route from a D.C. earth line running out in external leads. And they don't like hum. No, sir.

# "OVER THERE"

A feature devoted to various aspects of American radio, giving interesting sidelights on the artists and microphone methods of that country.

## STATION'S DAILY DOZEN

RADIO stations, like human beings, need setting-up exercises every morning. For example, W A B C, key transmitter of the Columbia Broadcasting System, is given an hour's strenuous warm-up before it goes on the air each day.

## BRAVO, MRS. FREEDMAN!

THE colossal file of more than 100,000 jokes and gags which Dave Freedman, ghost and script writer, left when he died last month is still providing laughs for the public.

Mr. Freedman's widow, who carries a lot of those jokes in her head, has taken up his fun business at a new stand. With the gags file insured for £2,500 plus a mass of completed and partly finished scripts and ideas as part of her stock-in-trade, Mrs. Beatrice Freedman has become Eastern programme director of a newly organised radio chain.

## NEW LANGUAGE FOR ESKIMOS

IN Alaska, where the only native musical instrument is the drum, the Eskimos listen tirelessly to American radio. The effect on the native language has been startling, to say the least. One of the boys from Alaska told about the phenomenon in a recent broadcast of Joe Rines' Dress Rehearsal heard on Sundays over the N.B.C.-Blue Network.

Some typical Eskimo slang phrases:

"Cha-o-nah"—"Shut up" or "Nuts."

"Kow-kow"—"Eat" or "nibble."

"Kee-tah"—"Let's swing it."

"Pew-pa-chim-tun-pe-che-co-wah"—"I can do anything I like" (Joe Rines' bon mot).

"Ah-laa"—"Oh, yeah?"

"O-me-na"—"Damn you, oh heck!"

## GENIUS

JACK MEAKIN, impresario of the Bug-house Rhythm programme, heard from the San Francisco N.B.C. studios, is a prolific composer. Though he is not yet thirty, he has written sixty popular songs, twelve piano solos, ten ballads, twenty ballet suites, four concert works for orchestras, three complete Bohemian Club shows, thirty-six theme songs and almost 1,000 arrangements.

## A NEW INSURANCE

A £10,000 policy to insure Gladys Swarthout against the possibility of missing a broadcast in her new N.B.C. series has been taken with Lloyd's of London by the ice and ice refrigerator sponsors of the singer's programme, broadcast on Wednesdays over the N.B.C.-Red Network.

This insurance, believed to be the first of its kind ever issued on a radio artist, was prompted by the opera and screen star's escape from missing her inaugural

programme of the new series recently, two days after laryngitis caused her to cancel her appearance in "The Tales of Hoffmann" at the Metropolitan Opera House.

Miss Swarthout has cancelled only two scheduled appearances in her ten years of operatic work, the first time, several years ago, because of a sprained ankle. She has maintained an unbroken record of 350 radio broadcasts. Her sponsors, however, are taking no chances.

## COLOUR CONSCIOUS

"It is reported that in India a car painted green cannot be sold because green is bad luck. . . . A maroon car cannot be used in Japan because the colour is reserved for the Emperor's household. . . . In China, to drive a yellow car means that the owner is in mourning."—U.S. Department of Commerce Talks.

## A STAR FROM CALIFORNIA



Beautiful Nadine Connor, who sings with Nelson Eddy in his "Vick's Open House" programmes. She comes from California.

## QUOTED FROM THE AMERICAN

BROADCASTERS, both British and American, have their don'ts for humorists. They follow the same general lines, but it would seem that the British restrictions are just a little stiffer than those on this side of the Atlantic.

The B.B.C. has started out to check what it describes as a tendency by some comedians to introduce "doubtful" jokes on the airwaves.

In this country, the regulations follow nearly an identical layout. Here are some requirements taken from the N.B.C. programme regulations, similar to those of other broadcasters:

"Use of the Deity's name is acceptable only

when used reverently or as part of a standard classic work.

"Statements or suggestions offensive to religious views, racial traits, and the like must be avoided.

"False or questionable statements and all other forms of misrepresentation must be eliminated.

"Obscene and off-colour songs or jokes, oaths, sacrilegious expressions and all other language of doubtful propriety must be eliminated.

"When a living character is impersonated, announcement must be made at least once in the programme that impersonation is made."

## NUTS!

YOU'VE got to be prepared for surprises if you play in Josef Cherniavsky's orchestra.

One day the maestro tapped his men to order and announced, "Boys, the next number is for mentally unbalanced musicians." Before any of the musicians had time to collect their senses Cherniavsky went on to explain:

"I've just turned out a number called 'A Squirrel Fantasy' and it's just a little nutty. I want it to sound as though it were played by an orchestra made up of screwy musicians. Get the idea?"

## STILL MOONSTRUCK

SONG subjects for the most part run in cycles, but the song writer, says Guy Lombardo, never gets over being moonstruck. He points to melodies like "Moon Over Miami," "Rocky Mountain Moon," and "Moonlight on the Ganges" in support of his statement, and then adds that "Chapel in the Moonlight" has had no competitor in the last five months.

## SWING ALONG

THERE have been swing tunes, swing bands and swing skirts and now the world is to be treated to swing fugues. A number of these compositions have been written by Mark Warnow, N.B.C. band leader, and will be published soon in book form. Some of these swing fugues have odd titles such as "Swing, Swing, Mother-in-Law," "Cry of a Tonsil To Its Mate" and "He Who Hoots Is An Owl."

## BARBERS STOP TALKING

SATURDAY afternoons in barber shops—in New York and in every large city and every small town in America—are traditional.

Perhaps the better-class barbers have become self-conscious of their reputation of too much talking to their customers.

There is a barber's in New York where the two-chair shop is equipped with a radio set. The set is not often turned on, because some customers object, but it is on very softly every Saturday afternoon and the door is ajar. The barbers and the manicurist are listening to grand opera.

If there's any talking during those hours the customers are doing it.

# ADDING A PICK-UP TO YOUR SET.

NOT all receivers are provided with terminals or sockets for the connection of a pick-up, but it is usually assumed that the necessary alterations are very simple. Unfortunately, this is not always so. To "bung" a couple of terminals on the back and insert a changeover switch in the grid circuit of the detector valve, together with the necessary alterations in wiring, are quite simple, but it is the final result which counts.

The addition of the switch may cause the radio performance of the receiver to be upset. And if, to avoid this possibility, the switching is applied to a stage subsequent to the detector, then insufficient amplification may result in poor pick-up performance.

Then, again, there is the question of tone. The input from a pick-up is somewhat different from radio, and while quality from radio may be perfectly satisfactory, that from the pick-up may be far from pleasing.

### For Battery Sets

All this sounds as though it were a pretty hopeless task to attempt to apply a pick-up to a set that was not originally designed for the job. But this is not so with the aid of the unit to be described in this article.

This unit is designed to look after all the points mentioned and to ensure satisfactory results from the pick-up. It is suitable for use with practically any battery receiver which is not provided with the means of connecting a pick-up.

Its use does not entail any alterations whatever to the receiver itself or its wiring, an adaptor plug providing the necessary connections between unit and receiver. Here are some of the tasks which the unit carries out:

Provides bias for the first amplifying stage which may use the detector valve from the set. Controls volume of pick-up, ensures adequate amplification and provides a tone control that enables the top output of the pick-up to be suited to any particular set and taste.

### Points To Note

An ordinary four-pin plug is used on the design as described, but if the set has a five-pin valve in the output stage, then a five-pin adaptor of similar design can be used instead. Due to the type of volume control employed, the unit is not really suitable for use with a crystal pick-up.

And so, having introduced you to the idea behind the unit, we can pass on to the few constructional and descriptive remarks needed.

The unit ensures that the best results are obtained when a pick-up is used on sets that are not originally designed for the purpose. It is, in fact, a very complete input device.

To start with, it provides a volume control immediately across the pick-up itself, the best position for such a control. Following this is a tone adjuster of an unusual type, for it is entirely made up of a variable resistance, and provides a very useful and effective means of varying the high notes.

The adaptor plug, by means of which the unit is joined up to the receiver, should have four sockets on top to take a valve,

*Details of a simple unit which provides amplification, volume control and tone adjustment. It will ensure satisfactory reproduction of your records*

and three valve legs below to fit into a valve holder. The grid pin is the missing one.

If you obtain an adaptor that has four pins, it is as well to remove the grid one, in case it allows radio to break through. The two filament and plate sockets should be wired up inside the adaptor plug to the three corresponding pins.

Usually this adaptor will be plugged into the last valve holder, but it may work quite well when placed into an earlier position. It is just a question of whether instability will result due to the enormous amplification.

You should note from the wiring diagram that there are only three wires running to the adaptor plug, and that the unconnected

socket and pin are the plate ones. Another important point concerning the adaptor plug is the method of connecting the filament pins.

There is a certain way round that these must be wired, and it is dependent upon which side of the valve holder that takes the adaptor is connected to low-tension negative. The wires from the filament pins should be so arranged that the lead from the negative one is connected in the unit to the filament terminal that goes to G.B. positive.

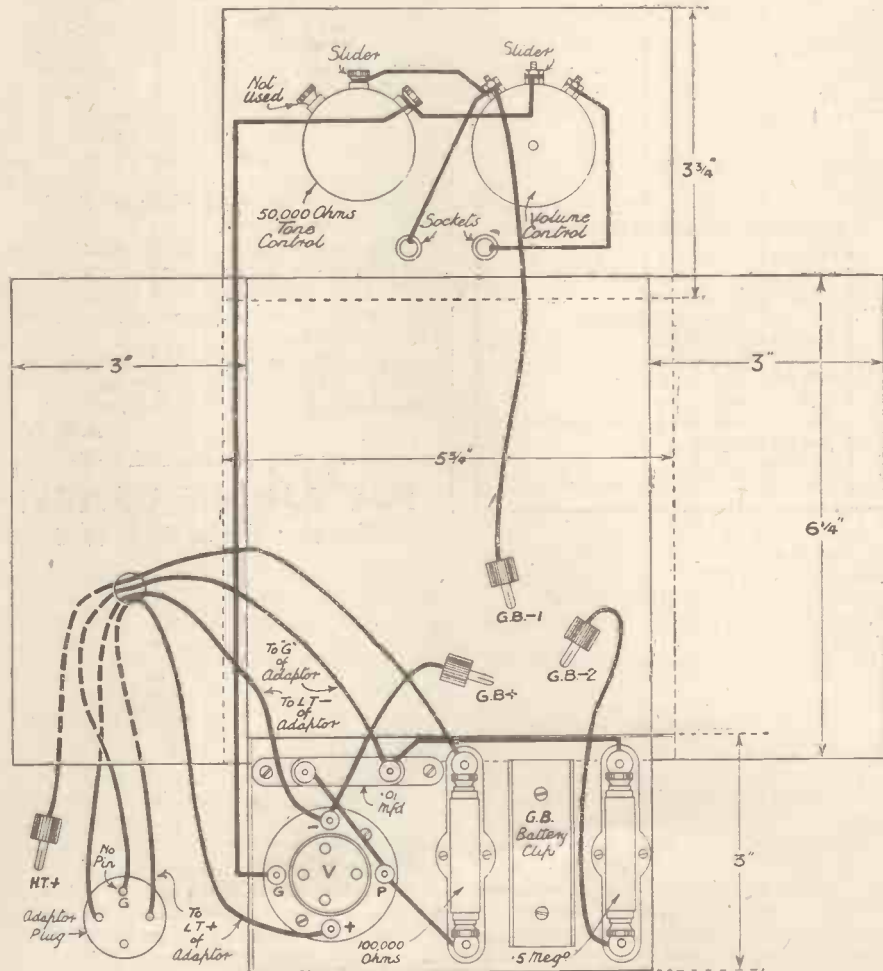
### The G.B. Connections

With this in mind you will appreciate that the connections as shown in the wiring diagram may not fit in with your set. But this simply means that the filament connections to the adaptor plug have to be reversed.

The next item that requires explanation is the presence of two G.B. negative plugs in the unit, when it contains only one valve. One of these, No. 1, is for the valve in the unit, while the other is for the valve into whose holder the adaptor is plugged.

Even if this has G.B. already applied in (Continued overleaf.)

## FEW COMPONENTS—SIMPLE LAYOUT—EASY WIRING



This diagram gives all the practical details required to make the pick-up unit described on this page. A list of the parts wanted will be found overleaf.

## ADDING A PICK-UP TO YOUR SET

(Continued from previous page.)

the set, it will nevertheless get its bias via this plug when the adaptor is in use.

The method of using the unit is as follows: Remove the output valve from the set and place the plug in the vacated socket. Now take the detector valve out of its holder and place it in the unit (a duplicate valve may be used, if desired, to avoid this changing over).

G.B.1 requires  $1\frac{1}{2}$  volts negative and feeds the first L.F. valve (in the unit). G.B.2 should be given the same voltage from the G.B. battery in the unit as it previously received from the G.B. battery in the set. The H.T.+ on the unit should be fed with the maximum voltage available, say, 120 volts.

### Getting More Amplification

If you wish to try the effect of more magnification, you can plug-in to the holder before the output valve. If this is the detector it should be replaced by a fresh L.F. valve biased via G.B.2 in the unit, and the detector valve put into the unit.

If the valve is an intermediate stage, replace it in the top of the adaptor and bias via G.B.2 in the unit, and again put the detector valve in the unit itself.

Besides the ebonite panel on which are mounted the controls, there are three other pieces of wood screwed to the baseboard. The sizes for these pieces of wood are given in the wiring diagram, and you will see that several components are mounted on the piece opposite the panel.

The other two pieces help to form a cabinet for the unit, the cabinet being completed by a piece of wood for the top.

### THE COMPONENTS REQUIRED

- 1 Panel,  $3\frac{1}{2} \times 5\frac{1}{2}$
- 1  $\frac{1}{4}$ -megohm volume-control
- 1 50,000 tone control
- 1 .01-mfd. fixed condenser
- 1 4-pin valve holder
- 1  $\frac{1}{2}$ -meg. resistance
- 1 100,000 resistance
- 1 G.B. battery clip
- 2 sockets and plugs for pick-up
- 4 battery plugs
- 1 adaptor plug
- Plywood, flex, wire, screws, etc.

You will see that the two side and the back pieces of wood are on top of the baseboard, the screws passing up into them through the latter. The top fits over the sides and back.

Finally, about the operation, which is as follows: Turn the right-hand knob until the tone of reproduction is to your liking, and adjust the left-hand control until volume is at a suitable level. A movement of the right-hand knob will make it necessary to shift the left-hand one also, if the same level of volume is desired. (When referring to these knobs we are, of course, looking at the front of the panel.)

Thus this little box with its two knobs will give you just the right volume and the right tone, and will ensure that your pick-up is working at its very best. And you will agree that it is very easily constructed.

## A DIFFICULTY AND A SOLUTION

An interesting experience

THE following experience will probably prove of interest to many. The idea is far from new, but it proved so satisfactory and worked out in such a pleasing manner that it bears recounting.

We had gone into the country to a small house party and had taken a battery set, together with a gramophone motor and pick-up, to provide a spot of dance music. The set was a fresh one in for test, and we had been rash enough not to bother to undo the carton even to inspect it.

The installation went well enough right up to the stage of joining up the leads from the pick-up and starting up a record. What a din! Miles too loud and overloading like a cartload of hay.

Examination of the "dope" with the set showed that the radio volume control worked on the H.F. stage and a separate one should be provided across the pick-up for record work.

What were we to do? There was no radio shop within miles, and if there had been the hour was such that a shopping expedition was out of the question.

So we decided to make a resistance. First came a piece of thickish paper about 4 in. square. Then some liquid grate black, which we proceeded to daub thickly over both sides of the paper square.

When the paper was dry we bared two pieces of flex for about 3 in.; after which the paper was rolled up tightly to about  $\frac{1}{4}$  in. in diameter. Near one end we fixed one lead by tightly twisting the bare wire round the roll.

Then the other lead was similarly attached about  $2\frac{1}{2}$  in. away.

This resistance was joined straight across the pick-up leads, and we switched on again, not having the slightest idea whether its value would come anywhere near right. But we were lucky.

The volume was reduced to exactly that desired, the overloading was gone, and the loss of top was in no way detrimental!

A. S. C.

## FOR GARDEN LOVERS!

Charming Flower Study FREE

EVERY week POPULAR GARDENING presents a beautiful plate in colour of a popular flower. This week's issue, now on sale, price 2d., contains a plate of the lovely Viscaria, Blue Pearl. It is printed by a process which reveals the true glory of the bloom; instructions for sowing are given on the reverse side of the colour plate.

This issue of POPULAR GARDENING is the Spring Bargains Number, packed with the names of the best new plants which are now available for the amateur. Every gardener who likes to keep his flower beds and borders up to date will be interested in this feature. There is a special article on planting-out sweet peas; conifers for the garden, and "Making a Water Lily Pool," and many other helpful articles are also included, all lavishly illustrated.

## FOR EASY WINDING

An important small point that is often overlooked

IT is a truism to state that the winding handle of the average clockwork-driven radiogram is easily the most neglected portion of the entire instrument.

Has the winding handle of your instrument ever seemed peculiarly stubborn and unresponsive in your grip? It may, at times, have seemed to have acquired this temporary characteristic.

Winding handles of radiograms are invariably provided with a hollow wooden grip which is free to revolve around a central metal shaft. It is essential that the wooden portion of the handle should revolve quite freely. Usually whenever a winding handle develops a squeak,

### WATCH THIS



Stiffness in winding is often due to a tightness of the wooden grip on the winding crank.

it will be found that the wooden grip of the handle is either binding on some part of its metal shaft or else that the handle grip has, for some other reason, become able to rotate around its shaft only with difficulty.

The remedy in such instances is an easy one. Poke away any masses of dirt or dust which may have accumulated around the metal shaft and under the wooden grip of the winding handle and then apply between the two a few drops of some light oil—ordinary sewing-machine oil, for instance. The grip of the handle will again be free to revolve around its shaft and greater ease of motor winding will result immediately.

## TURNTABLE TIMING

A MOST important consideration in record reproduction is to see that the turntable revolves at the correct speed, which is 78 times a minute.

If the speed is not right, the tone of the record will not be natural. If it is too fast the pitch will be made higher, and if too slow the pitch will be lower, and there will also be a danger of slurring due to a slowing up of the motor on loud passages.

A watch with a second hand will make the counting of the number of revs. of a motor quite easy. Place a record on the turntable and slip a little piece of paper under it so that one end projects. Then start the motor going and count the number of times in a minute the piece of paper comes round.

Counting with the aid of a scratch across a record is not to be recommended and the pick-up may become jarred.



# REPRODUCING RECORDS

*Practical pointers concerning record reproduction work and pick-up items of general interest*

By A. S. CLARK

**T**HE connecting of a pick-up to the terminals or sockets provided for it on the back of a receiver (mains or battery), is very easy indeed. There are, however, a few points which need bearing in mind if the best results are to be obtained from one's records.

First of all the question of volume control. If the radio volume control does not apply also to the pick-up, you will require a potentiometer resistance.

The value of this is somewhat important, and in this connection the recommendation of the makers of the pick-up should be borne in mind. Mount the control on the motor board itself.

## Cutting Out Hum

The ends of the resistance element are joined to the two pick-up leads. A length of single screened wire is best for running from the control to the set. The inner wire goes to the potentiometer slider and the outer casing to one end of the resistance element—either will do.

Should you get hum when running the pick-up, the leads to the pick-up sockets on the set should be reversed. It may also prove desirable to use screened leads between the pick-up and volume control, connecting the screening to the screening on the main lead.

With most sets almost any good pick-up will prove satisfactory. But if a crystal pick-up is recommended by the makers of your set, you will be wise to purchase one of this type, for otherwise you may be disappointed at the volume obtained.

Another important point concerns the tracking of the pick-up. To those not quite sure of the significance of the word "tracking," it is best explained as follows: In theoretically perfect tracking the straight line passing along the centre of the pick-up head (and therefore also passing through the point of the needle) should be at right angles at the needle point to the radius line joining the centre of the record to the needle point, no matter whether the needle be in an outside, middle or inside groove of the record.

It sounds rather complicated, I know, but, if you follow it out with a pick-up and record in front of you, you will appreciate it O.K. In practice absolute tracking at all parts of the record is not obtainable, but by offsetting the pick-up arm and pick-up head an excellent degree of tracking is available.

## Checking Up Tracking

The goodness of the tracking varies with different pick-ups, and it should be noted that in a properly placed pick-up arm the needle point does *not* usually swing over the centre point of the record.

If tracking is far out, both needle and record wear will be heavy and your records will soon begin to sound "groggy." A template showing just where to place a pick-up arm is provided with a new pick-up.

Should a template be lost it is easy to check up tracking with a square edged piece of paper. Place one corner at the point of contact of the needle and record and one side passing over the centre of the motor spindle, the other side from the needle should run under the centre line of the pick-up head.

By trial and error you can find the best position. If more or less perfect tracking is unobtainable, let it go out a little at the middle and a little at the outside of the record, treating the middle with a trifle more favour.

The angle of the needle with the record should be about 60 degrees. This can be varied by the height at which the arm is fixed to the motor-board. You should also see that the pick-up head is truly horizontal and not tilted either way.

## Crystal Pick-ups

With ordinary pick-ups, the use of a potentiometer of lower value than that recommended will produce a lessening of the reproduction of top. With a crystal pick-up the *opposite* tends to apply. Also series resistance on a crystal pick-up will increase the general bass effect at the expense of top. For this reason it is sometimes found desirable to connect a fixed condenser between the slider and the end of the resistance element which goes to the pick-up only.

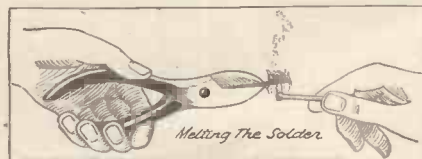
## SOLDERING WITHOUT AN IRON

Good joints simply made

**W**HEN one wants to solder a joint or two without having access to a soldering-iron, one usually makes a mess of it.

Yet there is a simple way of doing this which does not call for any elaborate equipment beyond a piece of solder, some flux, and a match or two. In addition, some very small pieces of flat brass, copper or zinc, about  $\frac{1}{4}$  in. square, will be required.

Presuming that we wish to unite two wires which meet "in the air," the following procedure is adopted: Hold one of the small pieces of brass or zinc in the pliers, apply a little flux and a blob of solder, strike a match and melt the solder. The



The first step is to melt a little solder on a piece of brass or other metal.

Once you have put a needle in a pick-up, do not remove it until you throw it away. This applies equally to ordinary needles and those of semi-permanent type. To partially twist a needle round after it has been used, and then to use it again, is to wreck your discs in no time.

## Universal Mains Sets

It has no doubt puzzled many why pick-up sockets are never fitted to universal mains receivers, so I will try to give you some idea. Incidentally though, this is a point which should be borne in mind when buying a new receiver if you are desirous of playing records electrically.

It is all a matter of avoiding the possibility of anyone getting a shock from the pick-up or wires used to join the pick-up to the receiver. No shock would be likely to be felt unless the person was "earthed," but such a possibility cannot be ruled out, especially when there is an earth lead for the set knocking about.

## When the Positive is Earthed

Many wonder why the pick-up sockets cannot be isolated by fixed condensers, big enough to pass L.F. currents but capable of stopping mains current from flowing. Here is the reason:

Suppose the positive main is earthed, and a person is also earthed in some way. Then he touches a pick-up lead going to a condenser, the other side of which goes to the cathode line and therefore H.T.—and the negative main. That condenser, which we know must be large, will be connected across the mains via his body. We all know that a condenser will pass A.C. fairly easily, so if the set is working on A.C. mains our mythical person will know all about it.

Yes, it's a pity about universal sets—but there you are!

solder will melt quite easily in the heat of the match. That is step No. 1.

The next thing is to bring the small piece of brass with the solder close to the wires to be joined, just immediately below and touching them, and to strike a second match and melt the solder again. The wires should have been previously fluxed, and no difficulty should be experienced in getting them to sink into the blob of solder on the small piece of brass. When this occurs simply take it away, and the two wires will be perfectly joined.



How the wires are applied to the solder for joining together.

The same principle can be applied to other jobs in an emergency, though it cannot be used in some positions owing to the heat being too rapidly conducted away, say by a large terminal.

The object of the small piece of brass or zinc is to shield the joint from the oxidising effect of the flame. The molecular tension of the molten solder comes into play, and with a little practice you can successfully tackle many little jobs when you have forgotten the soldering-iron.

W. N.

# SEEN ON THE AIR

*News and Views on the television programmes, by our special radio-screen correspondent,*

**L. MARSLAND GANDER**

**W**HAT are the next steps forward in television?

All the leading research experts to whom I have spoken recently agree that work must be concentrated on "getting the best out of 405 lines," before any consideration is given to the problem of moving up to a higher standard of definition.

The B.B.C. is not broadcasting the most that 405 lines can produce, and no receiver, I am sure, is picking up all that the B.B.C. is putting out. Here is a big enough task. I venture to think that we shall not recognise the 405-line picture of 1938 as the same thing as that of 1937. Work is going ahead fast with a hypersensitive television camera. This means better pictures; it also means that pictures can be picked up with less light on the subject. It will simplify some of the problems connected with outside television.

## Going Up to 600 Lines

Then, when everything possible has been done with 405-line definition, the next step will be to move up to about 600 lines. Cinema pictures have a definition equivalent to 1,000 lines, but taking into consideration the smallness of the home screen I expect that 600 lines will be sufficient to satisfy the most critical eye among ordinary viewers.

The next thing is enlargement of the screen. Mechanical optical systems offer prospects of a larger screen, but so far there is no receiver of this type on the market. I hear that progress is being made with the Mihaly-Traub receiver, which may soon reach the commercial stage. This set, it will be recalled, was not to be marketed until a single standard of definition was adopted. Now we have the single standard and are waiting expectantly for the Mihaly-Traub and Scopphony receivers to introduce an entirely new element into a field entirely monopolised by cathode-ray sets.

I have heard of one or two manufacturers, besides Baird, who intend to adopt fifteen-inch cathode-ray tubes, giving a picture 12 inches by 9½. But experts are inclined to argue that beyond this size the cathode tube should not go. Meanwhile, experiments continue with the projected cathode picture. Here the trouble is that no sooner do the research departments find a fluorescent material which gives the requisite brilliance than it is taken over for standard models to increase the brightness of the sets selling to the public.

## A Surprising Misconception

Largely as a consequence of reduced prices and the enormously improved B.B.C. programmes, sets are selling steadily. Dealers, however, have a great deal of educational work to do. An extraordinary misconception has become quite widespread owing to the publicity given to the Post Office television cable now being



Sir Kingsley Wood, Minister of Health, takes up his stand before the television camera and gives his views on the subject of food and health during his recent debate with Professor John Hilton.

installed in London and elsewhere. Some members of the public have the strange idea that this is the "television main" and until it reaches their district they cannot tap into it. They imagine, of course, that television is laid on like water, gas, or electricity.

Some members of the public believe that television sets are difficult to operate and liable to break down. Actually, now that we have one standard it is practically only a matter of switching on and off. Some neighbours wanted to see my television receiver at home the other day. I had to go out, but gave them a key and left the set running about an hour before the transmission with the controls untouched—exactly as it had been on the previous night. I came in after the programme had been running for ten minutes to find them watching it quite happily. None of them knew the slightest thing about a television set and only one of the three had ever seen a receiver before. They had not touched the receiver and the pictures were excellent.

## Few Calls for Service

As to service, the manufacturers have fewer calls to television sets proportionately to the number of sales, than they do to radio sets. Strange but true, in spite of the fact that the television receiver is far more complicated internally and has four times as many valves.

I said just now that B.B.C. programmes had improved and this is really the most noteworthy point of the week. Standards of production are rising steadily, intervals grow shorter and fewer, presentation becomes slicker, less slipshod. Just as the quality of the music on the television wavelengths is demonstrably 100 per cent. better than on London Regional, so the quality of the humour in the light entertainment is on a higher plane altogether.

In handing this bouquet I have in mind more particularly the recent effort of Mr. Dallas Bower "Pasquinade." I forgive

the B.B.C. their anxiety "for to shine in a high aesthetic line," which shows itself in a scramble for high-sounding titles music to Chelsea's ear. (Hence "Pasquinade," "Panache," really nothing but discarded tags). I forgive it, but I hope it won't go on for ever; indeed, it can't because the stock must be running low.

## A Refreshing Change

Mr. Bower presented a truly original entertainment, a refreshing change from vaudeville and Music Hall broadcasts on the sound wavelengths. Nowadays we have a surfeit of wisecracking humour, and to provide something different is television's chance. I believe Mr. Bower wrote a great deal of the material himself, and I compliment him again. However, the best part was the Maurice Baring sketch showing Julius Caesar and Calpurnia grappling with the problem of dinner invitations.

I thought that Hermione Baddeley and Cyril Ritchard were the most successful artists in this programme.

Another unusually good transmission was "Looking Back," featuring Henry Hall and the B.B.C. Dance Orchestra. Those who imagine that a dance music broadcast must always be the same sort of thing would have revised their views if they had seen this particular transmission.

The programme showed a considerable advance in slick camera manipulation. It was also well thought out from other points of view, showing the evolution of the B.B.C. Dance Orchestra of to-day from the original six of Gleneagles Hotel.

## Don't Thrash Old Ideas

On the other hand, I think it time that some programme ideas which have had a good run were passed over for something fresh. Mr. Cecil Madden has plenty of ideas, but "Cabaret Cartoons" is not one of the best. Give it a rest! The trouble is that it seems to be both a cartoon and a cabaret and in the end it is neither!

# W. SOMERSET MAUGHAM'S

*great novel*

## "The Narrow Corner"

*Complete in the May issue of*  
**The ARGOSY Magazine**

No lover of good fiction can afford to miss this thrilling romance of the South Seas by one of our greatest living story tellers. The May number of The ARGOSY Magazine also includes

*Short Stories by:*

**JOHN GALSWORTHY**

**EDEN PHILLPOTTS**

**W. W. JACOBS**

**WALTER DE LA MARE**

**HENRY WILLIAMSON**

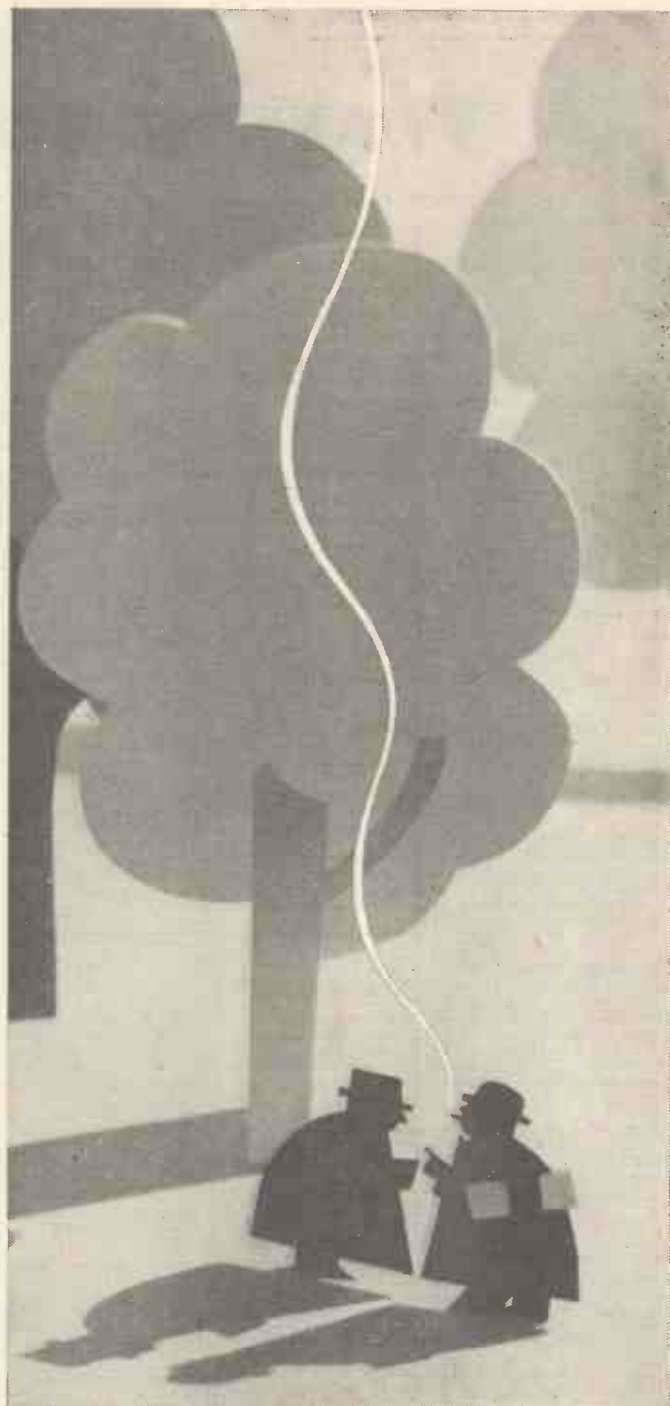
**and many other famous authors**

The ARGOSY Magazine always provides the best all-round fiction entertainment. All stories are complete and each is a masterpiece of its kind.

# The ARGOSY MAGAZINE

May number, now on Sale at all Newsagents

1/-



"Wills' Gold Flake  
— now there's a  
CLEAN SMOKE  
for you"

CLEAN AND SMOOTH TO THE PALATE

# A WARNING TO PENTODE USERS!

The following letter is published as a warning to users of output pentodes. It gives an actual experience of the build-up of voltage in a pentode when the load is taken off. That is a feature of pentodes on which I have written several times, and is one that should not be forgotten. In this case the owner of the pentode cannot be blamed, but the experience is worth quoting because of the phenomenon itself. Incidentally, it is lucky that the writer of the letter saw what was happening and switched off. Otherwise, a very battered pentode might have been found in that valve socket before very long.

Here is the letter:

"Some time ago I had an interesting experience which may interest your readers. I had to clean the wacchange switch of an A.C. set of the S.G.-v-Pen. type. I should mention that the output transformer was mounted on the chassis and the low-resistance speaker connected to it by very light flexible leads.

After the switch was cleaned and tested, the chassis was replaced in the cabinet and the set switched on. Volume and quality were very poor and, to my surprise, I saw flashes across the bottom of the output pentode, just below the pinch. These only appeared when the volume control was turned towards its maximum position. I switched the set off and examined the chassis once more. I found that one of the speaker leads from the output transformer was broken inside the braided covering. When this was replaced by a fresh piece of flex the set performed normally.

"I came to the conclusion that when the secondary circuit of the output transformer was broken the primary winding acted as a very efficient L.F. choke, and the arcing was due solely to the A.C. (L.F.) component in the output from the pentode being forced to jump across the leads of the valve to the cathode.

"This view is, I think, supported by the fact that the trouble only occurred when the volume control was advanced towards maximum.

"Can any of your readers offer a better explanation?"

"Yours faithfully, E. F. (Oldbury)."

The answer you have given to the problem is quite correct, E. F., so I don't think anyone will come along with a better solution. An unloaded pentode will develop a very high A.C. potential across its electrodes, and that is one reason why it has been suggested so many times that an equaliser circuit shall be connected across the output choke. That circuit consists of the usual condenser and resistance "tone control," and can be used both as tone control and a safeguard. The effect is that there is always a small load on the valve, even if the loudspeaker is not in use, and this load will prevent the build-up of any dangerous potential in the valve should the speaker become detached. A resistance of anything between 10,000 and 30,000 ohms is O.K. and the condenser can be of any value you like, say, .01. If this cuts down the top notes too much, try a smaller condenser or a higher value resistance.

## S.W. KIT

"Inquisitive" (Ryde).—*I have considered buying a one-valve S.W. kit, 12 to 94 metres. Is it possible to convert it for use on A.C. mains and for speaker?*

If I knew exactly what you meant by that I could answer you. I assume you want to know whether you can convert the one-valver from a battery kit to an all-mains one. You could, but it would be tantamount to rebuilding the whole thing. You would have to get a new valve, probably change the reaction coil or condenser, rewire the set, and add a power pack. Even then it would not work a speaker unless you added more valves.

I should hardly look upon the scheme as one which could be "converted," but as one in which the parts, or some of them, could be used again in the building of a mains model.

If you are hesitating about the purchase of a battery or a mains unit and want one that can be used on mains later on, I should go straight on for the mains unit. If you cannot use mains now you will have to get the battery model, but if you can use mains I should not hesitate about it.

## THE "SIMPLEX" TWO

H. B. (Middlesbrough) asks if we can help him out with details of the "Simplex" Two.

Well, H. B., if you refer back to W. L. S.'s "On the Short Waves" in the February 27th issue of "P.W.," you will find the circuit and wiring diagram of the "Simplex" Two. These were reprinted again owing to the large number of requests.

## LUXEMBOURG

T. M. P. (Kingston-on-Thames).—*I have the same trouble with Luxembourg as B. E. F. (Manchester). About 5.30 on Sundays it starts tricks, and I have to give it up in disgust.*

I don't know what the matter is. As you say later in your letter, it does not seem as if your set is unstable. Yet I get no such trouble with Luxembourg, and a week ago I listened to the station all through Sunday afternoon and evening at Ewell, not so far from you. I detected no tricks.

Perhaps other readers can help. The trouble which B. E. F. complained about is described on page 650 of "P.W." for February 27th. I have not found any other station on top of Luxembourg to cut it up to the extent of which you seem to complain. There is another station which is on, or very nearly on, the same wavelength, and it is possible that your set tunes it in stronger than other sets; but that is a case of freak reception that is hardly likely to occur. What of your neighbours? Let me know how they get on with Luxembourg. I cannot help feeling that the trouble is in your set or in the particular piece of England in which you live. I cannot account for the trouble. It's a case for help by all listeners, so I shall be glad if they will send in their experiences.

## STEP-UP TRANSFORMERS

*I have had a letter from a Bangor reader regarding Technicality No. 41. He says that he thinks I ought to make it clear to those*

*uninitiated in the habits of transformers that a transformer will only work with A.C.*

O.K. But it will also work with intermittent D.C., Mr. Bangor—that is, with D.C. that is broken and made by means of a revolving contact or with a mechanical make and break in the form of a trembler like that in an induction coil.

As a matter of fact, an induction coil is an elaborate transformer which has its own D.C. make and break. That is all the coil is.

So don't go trying to get a transformer working on D.C.; it will only burn out. You must have either A.C. or intermittent D.C., in which latter case the secondary of the transformer will have a ragged sort of A.C. in it.

In the power packs which make H.T. from I.T. the intermittent D.C. transformer arrangement is used. The D.C. from the I.T. battery is broken up by a trembler of some sort and then the voltage is stepped up from, say, 6 volts to some 150 or more. The current then has to be rectified for use as H.T. As the voltage is stepped up, of course, the current is stepped down. That always happens. You cannot step up voltage and current in one transformer. It is equivalent to getting something for nothing.

## EVER HAD IT?

K. D. R. (Hertfordshire).—*Yes, I am asking my own query and am going to try to answer it. It may be of interest.*

I have a superhet which is of the usual type and is employed for household listening. Recently, a new garage has been opened near. The other night a most annoying, strong tunable hum broke into the listening. It had a fairly sharp peak at 300 metres and faded off till it was inaudible at 180 and upwards at 400. On the long waves it could just be heard on 1,300, but it did not bother any station up there. On the London National, however, it completely broke up the programme.

"That beastly garage starting up, I suppose," I said to myself. "Some charging apparatus, or lathe." And for some twenty minutes I tuned about to see if I could get rid of the noise—libelling the garage all the time!

I was just about to ring up a friend in the place to ask if he was hearing it, when someone called. I went out to the front door to let him in.

As I was returning under the hall light, I heard a very high-pitched singing from the light. I turned it out, and the noise stopped. So did the noise of the "charger" in the set. I turned the light switch on again, but no light came. The bulb had broken. A new bulb was tried—and everything was O.K.!

What was the cause?

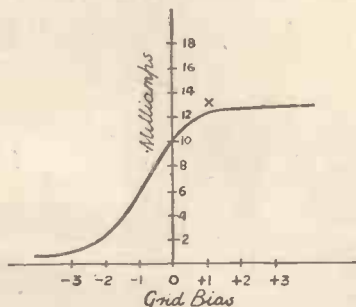
Well, K. D. R. (says he in his usual guarded fashion), obviously, the trouble came from the hall light. Did you inspect the bulb? Probably the filament, which is now broken, was just on the point of giving up the ghost; in fact, I should say it had actually broken, but was being held together by an electric arc between the ends of the wire. This arc made the singing and also supplied the noise in the set. Incidentally, probably the filament was vibrating all the time, too, and this might give rise to noises, both audible and electric, in the set.

Faulty switches and electric bulb contacts are very common causes of set noises, and are frequently

(Please turn to page 117.)

## TECHNICALITIES EXPLAINED—No. 47

### Saturation



and varying the H.T. voltage. In such a curve, too, a saturation point can be reached where with any given grid bias increase of H.T. will not result in increase of electron flow, or, in other words, increased anode current.

When a valve becomes saturated it reaches a state in which it is giving up as many electrons as it possibly can. In other words, no matter what you do in the way either of increasing H.T. or reducing grid bias, you cannot get any more electrons from the filament or cathode.

If you follow the valve curve shown you will see that it goes fairly straight up towards the right and then flops over and goes more or less horizontally. Where it bends, X, is the saturation point. It is the point of maximum electron flow, and allowing the grid to become more positive will not increase the flow.

The curve is one in which the grid bias is varied, and the anode voltage remains constant. Another curve can be obtained by keeping the bias constant and varying the H.T. voltage. In such a curve, too, a saturation point can be reached where with any given grid bias increase of H.T. will not result in increase of electron flow, or, in other words, increased anode current.

# TELEVISION TOPICS—Collected by A. S. Clark

*A weekly feature which will keep the reader au fait with all the latest news and developments in television science. It will appeal alike to the newcomer to television and the advanced experimenter.*

## "TELEFRAMES"

*Items of general interest*

THAT Miss Jasmine Bligh, the announcer, has a namesake was revealed recently when she was summoned for speeding. The records showed that a Miss Jasmine Bligh had already had her licence endorsed, while that of the Miss Bligh we know was quite clean. When the addresses were found to differ the existence of two Jasmine Blighs was proved.

Why not bring them both to be televised together in "Picture Page"?

### B.B.C.'s TELEVISION THEATRE

It has been stated that the B.B.C. are to build a special theatre for television broadcasting and that a site has already been chosen. If the scheme goes through, this will be the first television theatre ever to be built.

The stage will have to be large because in some cases it will be necessary to change from one "set" to another without an intermediate break.

### NO MAKE-UP NEEDED

Miss Mary Allen, the B.B.C.'s television make-up expert, has found the perfect television face. It belongs to Dolores Ray.

After commencing the usual colourful make-up on Dolores Ray, Miss Allen suddenly realised that none of it was really necessary, and sent her to the television camera with simply a little darkening under the eyes.

Miss Allen explained that the skin texture was more important in obtaining good televising than the profile of the features.

### A SURPRISE

Engineers at Alexandra Palace were recently surprised to receive a record of the sound of one of their programmes, we learn. It was recorded in New York during an unusually good set of conditions when the station was coming in remarkably well.

### TRANSMITTER FOR PARIS

For the coming Paris Exhibition a large television transmitter is to be erected at the Eiffel Tower. It will be supplied with programmes from two studios, one in the radio section of the Exhibition and the other at the P.T.T. Paris station.

### THOSE MOBILE VANS

There are always some slight snags in anything new which cannot be visualised beforehand and only become apparent in practice. So the fact that the B.B.C.'s

mobile television vans will not be ready for commission till a short time before the Coronation suggests that much experi-

mental work should be done in the intervening time.

Let's hope that this will show up in the immediately pre-Coronation programmes. The telescopic lenses to be provided should give some interesting effects if used to their full scope.

### GOOD WORK

Have you noticed how programme critics have been finding the recent television programmes better than the ordinary sound-only ones? What a change-round from the earlier impressions! And they are right, too.

But there is much significance in the fact, in so far as it portends a really successful future for television. No doubt the presence of the vision has had a lot to do with it. Who dare say now that television will not one day completely oust blind broadcasting?

### FOR TRANSMISSION



One of the large high-frequency "tubes" used in the R.C.A. television transmitter in the Empire State Building, New York. Note the inlet point for the water used to keep the anode cool when the valve is working

### IN THE PROVINCES

Unfortunate it is but true that in the provinces there is a tendency to take an all-round pessimistic view of television. No doubt it is largely engendered by the absence of television outside London and the nearby counties—there is a tendency

### "QUEUE FOR SONG"

"Queue for Song" is the title of a little show which Reginald Smith is presenting in the evening television programme on Saturday of this week. The title is a legacy from the days when "Reggie" collaborated with Cecil Madden in Empire programmes. The artists will be Kitty Reidy, the well-known principal boy of Lyceum pantomimes, and Hugh French, who has appeared in many Charlot shows.

There will be no orchestra, but Dennis Van Thal and Bobby Probst will play on two pianos throughout the show. It is hoped that "Queue for Song" will be the first of a series of these intimate little entertainments on Saturday evenings.

to persuade themselves that what they can't have is not worth having.

But it is not the best attitude with which to speed-up the provision of new stations. We fully sympathise with them, though.

### A DEFINITION

"Milk-coloured eyeball" is how an American paper describes the end of a television cathode-ray tube. Very apt, both from a descriptive and association point of view.

## QUESTIONS THEY ASK

SINCE the Television Inquiry Bureau was opened by the G.E.C. at Magnet House, Kingsway, W.C., a month ago, more questions have been asked about the Coronation than about any other subject.

"An increasing number of questions about the Coronation is reaching us each week," Mr. Derrick Murdoch, who is in charge of the Bureau, said. "It is giving a terrific fillip to the industry, and judging by the number of inquiries, a great many people are determined to 'look in' at Coronation scenes. Many of the inquiries received are leading to sales, and the G.E.C. is having to speed-up production.

"A surprising number of people still think that a television set acts like a magic-lantern, and throws a picture on to a screen as in a cinema," Mr. Murdoch continued.

"Many people who contemplate buying television sets are afraid that in a few months' time they will be out of date. We are able to reassure them that there are no grounds for this fear, as the design of the sets will not alter materially unless any different system of transmission is ever adopted, and the B.B.C. has promised not to consider this for at least two years.

"Many other inquiries relate to conditions in particular districts. It is impossible to lay down hard and fast rules, but since there have been daily transmissions our engineers have had enormous experience, and we are finding that very few problems of interference are so serious that they cannot be overcome."

A number of people ask whether their wireless aerial can be used for television reception. The answer is that in most cases a television set requires a special aerial.

"Television sets are not, as quite a number of inquirers seem to imagine, expensive to run," Mr. Murdoch concluded. "If a television set were switched on for a whole week's transmissions, it would use only three units of current, the cost being, taking an average rate, 2d. or 3d."

## TELEVISION TOPICS—Continued

### AN INFRA-RED FILTER

FOR LIGHT-RAY EXPERIMENTS

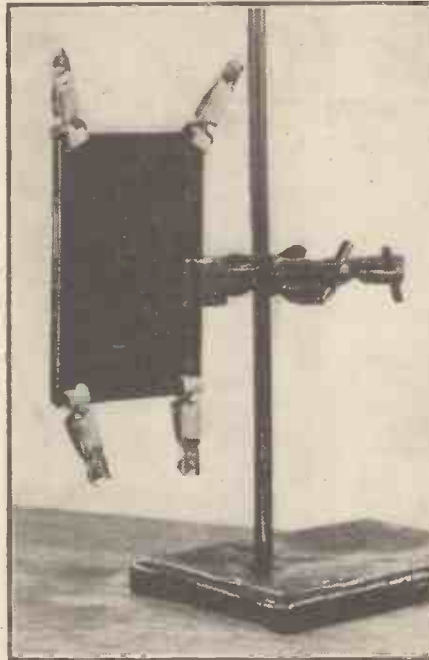
**P**HOTOCCELL experimenters and amateur television workers generally who desire to experiment with the reactions of various light-cells to infra-red rays may favour, at least for a time, the very simple and handy infra-red filter illustrated in the photograph herewith.

All it consists of is merely a piece of red glass clamped firmly up against a sheet of cobalt-blue glass. If the resulting infra-red filter is desired to be more or less permanent, the component glasses are best bound up together with adhesive strips around their edges after the fashion of an ordinary lantern slide.

#### Question of Efficiency

The precise infra-red efficiency of the filter will, of course, depend entirely upon the characteristics of its component glasses. Generally, however, a good piece of fairly dark red glass used in conjunction with a piece of blue glass will cut out all visible rays of light and pass only infra-red rays. Such a filter will appear absolutely black and opaque to the eye, but it will pass infra-red rays quite freely. Very frequently, such improvised filters pass a trace of visible

red light, but, for the generality of experimental purposes, such a characteristic does not detract from the usefulness of these easily-made and inexpensive filters.



An experimental mounting for the infra-red filter.

### TELEVISION FOR BEGINNERS

The next few articles in this series will deal with the cathode-ray tube and how the beam is focused.

**Y**OU will have seen lately in a paragraph that some manufacturers have developed "magnetically focused" cathode-ray tubes, and may have wondered what exactly the words mean. Although this is regarded as the latest development in tubes, the principle of magnetic focusing is quite old—about 1900 the first tubes available for laboratory work were focused in this way, and the practice only dropped because more convenient ways were found for the tubes then available. Now it has been revived for two chief reasons—the tubes are slightly cheaper to make and a great deal simpler, and the focus obtained is slightly sharper in some cases.

#### Like a Ray of Light

The opening sentences take it for granted that you know what focusing means: the focusing of an electron beam is exactly the same as that of a ray of light, and means bringing all the electrons to as small and as sharp a point as possible on the screen. The electrons produced by the cathode, although they travel in straight lines so far as possible are always tending to spread out because of their mutual repulsion.

Similarly charged bodies repel each other, according to the laws of electrostatics, and hence if a body of electrons is streaming up towards the screen they will

tend to get farther and farther apart. The object of focusing is to bring about the reverse process and make them draw closer and closer together until they all arrive at a spot about  $\frac{1}{2}$  mm. diameter.

Incidentally, the amount of energy concentrated on a spot this size is fairly considerable. We can easily work it out roughly by multiplying the current in the beam by the final voltage applied to it. Suppose the current is 50 microamperes (which corresponds to three hundred thousand million electrons per second) and the voltage 5,000. The power in watts is then  $50 \times 5,000$  microwatts, or  $\frac{1}{4}$  watt dissipated over an area of about a square millimetre. This is quite sufficient to burn the screen material if the spot is left in one position for any time, but if the same energy is expended over a single line the area is increased to perhaps 100 sq. mm. and the heating is correspondingly reduced.

#### Guiding the Electrons

However, returning to the focusing, we have to guide the electrons towards a given point from the time they leave the cathode, and in high vacuum tubes this can be done in two ways—by using electric fields surrounding the beam, or by magnetic fields surrounding it. We can take the first one later and deal with the magnetic field first.

The researches of Faraday (1830) gave us the first laws of the behaviour of current-carrying conductors in magnetic fields, and the one which concerns us is this: If a conductor carrying a current is placed in a magnetic field it will tend to move out of the field at right angles to the lines of force, and the force tending to push it out will be proportional to the strength of the field, the strength of the current and the length of wire in the field.

The diagram below gives an idea of what will happen. The field between two magnet poles is

#### MAGNETIC EFFECT



A conductor in a magnetic field tends to move in a certain direction.

shown by the lines across the page and the circle in the middle represents the cross-section of the conductor. If the current in the conductor is flowing upwards towards you the wire will be pushed towards the bottom of the page. If the current is flowing into the page the push will then be towards the top of the page.

Reversing either the direction of the field or the direction of the current will reverse the direction of movement of the wire. This is, of course, the principle of the electric motor, and the law holds good just as much in the case of

an electron stream, because we can consider it as an exceedingly flexible conductor carrying a current.

#### Those Old Conventions

If we think of the circle in the diagram as representing the electron stream on its way up the tube towards the screen, a magnetic field placed as shown will push the beam upwards. Why upwards? Because the electrons are negatively charged and the flow will therefore correspond to a movement of current into the paper.

This is always muddling because of our old conventions with regard to current flow. Until the electron theory the current was considered to flow from +ve to -ve, but the movement of the electron is actually in the opposite direction. But this may be confusing you, and it is not really vital, provided that we all agree to the same convention.

#### Deflecting the Stream

The diagram shows, therefore, how an electron stream is deflected by a magnetic field, but this is not quite the same as focusing the stream, because in this case we have a bodily movement to and fro, and we want a concentration in one spot. The principle is the same, however, and in the meantime we have learnt how the magnetically deflected tube works. All you have to do is to place a magnetic field across the beam, and it will move either up or down, depending on the polarity of the field. Next week we can carry on to the focusing coil.

### 345 AND 441 LINES COMPARED

**C**OMPARATIVE advantages of the new 441-line television system, as developed by Philco Radio in America over the old 345-line equipment, were clearly demonstrated at a semi-public exhibition held in Philadelphia last month, according to word just received by Philco Radio & Television Corporation of Great Britain, Ltd. Although definite progress was being made, Philco engineers and officials refused to answer the oft-repeated question, "When will television reach the average American home?"

The demonstration, which lasted an hour, consisted of a television fashion show, an interview, and a film "short." The highlight of the exhibition was the first public showing of the higher definition 441-line scanning, the standard recommended last autumn by the Radio Manufacturers' Association and adopted by all American television companies.

Arrangements were made to switch from the 441-line to the 345-line television broadcasting apparatus, in order to show comparisons. With the 441-line system in operation the second hand of a watch in the broadcasting station three miles away was plainly visible, while it was obscure when the transmitter was turned on to the 345-line system. The serial numbers on a dollar bill were legible with the 441-line system but illegible when shown with the 345-line system.

QUESTIONS & ANSWERS

(Continued from page 114.)

overlooked by set owners who are harassed by interference. It is a good plan when any noise like that starts up to go round the house tapping the electric light bulbs while they are on (not too hard, of course), and also turning the switches off and on to see what happens.

I have known electric fires to make noises while they are warming up. All very trying if you do not know what is happening with your set.

By the way, the other day I wrote about a faulty wavechange switch on a superhet. Said I had experienced it. So I had, but I have something else now, on another super. Just the same symptoms, too.

Seems O.K. all the time it is working, but every time it is switched off the wavechange switch has to be waggled before the set will start up. Aha, I said, wavechange switch again! Why can't these manufacturers make their things properly? But I was wrong—they had.

What was the trouble? The oscillator valve—an S.G. It was getting tired and wanted a kick in the grid to start it oscillating. That kick was given by repeated waggles of the wavechange switch. When I had changed the valve, everything in the garden was beautiful! And it will remain so until something else goes wrong, I suppose. Heigho, that is radio, isn't it?

INTER-VALVE COUPLING

S. R. (Bristol) writes to say that he cannot quite understand the action of A.C. coupling between valves in an L.F. stage. What worries him is that the anode current of valve number one is D.C., fluctuating between certain points. How can that D.C. fluctuation be passed on to the next valve through a condenser or transformer and cause a variation in grid bias of that next valve?

I am going to explain this without diagrams. To start with, the result of applying any fluctuating D.C. to a transformer or a condenser is to provide A.C. (perhaps rough in form, but at any rate true to the pattern of the D.C. fluctuations) in the secondary of the transformer or on the "other side of the condenser."

Those who are technical experts must forgive the "homely" phrasing.

Now I can see what worries S. R. He cannot see why the A.C. fluctuations that are applied to the grid of the second valve affect the grid bias.

Just draw a simple resistance-coupled stage, please. Label the anode of the first valve A, and the grid of the second valve G. Label the condenser C. Now follow the anode connections of A through the resistance to H.T. through H.T. to earth. Where do you arrive? At the filament or cathode of the second valve—AND AT THE POSITIVE SIDE OF THE GRID BIAS BATTERY.

O.K. Now follow the path of the A.C. "through" the condenser (C). You get to the grid of the second valve; through its grid leak you get to the negative side of the bias battery; through the battery you get to earth again.

IN OTHER WORDS THOSE TWO PATHS ARE IN PARALLEL.

Now, you have fluctuating D.C. across the anode resistance of A. That is, you have D.C. with A.C. "on" it. That resistance is in a parallel path with the grid leak of the second valve. Therefore, you have a corresponding fluctuation across the grid leak of the second valve, "through the condenser" C.

Now the grid G is supplied with, say, 3 volts negative in respect of earth by the bias battery.

That is, there is a potential of three volts across the grid leak and battery combined. Or between grid and filament or earth.

This is exactly where your fluctuating D.C. is being applied. Between grid and earth of the second valve. That fluctuating D.C. is, in other words A.C., since no D.C. current can pass through the condenser, and the steady anode current of the first valve is "left behind."

That condenser C blocks the D.C. from going down the parallel path from A to earth. It has to go through the anode resistance. But the A.C. part of it can "go through" the condenser and so builds up a potential across the grid resistance of the second valve.

That potential is alternating. Remember that. At one moment it makes the grid of the second valve negative in regard to earth or filament (forget the bias for the moment). The next instant it makes it positive in respect of filament.

In the old days before bias was used we used to run our sets like that. Then bias was introduced to prevent the grid becoming positive with regard to its filament and so giving rise to grid current and distortion.

So in went the bias. Sufficient bias is applied to overcome the biggest positive swing applied to the grid by the A.C. If the bias is three volts and the maximum swing of the A.C. is 2 volts we shall get this happening. Assume the A.C. swings between 2 volts positive and 2 volts negative.

The grid of the second valve will become 2 volts positive due to the A.C.; at the same time it is 3 volts negative due to the bias. In other words, it is 1 volt negative.

On the next half cycle the A.C. makes it 2 volts negative, which being added to the bias results in 5 volts negative in respect of the filament. Thus, the grid fluctuates between 1 volt negative and 5 volts negative, a fluctuation of 4 volts. It is carrying a 4-volt grid swing.

I hope this will help to clear matters up. Don't forget that parallel path business: it explains how the potential is applied from the anode A to the next grid G always IN RESPECT OF EARTH, OR THE FILAMENT OR CATHODE OF THE VALVES.

Both sides of the coupling condenser C are at the same A.C. potential. Remember that. It is only the D.C. that does not "pass through." That is blocked, and the full D.C. potential (the anode voltage of the first valve) is applied and can be measured across the coupling condenser.

For A.C. purposes you can forget the presence of the condenser and assume that the grid of the second valve is in contact with the anode of the first valve. Perhaps that thought will help you.

AIRCRAFT RADIO DEVELOPMENTS

Short-wave communication for Dutch air-liners on the India route.

By M. W. H. de GORTEN

ON April 1st the new short-wave transmitter at the Schiphol Aerodrome near Amsterdam commenced working with the aeroplanes of the Royal Dutch Air-lines on the route to India. Also the short-wave transmitter of Scheveningen-harbour is now used for this purpose. So the communication with the planes in the air will be much better than before.

Two Installations

The new Douglas machines D.C.3 are provided with two wireless installations, one for the ordinary long-wave and the other specially for short-wave communication. The old long-wave transmitter at Schiphol; which works in close contact with the ground and station organisation of the K L M could only establish communication with the departing 'planes over a rather short distance. When the 'planes passed the Belgian frontier, contact with the 'planes in the air was lost. With the new short-wave transmitters and receivers, Schiphol Aerodrome will be in direct contact with the crews of the 'planes until they reach Cairo.

After Cairo has been left en route to India, direct contact will be possible from Holland by means of the more powerful transmitter of Scheveningen-harbour. The postal authorities have decided that this transmitter will be on the air for the benefit of the India airplanes at special hours, during which the 'planes are en route.

Further Co-operation

As at present many aerodromes in British India are also installing short-wave transmitters, the new installations on board the new D.C.3 'planes is of very great value, as the short waves give less trouble in this part of the world than the ordinary long-wave service.

The Indian postal authorities have also decided to co-operate with this new short-wave service and have installed a special short-wave station at Bandoeng, Java, for communicating with the aeroplanes of the Royal Dutch Air lines.

PETO-SCOTT

S.T.800 BATTERY VERSION

PILOT AUTHOR KITS

KIT "A" YOURS FOR

7% DOWN

Complete Kit of Components exactly as FIRST specified and used by Mr. J. Scott-Taggart, with Konectakit (Gratis with Complete Kit) but less wander plugs, accumulator connectors, valves, Extractor Kit, Cabinet and Speaker. Cash or C.O.D. Carr. Pd. £3/10/0, or 7/- down and 11 monthly payments of 6/4.

KIT "B." Cash or C.O.D. Carriage Paid £4/16/6, or 9/- down and 11 monthly payments of 8/10.

9% DOWN

KIT "CT." Cash or C.O.D. Carriage Paid £5/14/0, or 12 monthly payments of 10/6.

10% DOWN

KIT "CC." Cash or C.O.D. Carriage Paid £6/11/6, or 12/3 down and 11 monthly payments of 12/-.

12% DOWN

KIT "CLL." Cash or C.O.D. Carriage Paid £6/14/0, or 12/3 down and 11 monthly payments of 12/3.

12% DOWN

★ S.T.800 EXTRACTOR is available as a kit of parts or ready-built at the same price, £14/4/0. Cash or C.O.D., or add 2/3 to deposit and each monthly payment. Please state which is required when ordering.

★ If the above Kits are required complete with 8 wander plugs and 2 accumulator connectors, as specified, ADD 1/9 to Cash or C.O.D. prices or 1/9 to the deposit.

FINISHED INSTRUMENTS

Exact to Mr. John Scott-Taggart's First Specification



TABLE MODEL

BATTERY VERSION. Built by Peto-Scott's expert technicians. Complete with FOUR FIRST SPECIFIED valves and Peto-Scott walnut table cabinet (illustrated on left) less batteries.

OVERALL DIMENSIONS: 13 3/4" DOWN

Width 18 1/2", Height 14 1/2", Depth 12". Cash or C.O.D. Carr. Paid £7/5/0, or 13/3 down and 11 monthly payments of 13/3.

CONSOLE MODEL £9/2/0, or 16/9 down and 11 monthly payments of 16/8.

SUPER CENTURION

KIT "A" YOURS FOR

5% DOWN

Complete Kit of components exactly as specified by Mr. John Scott-Taggart, with ready-drilled panel and Easibilt cabinet parts, but less valves, cabinet and extractor. Cash or C.O.D. Carriage Paid £2/18/9, or 5/- down and 11 monthly payments of 5/6.

Peto-Scott ALL-WAVE S.G.3 BATTERY CHASSIS

with S.G., Detector and Pentode Valves.

4 WAVE-BANDS: 14-31, 28-62, 200-550, 900-2,100 metres. Double ratio slow-motion drive, 8-1 and 100-1 reduction. New rotary type low-capacity switch, with silver-plated contacts. Air-plane colour-coded dial (stations and wavelengths).

Each chassis tested before dispatch. BRIEF SPECIFICATION: For reception of a high order all day and every day, from all parts of the world, 3 British valves: Variable-Mu H.F. Pentode, High Efficiency Detector and Harries' High Efficiency, distortionless output pentode. Variable selectivity by alternative aerial tapplings. Stove enamelled pressed-steel chassis. Screened air-cored Broadcast coils. Dual electrostatically screened short-wave coils. H.T. consumption approx. 12 m/A. Each chassis supplied complete with Screened Grid, Detector and Pentode output valves. Fully tested on all wavebands before dispatch. Cash or C.O.D. Carr. Paid £3/19/6, or 5/- down and 11 monthly payments of 7/6.

Overall Dimensions: 9" high; 11 3/4" wide; 9" deep.

5% DOWN

All Postal Orders must be crossed and currency registered. Peto-Scott Co. Ltd., Established 1919

77 (P.W.25), CITY ROAD, LONDON, E.C.1.

62 (P.W.25) HIGH HOLBORN, LONDON, W.C.1.

Holborn 3248.

TECHNICAL JOTTINGS

# AERIAL PROBLEMS IN CAR RADIO

Some items of interest to all

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

**N**OW that summer is coming along and the question of radio-in-the-car will again come to the fore, we shall no doubt see various new improvements and gadgets for this purpose. One of the things which I think badly needs attention is the aerial pick-up arrangement for use in the car. At present, as you no doubt know, there are various forms of "line" aerial, but these are so very restricted, owing to the small space available, that the actual pick-up of the aerial must be very minute, and consequently the amplification has to be correspondingly boosted to make up for it.

**Using a Frame Aerial**

The obvious form of aerial for use in a car would, of course, be the *frame* and, as you can readily imagine, this has been tried out in a number of different ways. But unfortunately, it seems to suffer from certain fundamental drawbacks when used in a car. I should mention in passing that the frame, in any case, would be most

applicable to a set of the superhet type, but as this type of set is now so popular and has been so much improved there is nothing very fundamentally objectionable in that.

**Drawbacks of Its Directional Effects**

One of the curious defects of the frame aerial when used in the car, one which would not perhaps strike you at first, is that owing to its pronounced directional effect it causes considerable variations in the strength of reception as the car changes its direction as it moves around the bends in the road. You can easily see that the direction of the car at any time may be at right angles to what it was only a few minutes before.

A further cause of variation is the passing through narrow cuttings which, from a radio point of view, are almost equivalent to tunnels, but the cutting down of the signal energy here is independent of the type of aerial and affects a line aerial just the same as it does a frame.

**Small Energy Pick-up**

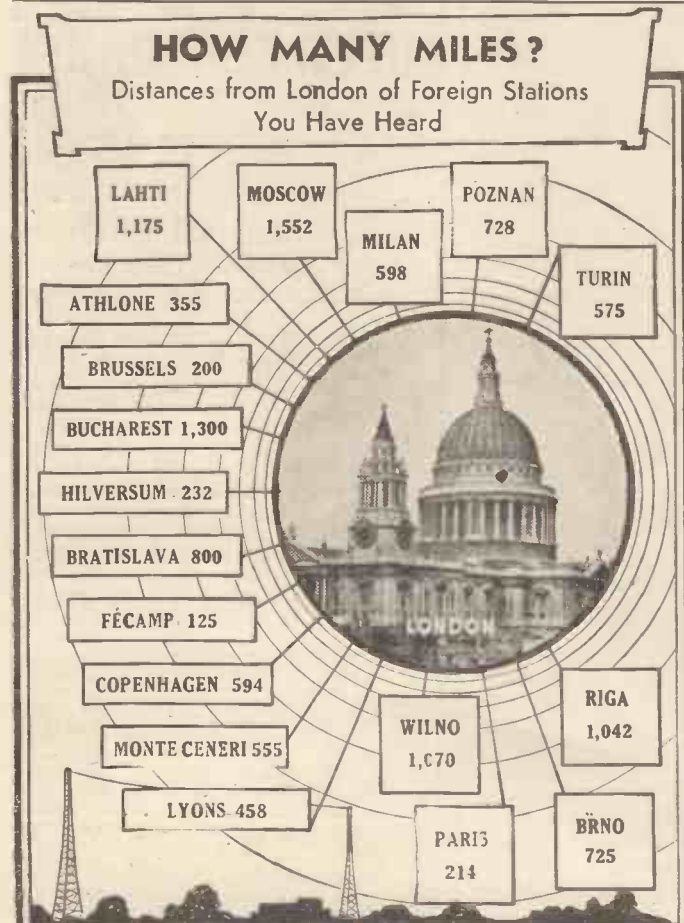
The greatest drawback with the frame, apart from its small signal energy pick-up, is its directional property, and for this reason, it doesn't seem to offer a great deal of scope for use in the car. It is for this reason principally that designers have fallen back on the extended or line type of aerial, with plenty of high-frequency amplification, and receivers on this principle are now operating very successfully and in increasing numbers.

Nevertheless, the aerial problem with car radio is still deserving of a good deal of further attention, and this is a field in which there is plenty of scope for those of my readers who are fond of experimenting. If you can find a really simple and efficient form of car aerial which is as far as possible free from directional effects it should meet a widespread need.

**Buying a Set**

People who are thinking of buying a new set often ask me whether I think they ought to go ahead or whether they ought to wait, in view of the possibility of improved sets coming along very soon. I should think this type of inquiry is one which I receive ten times more frequently than any other. It is quite natural when you come to think of it because perhaps in no other science has progress progressed, so to speak, more rapidly than in radio, and you can understand that what Sir Walford Davies calls "the ordinary listener," with not a great deal of inside knowledge of radio, will be a little bit nervous of investing quite a few pounds in a

(Continued on next page.)



Airmann Navy Cut De Luxe is an inexpensive Navy Cut, having something of the luxurious character of a higher priced Tobacco. It is only by experience in blending extending over 50 years that we are able to produce a Tobacco which gives pleasure to smokers of refined taste—and at an economical price.

**PLAYER'S**  
**AIRMAN**  
**NAVY CUT DE LUXE**



AIRMAN MIXTURE, FLAKE AND NAVY CUT ARE 10" AN. OZ.



## TECHNICAL JOTTINGS

(Continued from previous page.)

set if there seems any likelihood of this being quickly superseded.

### There Will be Minor Adjustments

Well, a few years ago this nervousness would have been much more justified than it is now. Nowadays, if you are going in for, say, a three-valve set or four-valve (if you count the rectifier for working off the A.C. mains), you are not likely to see any very startling improvements in the near future, by which I mean that although there may be, and will be, *minor* improvements, your set is not in any way going to become obsolete or unmarketable in the event that you should want to dispose of it—which after all is the real test. The possibilities of three valves have now been so thoroughly explored that one cannot conceive how *much* more can be done with them than is done at present.

### No Need to Worry

So, if you are thinking of going in for a three- or four-valve set I don't think you need have any hesitation, and it is really rather a waste of time to put off your purchase until next season. In doing so you will only be depriving yourself of the use of the set for that period, and you will not, in my opinion, gain anything which will make this sacrifice worth while.

### More Ambitious Receivers

If, however, you are thinking of going in for something much bigger, at a price of £20 to £30 or more, you might perhaps wait a little until you see what is coming along if you are not particular whether you have the set for the summer or not.

### Valve Improvements

One of the most amazing things in the development of radio is the improvements which have taken place in the thermionic valve. It goes without saying that the valve is the heart and centre of radio reception and without it it is impossible to see how radio could ever have become of such world-wide application as it has done. The introduction of the valve transformed radio and lifted it out of the rut so to speak and placed it on an utterly different plane.

We were accustomed to hear the praises of the valve sung long and loudly even in the early days of broadcasting some ten or twelve years ago, but we little realised that the valve with which we were so pleased, then, would be only a crude thing compared with its successors of to-day. As an example of this let us just consider the magnification which was obtainable from valves of a dozen years ago and compare with the magnification obtainable to-day.

### Factor of Ten

In those now far-off days we thought that a magnification factor of 10 for an ordinary triode valve was quite good. But it was not very long before the screen-grid principle was introduced and brought us to an amplification of 30 per stage. This was hailed as a marvellous improvement, but almost before the words were out of our mouths the screen-grid type of valve had been still further improved upon, and we had the pentode valve for low-frequency amplification, this latter subsequently

yielding the pentode for high-frequency amplification.

Now we come to the amazing comparison, for the high-frequency pentode is capable of giving us a magnification, theoretically, at any rate, of some 5,000 times. Compare this with the magnification factor of 10 for an ordinary triode only a few years back!

Now 5,000!

It is true that in actual practical conditions we can never turn this theoretical 5,000 to account and we only obtain in reality a small fraction of it. The fraction we obtain is many, many times the ratio of 10 which pleased us so much such a little while ago.

The high-frequency pentode, by the way, can often be used instead of the screen-grid valve, whilst another purpose to which it is applied is that of a power detector. In fact, some people think that it shines as a power detector more than in any other position.

### Tuning-Up a Moving Coil

You often hear a moving-coil speaker which although otherwise giving, or *trying* to give, excellent reproduction, nevertheless suffers from a jarring or grating sound. I have investigated several cases of this sort and I have found that in most cases the trouble is due to grit in between the moving coil and the poles of the field magnet. The noticeable thing is that this grit often consists of small iron filings, presumably filings which have been lying on the magnet or which have stuck to the magnet when it was turned out from the works and which, by some means or other, have gradually found their way on to the pole-pieces.

### Getting Rid of Iron Filings

If you have trouble of this sort there is nothing for it but to dismantle the speaker and make a thorough job of cleaning up the pole-pieces and the moving coil. The best way to do this is to remove the diaphragm, complete with moving coil, so that you can get at the pole-pieces. You then take a soft cloth and go very carefully over the pole-pieces many times to make absolutely sure that you have wiped off any adhering iron filings. I may mention that it is extremely difficult to wipe off iron filings from a strong magnet; they have a way of sticking and reappearing when the cloth has passed over as though they were doing it for devilment. Anyway, you will probably be able to tell with the fingers whether there are any particles still there.

### Centring the Coil

Having got the moving-coil and the pole-pieces clean and free from any sort of grit, you then reassemble the diaphragm in place and the most important point to remember here is to keep the moving coil central. The clearance between the moving coil and the pole-pieces is very small, so that the centring is rather a ticklish job. In some speakers you can centre by eye, but it is really better and more reliable to insert two or three strips of thin cardboard (usually about the thickness of a visiting card, but this you will have to find out by examining your own speaker) which will serve to keep the moving coil in the central position whilst you secure the diaphragm by means of its own screws. The strips of cardboard are then withdrawn, care being taken not to leave any pieces behind.

## BARGAINS

### HALCYON

★ AUTODYNE ★

### SHORT-WAVE CONVERTER

LIST PRICE £3:3:0  
**BARGAIN 29/6** With Mullard 3540 Valve

Instantly attached to your present A.C. Mains set and makes it an efficient All-Wave Receiver.

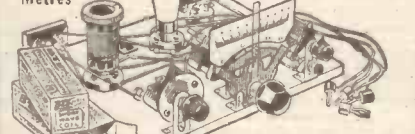
14-60 METRES. ● FOR A.C. MAINS SETS ONLY



● No alterations to your set. ● Simply attach, and your set is an all-waver, a special switch enabling short-wave or broadcast reception to be enjoyed at will. ● Tuning and Sensitivity controls. ● Dial calibrated degrees. ● Walnut finished cabinet. Complete with plug-in adaptor and instructions. ● For A.C. mains sets only. 2/6 down secures; balance in 10 monthly payments of 3/-. **2/6 DOWN**

### BARGAIN 1-valve S.W. KIT

LIST PRICE 35/- BARGAIN 19/6 Cash or C.O.D.



12-94 Metres. Kit comprises Metaplex baseboard, condensers, switch, valve and coil holders, H.F. choke, terminals, slow-motion drive, 3 coils, wire and WIRING DIAGRAM. Less valve. Cash or C.O.D. Carr. Paid 12/6, or 2/6 down and 3 monthly payments of 2/6. N.T.S. Light-weight headphones, 15/- pair extra. **2/6 DOWN**

### A.C. BANDPASS CONSOLE

S. C. 4 Complete with Moving-Coil Speaker, 4 British Valves and Console Cabinet READY TO PLAY.

PRICE LIST £9:9:0 BARGAIN

**£5:15:0**

Or 5/- down and 15 monthly payments 8/3.

● 4 British Valves: H.F. Pentode, Detector, Pentode output and rectifying valves ● Screened coils ● Metal Chassis ● Moving-Coil Speaker ● Illuminated wavelength calibrated scale ● 200-550 and 900-2100 metres ● Combined volume control and on-off switch ● Gramo, pick-up sockets ● Output 3 watts ● A.C. mains 200/250 volts; 40/100 cycles ● In console walnut veneered cabinet similar to illustration above.

This is a wonderful opportunity for you to buy a superlative receiver giving remarkable range and volume at a price only possible from N.T.S. Order now... only a few available. **5/- DOWN**

● SEND FOR BARGAIN CATALOGUE Postal Orders must be crossed and currency registered.

**New Times Sales Co.**

56 (P.W.26), LUDGATE HILL, LONDON, E.C.4. EST. 1924

EVERYTHING RADIO SUPPLIED on the BEST TERMS—all makes of RADIO SETS, RADIOGRAMS, LOUDSPEAKERS, VALVES and Accessories.

## S.T.800 KITS

AS SPECIFIED BY THE DESIGNER!  
KIT "A" WITHOUT VALVES. Cash Price of C.O.D. £3.10.0 or 6/3 down and 11 monthly payments of 6/6.  
KIT "B" WITH VALVES. Cash Price of C.O.D. £4.16.0 or 8/- down and 11 monthly payments of 8/3.0.  
All "P.V." Kits supplied for Cash or EASY TERMS.



### W.B. Stentorian Speakers

The Finest Permanent Magnet Loudspeakers on the market supplied on lowest terms:—

37S. Cash or C.O.D. 42/- or 2/6 down and 11 monthly payments of 4/- DOWN

CASH OR C.O.D.  
ORDERS DEALT WITH BY RETURN OF POST  
We pay all C.O.D. charges.

THE LONDON RADIO SUPPLY CO., LTD., 11, Oat Lane, Noble Street, London, E.C.2.

Convert your receiver into an ALL-WAVE with a—

## "RIDCO" SHORT WAVE UNIT



"Ranger" MODEL 15-85 metres. Price 27/6 (less valve). Price 37/6 (with valve).

"CUB" MODEL 19-50 metres. Price 9/6 complete, ready for reception.

Send for illustrated lists:—

RADIO INDUSTRIES DEVELOPMENT CO., BIRCH ST., HANLEY, STOKE-on-TRENT

## ENGINEERS! ARE YOU EARNING LESS THAN £10 PER WEEK?

If so, you cannot afford to carry on without reading our 268-page Handbook. The book explains clearly and definitely many ways of carving out a successful career. Among other things it explains the Services of our unique Appointments Department, outlines Home-Study Courses in all branches of Civil, Mechanical, Electrical, Motor, Aero, Wireless, Television, "Talkie" Eng., Building, Govt. Employment, etc., and gives details of A.M.I.E.E., A.M.I.R.E., A.M.I.W.T., G.P.O., M.A.T.R.I.C. and all Exams. We alone Guarantee—"No Pass—No Fee."

Whether you be an old hand or a budding apprentice get this book to-day — FREE AND POST FREE.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 101, Shakespeare House, 17/19, Stratford Place, London, W.1.

The World's Most Up-to-Date Boys' Paper!

# MODERN BOY

Every Saturday,  
Of all Newsagents

2d

## THE G.E.C. ALL-WAVE SIX

(Continued from page 100.)

main pointers as a second hand of a watch does to the minute hand. It enables any setting to be recorded with exactitude and facilitates tuning operations immensely.

The medium and long wavebands, with their jumbings of stations, enable the G.E.C. All-Wave Six to demonstrate its razor-edged selectivity. A station, however powerful, is left behind in a half-degree. It just goes completely, leaving the next channel unimpeded, except, of course, when there is definite overlapping. Even in such cases, though, there is the Fidelity Control with which heterodynes can be reduced.

Majestic volume, magnificent quality, and freedom from extraneous noises are provided by the powerful moving-coil loudspeaker.

And withal the set has a grand appearance. It is as attractive to the eye as it is to the ear. Here are some of the features included in the design:

The cabinet is of walnut and macassar, with chromium relief. The waveband coverage is 13.6-30, 29.4-81, 200-500 and 950-2,200 metres. A "Pre-selector" H.F. amplifying stage eliminates "background" and increases selectivity.

## SPECIAL NOTICE

Further new short-wave features, which we are confident will prove of great interest to all enthusiasts, are now being planned, and will appear shortly.

LOOK OUT FOR THEM

The dial is calibrated with station names, metres and megacycles, the short-wave broadcasting bands being clearly marked.

A micro-tuning pointer and "Variable Brilliance" tuning indicator facilitate tuning. Adjustable fidelity renders it possible to take in as wide a spectrum per station as the conditions will allow.

An inter-station noise suppressor eliminates, when required, "all-out" sensitivity when off stations, or when a station itself goes off.

The tone control enables you to set your quality to suit the circumstances.

There are sockets for pick-up connection and for extension speakers. The speaker in the set itself can be switched off, if desired.

The output of the set is 3 watts—3 good watts of undistorted power.

It is an A.C. set quickly adjustable for any mains between 100 and 150, and 200 and 250 volts (40-100 cycles).

And the price of the complete set is 19 guineas.

It should be mentioned that the results described above were obtained on a very short indoor aerial—anything more am-

bitious seems quite unnecessary, such is the great sensitivity of the set. You need not use even a small external aerial, for there is an extensible aerial bound on the back of the set on which we were able to tune-in a hundred European and many American stations.

Technically minded readers will want to know something about the circuit. Well, here is the G.E.C.'s own brief description, and we compliment them on their restraint:

"A tuned high-frequency stage employing a variable-mu screen pentode provides an initial gain on all wavebands. The frequency-changer is a triode hexode, particularly suitable for an all-wave receiver. The signal is then fed to the intermediate frequency amplifier, consisting of two I.F. transformers tuned to 445 kcs. and a variable-mu screen pentode. The coupling between the primary and secondary windings of these transformers is mechanically variable, thus providing a bandwidth which can be varied from 3 kcs. to 8 kcs. One of the diodes of a double-diode-triode rectifies the signal. The second diode feeds the A.V.C. line, which controls the gain of the H.F. amplifier, the hexode section of the frequency-changer and the I.F. amplifier. A small delay voltage is applied, so that the ultimate sensitivity of the receiver is unimpaired. The triode section of the D.D.T. amplifies the rectified signal, and is resistance-capacity-coupled to a 3-watt output pentode. An unusually efficient permanent magnet moving-coil loudspeaker is transformer-coupled to the output valve. A bi-phase rectifier is employed in the power supply circuit; the smoothing circuit consists of two L.F. chokes and three electrolytic condensers. Newly designed Osram valves are used, adding greatly increased reliability and efficiency to a very up-to-date circuit."

## THE BROADCASTER RADIO ANNUAL

A Valuable Reference Book for Radio Retailers and Servicemen

AERIAL-TO-PICTURE explanation of television.—Map of the television reception area. Thirty-page 'service book' and radio encyclopedia.—Directory of all makers and wholesalers in radio.—Who's Who of both personalities and associations.—Battery and mains set market review. These are a few of the features of the 1937 Broadcaster Radio Trade Annual just published by the "Wireless Retailer and Broadcaster," of 29, Bedford-street, London, W.C.2, at 5s. post free.

There are some 60 main sections in the Annual and these fall into Technical, Sales, Commercial-Legal and Directory sections. The comprehensive lines on which the Annual is compiled is indicated by the following figures.

There is "first aid" data for 60 best-selling sets; characteristics of 1,000 valves; supply voltages of 7,000 towns; details of 50 trade organisations; "Who's Who" entries for 300 trade personalities.

Among the many special features are H.P. and renting agreements, and articles on simple service costing, how to calculate maintenance premiums, and P.A. regulations.

The "Broadcaster" Annual is a reference work every radio retailer and service man should possess.

FROM OUR READERS

(Continued from page 103.)

parts are the valves, the midget type, about 2 in. high—they are 4-volt, of course. I thought these had only just been put on the market as a new type of valve.

I also have an old Ethophone, with several knobs on the front, so you know how old this is. These are only two of the old type sets I have tried. Another set I would like to mention, for the man of limited means, is the British General All-Wave Three. This must be three or four years out of date, but just the same about half a dozen stations can be received on the short waves at loudspeaker strength. This includes W 2 X A F, Rome 2 R O, P H I, and others. This set is just 2 L.F. and Def.

I also have the old Comet 3, as good as ever. This all goes to show it is not always the expensive set that is needed.

Yours truly,

T. ALLEN.

15, Wilton Street, Birmingham 19.

EFFECT OF BROKEN EARTH

The Editor, POPULAR WIRELESS.

Dear Sir,—I would like to recount an interesting experience I had recently. Quite suddenly one day our receiver, a 5-valve A.C. superhet, absolutely refused to get any stations at all on the long waves. The reception on medium waves was perfectly all right, but nothing could be got out of it on long waves. Being an enthusiastic amateur, I naturally began to examine things. I removed the chassis and tested the valves and coils, but could find nothing wrong.

The affair puzzled me for a whole week before I accidentally discovered that the earth lead, a length of bare copper wire, had broken and was hanging loose. This immediately explained everything, for the fact is well known that medium waves have a much higher frequency than long waves, and have a greater "penetrating" effect, as it were. Medium-wave stations would easily have found their way to earth, whereas long-wave stations would be effectively stopped.

Trusting this incident will be of interest to you.

Yours faithfully,

A. ROBINSON.

21, Lower Laithe Avenue, Todmorden, Lancs.

PRIME MINISTER ON THE RADIO NEXT WEEK

To give first talk in new series

"THE perfect broadcaster of talks is born and not made," says Sir Richard Maconachie, the B.B.C.'s Director of Talks, in a foreword to the B.B.C. Summer Talks booklet. He proceeds to indicate some of the general problems that must be solved before a talk is heard by listeners.

An important series of talks will be "Responsibilities of Empire," in which the Prime Minister, Mr. Stanley Baldwin, will give the first talk on April 16th. He will be followed by such eminent figures as Mr. Winston Churchill, Mr. Lloyd George, and Lord Snell. Five talks will be given by statesmen from the Dominions.

After the Coronation a number of American and British speakers will explain "America To-day," why it is so different from this country, and what are the causes of this difference.

The booklet, "Broadcast Talks, Summer 1937," may be obtained free and post free on application by post to the B.B.C. Publishing Department, 35, High Street, Marylebone, W.1, or on personal application to Broadcasting House, Portland Place, W.1.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

6d. per word for first words in heavy type  
6/- per line for displayed lines (12 pt. type)

Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for the following week's issue.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders in payment for advertisements should be made payable to The Amalgamated Press, Ltd., and crossed.

All communications should be addressed to Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance, Second-hand, &c.

SOUTHERN RADIO'S WIRELESS BARGAINS

All Goods Guaranteed and sent Post Paid.

RECEIVERS.—VIDOR. 3-valve Battery Sets. Model C.N. 212. Complete in attractive Walnut Cabinet with three Mullard Valves, Moving-Coil Speaker, Batteries and Accumulator. New, in sealed cartons, £3 17s. 6d. (List, 6½ gns.)

LUCILLE. 5-valve American Midget Sets. Complete with 5 Valves. Moving-Coil Speaker. Ready for use on any mains 100/250 volts A.C./D.C. Long and Medium Waves, £3 15s. 0d. New in sealed cartons.

RECORD CHANGERS.—Garrard Model R.C.4, plays automatically and changes eight 10-in. or 12-in. Records of any kind. New, in sealed cartons, 5s.

GRAMOPHONE MOTORS.—GOLLARO Spring Gramophone motors, complete with all accessories, 11/-.

SPEAKERS.—CELESTION Soundex permanent magnet, 10/-; TELSEN permanent magnet, with 10-ratio Transformers to suit any Receiver, 12/6; Telsen Loud-Speaker Units, 2/6. All Brand New and Boxed.

COILS.—Telsen Iron Core, W.349 (Midget size) 4/-, Type W.478 (Twin), 9/- pair; Type W.477 (triple), 16/- per set; Type W.476 (triple Superhet, Selector and Oscillator), 16/- per set. All ganged coils complete on base with switch. Telsen I.F. Transformer Coils, 110 kc, 5/-; Telsen Dual Range Coils, with aerial series condenser incorporated type W.76, 4/-; Telsen Aerial Condensers with shunting switch, 2/-.

All Telsen components Brand New in sealed cartons. AMERICAN VALVES. A full range of valves for all American receivers, 6/- each.

MISCELLANEOUS BARGAINS.—All brand new in original sealed cartons: Telsen A.C./D.C. Multimeters test anything radio or electrical, 8/6; Telsen 2-range Voltmeters, 3/-; 3-range meters, including milliamps, 4/-; Ace (P.O.) Microphones, with transformer ready for use with any receiver, 4/6; 36 assorted Tru-ohm Resistances, 1 watt, colour-coded and marked, 36 on card, 6/- per card; Bell Transformers, 200/250 volts input, 3, 5, and 8 volts output, 3/6; Morse Signal Units, incorporating buzzer, tapper and flash with international code, complete with batteries and bulbs, 3/9 each; Marconi V.24 and Q type valves (useful for short-wave experiments), 1/6; Lightweight headphones, double pole, 4,000 ohms, each earpiece, 3/- pair.

REGENTONE ELIMINATORS A.C., 200/250 volts, type W.5a, with trickle charger, 37/6.

SOUTHERN RADIO. Branches at 271-275, High Road, Willesden Green, N.W.10; 46, Lisle Street, London, W.C.2. All mail orders to 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, Euston Road, London, N.W.1 (Near Warren St. Tube). Phone: Euston3775.

HEADPHONES. Brown, G.E.C., B.T.H., Ericsson, Brandes, Siemens, etc., 2,000 ohms, 2/6; 4,000, 5/-; Postage 6d. Guaranteed.

SPECIAL. Ericsson, 4,000 ohms, as new, 7/6. Telefunken, adjustable, 7/6.

CRYSTAL SETS. Burne-Jones. Double circuit. Complete. Guaranteed 8/-. Sensitive permanent detectors, 1/6. Crystal detectors, complete parts 1/-. Crystals, 6d. Post Radio, 183, Caledonian Road, London, N.1.

WHEN replying to advertisers please be sure to mention "Popular Wireless." Thanks!

A THOUSAND BARGAINS  
MAINS TRANSFORMERS, M.C. SPEAKERS, MAINS VALVES, SHORT-WAVE GEAR, CABINETS, Etc.

PREMIER SUPPLY STORES  
20-22, HIGH STREET, CLAPHAM, S.W.4.  
SEND 3d. STAMP FOR CATALOGUE.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance, Second-hand, &c.  
(Continued)

MESSRS. BOYES RADIO, LTD. Mail Order Bargains, Garrard S.S. Gramo Motors Comp., 8/6; Rheostat 3d.; Sлектun L.F. Trans., 1/3; Telsen L.F. Trans. from 1/3; Output Trans., 1/9; Telsen output and C.B. and L.F. Chokes, from 1/6d.; Telsen Binoc Chokes, 1/-; Telsen Small Disc Drives, 1/3; Large, 1/6; Reaction Cond., 6d.; 4-pt. switches, 8d.; W.E. Resist. 3d.; Highohm Vol. Controls, 9d.; W.W. Vol. Controls, 1/6; H.F. Chokes, 44d.; P.P. Switches, 3d.; Tubular Cond., 6d.; 8 mf. Electrolytic, 3/6; 16 x 16 mf. Cond., 5/6; 5 x 5 mf. Cond., 1/-; 1 mf. Cond., 9d.; 2 mf. cond., 1/-; Modula Tone Controls, 6d.; Ormond S.M. Cond. I.D. 0005, 1/9; S.L.F., 1/-; 5-way Batt. Cords, 6d.; Lotus 3-gang Cond., 6/11; D.C. Eliminators, 9/6; A.C. from 17/6; S.W. 4-pin and 6-pin coils, 1/8 and 1/10; Celestion P.M. Speakers, 9/11; 2,500 energised speakers, 5/6; Atlas P.M. M/C speakers, 11/9; Pick-up heads, 5/-; With tone arm, 8/11; 2-volt valves, 2/11; A.C. valves, 3/6 each. Thousands of other bargains. Write for our latest catalogue.  
49A, BRUDEHILL, MANCHESTER, 4.

S.T.800 Specified kit assembled, including H.F. valve, 65/-; Budden, 15, Firwood Avenue, Ewell.

CONVERSION UNITS for operating D.C. Receivers from A.C. mains. Improved type, 120-watt output at £2/10/0. Send for our comprehensive list of Speakers, Resistances and other components. WARD, 46, Farringdon Street, London, E.C.4. Tele.: HOLborn 9703.

S.T.800 Mains version, Cabinet, Extractor, Powerful set, perfect, £10. W.W., 2, Fairdene Road, Coulsdon, Surrey.

S.T.800 Specified Kits, including specified valves and dial, £4. A.C. S.T.800 Kits "A," £8. Specified S.T.700 Kits "B," £3 4s. Serwelly Wireless Supplies, 64, Prestbury Road, London, E.7.

VALVES

10,000 VALVES in stock. Replacements for any American Radio, 3/-. Big Range Hivac Valves at really keen prices. Radiographic Ltd., 66, Osborne Street, Glasgow, C.1.

LEEDS' SPECIAL OFFER!

3/- EACH. All popular types American Valves including 6L6, 6K7, 6C5, 6F6, 25A6, 6J7. LEEDS, 66, New Briggate, Leeds.

MISCELLANEOUS

A.C.—D.C. New Motors all voltages from 11/9. Lists free. Repair Specialists. EASCO Electrical Service, 18, Brixton Road, S.W.9.

BESTERTH Patent Earthing System for modern receivers. For particulars write John Holmes & Sons, 16, Isleworth Drive, Chorley, Lancs.

SITUATIONS VACANT

POST OFFICE ENGINEERING. Excellent openings for young men age 18-23. Start £3/13/0 weekly at age 18. No experience required. FREE details of exams. from N.I.E. (Dept. 606), Staple Inn Buildings, High Holborn, W.C.1.

Please be sure to mention  
"POPULAR WIRELESS"  
when communicating with  
Advertisers. Thanks!

ADVERTISEMENTS

As far as possible all advertisements appearing in "Popular Wireless" are subject to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

