

# RESULT OF OUR RADIO PLAY COMPETITION (SEE PAGE 320)

## TONE-CONTROL METHODS

# Popular Wireless

No. 627.  
Vol. XXV.  
June 9th,  
1934.

SPECIAL  
TELEVISION  
ARTICLE

By G. P. KENDALL, B.Sc.

ON THE  
SHORT  
WAVES

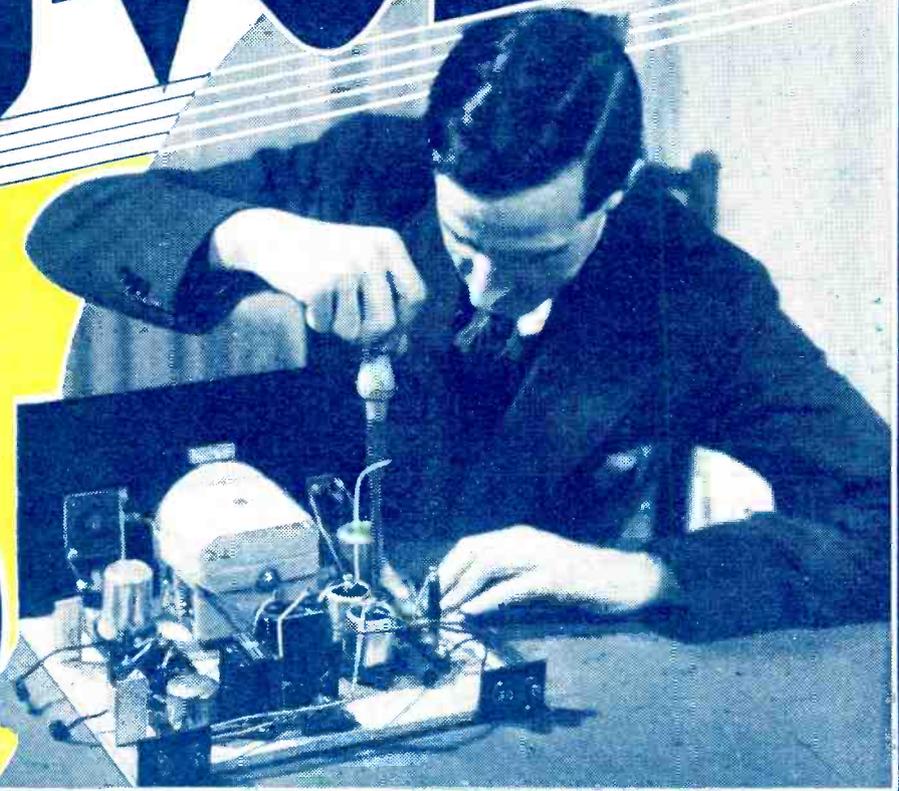
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# POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY FOR THE CONSTRUCTOR & AMATEUR EXPERIMENTER

Scientific Adviser: SIR OLIVER LODGE, F.R.S.  
 Technical Editor: G. V. DOWDING, Associate I.E.E.  
 Assistant Editor: P. ROBERT BIRD.

Managing Editor:  
 N. F. EDWARDS.

Chief Radio Consultant: P. P. ECKERSLEY.  
 Assistant Editor: A. JOHNSON-RANDALL.  
 Chief of Research: K. D. ROGERS.

TELEVISION  
 RADIO POWER  
 WRITTE DAYS  
 NEW WAVES

## RADIO NOTES & NEWS

CART AND HORSE  
 IN THE NECK  
 DAHLIA SUGAR  
 THIS WEEK'S MORAL

### The Television Committee.

THE Postmaster-General's Committee on television might be worse. I have seen worse; I collect committees and have some fine specimens of mal-selection. But here we have a judicious blend of Post Office official, B.B.C. personage and technical expert.

I am, however, puzzled by the inclusion of Sir John Cadman, for this sort of inquiry does not seem to be at all in his line. Perhaps he is to pour oil on any troubled waters which may be encountered, lubricate the machinery of inquiry and generally smooth the way!

### A Distinction for Radio.

THE generosity of private donors has made it possible for the Council of the Institution of Electrical Engineers to have "speaking-portrait" films of eminent electrical engineers made. The first subject of this remarkable portrait gallery is Sir Ambrose Fleming.

Therefore I take this—though it is not so meant—as a compliment to wireless, because, although Sir Ambrose had a long and distinguished career as professor, author and inventor, we radio people revere him mostly for his practical pioneering work with Marconi, his invention of the rectifying thermionic valve and his first book on wireless.

### The I.E.E. Wireless Section.

TALK of the I.E.E. reminds me that my attendances at its meetings have been few and far between during 1933. If I went to every meeting of the various bodies to which I pay subscription I'd never have time to listen-in or talk to my wife about Clark Gable & Co.

However, as Mr. S. R. Mullard has been nominated Chairman of the I.E.E. Wireless Section, Session 1934-1935, my sense of duty pricks an ear and my interest in that Section sits up and rubs its eyes.

### Power Transmission by Radio.

BECAUSE his is a name "to conjure with," as the saying goes, Tesla's latest announcement must be recorded here. The

veteran electrician (sometimes called a wizard) states that he has invented a means of transmitting electrical energy by wireless to any distance, practically without loss. He means energy in quantities enough to enable it to be intercepted and used for running motors, lamps, etc. That's that, then.

But my difficulty, in considering this matter, is that of understanding how the

took the initiative in this matter and approached the Post Office for permission to broadcast as far back as 1920.

### Early Days.

IN December, 1920, the Marconi Company asked to be allowed to broadcast Morse, speech and music for the benefit of amateurs. Correspondence went on until, in August, 1921, the Post Office sanctioned one half-hour per week of Morse only—7-7.30 p.m.—and a maximum power of 1 kw.

The company continued to press for a quarter of an hour a week for telephony, and in January, 1922 (not 1921), after the Wireless Society of London had added its voice, that quarter of an hour was authorised.

### Germs Be Blown!

I HAVE already reported Dr. Oartel's claim to cure toothache by radio-wave treatment. Since then dentists have had bad nights and dreams of Carey Street—where dreams of bankruptcy come true. Therefore I come to comfort the Knights of the Forceps, saying that further news is to the effect that Dr. Oartel claims only that his method conks the microbes in diseased teeth.

Pooh! Microbes are only the beginning of the business. We all know that it is the *exposed nerve* which makes us yowl. Dentists may therefore take courage. They will get us in the end, because long before we can "oartelise" our teeth the microbes will have won.

### A Nightmare Wavelength.

NOWADAYS, I suppose, we look upon a wavelength of, say, 5,000 metres as something like the sea serpent of waves: too, too long to be true. Nevertheless, Mr. Edward G. Herbert tells of newly found pulsations which fit into the spectrum beyond the low-frequency end.

These sluggish alternations are manifested by alternating changes of hardness in metals, their frequencies varying between a few minutes and a few hours.

(Continued on next page.)

**ON OTHER PAGES:**  
 "Your set, if it is of the 'straight' variety, is much less selective at high frequencies than at lower frequencies." Page 323  
 "A certain amount of tone correction or compensation is essential to every radio arrangement." Page 324  
 "If you take the speaker out into the garden there is no need to have it blaring away at full volume." Page 334

process could be worked commercially. Won't it be a sort of "free-for-all" mains supply? Or, if a beam is used, won't the power mess up intervening things?

### A Little History.

I FIND, in a certain monthly, an article about the beginning of broadcasting in this country in which it is stated that two or three hundred amateurs grouped together in 1921 and exerted pressure on the Post Office, with the result that 2 M T (Writtle) was allowed to broadcast.

That is not quite complete, for it ignores the fact that the owners of 2 M T

### BRITAIN'S NEW GIANT



The station house of the new long-wave B.B.C. transmitter at Droitwich which will eventually replace the present Daventry 5 X X on 1,500 metres. It is expected that it will be testing within the next few weeks.

## "The Untrodden Waters of a New Year"

One of the *highest* frequencies which has been measured is that of 24 minutes per cycle in gold. A little arithmetic gives for this a wavelength of 432,000,000,000 metres. Just a mere mile or so!

### Announcers' Slips.

**I** COMMANDER a few amusing instances of slips made by American announcers and artists: (Ann.) "Just-Rite Bird Seed will bring new health and song to your canary; try it for yourself and see." (Ann.) "The Supreme Court ruled that players killed by sunstroke on golf courses cannot collect damages." (Art.) "Write down your name and address before you forget it." (Art.) "I was more or less born into a singing family." (Ann.) "We shall propel the ship of State through the untrodden waters of a new year."



### A Perfect Balance.

**TIP** "The Wireless Constructor." True, our own House publishes it, but read what an American publishing expert said about it. I gave him a copy and asked, casually, for his opinion.

Well, he weighed it in his hand, smelt and rubbed the print, tried to break the "spine," counted the pages, the columns, the ads. and the illustrations, and looked at the contents closely. "Say," he said in a sort of injured tone, "it balances perfectly. Some guy has been thinking."

He knew! For this wonderful sixpenny-worth is balanced, which means that it has something to offer to all of you.

### The Cart Before the Horse.

**A**N official of one of the great American broadcasting systems has been letting us down. In the "Harvard Alumni Bulletin" he said: "It is to the telephone, not to radio, that we owe the development of the equipment whereby speech and music are made available for broadcasting."

I pause to inquire how much broadcasting, as we conceive it to-day, could be done without radio. He goes on to say: "Broadcasting, then, is the child of the telephone." Oh, no, non, nein! The telephone is just a useful adjunct to radio. One might as well call the steam engine the child of H<sub>2</sub>O.

### In the Neck.

**W**ITH the traditional thoroughness of Teutons, the German Government have decided that the use of secret radio transmitters is to be regarded as high treason and punishable with death by the axe. Nay, more! It has broken up a club which existed for receiving Soviet broadcasts and has tried and punished the members.

I think that our



young illicit broadcaster of Norwich and a certain gentleman who has recently written to me from Glasgow in a very violent manner about a Russian station might well be thankful that they are subject to the humane and tolerant laws of England.

### South Africa Forges Ahead.

**T**HE Union is to have two more high-power broadcasting stations—at Grahamstown and Pietermaritzburg. They are to be made at Chelmsford, Essex, and their working wavelengths will probably be between 480 and 530 metres. In addition, £39,000 is to be spent on eleven new stations, which will be used chiefly for working with aircraft.

There is a rumour that the Union Government will consider taking over the broadcasting services or having them turned into a public-utility company, and that Sir John Reith may be asked to visit the country in order to deliberate on its broadcasting problems and potentialities.

## ON THE AIR NEXT WEEK

### Peter Dawson (London National, Sunday, June 10th.)

Born in Australia of Scottish parentage, Peter Dawson studied singing from his earliest years and sang the bass solo in the "Messiah" when only eighteen. In 1902, when he was twenty, he came to England with many medals and prizes to his credit, and toured the country in 1904 with Madame Albani. Peter Dawson used the name of Hector Grant for some years, but later reverted to his own name and appeared in opera at Covent Garden. About thirty years ago he made his first gramophone record, and since then more than 10,000,000 records of his songs have been sold, covering one hundred and fifty items ranging from opera to "The Miner's Dream of Home."

### The Advance of Television.

**T**HE oncoming of television is like the sea tide—slow, irresistible, immense. Research is being intensified all over the world; new television societies are being formed every month; already in America there are about thirty experimental television stations and thousands of "lookers-in." In America, too, attempts have been made to use television in schools for showing the pupils simple charts and movements; and at the Regent Street Polytechnic you can take a course of lectures on the subject.

### Straining at the Gnat—

**A**ND swallowing the camel! I was reminded of that excellent simile when I heard the screech which was sent up from some quarters over a wee wurrud uttered by Capt. David Bone in the course of one of his talks about sea, seamen and ships.

If some of these delicate creatures would devote their zeal to keeping the cinema films as free from objectionable matter as the B.B.C. keeps its broadcasts they would be barking up the right tree. Dour as he is, Sir John Reith is well cast for film censorship.

### Zeal versus Discretion.

**T**HE "Yorkshire Post" reports that Mr. F. Ashton, Carlisle Director of Education, said, on April 19th, that all people were born with a desire to be

creative and use their hands, but that he feared we are losing this on account of wireless and the cinema. He described radio as "noise" and the cinema as "grinning celluloid."



Mr. Ashton spoke at the opening of a handicraft exhibition, which prompts me to say that the hundreds of thousands of home constructors of radio sets can claim to be in the forefront of true craftsmanship. Our hobby requires ceaseless experimenting and is far more creative than some of the merely ornamental survivors from Victorian days.

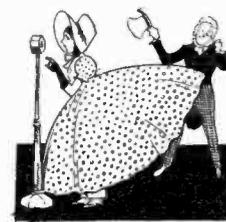
### Ariel is Stunned.

**I** HAVE been having some good fun in my chemical lab. with accumulator acids, patent "gadgets" and so forth, but during Whitsun I broke away from the radio side and refreshed myself with the preparation of a rather rare sugar, called *laevulose*, from the tubers of dahlias.

It answered up to the tests gorgeously, and I pranced down to lunch in high glee, recounting the great triumph. But I was just simply stunned when Arieline said, in her matter-of-fact way: "Oh—did you want some sugar, then?" Yes, when Providence made Madame Curie a scientist it worked a miracle.

### This Week's English Lesson.

**S**TATION KSTP was giving "Little Women" over the microphone. This is what an American writer said about it: "Hoop skirts make it brutal on the dolls



getting close enough to the mike for heavy emoting, but the more willowy ones are doing oke."

And the following means that the Tidewater Oil Company refused to allow a certain

Mr. Kemper to broadcast for Messrs. Baur and Black:

"Tydol Nixes Kemper double to B. and B."

(Coming shortly: Translation of "Chiropractic Spiel Pegs Seads of Dough.")

### Moral: Read "P.W."

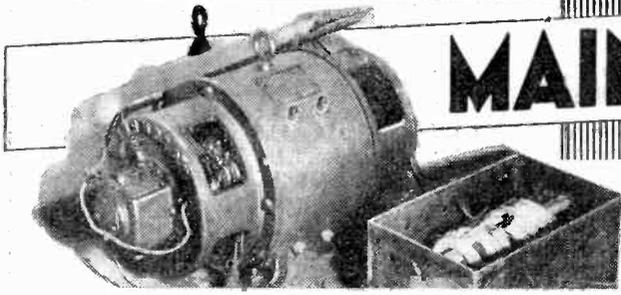
**T**OOK a flying trip to Bournemouth to fix up summer digs. for Ariel and Co. Saw no car radio, though I saw what seemed to me some three million cars. Whilst waiting in the office of one of these "private hotels"—"boarding houses" before the war—I heard Mr. and Mrs. Proprietor consulting about the radio set.

Said Mrs.: "Last time we put *this* wire *there* it went bang and cost us three pounds. When we put it *there* it nearly knocked you silly and cost us only thirty shillings. Can't you ask the man if there's a place about a shilling?" The poor ignorant old darlings!

ARIEL.

# DESTROYING MAN-MADE STATIC

## MAINS MACHINERY



In this the concluding article of his series, Mr. BERNARD BARNARD deals with the elimination of interference caused by electrical machinery actually under the control of the listener. The practical hints on the methods to employ in preventing radiation from electric motors will be found especially valuable.

WE now come to the last of these discussions on interference, which is solely concerned with the prevention of radiation by machinery that is under the control of the reader.

Machinery which is in common domestic and commercial use can be divided into, roughly, two groups, i.e. dynamic, or current-consuming apparatus, and what we may call static devices which do not, in the normal course of operation, consume more than a few milliamperes.

All types of electric motors, dynamos and vibrators come within the first category, whilst the other group includes such apparatus as violet-ray equipment and some types of flashing signs.

Fortunately, by far the greatest amount of electrical machinery in general use is "dynamic" in character, and this type, while it probably creates more interference energy than static apparatus, lends itself more readily to treatment.

### Caused by Uneven Contact.

An ordinary electric motor employs carbon brushes, which supply the necessary current by means of rubbing contact with a segmented copper commutator. This commutator, of course, revolves at high speed when the motor is running, and consequently, unless both brush and commutator surfaces are perfect, the contact is bound to be irregular.

Whenever the contact is partially broken, due to bad surfaces or the presence of dirt, the supply current to the motor will be broken for a fraction of a second, sparking will occur and consequent current surges will take place.

The same dirty or worn surface will appear at each revolution of the motor armature, and will produce a similar surge or fluctuation each time. Since each fluctuation causes a "plop" to be heard in the loudspeaker, a rhythmic noise, built up of these individual "plops," will be the audible result.

In almost every case this can be cured by making the necessary adjustments to the brush gear and cleaning up the commutator surfaces.

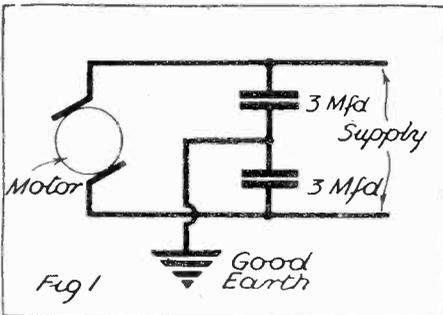
### Test the Earthing.

Where specialised products, such as refrigerators, are found to be the offenders, the amateur may not consider it advisable to undertake the necessary repair work himself, and will therefore prefer to call in the manufacturers or suppliers to cope with the trouble on his behalf.

If the motor is still found to radiate interference after this cleaning up has been completed, I suggest that attention should next be directed to the earthing arrangements of the motor casing.

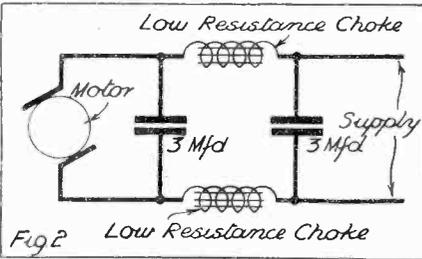
I have found that in very many installations insufficient care is taken to ensure that the motor itself is properly joined to the supply conduit, so that the various fluctuating currents which are induced in the motor casing are not led away to earth. Very often it will be found that attention to this small matter will completely cure serious interference.

Presuming that all this does not have the desired effect of suppressing the radiations, we must now turn to the question of fitting some electrical gear that will smooth out the troublesome current fluctuations without interfering with the normal operation of the plant.



### TWO SCHEMES TO TRY

Two methods of cutting out interference from electric motors. The Fig. 2 scheme will be found effective in very bad cases of interference; but the Fig. 1 method should be tried first.



We have two electrical qualities at our command which will, in different ways, do this job for us.

The first is inductance, which resents any sudden change of current; the second is capacity, which exerts a "reservoir" effect and thus tends to build up a falling current to average value.

In practice, we can use either or both of these means, but it is best, and usually cheapest, to start off by trying the effect of connecting a large capacity across the circuit over which the fluctuations are occurring.

For ordinary-sized motors and dynamos, about 6 microfarads connected across the brush gear will usually be found to be sufficient to suppress all interference.

It is sometimes advantageous to split this capacity into two equal amounts of 3 mfd. each, and to take the connecting point to earth, as shown in the accompanying diagram.

Inductance can be employed by fitting iron-cored chokes (on D.C. mains) or air-cored H.F. chokes (on A.C. mains) in the supply leads. Such chokes should have a low D.C. resistance and be capable of carrying the full starting load of the plant.

A combination of both capacity and inductance interference stoppers is shown in Fig. 2, and such an arrangement will be found to be adequate for even the worst of interference generators.

### A Common Trouble.

Electric lifts are a very common source of "man-made static," because they employ a great deal of different equipment, almost all of which is capable of causing radiation on its own account. The lift motors can be dealt with, as we have seen, but the relays and remotely controlled switches require individual treatment.

Nearly all switches spark slightly when actually making or breaking contact, but in most cases this is not very serious, since the average switch is not in constant use.

With lifts, however, this is not the case, and the contacts are continually operating, and therefore causing very troublesome interference.

On direct-current mains these can be silenced by connecting condensers of about 4-mfd. capacity across each set of contacts. Condensers can be used on A.C., but a more advisable plan is to connect, in series with the contacts, small iron-cored chokes.

Obviously, most of this work entails meddling with the wiring of the plant, and I have no doubt that the majority of amateurs will prefer to place this more complicated job in the hands of qualified electrical engineers.

### More Difficult Cases.

With regard to the other group of apparatus which I mentioned earlier in this article—namely, the "static" plant—I most strongly advise amateurs to leave interference suppressing to competent and experienced men.

Medical and semi-medical apparatus composes almost the whole of this group; and as such apparatus is usually used in actual contact with the human body, it is obviously inadvisable that any adjustments or modifications should be made to such apparatus unless a complete knowledge of the operation and possibilities is available.

AT last the task of judging the Radio Play Competition is over. After much reading and re-reading the judges have chosen the winner of the fifty-pounds prize. He is:

Mr. F. W. Beasley,  
47, Ridge Road,  
Winchmore Hill,  
London, N.21.

And last week a cheque was handed to him on behalf of "P.W."

The task of judging was no easy one. There was no one play that was outstanding above the others. Instead, the level of the first twenty plays was such that it seemed at one time that a winner would never be found!

#### Why "Roundabouts" Was Chosen.

The three judges were Mr. Val Gielgud, the Drama Director of the B.B.C., the Programme Critic of "The Wireless Constructor," and the Editor of POPULAR WIRELESS. They chose Mr. Beasley's play, "Roundabouts," for several reasons.

In the first place, it had a definite story without being in any way melodramatic.

## U.I.R. TO MEET IN LONDON.

### SOME NOTES ON NEXT WEEK'S CONFERENCE OF RADIO EXPERTS.

NINE years ago a little group of broadcasting experts met in conference at the old Savoy Hill headquarters of the B.B.C., and as a result of that meeting there was formed the Union Internationale de Radiodiffusion, which to-day holds a watching brief on behalf of Europe's 70,000,000 listeners. This year the annual general meeting of the Union will take place, for the first time in London, and from June 12th to June 20th delegates from nearly every country in Europe will assemble at Grosvenor House, Park Lane.

The average listener is familiar with the name of the International Broadcasting Union as a central body for ensuring a minimum of interference between European transmitters, but he does not realise, perhaps, the important contribution of the Union towards better transmission and programmes.

In the city of Geneva there is a permanent headquarters staff working at full pressure, and here the secretary general, Mr. A. R. Burrows, kindly put a POPULAR WIRELESS correspondent through the whole A B C of the Union's activities.

#### Guardian of the Ether.

Mr. Burrows, as all old readers will recall, was the first programme director of the B.B.C., and as the inimitable "Uncle Arthur" was a veritable institution in the early Savoy Hill days of British broadcasting.

The even tenor of broadcasting was threatened by a battle royal for wavelengths as early as 1925, and it was as a "guardian of the ether" that the Union had its inception. Since then, like Topsy, it has "just grown," and to-day its activities embrace every aspect of broadcasting. The original officers of the Union were Vice-Admiral Sir Charles Carpendale (whose pioneering work as president has been recognised by his eight successive reappointments to the "chair"); Ministerialist H. Giesecke (Germany) and M. R. Tabouis (France), vice-presidents; and Mr. Burrows, secretary general. P. P. Eckersley (then of the B.B.C.) did yeoman work as chairman of the technical committee.

To-day the work of the Union necessitates four specialised committees. Since 1926 the helm of the technical committee has been taken by M. Raymond Braillard, director of the Union's research and frequency-checking station at Uccle, Brussels.

The legal side of broadcasting is in the care of the judicial committee under Dr. Sourek, director of the Czechoslovak broadcasting organisation. This committee also caters for the listener indirectly, as it is concerned with such problems as "man-made" static and electrical interference.

The actual arrangement of international programmes calls for a fourth committee, of which M. Chamiec, director of Polish radio, has charge.

C. L.



## OUR RADIO PLAY COMPETITION

### THE RESULT ——— AND THE JUDGES' COMMENTS



Miss Jessie Matthews enjoying a programme on her new Columbia "Superhet Battery Grand."

Secondly, the characters were few and well defined. The dialogue, although rather on the long side, was well thought out and to the point—above all, it was true to the characterisation. Finally, the play showed that the author had made a careful study of the requirements of the radio play.

It was disappointing, perhaps, that the winning play was not a comedy, for it is in this branch of entertainment that radio drama is most lacking. Actually very few comedies were submitted, and the last few plays from which the choice had to be made were all serious drama.

#### Some Distinguished Entries.

Of the plays which were left after the winner had been chosen, "Dead Reckoning," by Mr. Philip Moran, of Bushey Heath, is chosen as runner-up. This was an excellently written "thriller" of the air which

gave a lot of scope for enterprising production.

The judges wish especially to commend the following plays, which were obviously the result of much thought and care:

"Running To Me," by Mr. F. A. Butt, of Paignton, Devon; "Interval for Sanity," by Mr. H. B. Aldrich, of Ruthin, N. Wales; "Prophecies," by Miss Rebecca Lyons, of N. Kensington, London; "The Wheel," by Mr. Thomas Insull, of Birmingham; and "Between Eight and Eight-Five," by Mr. B. J. Healey, also of Birmingham.

The majority of entries showed a surprising grasp of the technical requirements of a radio play, perhaps owing to the various articles written by experts which appeared in POPULAR WIRELESS during the competition. Many of the stories, too, were brightly original, though the influence of L. du Garde Peach and Lance Sieveking was apparent in several cases.

#### A Great Diversity.

If the plays submitted reflect the favourite type of drama of their authors, then the B.B.C. is going to have a busy time during the next few months catering for such a diversity of needs! But the great point about the competition—apart from the overwhelming number of entries received, which in itself is remarkable—is the definite proof that radio drama, of whatever kind, is much more popular than certain people would have us believe, and that listeners are not content just to "hear," but are interested enough to study, criticise and think for themselves.

It is to be hoped that not only the winner, but also all those who were not successful in gaining the first place in this competition, will not give up in despair. There is always plenty of room for radio plays—if they are good!

## SIR OLIVER LODGE, F.R.S.,

WHO CELEBRATES HIS EIGHTY-  
THIRD BIRTHDAY ON TUESDAY,  
JUNE 12.

SIR OLIVER LODGE was born in 1851 near Stoke-on-Trent and educated at Newport Grammar School. At fourteen he was taken into business to help his father, but when he was about twenty-two he abandoned all idea of a commercial career and went to University College, London, becoming a Doctor of Science and a Fellow of the Royal Society, and receiving the honorary degree of LL.D. from the University of St. Andrews. In 1902 he received the honour of knighthood on the King's Coronation.

#### His Link With "P.W."

His work in connection with electricity and wireless telegraphy is too well known to need repetition. Hertz acknowledged his genius ungrudgingly, and the Marchese Marconi built much upon the foundations which he laid.

In 1923 Sir Oliver became Scientific Adviser to POPULAR WIRELESS, a position which he has held ever since.

He is a brilliant speaker and lecturer, and has broadcast on many occasions for the B.B.C.

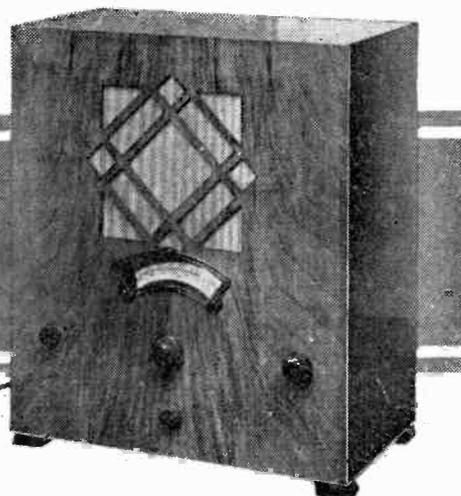
Work is his principal hobby, and he has recently taken to travelling abroad in his car. In his spare time he reads frivolous books, especially those by P. G. Wodehouse.



CONTINUING THE DESCRIPTION OF

# A UNIVERSAL THREE

Further details about the all-electric three-valver described last week, dealing with the use of the receiver on mains having voltages outside the normal.



LAST week we published the design of a three-valve receiver employing valves that can be operated from either D.C. or A.C. electric-light mains without the need for any alteration in the circuit when a change is made from one kind of power supply to another.

Such a receiver is, of course, ideal for those who live on D.C. mains and are in expectation of being changed over to A.C., while it is exceptionally cheap as an A.C. design for those who already have alternating current.

For electric light supplies that have voltages between 200 and 250 there is no need for any modification of any of the parts in the set as described, for the series resistance covers those voltages.

But where the supply is of less voltage, such as at Southport (where it is 190 volts) or in the Leyton district of London (where the supply is 150 volts D.C.), some alteration of the resistance is required.

**Resistances Required.**

In the case of Southport a resistance of a little less than the minimum allowed by the tapped resistor in the receiver is required, and this can be obtained from Bulgin to order. The same procedure is necessary for the set if it is to be used on

150-volt mains, when a resistance of only 166 ohms is needed.

This can conveniently take the form of one of the fixed-power resistors, also sold by Bulgin, who will wind one to the required value. It need not, of course, be tapped.

**The Essential Voltage.**

The valves themselves drop a voltage across the heaters of 120, 20 volts each being required for the first two valves and

40 volts each for the pentode and rectifier. This voltage is needed no matter what the mains supply, so that it is not possible to use the set on such freak supplies as the one or two 105-volt mains still used in some districts. In such cases, obviously, there is not enough potential to feed the series heaters of the valves.

While on the subject of voltage variations it must be remembered that, in a set of this nature, the heater voltage does not have to be subtracted from that available on the anodes as would be the case in directly-heated filament valves used in series. In such cases one of the valves would have very much less voltage available across its anode and filament, because it comes at the end of the row of a series.

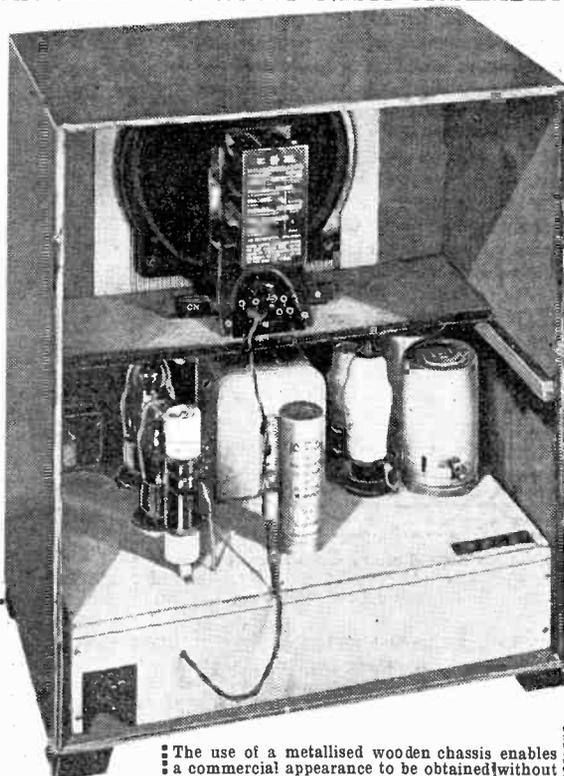
**A Valve-holder Point.**

In these indirectly-heated valves the full mains voltage (less that lost in smoothing circuits, etc.) is available across anode and cathode of each valve, even when the valve heaters are taking up practically the full voltage of the mains.

This, of course, is because the heaters are in parallel with the anode-cathode circuits across the mains, a point not always understood.

A final word about the two 7-pin valves and their holders. It will be seen in the wiring diagram published last week, and in the list of components below, that two valves require ordinary 5-pin chassis-mounting holders. The other two valves need 7-pin holders of *Continental* type. These are different from the British standard 7-pin holders, which will not take the valves in question.

**AN EXCEPTIONALLY NEAT ASSEMBLY**



The use of a metallised wooden chassis enables a commercial appearance to be obtained without the need for difficult metal working. Such a chassis is particularly easy to construct, and makes for easy wiring and efficient layout.

**THE COMPONENTS**

- 1 Pair screened matched coils (Telsen W.287).
- 1 2-gang tuning condenser (Polar Star Minor).
- 1 Slow Motion drive for above (Polar Arcuate, marked in degrees).
- 2 Chassis-mounting valve holders. Five-pin (Clix).
- 2 do. Continental 7-pin type (Clix).
- 1 L.F. transformer (Telsen type W.59).
- 1 .0003-mfd. reaction condenser (Telsen W.354).
- 1 20-mfd. 50-volt elect. condenser (Dubilier type 402).
- 1 8-mfd. dry elect. condenser (Dubilier type 0281).
- 2 4-mfd. fixed condensers (Hydra type No. 25).
- 1 2-mfd. fixed condenser (Hydra type No. 25).
- 2 .1-mfd. fixed condensers (Hydra type No. 25).
- 1 .01-mfd. fixed condenser (Dubilier type 620).
- 1 .0002-mfd. fixed condenser (Dubilier type 610).
- 1 .0001-mfd. fixed condenser (Dubilier type 610).
- 1 .0001-mfd. fixed condenser (Dubilier type 620).
- 1 250,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).

- 1 20,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 25,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 10,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 5,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 400-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).

**THAT YOU WILL REQUIRE.**

- 1 250-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 15,000-ohm resistance and horizontal holder (Graham Farish 1½-watt Ohmite).
- 1 Mains resistance (Bulgin M.R.27).
- 1 Mains plug and fuses (Bulgin F.15).
- 1 L.F. choke (Bulgin L.F.21S).
- 1 Screened H.F. choke (Graham Farish H.M.S.).
- 1 10,000-ohm potentiometer and mains switch (Cosmocord).
- 1 Terminal strip, 3-socket aerial type (Clix).
- 3 Brackets (B.R.G. Nos. 21, 22/1, 21/1).
- 6 in. of screened sleeving (Goltone).
- 2 10-ft. hanks insulated wire (B.R.G. Quikon).
- Flex, screws, etc.
- 1 Loudspeaker (Blue Spot Star type).
- 1 Cabinet (Peto-Scott Universal, complete with 16 by 10 in. Metalex chassis, with 3-in. runners).
- VALVES. Tunestram 1 H.P.211S, 1 R.201S, 1 P.F.401S, 1 P.V.401S.

**MR. ROGER ECKERSLEY**, the B.B.C. Director of Entertainment, who spent some time in America recently, returns not at all impressed by what he saw at Radio City. He was well treated, and he has nothing but praise for Americans personally. But he thinks their broadcasting is just hopeless. The only thing he would exclude from this general condemnation is dance music.

#### The Other Point of View.

Meanwhile, Mr. Frazier Hunt, a well-known American publicist, who came specially to England to study the B.B.C., is telling his fellow-countrymen that the programmes in Great Britain are just "unspeakable." He listened continuously for a fortnight, and he says the horror of the experience will persist with him all his life.

#### Listeners' Wishes.

All of which goes to show the absurdity of trying to compare things which do not lend themselves to comparison. Broadcasting in the final resort accommodates itself to the wishes of listeners.

The difference between British and American broadcasting is the difference between the Britisher and the American.

#### Wireless Trade Dissatisfied.

I hear authentic reports of a good deal of resentment in wireless trade circles at the alleged failure of the B.B.C. to live up to promises of programme reform. In the past few months both Sir John Reith and Colonel Alan Dawnay have met the General Purposes Committee of the R.M.A., and, as a result, there were agreed certain changes that would have improved the programme service and at the same time helped the trade over the difficult summer period.

There were to be regular morning transmissions, making programmes continuous from 10.15 to midnight. There were also to be more lively Sunday programmes and more definite alternatives of an entertainment kind. Moreover, the B.B.C. was to get these reforms applied without avoidable delay.

#### A Serious Blow.

The wireless trade, although not altogether satisfied with what they had secured as a first instalment, felt justified in looking forward to better broadcasting this summer.

Now they find out that the B.B.C. does not intend to introduce any of the changes until the beginning of October. This is a serious blow, and the matter is to become the subject of public and Parliamentary agitation.

Meanwhile, the new liaison machinery between the trade and the B.B.C. is in danger.

#### Colonel Dawnay's Future.

Colonel Alan Dawnay, the head of B.B.C. Programmes, has had a nervous breakdown, and there are conflicting rumours about his



Billy Merrin and his Commanders, who are now playing at—and broadcasting from—various London and provincial cinemas.

of the claims of unknown and new writers.

I heard of a case the other day. Mr. Goodwin, a youthful composer, with some natural aptitude, approached Mr. Hall, who is now examining his work sympathetically, with the result that a new star may soon appear in the dance-music firmament.

#### Sandy Powell's "Hour."

An hour of his life as a comedian will be the basis of Sandy Powell's "Hour" for Regional and National listeners on Wednesday and Friday, June 13th and 15th respectively.

That Sandy is one of Britain's premier comedians cannot be denied. In fact, over three million of his records have been sold. Already his 1934 Road Show has proved to be one of the most popular successes on tour to-day.

#### "On the Embankment."

For his broadcast "Hour" he will have the assistance of some of his artists: Billy Matchett, Roy Jefferies, Clara Kenyon, and Master James Fletcher, as well as of the Harmonica Band. The Band will broadcast with Sandy in the popular sketch "A Night on the Embankment."

#### The Aldershot Tattoo.

Two relays of half an hour each will be taken of excerpts from the Aldershot Tattoo on Saturday, June 16th.

For seven years the Aldershot Tattoo has provided one of the most enjoyable broadcasts of the summer months and this year's relays should be well up to standard.

#### Massed Bands.

The first will comprise the combined display by the 3rd Brigade Royal Horse Artillery, 1st Battalion Grenadier Guards, and 2nd Battalion Coldstream Guards, accompanied by the massed dismounted bands of the Aldershot Command.

This will be followed by the massed dismounted bands playing excerpts from "Tannhauser."

#### Familiar National Airs.

The second relay will consist of Rally of Empire and Grand Finale, with the familiar national airs, the evening hymn, "Abide With Me"—sung by the whole assembly—the Grand Salute, and the National Anthem.

In all a thousand musical instruments will be utilised in the display.

#### Kentucky Minstrels.

More "Kentucky Minstrels" broadcasts are arranged for Regional and National listeners on Tuesday and Wednesday, June 26th and 27th respectively. Harry S. Pepper will be responsible for the production of this show, and he and Doris Arnold will, as usual, preside at the pianos.

Doris Arnold is also arranging the music, Wally Wallond the orchestral items, and Leslie Woodgate will conduct the B.B.C. Theatre Orchestra. I hear that "The Kentucky Minstrels" is to be filmed by Julius Hagen at the Twickenham Film Studios.

O. H. M.

## "HOPELESS AMERICAN PROGRAMMES!"

### SAYS THE B.B.C. DIRECTOR OF ENTERTAINMENT

future. The nervous breakdown is not so serious as is commonly believed, but it does mean that he has overworked himself during the six months or so in which he has been responsible for B.B.C. programmes.

Colonel Dawnay is of the stuff that will not give in easily, and he can be counted on to be back at his desk before the end of June. There is nothing in the suggestion that he will return to the General Staff at the War Office at the end of the year. He has thrown in his lot with broadcasting for the rest of his life.

#### Discovering Genius.

Mr. Henry Hall is particularly keen on getting hold of new dance-music composers. He devotes much time to the examination

### LISTEN TO THESE NEXT WEEK!

**CRICKET.**—THE TEST MATCH. Eye-witness accounts of the day's play in the first Test Match at Nottingham, by Howard Marshall (*National Programme, Monday, June 11.*)

**ORCHESTRA.**—"DANCING ROUND EUROPE." Another of these popular programmes of representative light music (*Scottish Regional, Tuesday, June 12.*)

**REVUE.**—"SANDY'S HOUR." The well-known radio and stage comedian, Sandy Powell, in a programme of his own devising (*London Regional, Wednesday, June 13.*)

**DRAMA.**—"QUARTET." A new play for broadcasting by Cedric Wallis (*National Programme, Thursday, June 14.*)

**LIGHT MUSIC.**—"RALENTANDO." A musical extravaganza by Bruno Barnabe and Arthur Goulet (*Midland Regional, Thursday, June 14.*)

**VARIETY.**—"SATURDAY NIGHT." The end of the week programme, with a summery flavour (*National Programme, Saturday, June 16.*)



"What is the good of these iron-cored coils?" asks a correspondent, and our Chief Radio Consultant proceeds to tell him—showing how valuable they are in the reduction of physical dimensions and their possibilities of decreased cost!

"WHAT," writes a correspondent, "is the good of these iron-cored coils? I was always taught that iron 'damped' circuits and made them less, not more, selective."

The truth is a little difficult to see clearly. There are so many entangling "ifs" and "buts."

It is a fact that iron does introduce losses. For instance, if I take a marketed coil and measure its resistance I find that, at an upper-medium wavelength, its resistance is less than a coil of the same inductance wound over iron. But only one invention seems to be based upon the real value of iron for medium-wave working, and that uses the iron to get the useful quality of constant-response tuning.

**Resistance and Selectivity.**

You know quite well that your set, if it is of the "straight" variety, is much less selective at high frequencies (shorter waves) than at lower frequencies. That is to say, it is much more selective (and boomy) when tuning in Rome than when selecting, say, Radio-Normandy. Unless, of course, you are very clever with your retroaction control. This comes about because, with an air coil, the resistance of that coil increases enormously with frequency.

The selectivity of a tuned circuit depends only upon the ratio of its resistance (R) to its inductance (L). The greater the R for a given L the worse the selectivity. When you tune a circuit with a condenser the inductance L stays the same, but the resistance of the coil increases as the "tune" or frequency of maximum-circuit response increases.

This comes about because the currents are circulating more rapidly at higher frequencies, and it is their rate of change which causes the extra losses.

If, somehow, you could tune by keeping the ratio of resistance to inductance constant you would get constant-response tuning. For instance, you could increase inductance and increase resistance proportionately.

**The Permeability Tuner.**

This is what they do with so-called permeability tuning. In this invention there is a coil of wire (which has a certain small inductance) and a certain capacity across it sufficient to give it a "tune" for 200-metres wavelength when there is no iron in its field.

Then the iron (pellet) is slid into the embracing turns of the coil. Result—that

as the iron slides in there is more inductance with more loss, and hence more effective resistance, so that the ratio resistance to inductance stays constant. So the performance is the same over the full range of tuning.

**Keeping Constant "Quality."**

The difficulties, so far as I can see, are, first, that it must be difficult in a ganged arrangement to keep the pellets, which slide into the coils, exactly uniform in their behaviour and their movement; and, secondly, that the actual fixed "quality" of the circuit, while constant, is inferior to air-coil quality over most of the waveband.

constant performance, so why bother with anything else? People appear to be losing sight of one of the necessities of superheterodyne operation. There must be, as I see it, selectivity of a quite high order in the circuits preceding the first detector.

Some have argued that all that need be done is to eliminate the so-called second-channel interference and all is well. (You know that the superheterodyne principle consists in introducing a local oscillator to "beat" with the wanted signal when, after rectification, the wanted frequency is changed to a new lower intermediate frequency.

**Second-channel Interference.**

But if the oscillator can beat into a wanted station of, say, 100 kilocycles less frequency than the frequency of the oscillator, then it can equally beat with an unwanted station of frequency 100 kilocycles greater frequency than the oscillator.

The latter causes second-channel interference unless there are selection circuits arranged to filter the high frequencies before they are introduced to the local oscillator frequencies. It has, for example, been suggested that you can use a low- and high-pass filter and eliminate all second-channel interference by having a filter to embrace only the wanted channel and all frequencies above (or below) it.

But, to take a limiting case, what would happen if you were residing near to a very powerful station which was in the pass-range of the filter? It might not be appreciated *per se* as a beat frequency, because its beat is way outside the intermediate-frequency filter's pass-band.

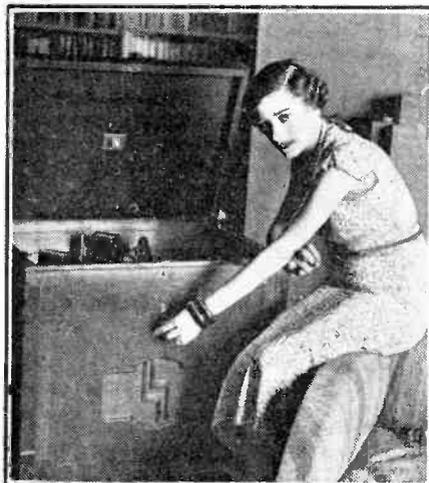
**Smaller and Cheaper.**

But what does it do to the high-frequency valves and the first detector itself? I visualise the voltages sweeping the grid excursions all over the place. And high-frequency valves are non-linear. Therefore so-called intermodulation takes place.

It is my submission that selection—and constant-band-width selection at that—is as necessary to a superheterodyne as to any other receiver to prevent intermodulation and to present a clean product to the first detector. Iron, if properly used, gives us constant-band-width tuning. But it does introduce losses.

Apart from constant-performance tuning, I should say that the great value of iron for high-frequency working is that it enables us to get coils so much smaller and, by inference, cheaper.

**FOR THE WIMBLEDON FINALS?**



Phyllis Konstam, the popular film actress, with her new H.M.V. Superhet-Seven Autoradiogram. Will she use it to listen to the tennis finals at Wimbledon? For her husband is "Bunny" Austin.

The first problem has, I understand, been overcome; the second is more formidable. Someone said of the automatic carburetter, when it first came out, that it automatically gave the wrong mixture at all speeds!

But it is better to give mediocre consistency over a wide range of conditions than to make performance dependent upon what are, to the user, irrelevant factors. Permeability tuning has the great merit of enabling us to have a constant performance over the wave-range.

On the other hand, the superheterodyne is said to give this desirable quality of

A CERTAIN amount of tone correction or compensation is essential to every radio arrangement. For example, it is well known that a pentode valve tends to give undue emphasis to high notes. It should, therefore, be the responsibility of the designer to ensure that adequate correction is provided for such distortion.

In the case of a highly selective set there might well be sufficient offsetting of a pentode's high-pitched characteristics in the reduction of high-note response consequent upon such selectivity.

Again, the designer might well consider that the average selectivity of a set having variable selectivity, plus the average use of reaction, plus the high-note failings of the average moving-coil loudspeaker, might together demand greater high-note compensation than is provided by a pentode.

**Lack of High Notes.**

Unfortunately, it is not advisable evenly to extend the high-note response of a set beyond a certain point owing to the existence of so much high-note interference in the crowded European ether.

However, more sets err on the side of lack of high notes than otherwise, and a wide experience of the results obtained by the average listener clearly reveals a deplorably general muzziness and lack of brilliance.

In our opinion, it is much more desirable to preserve a clear-cut treble in which string and brass instruments are heard with characteristic timbre and the sibilants of speech are present than to strive for the "mellow" fetich of resonant, spurious bass.

Now, this should be carefully noted: What is frequently thought to be a general over-emphasis of "top" is nothing more than a peaking effect occurring on a note which is really not high at all, comparatively speaking.

Many listeners consider that the B.B.C. tuning note has a high frequency, but this is not the case. It lies towards the higher limits of the middle-speech frequencies, and is far from being that kind of frequency which goes to construct clear-cut speech and to provide those most valuable overtones which differentiate between the notes produced by string and brass instruments, etc.

**The Fixed Condenser.**

When a frequency of this order, or even higher, is over-accentuated by a peaking effect in a transformer or loudspeaker, to apply a general diminution of high notes to correct it is as bad as removing the whole of a man's leg because he has an ingrowing toe-nail!

In so far as tone adjustment or correction in a set is concerned, the fixed condenser can play a

OUR BEGINNERS' PAGE . . . . .

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

# TONE CORRECTION AND CONTROL

valuable part, for its reactance (resistance to alternating currents) varies as with the frequencies of the currents. The higher the frequency the lower the reactance.

To illustrate its use we can imagine that the fixed condenser is connected to the loudspeaker. When it is in parallel—that is, joined across the terminals of the speaker—it provides an alternative path to the energy that is being fed to the speaker. And the higher the frequency of this energy the more easy becomes this alternative path, and proportionately less the high-note response of the loudspeaker.

If the condenser is joined in series with the loudspeaker, as is shown in the other diagrammatic illustration, it will be seen that the effect will be the opposite. The higher frequencies will now get to the loudspeaker in a greater proportion than the low frequencies, be-

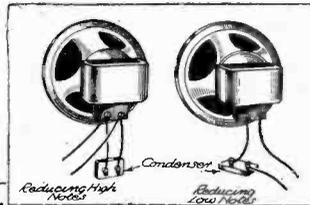
ling condensers can be varied in order to apply tone correction.

The remaining diagram illustrates the automatic tone-balance scheme. The purpose of this is to provide an automatic adjustment when reaction is applied.

Reaction has the effect of seriously cutting down the high notes. That is why distant stations sound so muffled and boomy on the average set.

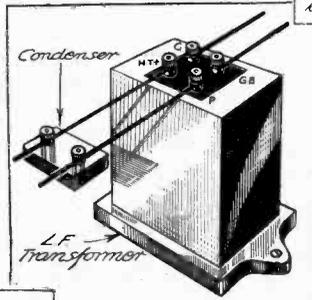
**An Ingenious Scheme.**

Automatic tone balance works in this manner: An L.F. transformer of a special type is employed. It is known as a "compensating transformer," and its purpose is to give em-



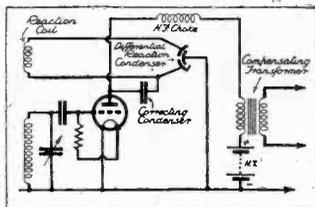
**A.T.B.**

The circuit diagram below shows the system of automatic tone balance which, by the use of a compensating transformer and condenser, gives an even balance of tone, whether or not reaction is being used.



**HIGH OR LOW**

When a condenser is connected across the primary of a transformer (left) high notes are reduced. The drawing above shows a condenser in parallel with a loudspeaker to reduce high notes, or in series with it to reduce low notes.



cause the lower the frequency the greater the resistance offered to it by the condenser.

Of course, it is presumed that the loudspeaker is fed via a transformer or inductance-capacity filter, for otherwise the series condenser would break the H.T. current from flowing.

**Automatic Tone Balance.**

When a condenser is connected across the winding of an L.F. transformer it reduces the high notes, and, as in the cases of the loudspeaker, the greater its capacity the more will be the effect. The capacities of comp-

phasing to high notes. But such emphasis is not required when reaction is not used, such as, for example, when the local station is being received. At the minimum setting of the reaction condenser a short circuit automatically takes place between the moving vanes and one set of fixed vanes. This brings a large fixed condenser into what is virtually a parallel connection with the primary winding of the compensating L.F. transformer.

The parallel capacity thus shunted across the component offsets its high-note emphasising properties, and thus it now operates as an ordinary transformer having a more or less straight-line response.

On the application of reaction the parallel capacity is removed, and the high-note correction once more applied in order to compensate for the high-note loss inevitably consequential on using reaction.

This is a simple application of the scheme, but there are, of course, more elaborate methods of applying it. In one in particular the amount of high-note correction is carefully graded in respect to definite degrees of reaction.

But for normal purposes the simple application which we have outlined does all that is needed.

**TONE CONTROL.**

The adjustment of the low-frequency response of a set so that certain frequencies are given greater or lesser prominence than others.

Tone control should be differentiated from tone correction, which is a fixed-design feature of the set itself.

One of the best methods of tone control employs a special transformer in conjunction with a potentiometer. By manipulating this latter the transformer is made to give a wide range of tone control, and either high notes or low notes can be emphasised at will by the user of the set in which the scheme is incorporated.

An alternative method, but one which is seldom quite as

effective, is to design the set so that it gives an over-emphasis to the high notes and a good proportion of bass. Then, by means of a variable condenser or resistance control, more or less of the high-note exaggeration is removed according to the individual requirements of the listener.

But there is this to be said for the scheme: Seldom, if ever, should it be necessary to reduce bass if this is clean bass and there is not a spurious superfluity due to resonances in the loudspeaker or elsewhere that it is required to subdue.

The power of the average set is such that it cannot produce anything more than a relatively small proportion of the bass, and we do not regard with favour attempts to boost it up by means of resonances covering comparatively narrow bands of the frequency spectrum.

This, then, would appear to be an argument in favour of restricting tone control to the high notes, and so enabling these to be reduced for the reduction of high-pitched heterodyne squeals (though we favour the use of tuned filters for that), or to be adjusted in accordance with the deficiencies or otherwise of the high-note characteristics of specific broadcast items or gramophone records, or to compensate for high-note losses of varying degrees through the use of reaction, selectivity devices and so on.

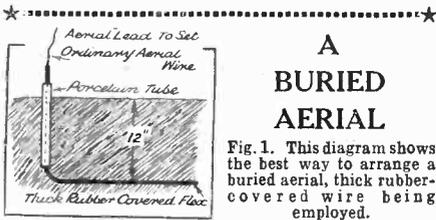
**TETRODE.**  
A valve having four electrodes, such as the screen-grid valve, in which there are two grids, an anode and a cathode (filament).

# ON THE SHORT-WAVES

## OUR SPECIAL SECTION for SHORT-WAVE ENTHUSIASTS CONDUCTED by W.L.S.

IT occurred to me this week that it was time my Ideas Department had a holiday. The staff of the said department has accordingly gone away for a week-end, and I am handing this page over to some of my brighter readers, who have from time to time made suggestions and hints.

About three months ago I had an unusually large batch of letters from people who had been trying underground aeri-als. Some had had good results; others reported "nothing doing." The latter, I found, had only themselves to blame for the results, as they had installed their so-called aeri-als



### A BURIED AERIAL

Fig. 1. This diagram shows the best way to arrange a buried aerial, thick rubber-covered wire being employed.

in a way which would effectively prevent them from working at all.

Fig. 1 is a more or less detailed sketch of the simplest type of underground aerial. Note that the underground portion is of thick rubber-covered flex. Don't try to use ordinary lighting flex, as you're almost sure to be disappointed.

"Seal up" the far end with insulating tape, Chatterton's compound or some similar means. The whole aerial must be completely insulated from earth. The "lead-in" may be brought up a porcelain tube, as shown, and once the wire is above the surface you can economise and use ordinary bare wire.

### Gives a Clearer Background.

Perhaps it is necessary for me to point out that the joint between the two kinds of wire should be carefully made and taped over. Readers who have used underground aeri-als, made more or less to this specification, report successful results, particularly in the following ways: "Man-made static" is appreciably reduced. Genuine static is almost non-existent. Signals that they have never heard before are received quite clearly.

This latter effect, I should say, is probably due to the fact that such an aerial, particularly if it is on the long side, must be very directional.

One foot is suggested as the optimum depth by readers. I take no responsibility

### SOME READERS' SUGGESTIONS

Many of the letters received by W.L.S. from readers contain hints which he feels will do a service to all short-wave enthusiasts if they are passed on.

for that figure. I would suggest, however, that the total length should not be greater than 20 feet. You'll probably be fed up with digging long before then, anyway.

Fig. 2 takes us inside the "shack" again. The word "wave-trap" probably conjures up visions of very primitive receivers of 1924 vintage, but wave-traps can be applied very profitably to short-wave work in the approved 1934 manner. Quite a few readers have complained at various times about a break-through effect from their local station in certain patches on the short-wave bands.

### Receiver Re-radiation.

I can only put this down to the re-radiation from near-by receivers that still troubles some of us.

### A LOCAL STOPPER

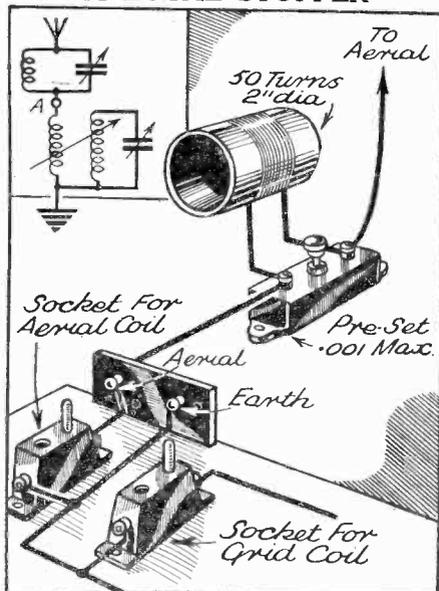


Fig. 2. Short-wave listeners situated near a powerful local broadcasting station sometimes experience interference from it. In such cases a simple wave-trap on the lines indicated above will prove beneficial.

Never having had it myself, I can't vouch for the efficacy of the cure; but it looks all right on paper, and I have the word of three different readers that it has put a stop to their trouble.

Simply insert, between your aerial terminal and the aerial lead, a circuit tuned to the wavelength of the interfering station. It will generally be a medium-wave station, in which case a quickly made 50-turn coil (or a commercial plug-in coil of that size) and a preset condenser with a .001 maximum will do the trick.

In any case, you're not committing yourself to an awful lot of trouble to try this out, and if it cures your interference you will be amply rewarded.

### TRYING A FRAME

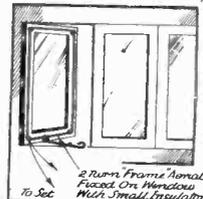


Fig. 3. Those who would like to try frame-aerial reception on short waves will find a window makes a good frame for the wire.

Incidentally, a kind of "backwards" version of this has been installed in several cases of interference from a near-by amateur transmitter working on short waves. A circuit tuned to 40 or 20 metres (or whatever wavelength he works on) inserted in the aerial lead of the broadcast receiver will generally do the trick. In most cases a short-wave H.F. choke in the same position is all that is required.

The last idea (Fig. 3) is described rather for its ingenuity than for its usefulness. Not many of us want to use a frame aerial for short-wave work nowadays. Those who do, however, will find in the sketch a beautifully easy way of rigging one up.

### Connecting to the Set.

Two turns round the window frame (metal windows excepted!) will tune over a wide range of the short waves, according to whether we wire our tuning condenser in series or parallel with them. They may be coupled to the set in various ways. Probably the simplest method is to connect them straight across the existing aerial coil, in which case the tuning condenser should be in series.

Needless to say, an indoor version may be arranged on a cupboard door or some similar place. Generally speaking, however, an indoor aerial of the picture-rail type will give better results.

ON THE SHORT WAVES—(Cont. from previous page)



MR. A. E. BEAR, of the International Short-Wave Club, asks me to mention, for the benefit of all readers who have been inquiring about this body, that a Convention is being held on Sunday, June 24th. It will be held in the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.18, at 3 p.m., and all "P.W." readers will be welcomed.

(I'm thinking that if they were all to turn up the R.A.C.S. Hall might need enlarging!)

**An Old Friend.**

Will A. H. (Leeds) and several others please note that the Venezuelan station YV-5 BMO is none other than the old YV-2 AM, which most of us have already heard? He may be heard almost any night in the 49-metre band.

D. B. (Leicester) who raised a query about a Swiss station working just below Jeloy's old wavelength, may be interested to know that he has nearly caused my post-bag to burst. Many thanks to all those who have written and told me that the station is HB9B, Radio Club, Basle, Switzerland.

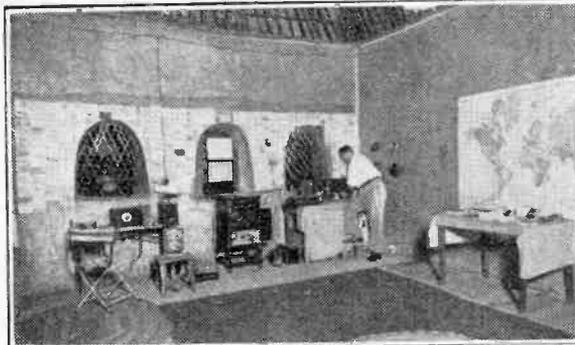
C. S. (Southampton) asks whether I know how noisy grid leaks can be, irre-

spective of their make or value? I do, C. S.! I have often advised readers to try more than one, if possible. A dud grid leak has been the cause of failure in short-wave work more times than I could possibly reckon up. Please note, everybody, if your set is unaccountably noisy, even when not oscillating, look to your grid leak. Change it, if possible.

No, C. S., your guess is wrong. I have already stated that my real initials are not W. L. S., which I only use for fun!

R. W. (Workshop) sends in a list of DX amateur stations logged in the 20-metre band, most of which he can't identify. He will probably be interested to know

**HOW IT'S DONE IN NIGERIA**



This roomy station was operated until recently by Capt. G. C. Wilmot at Zaria, Nigeria. Its call is Z D 2 A. and it figured prominently in the "B.E.R.U." contest this year.

that V U 2 K B is Indian, C M 2 Q Y Cuban, T F 3 T P Icelandic (or is it Icelandic?), Z S 6 A A South African and L U 3 D H Argentinian! So R. W. has logged some very good stuff without knowing it.

A station with the cryptic call-sign U C S K W is quite genuine, and hails from Moscow. R. W. wants an explanation of the "T" code for tone of signals. Here it is, condensed on account of space:

T 1, raw A.C. T 2, little better. T 3, poor rectified A.C. T 4, little better. T 5, nearly D.C., but poor. T 6, nearly D.C. and good and regular. T 7, pure D.C., but poor. T 8, good, pure D.C. T 9, crystal control, perfect.

Mr. Don B. Knock, Editor of "Australian Radio News," tells me that he is going to put me on his mailing list. Anything of interest in Australia will, therefore, reach you in the shortest possible time.

P. G. D. (Newquay) is joyful because the first test of a new aerial pulled in Sydney on the speaker! He also comments on the excellent strength of W 2 X A D during the afternoons and early evenings lately.

**Born, Not Made.**

M. K. J. (Bilston) comments on my remarks about good and bad operating. I rather agree with him when he says that "a successful knob twiddler is born, not made." There are some people who will never be a success at short waves, simply because they seem to

be incapable of moving a dial by a less amount than a jump of five degrees. If they do happen to hit on a station its more by luck than judgment.

W. L. S.

AFTER my disappointment over the dance records I reviewed last time I have had a good go at a number of other discs, and, as I had hoped, have found several items that have made me think better of the latest releases in this sphere of gramophone records. One of these is Henry Hall's recording of *One Morning in May*, with *Rolling in Money*, which numbers are quite pleasing in their effect. (Col. CB742.)

Another is the Hot Rhythm record of Chick Webb's Savoy Orchestra playing *On the Sunny Side of the Street* and *Get Together*. It is a snappy combination that will appeal to a large number of dance enthusiasts. (Col. CB741.)

The Mills Brothers, too, are a pleasure to listen to if one likes that kind of syncopated harmony. On their Brunswick records (01750, 01761 and 01766) they have recorded three pairs, all having the famous guitar accompaniment and the equally famous effects of instruments made with the mouth.

Here are the six numbers in order: *Swing It, Sister and Money in My Pockets*; *Put on Your Old Grey Bonnet and I've Found a New Baby*; *Jungle Fever and Sleepy Head*. I find the Mills Brothers are inclined to get a little monotonous, especially in such an item as the last named, but there is no gainsaying their skill, and the records are notable achievements.

Connie Boswell is disappointing to me—at any rate, on Brunswick 01745—singing *Butterfingers* and *I Knew You When*. But that is only my feelings about it. I should advise you to hear it for yourself before deciding.

Stanley Lupino is a fresh type of artist on a record, and his [Decca E3974 is pregnant with his personality. Somehow it does not quite do the popular comedian justice, and one misses the visual assistance we are so used to with stage and screen. But Stanley is there right enough, in spite of the limitations of the medium. He "sings" *Happy* (from the film) and *How're Ya Getting On* (from "Sporting Love").

Another famous film character to be heard (I believe for the first time) on disc is Jimmy (Schnozzle) Durante, who gives us a typical performance on Brunswick 01754. He provides *Hot Patatta* (from "Strictly Dynamite") and *Inka Dinka Doo* (from "The Great Schnozzle"). An interesting souvenir.

The Decca Musical Impression of "The Three Sisters" is not, in my opinion, good entertainment in itself. For those who have seen the show at

**ROUND the RECORDS**

Selections and recommendations from the latest gramophone lists.

Drury Lane it probably carries much more satisfaction, and to them I commend K750 as worthy of close attention. It carries as stars Victoria Hopper, Adele Dixon and Esmond Knight, together with the Chorus at the Theatre Royal, under the personal direction of Jerome Kern.

Talking about film stars, I am reminded of one of their greatest mimics, for once again we welcome Florence Desmond to the gramophone. She has returned from Hollywood with much new material, and has made a record called *A Hollywood Bridge Game* (H.M.V. B8159), bringing in four of the film favourites—Zasu Pitts, Mae West, Lupe Velez and Jimmy (Schnozzle) Durante. Not up to Miss Desmond's usual material, the mimicry is perfect, but the "book" is poor. (It is interesting to compare the synthetic Schnozzle of this record with the original in the disc just reviewed.)

Few have not heard José Collins, either in her "Maid of the Mountains" and "Southern Maid" days or when she has sung over the ether. But whether they have heard her or not they will enjoy the Decca record called *José Collins' Memories*, which introduces such favourites as "Love's Cigarette" ("Southern Maid") and "Love Will Find a Way" ("Maid of the Mountains"). It is a twelve-incher (K750).

If my memory serves me right, one of the fairly recent broadcasts of the "In Town to-night" series included a short turn by the Yacht Club Boys, who have been appearing at the Monseigneur Restaurant in London. Anyhow, Columbia have now released one of their records, giving all of us a chance to hear this really fine quartet in two of their most effective songs. I particularly like *Sing-Sing Isn't Prison Any More*, which is well backed up by *The Super-Special Picture of the*

**A FINE QUARTET**

Year. Ask your dealer to let you hear it, and be prepared to spend your half-crown—you will want that disc!

Let me mention two more dance numbers that I have heard, and which have done a great deal to banish my after-Whitsun blues. One is by Scott Wood (orchestrator to Harry Roy) and His Dance Orchestra of the tuneful theme song, *Let's Fall in Love*. This is going to be a hit among the public, even if it is not being pressed for an official hit by the music publishers. Even now I hear it whistled and hummed all over the place.

Its melody and haunting rhythm cannot be denied, and on the Regal-Zonophone record Scott Wood has done it full justice. I like the whole ensemble of this band and think you will, too. The accompanying number is *Au Revoir* (MR1285).

The other record is by Billy Merrin and His Commanders, staunch favourites with Midland Region listeners, and is of *Go To Sleep* and *That's Love* (from "Lady of the Boulevards"). Merrin and Co.

are always the quintessence of high spirits, and their admirers will find any amount of enjoyment in these records.

The Commodore Grand Orchestra has long been celebrated for the excellence of its Saturday wireless programmes. Their playing is always of the highest order, and the selections are arranged in the most attractive way to make welcome hearing.

Their latest record is *Procession of the Sirdar* (a blood-curdling Oriental melody that comes from a collection of "Caucasian Sketches") and *The Juggler* (a novelty). Both were recorded in the Commodore Cinema, noted for its acoustics, and conducted by Joseph Muscant. (Regal-Zono MR1276).

The number of amateur crooners aspiring to Bing Crosby fame is legion, but there is one genuine discovery announced by Regal-Zono this month. He is Alfred Thripp, a young man who is quite blind, and who has to memorise all his numbers by having them played over on the piano. Moreover—and this is more astonishing—he actually has a voice closely resembling Bing Crosby's.

Thripp makes no pretence of hiding this fact, for he has worked hard to model his style on the illustrious Bing's, and that he has the identical sort of voice few will deny on hearing him.

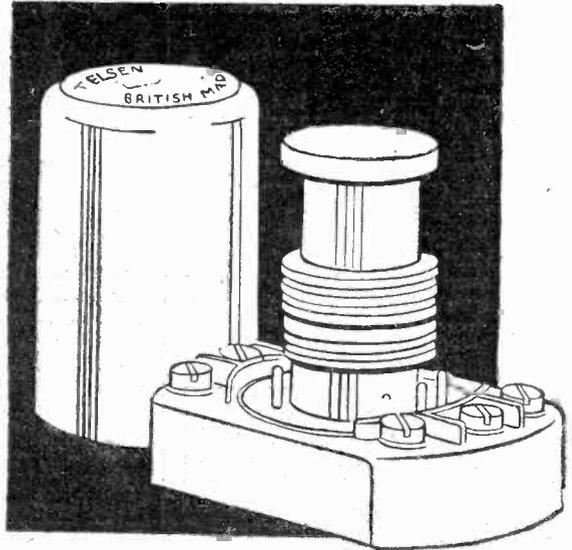
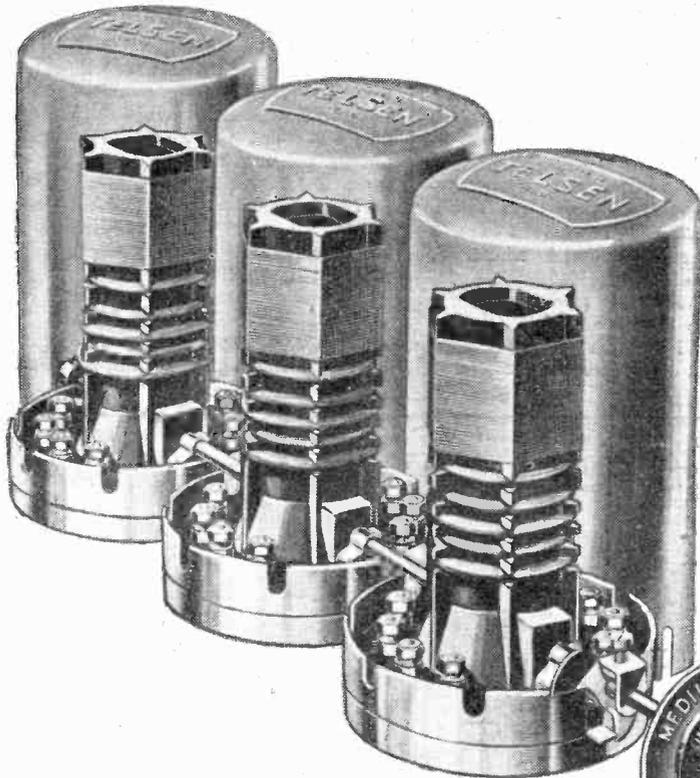
His songs are *Throw Another Log on the Fire* and *Our Big Love Scene*. (MR1270.)

K. D. R.

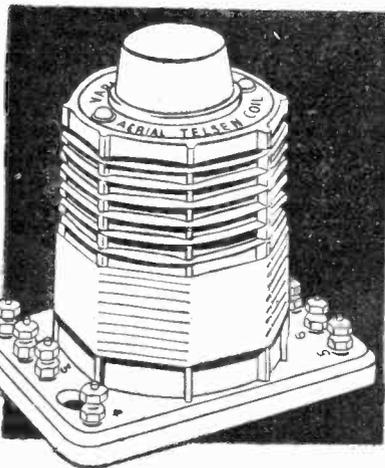
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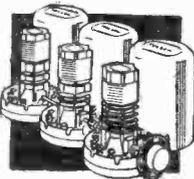
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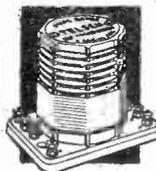
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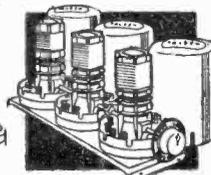
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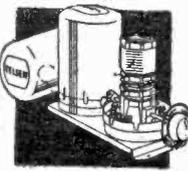
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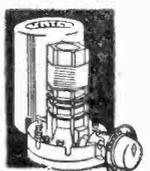
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**TELSEN FOR EVERYTHING IN RADIO**

Announcement of THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM

# These "LASH-UPS"

IN club-rooms and places where wireless fans are gathered together one cannot listen to the general conversation for five minutes without hearing the words, "I lashed up So-and-so's latest circuit, but didn't think much of it."

It seems to me that the one redeeming feature of this new verb, "to lash-up," is that it describes so perfectly what people do nowadays. One doesn't experiment with a circuit; one doesn't even "try it out"; one simply "lashes it up"; and, having found that there is very little reward for one's energies beyond the familiar crackle of loose connections and bad joints, one unlashes it again.

## Saving Time and Patience.

There once lived in this world a man who earned fame by uttering the words: "If a thing is worth doing, it's worth doing well." I don't think the words have ever been forgotten, but the putting of them into practice doesn't seem to be much in evidence nowadays.

The object of this little discourse is to make a few suggestions that may result in much saving of time and patience. I haven't seen many "P.W." readers' lash-ups, but I have seen some of my own friends', and they were a sight not easily forgotten.

## First Tests.

Where has our common sense and logic gone to? Why do we expect a circuit to give marvellous results on the first test, after we have spread it all over the kitchen table and wired it up with odd lengths of flex and D.C.C. wire? And, worse still, the components we use! Variable condensers, for instance, that first saw the light of day in A.D. 1925, that we would not dream of using in a complete receiver, are considered good enough for these las— (No! I won't use the horrible words again!)

It is not every reader of "P.W." who is experimentally minded. Many of them, with due faith in the efficacy of modern circuits, decide to make a new set, buy the components, wire it up according to the diagrams and all is finished.

But there are some who like to try out circuits for themselves before definitely making a finished job of a set, and it is principally for them that I am making this suggestion:

When you try out a new circuit, do you give it a fair start in life? Whatever your method, you will find these practical suggestions of great interest and value.

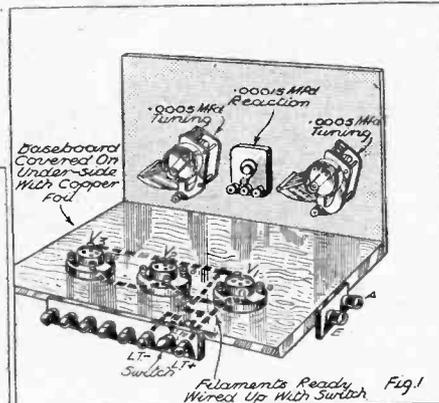
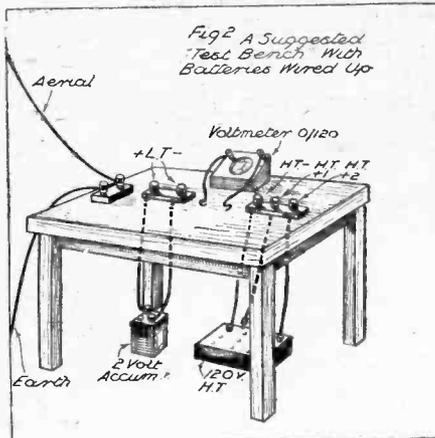
By L. H. THOMAS.

Why not build up a "testing board," to be kept solely for trying-out new arrangements? Requirements: one baseboard, one panel, three or four valveholders, a few terminals and perhaps a couple of variable condensers.

I have had one in my possession for a considerable time, and wouldn't be without it for anything. It is such a familiar sight in my den that it only recently occurred to

## EASY

To the right is the proposed skeleton layout which renders new circuit testing a very easy matter, as the author explains.



## EFFICIENT.

For the experimenter who frequently uses different sets there is much to be said for the workmanlike assembly shown to the left.

me that it was worth describing. The idea is so straightforward that one would imagine that everyone would be using one.

Fig. 1 is a rough sketch of the scheme. This is a fairly complete job. The front panel is about 16 in. by 8 in., and on it are mounted two .0005 variable condensers equipped with slow-motion dials, and between them a .00015 reaction condenser.

## Trying Out a New Three

On the baseboard are three valveholders, duly wired up to the filament terminals and L.T. switch on the strip at the rear. Plenty of space is left for trying out circuits of all shapes and sizes.

As an example, a simple "det. and 2 L.F.," with perhaps something special

about the detector circuit, would be laid out as follows: In the space to the right of No. 1 valveholder (looking from the back) would go the tuning coils, the grid winding being taken through the appropriate grid condenser and leak to the valveholder. No. 1 tuning condenser would be connected to the two ends of this winding.

## Ready Wired for A.C.

The reaction condenser is already mounted; the filaments are already wired up; and the business of mounting, say, a resistance-coupling unit between valveholders 1 and 2 and a transformer between valveholders 2 and 3 is not very formidable. Note, also, that there is space for an output choke and condenser to the left of the third valveholder.

The second variable condenser, in such a case, would not be used.

A four-valve set could easily be assembled on the same baseboard, but, in general, when one tries out a new circuit, one does not have to rig up the whole of the L.F. side to find out what one wants to know. As a matter of fact, a board making provision for a detector only, or for an H.F. stage and the detector, would serve all my own needs, as I have a "standard" L.F. amplifier into which the output from any new circuit could be fed.

Endless variations in the scheme come to mind at once. The valveholders may be of the five-pin type, ready wired for "raw A.C." on the heaters, using screened twin wire beneath the baseboard. This is a point on which most rough arrangements fall down badly.

## Variations.

With a little ingenuity one could carry the business much farther and have a baseboard bristling with sockets, into which could be plugged a kind of "tray" equipped with plugs to correspond, the components being mounted thereon and

wired up in almost any conceivable way.

To make the thing really complete, one wants an accumulator and an H.T. supply, preferably wired up with some degree of permanency (see sketch), so that one does not have to start pulling another outfit to pieces when a new circuit is being tried.

## OUR NATIONAL THREE-VALVER

A readers' grateful thanks.

The Editor, POPULAR WIRELESS.

Dear Sir.—In your issue of January 20th you gave P. P. Eckersley's "National Three" as a battery set, and the following week for Alternating Current Mains, and the latter so attracted me that I purchased the components necessary to turn my mains two-valve set into the "National Three-Valve Set." After two months' enjoyment of the smooth and efficient working of the "National Three" I am constrained to hereby offer to the designer my most grateful thanks.

I had a Regentone transformer giving 200 volts at 30 m/a., which includes Westinghouse Metal Rectifier H.T.4, and as the designer worked on a mains transformer giving 250 volts at 60 m/a., I found it necessary to cut down the resistances by half, except, of course, the valve biases and grid leak.

Yours faithfully,

The Willows, 66, Squirrels  
Heath Lane, Romford.

J. W. NEWELL.



## THE "TRU-VOL" BATTERY SET

(Continued from previous page.)

changes everything to useful proportions, the locals can be made like distant stations and the distant stations come in like locals.

You will soon be making me as enthusiastic about the set as you are yourself. What is the actual circuit on which it is based?

If you'll have a look at this circuit diagram with me, we'll soon have that clear.

Let's consider the reaction first. You will see that the detector's grid circuit is quite normal. Also its anode circuit is normal if we ignore the reaction circuit with its coil and condenser. Is that clear?

Yes, perfectly. In fact, it seems to be the same as my present anode circuit, bar the reaction.

We will come to that in a minute. If we now consider the anode circuit of the S.G. valve, neglecting the connection from the moving vanes of the differential to the preset, we find a straightforward differential input. As the differential's fixed vanes are across the primary winding, the amount of energy passed to the detector varies with its setting. Thus, you see, we use our differential to control both reaction and volume.

And what does the preset do?

### The Action of the Preset.

That enables the point at which the differential begins to provide reaction, to be varied so that it does not occur before the maximum desirable coupling is being obtained. By increasing its capacity beyond the normal point, selectivity will be increased, because reaction will occur when coupling is less. You see, the less the coupling the greater the selectivity, as well as the smaller the volume.

Then, apart from that striking simplification of the two controls, what is the circuit?

It starts off with an efficient screened-grid stage, coupled, as I have explained, to the detector, which is followed by another efficient stage—this time of the transformer-coupled low-frequency type.

### Main Features of Construction.

What are the main points to watch in construction?

If you look at the set you will immediately appreciate that, in spite of its advantages, it is an easy job to tackle. It is constructed on plain panel and baseboard lines, but this does not preclude its being used in an attractive console-type cabinet.

The baseboard is of the metallised type, and this, in itself, simplifies the wiring, as some of the leads are taken direct to it by means of washers and screws. There are no "tricky bits" in the construction at all, but an interesting feature is the arrangement of the coils on either side of the two-

gang condenser. This certainly calls for two wavechange switches, but this is not a complication, and the arrangement makes for great efficiency.

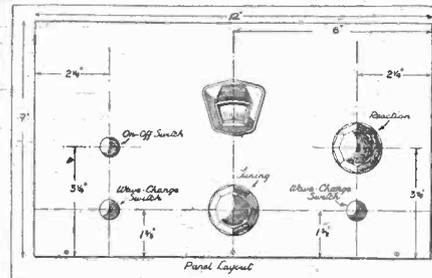
With the aid of the usual wiring diagram I think I should have no difficulty in the construction. I notice that the coil units are unusually small and neat. Why is that?

The coils are of the iron-cored variety. That is why they can be so small and yet impart a high degree of efficiency to the

receiver. They were chosen with their efficiency in mind, as indeed were all the components, and that is why I would advise you to keep to similar components to those used in the original receiver.

As they are all of the standard types, I shall certainly be able to do that. When I have finished the actual wiring and checked

## THE SIMPLE CONTROLS



There are only two variable controls which have to be adjusted when tuning in stations. The remaining three knobs are for wavechange and on-off switching.

it, how should I set about the first test? What voltages do I need for each lead, for instance?

On H.T.+1, which feeds the screening grid of the first valve, you will need between 60 and 90 volts, whatever voltage gives best results. On H.T.+2, the detector's feed, you want about 90, and on H.T.+3 put the highest voltage available. (That is, so long as it is not above 150.)

### Getting Ready to Listen.

The amount of negative bias for the last valve depends on its make, and should be found from the manufacturer's details.

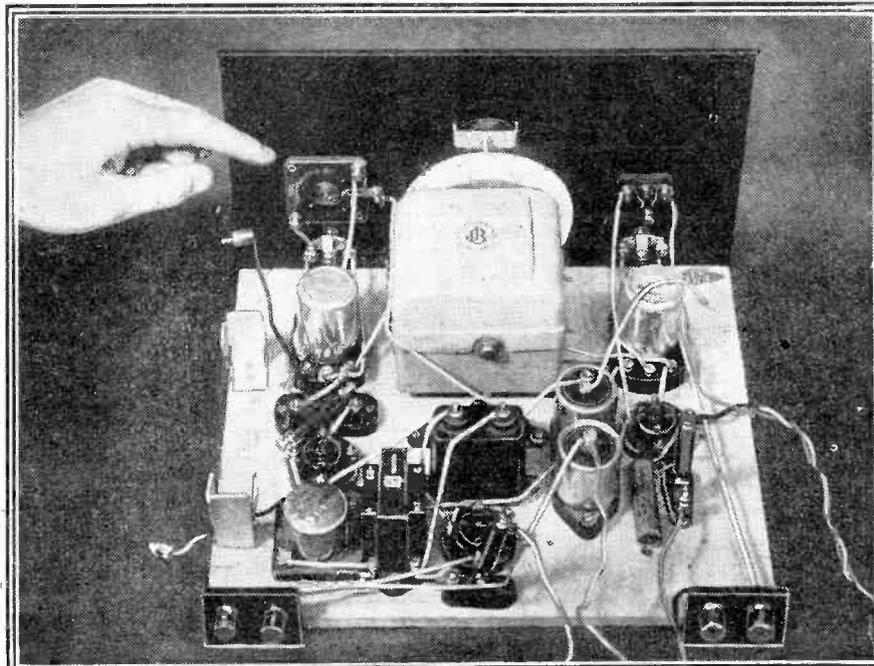
Right. L.T., loud-speaker and aerial and earth terminals as usual, I suppose. Now, what about preliminary adjustments: trimming, for instance?

The trimming is important, but not difficult. The back trimmer (the trimmers are the small wheels on the side of the gang condenser) is for the aerial tuning and the other one for the H.F. transformer.

### Adjusting the Two Trimmers.

First pull the two wavechange switches out for medium waves, set the volume control

(Continued on page 332.)



## THE SET AS ASSEMBLED WITH THESE COMPONENTS

- 1 J.B. "Nugang" 0005-mfd. 2-gang tuning condenser, type A.
- 1 pair Telsen matched iron-cored coils, No. W.422.
- 3 W.B. 4-pin valve holders, small type.
- 1 Telsen screened binocular H.F. choke.
- 1 Graham Farish screened H.F. choke, type H.M.S.
- 1 Dubilier 2-mfd. fixed condenser, type B.B.
- 1 Dubilier 1-mfd. fixed condenser, type 4404.
- 1 Dubilier 0003-mfd. fixed condenser, type 610.
- 1 Polar 0001-mfd. preset condenser.
- 1 Graham Farish 0003-mfd. differential reaction condenser.

- 1 Graham Farish 2-meg. grid leak, type 1 1/2-watt Ohmite.
- 1 Graham Farish 20,000-ohm resistance in vertical holder, type 1 1/2-watt Ohmite.
- 1 Graham Farish 1,500-ohm resistance in vertical holder, type 1 1/2-watt Ohmite.
- 2 Benjamin 2-pt. push-pull switches.
- 1 Bulgin 2-pt. push-pull switch, type S.22.
- 1 R.I. Hypermite L.F. transformer.

- 2 Peto-Scott terminal strips, 2 in. x 1 1/2 in.
- 4 Clix terminals, type B.
- 1 coil B.E.G. "Quikon" connecting wire.
- 2 Clix accumulator spades.
- 5 Clix wander-plugs.
- 1 Belling & Lee wander-fuse.
- 1 Peto-Scott cabinet to suit above panel and baseboard.
- Screws, flex, etc.



*"Light a fire with one match, Sir? Easy, Sir!  
In those Tungram valves I could make a  
symphony orchestra with one bugle!"*

## "POPULAR WIRELESS" SPECIFIES TUNGSRAM UNIVERSAL VALVES (AC & DC COMBINED IN ONE!)



A valve that is far better than the ordinary D.C. type and even better than an A.C.; yet works as either! Tungram's supreme achievement! No need for alterations if your supply changes from D.C. to A.C.! No need for a transformer! "Popular Wireless" exclusively specify for their UNIVERSAL THREE H.P. 2118 (14/6), R. 2018 (10/6), P.P. 4018 (17/-) and P.V. 4018 (15/-).

*There's a Tungram for every radio need.*

# TUNGSRAM VALVES

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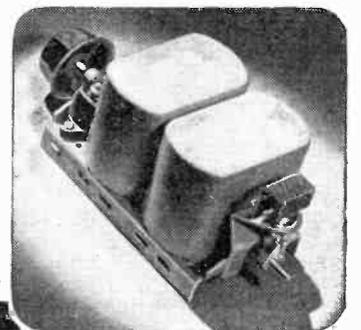
## the needle and the poker

You can't pin point a dot on a map with a poker, can you? You can only get somewhere near it. It's the same story with your set... however perfect the rest of your components, inferior coils will rob you of "needle fine" tuning—take all the crispness and the clarity out of your listening, because you can only get "some-where near that station."

Colvernise your set now. Put in Colvern Ferrocart, the finest coils ever made. Put them in and forget them—you'll never have any trouble in their direction. You will be certain that you are getting more accurate, more sensitive tuning—Better, clearer, crisper, more enjoyable Radio.

# COLVERNISE YOUR RADIO

*Here are the famous Colvern Ferrocart Coils—chosen by leading experts—recognised as the most perfectly designed coils in the world... the coils your set deserves. Get Ferrocart coils to-day, or send for Radio List No. 12, to Colvern Ltd., Romford, Essex.*



Made under licence from patentee, Hans Vogt.

## THE "TRU-VOL" BATTERY SET

(Continued from page 330.)

about half-way round, screw the trimmers right up and then slack them off two complete turns.

The next step is to tune in a station at the lower end of the dial, and then to proceed to turn the trimmers backwards and forwards until loudest results are obtained.

After that there is only one other preliminary adjustment to be carried out.

*That trimming seems clear enough. What is the other preliminary adjustment to which you referred?*

It is the preset condenser, and is very simply done. Unscrew the preset condenser four or five turns from maximum, turn the tuning condenser fully clockwise and also the volume control fully clockwise

### Setting the Preset.

Now screw the preset down until a click or rushing noise indicates the set is oscillating, and the adjustment is made. If you want the set to be extra selective for separating foreign stations that are close together, simply screw the preset down a bit farther.

*I take it that the preliminary setting of this preset is the only time it has to be touched. Is that correct?*

Yes, it is a matter of balancing the set to suit the particular aerial-earth system and other individual conditions. If you find the set will not react sufficiently as the H.T. battery runs down, all you have

## THE VALVES TO EMPLOY

Make.	S.G.	Det.	Output.
Cossor ..	220 S.G.	210 H.F.	220 P.A.
Mullard ..	P.M.12A.	P.M.1 H.L.	P.M.2 A.
Mazda ..	S.G.215	H.L.2	P.220
Marconi ..	S.22	H.L.2	L.P.2
Osram ..	S.22	H.L.2	L.P.2
Hivac ..	S.G.210	H.210	P.220
Tungsram ..	S.220	H.R.210	
Dario ..	T.B.422	T.B.282	T.B.122

to do is to increase the voltage tapping to which H.T. +2 is taken.

*Is the H.T. +2 lead solely concerned with the detector H.T. supply and the H.T. +1 lead with that for the S.G. valve?*

We have covered that point already, but perhaps I had better emphasise that all the detector's H.T. (which incidentally is not much, being only one milliamp or so) is carried by the H.T. +2 lead; but not all the S.G.'s current is supplied by H.T. +1.

### The H.T. Supply.

If you look at the diagrams you will see that it is only the H.T. for the screened-grid itself that is drawn by the H.T. +1 lead, the S.G.'s anode current being derived from H.T. +3 via the screened binocular H.F. choke.

Thus the full + voltage is applied to the last valve and also to the S.G. anode, whilst, as I said before, the S.G.'s screen voltage is found by trial with the H.T. +1 tapping, and is somewhere between 60 and 90 volts.

*And now how about the size of the H.T. battery required? Will one of the standard types of H.T. battery suit the set?*

Yes, that will be perfectly O.K. provided

that you are not going to use a team of valves that are all rather voracious so far as H.T. consumption is concerned. The actual current drain will depend upon both H.T. and the grid-bias setting, and it can be calculated for the various valves from the valve-makers' literature, or tested under working conditions by a milliammeter, joined in the H.T. circuit.

*So if I use a 10-milliamp battery the total H.T. current of the three valves should be more than that figure?*

### The Discharge Rate.

That is right. For economical running and long battery life you should aim at not exceeding the battery's discharge rate.

Any H.T. battery's life is shortened if it is overworked, but if you adhere to the correct discharge rate you can be sure of getting full service from it.

*That, too, seems as simple as could be desired. I think you have answered all the questions I had in mind, and you have certainly convinced me, that even in these*

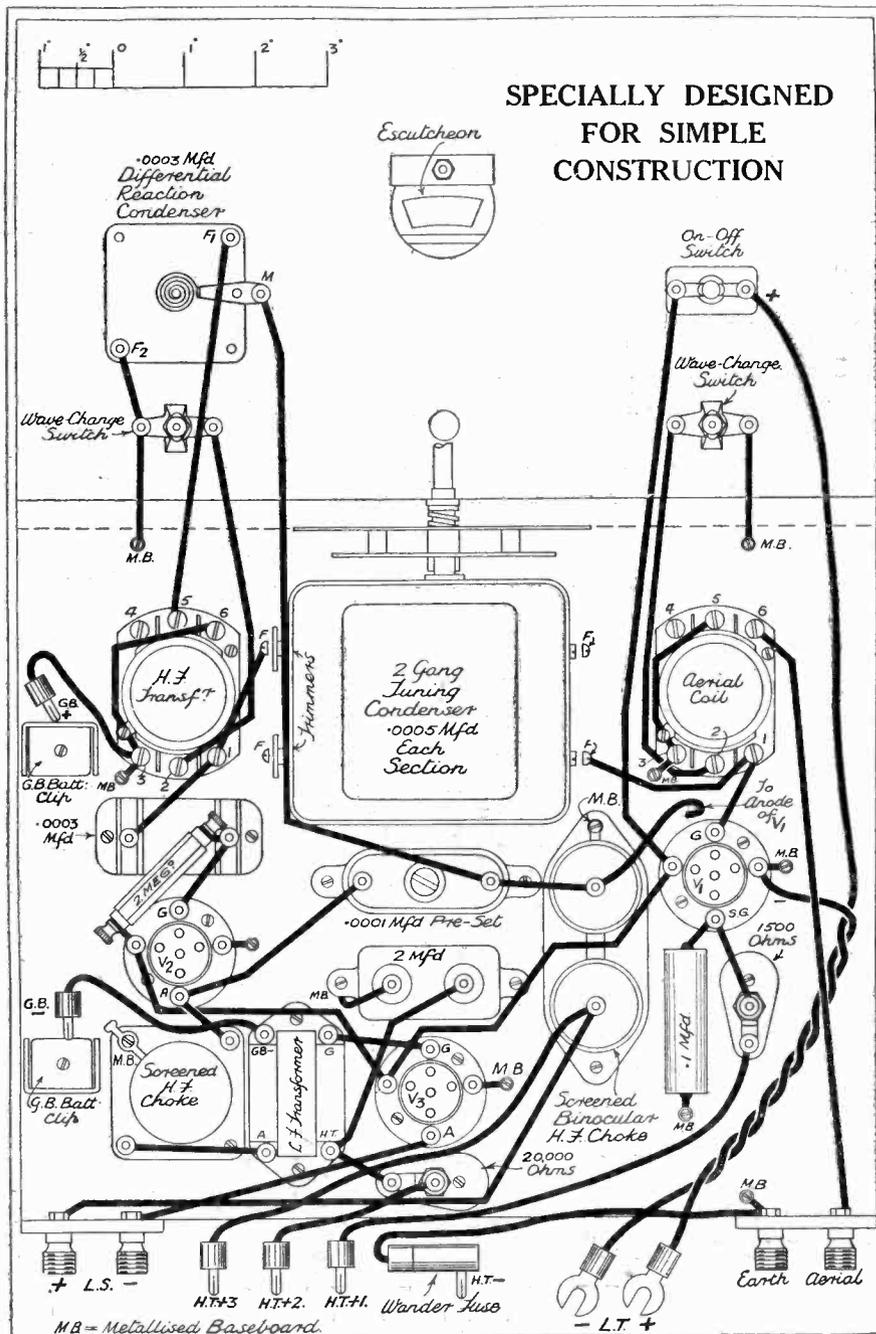
## BATTERIES AND SPEAKER

H.T. ..	120 volts	Ediswan
G.B. ..	9 volts	Drydex
L.T. ..	2 volts	Exide

LOUDSPEAKER—Amplion.

*days of advanced design, the "Tru-Vol" represents something quite outstanding.*

I can see you are going to build this set. Well, I wish you the best of luck and can assure you that you will find the results no less outstanding than the design itself.



Simplicity and efficiency came first in the design of the "Tru-Vol," and in no instances were either of these sacrificed for any purpose. The wiring itself is particularly short and straightforward.

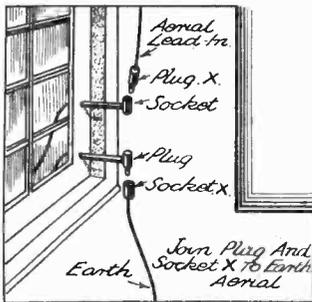
# A PAGE of Recommended WRINKLES

## ★ SIMPLE AERIAL EARTHING.

TWO pairs of brass plugs and sockets from discarded plug-in coil mounts are used, and two lead-in tubes are inserted through the window frame. The four brass plugs and sockets are attached (soldered) in the following manner:

- Aerial down-lead . . . . Plug
- Earth wire . . . . . Socket
- Aerial lead-in tube to set . . . Socket
- Earth lead-in tube to set . . Plug

When the set is in operation the aerial down-lead is plugged into the socket on the end of the aerial lead-in tube, and the earth wire attached to the plug on the end of the earth lead-in tube.



An alternative to the usual S.P.D.T. switch.

To earth the aerial, plug it directly into the socket on the end of the earth wire, and it is then completely earthed right away from the house or other building.

## PAPER DIAL INDICATORS.

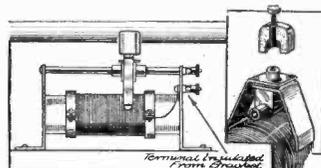
TO obtain accurate dial settings, as, for example, with S.T.500 dials, take a piece of ruled paper and cut two small triangles so that a ruled line bisects an angle. The little triangle can be then gummed on to the panel.

## A SMALL-POWER RHEOSTAT.

HAVING had difficulty in finding a suitable rheostat of about 30 ohms which would carry up to 1.5 amps. without heating to such an extent that the former for the resistance wire was burnt out in a short time, I made this rheostat, a description of which is the following:

A thin, wet asbestos sheet was wrapped on to a 3-in. length of 1/4-in. copper tubing; this was then covered with thin metal, tied tightly with string and put in an oven to dry. The thin metal was put on to protect the soft asbestos from being furrowed by the string.

When dry, two strips of thin brass were bent to form clamps, which are



This rheostat can be used to limit the charging rate of accumulators.

fitted with screws and nuts in order to tighten them on to the asbestos former. These clamps serve the double purpose of anchoring the ends of the wire and of preventing the adjacent turns from separating.

The resistance wire can now be wound tightly on the former, having first ascertained the length of wire required for the total resistance of the rheostat. I used wire similar to that used in electric fires, which had a resistance of 1.8 ohms per foot. The stand of the rheostat is made from two pieces of angle brass to which each end of the copper tube is soldered.

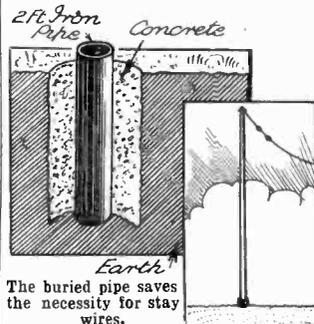
The rod carrying the sliding arm is 3/8-in. brass rod and is soldered at each end to the uprights. Two contact arms are arranged as shown in the sketch. They are soldered to a piece of brass through which a 1/4-in. length of copper tubing passes at right angles to the contact arms.

The slider rod is a sliding fit into this tube. Two terminals are fitted to one of the uprights, the one insulated from it being connected to the resistance wire end.

This rheostat was used to limit the charging rate of accumulators by a charger whose transformer was only capable of delivering 1.0-1.5 amps. for long periods without overheating.

## ERECTING AERIAL MASTS.

A FAIRLY stiff aerial mast of the scaffold-pole type, about 3 in. diameter at the base, may be very effectively installed by burying a 2-ft. length of pipe, of suitable diameter, in a perfectly erect position and filling the hole round the pipe with concrete. It is then only a one-man job to erect or take down the pole, and it is quite



The buried pipe saves the necessity for stay wires.

unnecessary to make provision for raising or lowering the aerial wire by means of a halyard. No stay wires are necessary. If the mast is not a snug fit in the pipe, small wedges may be driven into the space between mast and pipe.

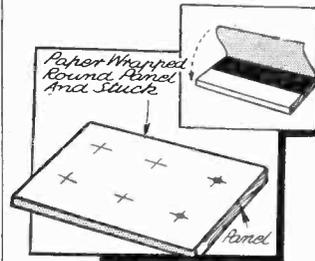
## ACCURATE PANEL MARKING.

MORE often than not one's ebonite panel is purchased ready drilled for use. But this is not always the case, and where a great degree of accuracy is essential, such as in the drilling of suitable holes for escutcheons, etc., the following scheme is extremely useful: Procure a large sheet of fairly stout white paper, sufficient to cover both sides of the panel, with an inch or two to spare.

Wrap the paper completely round the panel and then gum one edge over the other, ensuring that the paper fits as tightly as possible. Then trim the edges of the paper flush with the ends of the panel.

A surface is now given which enables the most accurate pencil markings to be made. This also ensures that no pencil marks get on the panel.

The "wrapper" is preferable to a piece of paper stuck direct on the panel, and, if tight enough, there will be no trouble from slipping.



Covering the panel with paper, as shown, enables accurate drilling to be achieved.

## THAT G.B. BATTERY.

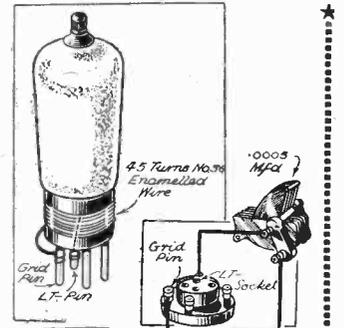
TO owners of sets who habitually forget to renew their G.B.'s, this little dodge should be useful:

When you buy your next battery, paste a piece of paper on it and write, in bold letters, "RENEW XMAS," or whenever the specified six months' life is up. Then you can save that falling off of quality.

## WINDING COILS ON VALVES

A FEW days ago I fixed up an S.G. adaptor for a friend who had only a two-valver, but, not having a ready-made coil, adopted the following method:

On the base of the S.G. valve I wound 45 turns of No. 36 enamelled wire, connecting one end to the grid pin and the other to the L.T.—pin. I then connected the tuning condenser (0005) across the corresponding terminals on the valve holder. This



The method of winding a coil direct on to an S.G. valve.

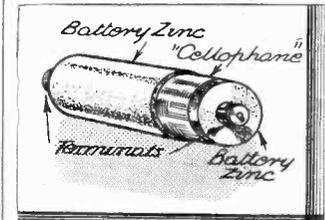
functioned very satisfactorily indeed, except that tuning was flatter than usual.

You will see that a long-wave winding is not included, the existing coil tuning from 220 to 500 metres approx., but on some valves the base may be long enough to include the long-wave winding. It would then be possible to use a 5-pin valve holder and connect the tapping for the wavechange switch to the fifth pin. Alternatively, the two windings could be accommodated in two slots made from cardboard discs slid over the valve base.

## A CHEAP CONDENSER.

A USEFUL small variable condenser can be made with two zinc cells from old H.T. or grid batteries.

Choose two different sizes, so that one will slide easily inside the other. Remove rods and thoroughly clean paste out. Fix a terminal through the bottom of each, and cover the smaller cell with "Cellophane" or similar material for insulation, then slip one in the other.



The capacity is varied by moving the inside cell.

The capacity can now be varied by in or out movement. I have found it useful as a series-aerial condenser, and it could no doubt be adapted for various other uses.

## MAGNIFYING THE TUNING SCALE.

ON some sets the tuning scale is small. In any case, the scale will bear magnifying to enable fine tuning to be made. Most of the modern sets have a small window on which the edges have a flat border or edge. This is often wide enough to stick a small lens on in order to magnify the scale. A plano-convex is most suitable. Canada balsam or transparent lacquer will be suitable for sticking in place. Chatterton's compound or any suitable medium may be used as long as the parts looked through are left clear.

## ★ ONE GUINEA FOR THE BEST WRINKLE! ★

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 is. will be paid for the best Wrinkle from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate piece of paper, written on one side of the page. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

The best Wrinkle in the issue dated May 26th was sent by Mr. F. B. Belton, of 49, Uttoxeter Road, Mickleover, to whom a guinea has been awarded.

# TESTED AND FOUND

Being Leaves from the Technical Editor's Notebook

## LIGHTNING AND RADIO

A FULL-SIZED thunderstorm is awe-inspiring at the very least. Many are thoroughly frightened by it. Even those of us who can remain quite unperturbed when safe at home no doubt feel just a shade of anxiety on those occasions when we are caught in the middle of one during a hike through a forest or while walking (if not running!) across open moors.

But then we know that these forces of Nature are terrific in their magnitude, and should they be directed against our poor, puny selves.

One can gather something of an idea of the electrical power behind a thunderstorm if one can witness the heat that can be done in the way of spark production with man-made apparatus.

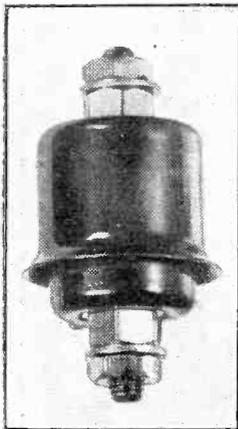
### A Colossal Spark.

A couple of years or so ago I stood in Ferranti's vast experimental laboratory at Hollinwood. By means of colossal generators and huge coils and condensers, one million volts were generated, and a spark leapt across several yards of air to the accompaniment of a deafening crackle. It was a perfect lightning discharge in miniature, with jagged branches leaping at acute angles into the surrounding atmosphere.

One million volts! But only a comparatively short "flash" resulted. You'd hardly take any notice of one of that length if it took place in the sky even between two low clouds right above your head.

Not that I intend in any way to depreciate the magnificence of the Ferranti achievement. To develop and to hold in secure restraint a pressure of no less than one million volts is something to be very proud of; but the illustration serves to show what a tremendous thing lightning is, transcending to an almost incredible degree, as it does,

Left permanently between aerial and earth, the Graham Farish "Gard" forms a constant protection against lightning damage, and offers a never-ending guarantee to users.



anything that man can do. It has been estimated that something like 100 lightning flashes occur per hour, there being over sixteen million thunderstorms per year.

Fortunately, they do not all occur in this country!

Nevertheless, we get quite enough of them, and at the very moment of writing there is a distant rumbling to be heard that heralds an approaching storm.

Possibly some damage will be caused to something somewhere by it, though the odds are greatly against a wireless aerial assisting in this. A long, suspended wire insulated at each end might have tremendous voltages induced in it.

### The Aerial Pick-up.

In an experiment on these lines in Switzerland two scientists recorded an electrical pressure of about ten million volts induced by lightning. There were sparks from their insulated cable no less than sixty feet in length.

But the comparatively short, low wire used by a listener as an aerial is not likely to attract anything approaching that. And in any case it is, at the worst, earthed through the radio set.

But, however remote the real danger of lightning may be for the average listener, I fail to see any

arguments against taking simple precautions, if only for the sake of one's peace of mind.

Millions of people pay together many thousands of pounds per year to safeguard themselves against what really are rather remote chances as viewed by any one individual. But the cost to the individual is proportionately small and out of all proportion to the sense of security thereby engendered.

A thousand-pound house can be insured against fire for only a few shillings a year, and those who fail to take advantage of such a service are either foolish or are very unimaginative.

### A £200 Guarantee.

And so with lightning. For only two shillings Messrs. Graham Farish, Ltd., of Masons Hill, Bromley, Kent, will supply you with a little device which not only prevents lightning from "striking" a radio set, but actually transforms the aerial into a lightning conductor for safeguarding the whole house.

The device is known as the "Gard" Lightning Arrester, and it carries with it a £200 safety guarantee that, if called upon, it will do its job.

It is not a switch; it requires no operation or manipulation whatever. You connect it to the aerial system and you can then forget all about it—and the lightning, too.

But I expect the majority of "P.W." readers know what a lightning arrester is: it is just a small gap formed by adjacent pieces of metal, one of which is connected to the aerial and the other straight to earth.

This gap presents an easier path to electrical energy developed by lightning than does the radio set, and so it leaps across and harmlessly goes to earth.

The "Gard" Automatic Lightning Arrester is extremely neat in construction, and I should imagine that it would weather very well, particularly as the terminals are substantial and there is a close-fitting

THERE is nothing that succeeds like success. I can remember the time—not so very long ago—when Messrs. A. C. Cossor, Ltd., had but one factory, and although even at that time it was one of the most extensive radio factories in the country, it rapidly became inadequate to cope with the ever-increasing demand for Cossor products.

To-day news comes from this enterprising firm to the effect that work on factory number five is in an advanced stage! Certainly there is nothing that succeeds like success.

This latest Cossor factory, which is being built on a site adjoining the existing Cossor premises at Highbury, is to be a five-storey affair, with 60,000 square feet of floor space for manufacturing plant. When the building is finished and the plant installed, work will be available for over 1,000 workers, and even in the actual building process steady employment is being given to 400 men.

### A Fine Battery Set.

Whether or not it is in anticipation of these greatly increased manufacturing facilities that Messrs. A. C. Cossor have just produced another fine commercial receiver I do not know. But judging from the information that I have concerning this latest effort, it is certain that there will be a huge demand for it. I base my contention on the fact that this set appears to me to be just the thing to meet the requirements of a very great number of battery users.

It is a four-valve battery-operated set, with Class B output and all the very latest refine-

metal cowl which covers the greater part of the device. I can strongly recommend it to all who subscribe to that excellent motto: "It is better to be sure than to be sorry."

## A NEAT COMPONENT

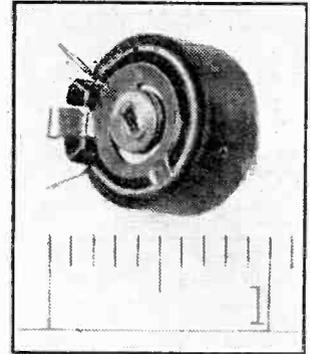
THE claim for the "Kabi" Hum Balancer made by F. W. Lechner and Co., Ltd., is that it is "the neatest component yet produced." With that I would certainly agree to the extent of saying that it is the neatest that has been brought to my notice.

If you can visualise a potentiometer no larger than a sixpence, you have a picture of this extraordinarily compact little device.

Yet it is robust and perfectly satisfactory in operation.

It is adjustable with a screwdriver, and that is no shortcoming, for it is a component that need only be set for a particular circuit and does not require readjustment at intervals, as with volume controls or potentiometers used for various other purposes.

Nor does the smallness militate against obtaining a fine setting, for there is a 300-degree movement of the contact arm and, as I have found on test, a sufficiently



This neat component, which costs only two shillings, effectively balances out hum on mains receivers.

fine setting is easy to secure.

The contact, too, is good, and the remarks I recently made in reference to the normal "Kabi" potentiometers apply.

The object of the Hum Balancer is, as will have been guessed, to obtain an electrical dead centre of a transformer winding, and this it can do efficiently and without occupying more than an almost microscopic amount of space.

The price of this interesting and effective new component is 2s.



Jottings of Interest to Buyers. By G. T. KELSEY.

ments. The speaker is of the permanent-magnet moving-coil type, and it is housed, together with the set and the batteries, in an attractive walnut-and-brown finish cabinet measuring 20 in. x 14 in. x 10 in.

The price of this new Cossor receiver—which is to be known as the 435B—had not been announced up to the time of going to press, but information in this respect will be passed on to "P.W." readers as soon as it is available.

respect will be passed on to "P.W." readers as soon as it is available.

### Using Extension Speakers.

These summery conditions (said he, optimistically!) bring to mind the efforts which have been made by speaker manufacturers generally this year to popularise the use of extension speakers—an infinitely better scheme than dragging the set out into the garden. You will deduce from this that I am advocating radio in the garden. Well, with certain provisions I see no objections to it—in fact, I do it myself.

There has been a lot of controversy about the vexed question of loudspeaker nuisance, but my own views on the matter are that all the trouble has been caused by the inevitable few who will endeavour to get a three-watt output from a set capable of giving only one and a half.

### Quality and Volume.

If you take the speaker out into the garden there is no need to have it blaring away at full volume. If you remember your neighbours and

(Continued on page 338)

# The Analysis of

# The PICTURE SIGNAL

By G.P. Kendall, B.Sc.

SOME of my readers must by now, I fancy, have been getting a little impatient with me because, in all this series, I have never yet given any real explanation of the nature of the currents which are used to modulate the broadcast transmitter when a television picture is being sent out.

I plead guilty; but the fact is that this is one of those things which should only be tackled *after* one had got a good general grasp of the subject as a whole. It is not just the easiest thing in the world to understand, and unless one has some general knowledge of the main principles it is really quite difficult.

## Two Types of Current.

So far we have been content to assume that the currents fed to the broadcast transmitter from the television apparatus contain two main components: we know that there is some sort of regularly repeated impulse, with a frequency of 375 per second, which constitutes the synchronising signal; also that there must be other currents of much higher, and presumably irregular, frequency to represent the actual detail of the picture.

We have not, however, made any attempt to understand how these two radically different types of current combine to form something which can be handled by the transmitter and to which our receiver can respond. True, it is not essential that we should do so, but this sort of detailed knowledge does certainly help one to get that thorough grasp of a subject which enables the maximum pleasure to be extracted from it.

## The Synchronising Impulses.

First, then, those synchronising signals: these we can best visualise as taking the form of a simple alternating current with a frequency of 375 cycles per second in the case of the present B.B.C. 30-line transmissions.

Imagine that the transmitting television apparatus was "looking" at a completely black scene, with no detail whatever. We should then have no picture signals proper, since there would be no variation in the current from the transmitting photo-electric cell.

No picture would appear at the receiving end, and there would just be the synchronising signal to hold the receiving disc, drum, or screw in step with the idling television transmitter.

In this case we can see that the modulation of the broadcast transmitter would consist merely of a steady 375-per-second series of impulses. If we listened to it with an ordinary "sound"

## HOW TELEVISION WORKS

One of the most important features of television is the synchronising signal, that keeps the receiver exactly "in step" with the transmitter. This signal must be sent out to accompany the picture elements, and the way in which this is carried out forms the subject of Mr. Kendall's easy-to-understand article.

receiver we should hear just a clear, steady note of that frequency.

Now suppose that sundry small objects

## HOW THEY ARE COMBINED

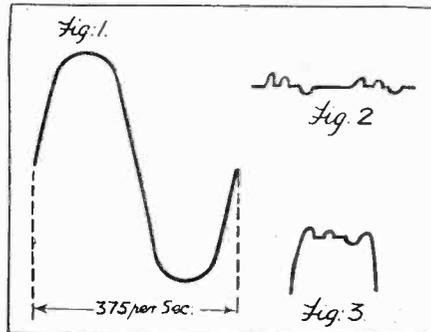


Fig. 1 shows the basic rise and fall of the transmitter currents at a frequency of 375 per second. And Fig. 2 shows the smaller but all-important variations of the photo-electric cell's output during two successive lines of a simple picture, due to the light and shade that are being transmitted.

In practice, the latter modulation is superimposed on the former, the resultant waveform of one half-cycle being represented by Fig. 3.

are placed before the television transmitter, so introducing a series of details of light and shade upon the previously blank field of view.

The current from the photo-electric cell will now begin to carry rapid fluctuations, which are the electrical equivalents of the details in question. These fluctuations will be of all sorts of frequencies, some quite low and others extremely high, and our problem is to see how these new currents can combine with the previous ones to form something with which the radio link can deal.

## An Unusual Process.

What actually happens is not unlike the process of modulation as we know it in ordinary broadcast transmission, except that it works the other way round, so to speak. In the aerial of a broadcasting station we have a series of high-frequency oscillations modulated by the *much lower* frequency speech and music currents; in the output from a television scanner we have a low-frequency current (the synchronising impulse) modulated by the *higher* frequency picture signals. There are some picture currents of lower frequency, too, but for the most part the process is one of modulating a low-frequency current with ones of higher frequency.

Don't let me mislead you by the analogy I have just given: I am merely comparing the modulated currents in the aerial of a broadcasting station with those produced by a television scanning and synchronising system. You will, of course, understand that the television currents would actually be fed to a broadcast transmitter, where they would modulate the radio-frequency currents in the aerial in just the usual way.

## A Sort of Double Modulation.

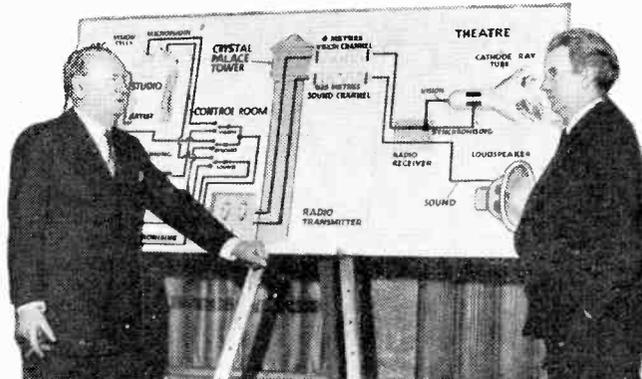
Actually, we can imagine a sort of double process of modulation going on in the case of a television transmission by radio. First, there is the modulation of the synchronising signal by the picture-detail currents, then the composite current which results is taken to the radio transmitter and modulates the high-frequency output thereof.

In order to make the process of combination of picture and synchronising currents clearer, I have drawn some small sketches, which you will find reproduced on this page.

Fig. 1 is just the conventional way of representing one complete cycle of the synchronising current. It is simplest for our present purpose to regard it as the usual "sine-wave" affair.

Fig. 2 shows, in the same way, a sample of some picture

(Continued on page 338.)



Following "P.W.'s" important ultra-short-wave experiments from the Crystal Palace, London, that lofty building has been used as a "mast" for television transmissions, and it figures pictorially in the sketch on the easel above. To the right is John Logie Baird explaining to Sir Harry Greer how the recent highly successful demonstration of ultra-short-wave television was carried out.

# RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped addressed envelope must be sent with every article.

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

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

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

## QUESTIONS AND ANSWERS

### "SOUNDS LIKE A MAN GARGLING."

W. M. (Newport, Mon.).—"The set is an H.F. (screened grid) detector and super-power valve. Its behaviour on batteries is excellent.

"But as soon as it is put on an eliminator it sounds like a man gargling. Why is that? What can we do?"

A possible cause is that the mains unit you have been attempting to use cannot supply enough smoothed current for the set as arranged at present with a super-power valve output.

If that is the case the use of a less "greedy" output valve (one which uses less H.T. current) might prove a satisfactory solution to your problem.

Another likely line of attack is the decoupling arrangements, especially if the set is an old one.

If not already in use an output filter circuit, for example, might effect a great improvement. And if the S.G.'s H.T. supply is at fault you may improve matters by joining a 600-ohm or so resistance in the H.T. lead close to the S.G.'s valve holder, with a 1-mfd. non-inductive condenser connected between the S.G. terminal of the valve holder and its L.T.—terminal.

As you will see, much depends upon the actual circuit, and you give us very little information about this. But in general we can say that in such cases

## ABOUT YOUR CONTROLS

### ADJUSTING REACTION

To demonstrate the benefits of reaction, first set that dial at zero, and note how many stations can then be tuned in. If one of these is weak, increase reaction slowly, and notice how the programme is strengthened when this is done.

The increase is progressive until the oscillation point is reached, when reception becomes spoilt by distortion, instability, etc. Thus the object of adjustment is to bring the set near to oscillation at each and every new tuning position.

It will be found necessary to increase the reaction control as the wavelength is increased; and to decrease it as the set is tuned to lower-dial readings. The best way generally is to use one hand for tuning and the other for reaction simultaneously. And a little practice will soon enable the operation to become not only easy but automatic.

Reaction is so important and its effects so marked that a one-valve set with reaction well handled will receive programmes from hundreds or even thousands of miles away.

as yours it is often possible to effect improvements to the set which will enable an apparently unsuitable mains unit to function satisfactorily.

Nevertheless, the cardinal principle of good reception is an adequate H.T. supply, so there are sharply set limits of current supply within which the mains unit must be classed if it is to be satisfactory.

### CURING A PERSISTENT WHISTLE.

A good many readers appear to suffer—or to have suffered in the past—from this fault, and recent references to it in these columns have resulted in some interesting correspondence.

We should like to thank the many who sent details of similar experiences and friendly suggestions to be passed on to S. V. C. about the fault reported in our issue dated April 28th, 1934. But although most of these were eminently practicable they often involved the use of additional apparatus, etc., which was exactly what S. V. C. wanted to avoid.

As the technical merits of all the schemes suggested have at various times been discussed in "P.W.," we cannot reproduce them this week; but the following letter to the Editor, from Mr. D. J. Edmunds, of 16, Cambrian Place, Llanelli, is of such general interest that we give it almost in full.

Mr. Edmunds says:

"With reference to the letter of S. V. C. (Mitcham) in the 'Radiotorial' of April 28th, I hereby suggest a means of curing the whistle which I found very useful.

"As W. A. (Willesden) suggests in 'Radiotorial,' May 12th, S. V. C. can try curing it by reversal of transformers or R.C.C. coupling; but instead of following the last hint, why not try parallel feeding, as this prevents saturation of transformer cores and, by different connections, alters the ratio of the step-up in order to match it with the other transformer? This saves the undue expenditure of buying a new transformer.

"Another suggestion is that S. V. C. should try the effect of joining the G terminal of the transformer in the second stage to the G.B. terminal, and join the G.B. terminal vice-versa.

"As a third suggestion S. V. C. could try the effect of connecting a quarter meg. resistance (a grid leak will do) across the primary (i.e. H.T. and A.) terminals of the second transformer.

"It may interest you to know that I built the 'Eckersley National Three,' and I found that it functioned splendidly, better than any I have built besides, which is a large number, although I am now only sixteen.

"A good number of the sets that I have built have been of my own circuits, and I am now working on the details of a Class B five-valver, which I intend making into a portable for the summer holidays."

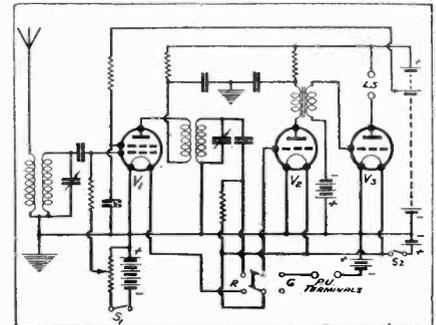
### WHEN THE H.F. VALVE IS NOT WANTED.

The interest aroused by the "P.W." Contra-phase system—in which the S.G. valve is switched off when the set is receiving the local station, thus saving H.T.—has led to inquiries about the possibility of switching off the S.G. in sets that employ a gramophone pick-up for their detector and L.F. stages.

The accompanying circuit shows how a double-pole double-throw type of switch can be utilised, one arm being concerned with the making and breaking of the filament supply, whilst the other arm controls "Radio" or "Gramophone" switching.

It will be seen that when the pick-up is placed in the detector's grid circuit, and negative bias is applied for this, the opposite switch arm breaks the filament supply to the S.G. valve.

### CUTTING OUT THE S.G.



How a double-pole switch can be used to save current from the batteries.

Thus for radiogram work only the detector and L.F. will be taking current from the batteries. And on switching off the pick-up and going over to radio the S.G. valve automatically lights up.

### A BLUE PRINT FOR A ONE-VALVER.

Interest in the old "Hartley" circuit has recently been revived to some extent, and we have had inquiries from H. S., of N.W.3, and others for blue prints of this design. We are afraid that we do not know where they can be obtained nowadays, as, like so many once-popular one-valve arrangements, the "Hartley" has gone completely out of fashion.

However, it is worth remembering that the famous "P.W." "Chitos" is still obtainable in one-valve blue-print form, being No. 23 in the "P.W." series of Sixpenny Blue Prints.

Of the one-valver "P.W." Sixpenny Blue Prints still in print there is, in addition to No. 23 named above, No. 47, which deals with the "Wavechange" One. It is a neat little one-valver for headphone work, with good long-range capabilities. Plug-in coils are employed, and the set covers both upper and lower broadcast wavebands without changing coils.

There are also two one-valve "M.W." Blue Prints still obtainable for 6d. each. These are "M.W." No. 3 and "M.W." No. 11, the former being the "Switch-Over" one-valver, and the latter the "Change-Range" One.

The "Switch-Over" uses one of the old "P.W." Titan coil units, and was designed for use in Regional areas. It covers both wavebands without coil-changing, and a simple switching scheme enables you to change from National to Regional programme, and vice-versa, without retuning, merely by operating a switch.

The "Change-Range" is a somewhat less selective set, using plug-in coils.

Although all the foregoing designs are several years old, they are still in demand, and can be obtained from the publishers, price 7d. each, including postage. The address is The Amalgamated Press, Ltd., Back Number Department, Bear Alley, Farringdon Street, London, E.C.4.

### TAKING THAT PORTABLE SET ON HOLIDAY.

There seems to be considerable divergence of opinion about the behaviour of portable sets on holiday, and although many tributes have been paid to them some readers have expressed doubt about their powers in very hilly or mountainous districts.

(Continued on next page.)

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

In this connection the following typical letter to the Editor, from Burton Road, Woodville, Buxton, is specially interesting:

The writer, who is "Recently Married and Stoney Broke," says:

"Having just read the query from T. T. (Chesterfield) in this week's 'P.W.' I hasten to make the following remarks, which I trust he will duly receive and appreciate:

"I would strongly advise him not to spend good money in making a small portable unless he cares to go to 'some other place.' Devon and Cornwall are glorious for scenery, but for wireless reception and with a portable! I took a five-valver with me two years ago, and the only reliable station was, curiously enough, Radio Paris.

### FAULT FINDING

If you are up against a radio problem remember that our Technical Query Department is thoroughly equipped to assist our readers, and offers you its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

"With a short aerial along the ridge-pole of the tent, or from the tent to some convenient tree, things were a little better, but not exactly good. At home the set behaved quite well, getting North, Midland and London Regionals, 5 X X and Radio Paris at fair loudspeaker strength, not to mention quite a few of the stronger 'Continentials.'

"I was told by a dealer in Minehead that he hadn't sold a portable for two years, for the simple reason, 'conditions not suitable.' Then, again, a portable takes up quite a lot of room, even in a car, not to mention the weight.

"Still, I must admit, when camping it is quite adaptable. It can be used either as a small table, a seat in the tent or as an extra seat in the car.

"However, if T. T. (Chesterfield) does do as he proposes, I should like to hear how he gets on and what circuit he uses (if satisfactory). My tour was Bristol, Weston, Watchet, Clovelly, Bude, St. Ives, Plymouth, Torquay, Dartmoor, etc. I wonder how my 'S.T.500' would behave in these districts? Hoping I have been helpful, if a little doubtful!"

**NOTE.**—Our own experiences of reception in this district have been distinctly more favourable than the above.

### SPRING CONTACTS WHICH NEED TIGHTENING.

Despite the warnings so often given about spring contacts on wavechange switches, coil units and the like, we still find numbers of readers who have trouble because the springs weaken or get bent accidentally.

When this happens the necessary contact either fails altogether or is of a weak and "chancy" nature. And this gives rise to all sorts of puzzling faults.

Typical symptoms are those which were reported by Mr. H. Fear, of 80, High Street, Bridgnorth, Salop. He says:

"I have made up the 'A. T. B. Economy

Three,' and am very pleased with it. There is one matter, however, needing a little elucidation.

"On the long waves the two tuning condensers have to be kept in step to obtain best results—and by that I mean the two dial readings are the same.

"On the medium waveband I can rarely tune to any station if the dials are the same. The right-hand dial has to be turned right out to 0 in order to obtain results. Why is this? Can you explain? The peculiar feature about it is that just once in a dozen times I am able to tune in with the two dial readings the same.

"Perhaps you will be able to put me right about this matter. Volume, tone and selectivity all quite good when the set works normally."

This failure to tune on the one dial whilst tuning on the other is consistent with the wavechange switch of the faulty circuit failing to change over when on the medium-wave position.

As most readers will know, the action of the switch is to join the two ends of the long-wave winding together when the set is in the medium-wave position, thus leaving only the few turns of the coil active across the tuning condenser.

### How to Remedy the Trouble.

If the switch contacts are faulty and do not come together properly, the whole coil—both long- and medium-wave sections—remains in circuit, and consequently cannot be tuned to the medium wavelengths only.

The remedy, of course, is to look underneath the coil unit (or wherever the wavechange switch may be) and examine its action critically when the control knob is operated.

In the long-wave position the contacts should be well apart, so that all the coil is being tuned. In the medium-wave position the two springy contacts come together and so cut out the requisite number of turns.

But they should come together firmly and cleanly. And if they do not appear to do so the spring should be gently pressed (when in the open position) so as to make it bear down more heavily when it is placed by the control in the closed position.

And, incidentally, it will be as well to check that there is no danger of any of the contacts or tags bending too far down, because if the coil unit is used on a Metaplex or screened baseboard there will then be the danger of something being shorted to the earthed coating. It will be obvious that a little care is well bestowed when mounting apparatus of this type.

### A BOOK ON TELEVISION

Many previous books on television have given prominence to one system, not always the same one, and only briefly referred to the others.

But "Television Theory and Practice," by J. H. Reyner, B.Sc., A.C.G.I., A.M.I.E.E., M.Inst.R.E.E. (Chapman and Hall, 12s. 6d. net), presents a complete perspective of the whole art.

It is, too, bang up to date, and such modern developments as "Scophony," Velocity Modulation and other cathode-ray systems are described in detail.

The book is lavishly illustrated and is packed with interesting and informative reading. As a matter of fact, I do not know another work on the subject which is so interestingly practical and which is so free from unnecessary padding.

There is also great value in the restrained, reasoned manner in which the pros and cons of all the various systems are discussed.

G. V. D.

# PILOT

## AUTHOR

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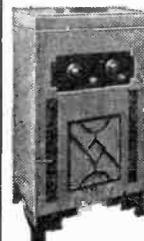
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## THE LISTENER'S NOTEBOOK

Comment and criticism on recent B.B.C. programmes.

I HAVEN'T a word of serious adverse criticism to say about Whit Mouday's doings on the air. Not only was the entertainment of good value, but I was pleased to find in this entertainment confirmation of certain settled convictions of mine. Witness the relay from the Gaiety. Stanley Lupino and Laddie Cliff were in tip-top form. There were no inhibitions to affect their mood. The mood was hectic, and the Gaiety audience can claim all the credit for it.

Without this audience Stanley Lupino could never have put over the sort of stuff he did. I am not thinking of the way he did it, but of the stuff itself. He got his biggest laugh (and rightly, too) when he addressed the boiled-shirt brigade in the stalls as the "laundry." This couldn't have happened at St. George's.

Again, he was at his best when playing with the audience, and especially when he persuaded them to join in his choruses with him. It is a fact that the audience on this occasion was an indispensable part of the whole show.

The excerpt from the Gaiety decided one thing for me. I am going to see the whole of "Sporting Love" as soon as I possibly can. I know I am certain of a good evening's fun. I cannot say that of anything else with the same degree of certainty.

### The News Reel.

The News Reel, too, had many attractive points. It was unique. I don't think the items selected were the best possible, though I am not going to complain much about them. Perhaps I may be permitted to say that it is no sort of entertainment to hear the tap-tap of workmen's hammers from a half-constructed amusement house that "is to be opened shortly."

This sound picture was unworthy of the rest. It may be argued, of course, that there was a little too much "fair" or that the three Cockney carters might have said more about their show generally and their horses in particular. Their conversation wasn't very illuminating, but we'll let that pass.

Of the whole reel the part that interested me most was the recorded part. Last week, in these notes, I asked for more outside broadcasts this summer. This week I make a similar request for these strip recordings. In fact, I don't care how many of the outside broadcasts take this form, for then I would have greater opportunities of hearing them than if they were all relays on the spot.

I am assuming, naturally, that these strips would be taken during the day and played (I hope that's the right word) during the evening. Evening listening is much more universal than morning or afternoon. Consequently, the strips would be sure of a bigger audience than the relays. And this is no small advantage. There is no gainsaying the fact that the B.B.C. has, up to the present, made very little use of the strip.

### A Disappointing Lullaby.

Although there is no better trio to be found in their own line of business than George Baker, Webster Booth and Natalie Hall, these stars couldn't make much of "Puritan Lullaby." Before I heard this operetta I found it difficult to imagine anything less apt for an operetta title than that chosen by James Dyrenforth for his work. I discovered, however, that it was rightly called. The Puritan flavour was far too strong for pleasurable entertainment.

The songs, though they were well sung, were all wailing dirges, and were depressing. I had no real regrets when the final curtain fell. As a successor to "Love Needs a Waltz," "Puritan Lullaby" was disappointing. We didn't expect to find anything quite so sombre. In Lent it might have scored a big success, but, dash it all, it's past Whitsun now!

I liked the relay from the Gravesend Pilot Station. I thought the pilots rose to the occasion well. Their little act had obviously been well rehearsed, and the players all timed their exits and entrances perfectly.

The background noises of swirling water and ships' sirens gave the required atmosphere, and it was interesting to notice that not one of the pilots attempted to compete against them. Hence the continuity of the narrative was interfered with on several occasions, but it didn't matter.

Judging from the amount of applause Donald Peers gets, this concert-party product is very popular. It has often been said by the giants of the stage that concert-party training is the best training in the world for an aspiring stage recruit. And I am inclined to believe it. There is something essentially British about Donald's singing—something that snacks of roast beef rather than the peanut.

Of John Oliviero and Morey Wicks and their Harmonious Humour act I think it might be said that there is too little humour and not enough

harmony. Perhaps I came to this conclusion after hearing the Mills Brothers, who were in the same bill. If I were a professed harmony king I should feel inclined to go into retirement for a bit, at any rate until the Mills Brothers had left our shores. All the same, I would like to ask the Mills Brothers what some of their songs mean. One doesn't know, sometimes, whether one is to laugh or cry, and I should hate to do the wrong thing.

C. B.

## THE LINK BETWEEN

(Continued from page 334.)

take particular care to ensure that the quality is respectable there are very few people who would object, and it certainly does help to while away many a pleasant summer evening when it is too hot to move anywhere.

I have already stressed the importance of quality, and it is appropriate that I should follow that up by giving you some guidance on the question of suitable extension speakers. If you consult the catalogues of the leading speaker manufacturers you will find that most of them produce a model specially intended for extension work, but it is important that you should choose one to match up with the output of your set.

One or two of the speaker manufacturers produce extension speakers which, by means of a selector switch, can be matched up to any set, but, in any case, almost all of the others are prepared to give free advice on the subject.

The British Rola Company, Ltd., are particularly enterprising in this connection. They have compiled a list of practically every commercial set for which, in each case, the appropriate speaker in their range is indicated. "P.W." readers may avail themselves of this service by writing direct to the company at Minerva Road, Park Royal, London, N.W.10. But be sure to mention the make of your set when you write!

Those readers who keep in touch with trade activities through "P.W.'s" Postcard Service, may, if they prefer, quote the number at the foot of this paragraph, in the usual way, on a postcard.

Their request will then be noted and passed to the firm for attention. (No. 89.)

## OUR POSTCARD SERVICE

Application for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.

## THE PICTURE SIGNAL

(Continued from page 335.)

currents. Note that this time there is no suggestion of the sine-wave outline which is characteristic of all ordinary, well-behaved alternating currents.

It is interesting to note that it is just this irregular "shape" which makes the picture currents so hard to deal with successfully in L.F. amplifiers. It becomes a question of those "transients" about which the learned authorities argue so fiercely. (And change their minds so frequently!)

In Fig. 3 you will find my attempt to show the form of the composite current which results from the combination of parts of the first two. I have chosen a nice simple case, of course, and I must confess that I have deliberately glossed over certain difficulties in presentation in order to make the business as easy to understand as possible.

However, I think you will find that I have given you a fair picture of the process we are trying to understand, in spite of the way I have simplified things here and there.

# TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

## A Tip for Chassis Users.

WHEN you are using an aluminium chassis it is a good plan to run a piece of bare busbar the full length of the chassis on the underside. This is particularly the case with short-wave receivers.

Any wires which have to be connected to earth are then twisted around this busbar at a convenient point and can easily be soldered. One end of the busbar should, of course, be joined to the earth terminal of the set.

Apart from the convenience of soldering—since you cannot make the soldered connections to the aluminium chassis itself—this little dodge has electrical advantages because, using one wire as a common earth return, there is practically no possibility of "loop" circuits forming in the metal chassis.

Indiscriminate earthing to any convenient part of a metal chassis has often been responsible for mysterious and stubborn cases of instability in a set.

## Those Studio Effects.

I expect most listeners know in these days that a broadcasting studio keeps a whole range of gadgets for the purpose of producing different sounds and "effects" which are required from time to time. A thunderstorm or a rainstorm cannot just be had to order, and so these have to be made in the studio.

It is a curious thing that even in cases where the actual genuine sound can be produced in the studio, it often does not come over the microphone so well as an imitation does. After all, what is really wanted is something which, at the listeners' end, sounds like the real thing, and as long as that is accomplished it doesn't matter very much what the means may be for producing it at the transmitting end.

Alarm clocks, with bells deadened, are used to imitate riveting machines in a shipyard, and a stockbroker's ticker machine has done duty for a battery of linotype machines in a newspaper sketch.

## The Sounds of the Sea.

If you want the roar of waves coming over the prow of a boat, this is easily done by the aid of a few marbles or shelled peas rolling on a bass drum, whilst if the ship is sailing in a calmer sea and the waves are swishing gently past the prow, a tin canister with a handful of gravel is shaken gently before the microphone.

The crumpling of stiff paper sounds like a crackling fire, whilst the sound of heavy rain is produced by pouring salt or sand on to a small piece of waxed paper. The sound of aeroplane motors can be imitated by means of a small electric motor to which are attached some whirling strips of cloth that beat against a small drum.

## Gramophone Records of "Effects."

Nowadays gramophone records are made of all kinds of "effects," and these are

much more convenient even than the gadgets themselves.

It is possible now, for instance, to get a gramophone record of a magnificent thunderstorm, hail and rainstorm, sound of the sea, ship's siren, railway engines whistling, the clatter of shunting railway trucks and a whole host of other sounds and noises which may be required from time to time.

## Short-Wave Volume Controlling.

In a short-wave set of the single-stage tuned-H.F.-detector-reaction type it is a good plan to provide a volume control in the H.F. circuit, preferably in the aerial part, so that the response of the set may be adjusted when loud signals are being received without the reaction control being touched.

If the reaction is eased off too much without such an auxiliary control the set is apt to lose its selectivity and you may get two or three stations coming in together.

## A Simple Method.

The best form of H.F. volume control for this purpose is a potentiometer of two or three thousand ohms maximum, with its outside terminals connected to the primary of the aerial plug-in coil and the slider to the aerial, one side of the primary being earthed in the usual way.

Used in this manner, the control has no effect on the actual tuning of the set, but is effective in cutting down the powerful signals to a point where the valves can handle them without overloading.

## Employing Dual Speakers.

Many people nowadays use a pair of loudspeakers instead of a single loudspeaker, one of these being specially adapted for reproducing the lower register and the other for the higher register.

In fact, manufacturers have for some time past been supplying dual loudspeakers in this way, and there is no doubt that they have attained a good deal of popularity. After all, it is much simpler to have two separate speakers for the opposite ends of the scale rather than to expect one speaker to cover the whole of the range.

## How to Arrange Them.

If you want to use an additional speaker—one with a small cone for high frequencies—with the present speaker in your cabinet, it may be awkward to find a place for it, and a very simple dodge is to shift the original speaker from its place against the baffleboard or front of the cabinet and to set it a little to one side, so that the smaller speaker can also have a "look in" at the hole in the front of the cabinet.

Sometimes, however, you will find, especially in a commercially made set, that there is no room to shift the speaker at all, and often it is quite impossible to interfere with it in any way. In such a case there is no alternative but to mount

(Continued on next page.)

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British Radiogram Q.P.P. Transformers and Chokes. Listed 16/6 per pair. Full-size Blue Print of Q.P.P. 4-valve set. Bargain price per pair 8 6

Q.P.P. Conversion Kit. Includes all components necessary for converting a battery set to Q.P.P. output. List price £2/2/6 1 2 6

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Discoverer Short Wave S.G.3 designed by Mr. G. T. Kelsey. "Popular Wireless" Short Wave Expert. Ready Built and Tested. Less Valves and Cabinet. List Price 5 guineas. To clear 2 5 0

Cosmor 335, with Speaker and Valves. List price £6/17/6 3 12 6

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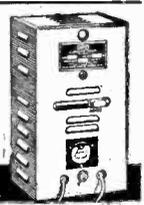
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**TECHNICAL NOTES**

(Continued from previous page.)

the additional speaker at the back of the cabinet or underneath it.

**Those High Notes.**

Manufacturers of sets and loudspeakers seem to be realising more and more the importance of the higher audio frequencies. The B.B.C. is supposed to send out frequencies up to about 10,000, but it must be precious few sets or loudspeakers that can cope with anything much above 5,000. Some people argue that sounds above about 5,000 or 6,000 cycles are not of any importance, anyway. This, however, is hardly the right view, because we require those high-frequency harmonics which make all the difference to the naturalness.

**Non-Inductive Condensers.**

Often when you are making up a set from a published design you will find that

non-inductive condensers are specified at some point in the set. A familiar example is for by-passing in the screened-grid circuit of an S.G. valve.

You may think that, although a non-inductive condenser is specified, it is not a matter of any importance whether you use a non-inductive or ordinary type of fixed condenser, but this is quite a mistake. Never use an ordinary condenser when a non-inductive one is specified.

**The Superhet Receiver.**

I have more than once spoken in these Notes about the increasing popularity of the superheterodyne receiver, and I think I have said before that, in my opinion, the popularity of this set will not only continue but increase in the near future. I get quite a number of letters from readers about this point, which all go to confirm what I have just said:

**Its Past Disadvantages.**

It is not so very long ago that people rather looked down their noses at the superhet as being a very ingenious contrivance in years gone by, but completely superseded. It is true that not so long ago the superhet suffered very many serious disadvantages. For one thing, it was noisy and difficult to tune, while for another thing the quality was generally poor.

Another point about the superhet was the curious property of receiving stations on two (or even more) channels, so that stations were obtained on different settings of the dial. With these and other disadvantages, not forgetting the very large consumption of H.T. and L.T. current, the superhet seemed at that time doomed to failure.

**Complete Regeneration Taken Place.**

But a complete regeneration has taken place in this unique type of receiver, and the modern version is hardly recognisable as any relation to the original one.

The current consumption is now extraordinarily small, whilst the noisiness is almost completely overcome, and, as regards selectivity, needless to say, the superheterodyne completely outclasses any other type of receiving set. The introduction of ganged tuning has brought real one-knob control, so that the superhet, so far from being difficult to operate, is now the easiest, or certainly one of the easiest, of all receivers to operate.

The second-channel problem, as it is sometimes called, has been practically eliminated, and the superhet has finally come into its own.

**H.F. Coils with Granular Cores.**

In view of the great advantages of high-frequency coils with granular cores, a large amount of experimental work is now being devoted to this subject. Many people think that the granular core was only invented during the last year or two, but it dates quite a long time back, although curiously enough it has only lately come into prominence. I believe that some of the original patents date many years back, even before broadcasting came in.

A large number of investigators have worked on this subject, and their discoveries are scattered through scientific papers in various parts of the world.

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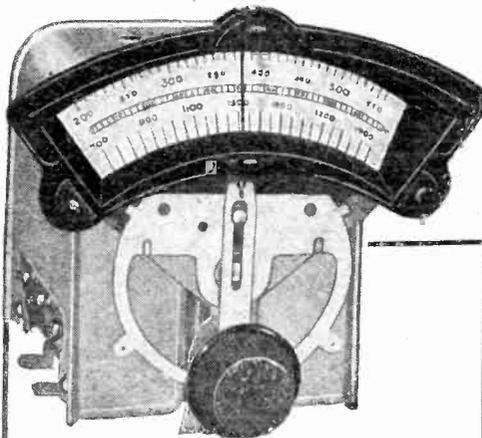
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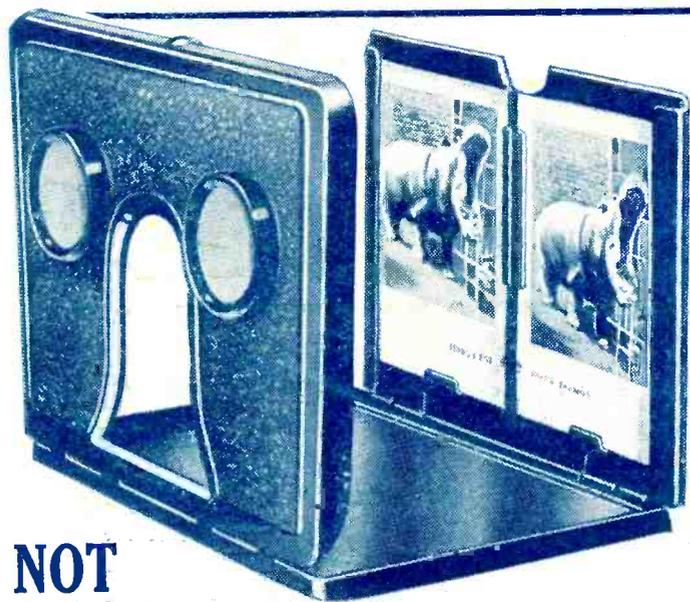
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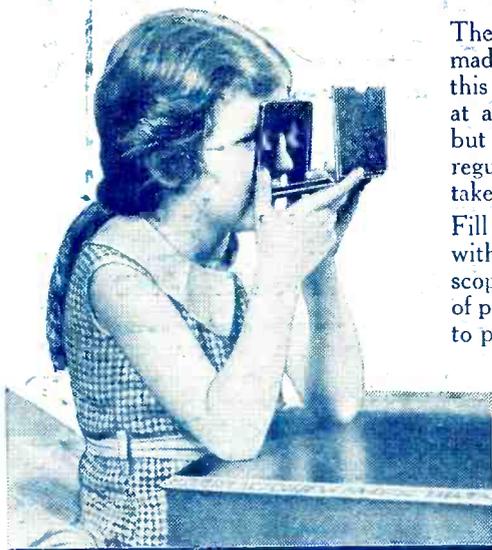
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