

LARGEST RADIO CIRCULATION IN THE WORLD

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 517. Vol. XXI.

INCORPORATING "WIRELESS"

April 30th, 1932.



**THIS WEEK'S  
LEADING FEATURES:**

**SOME "COSMIC"  
POINTERS**

□ □

**HOW TO MAKE  
THE "P.W."  
"PHONOTRAP"**

A very inexpensive gadget which can be used in conjunction with any valve set. It acts as a standby against battery or valve failures, and also cuts out interference from unwanted stations.

□ □

**CAPT. P. P. ECKERSLEY**  
continues his new series  
by frankly discussing  
**VARIABLE CONDENSERS**

□ □

**WIRELESS IN  
WAR-TIME**

Further extracts from an intriguing and exciting diary.

□ □

**The EARTH WAR**

**HER HEART GOES OUT TO A NATION!**

Here you see Miss Virginia Gardiner. An amplifier is connected to her wrist, and her heart-beats are being broadcast to the whole U.S.A. from a New York studio.

*Everything Radio from Ready Radio*

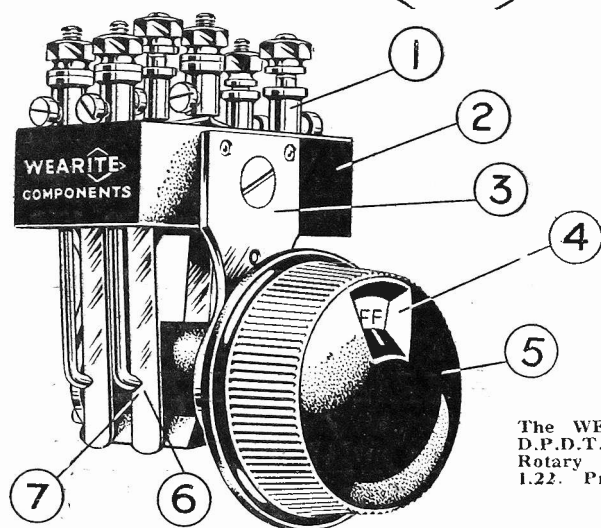
See also page 225.

Advt.



For any switching  
problem—

# WEARITE



The WEARITE  
D.P.D.T. Switch  
Rotary Type.  
I.22. Price 3/6.

Click! Positive contact every time—clean make and break. Each type a scientific job. Designed and built by switch specialists—men who know their job from A to Z. That is why leading Set designers—whatever the switching problem—specify WEARITE switches. There is a WEARITE switch for every switching problem—a switch that does its job—and does it properly. If you have any switching problems write to our Query Dept.—they will gladly help you.

#### HERE ARE A FEW OUTSTANDING FEATURES.

1. Robust Terminals, easy of access.
2. Solid Ebonite body.
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- ★ 4. INDICATING WINDOW.
5. Large Knob (Black, or otherwise specified.)
6. Positive Contacts.
7. Self-Cleaning Contacts.

There is also a miniature pattern of this switch :  
List Nos. I 31, 32, 33, 34, 35, 36, 38. Prices 3/3 to 5/-.

Ask for Leaflet.

These switches are now fitted with terminals and are complete with window knob, dial and bracket—and are "one-hole" fixing.

Price.		Price	
No. I.21 .. 1-way,	3/3	No. I.24 .. 4-way,	4/6
No. I.22 .. 2-way,	3/6	No. I.25 .. 5-way,	5/3
No. I.23 .. 3-way,	4/-	No. I.26 .. 6-way,	6/3

The following indicating discs are available—either black lettering on white, or white lettering on black. "Rad-off-Gram," "L-off-S," "Off-On," and also blank white for own marking.

IF YOU HAVE  
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WRITE US DIRECT  
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WILL POST YOUR  
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RETURN C.O.D.

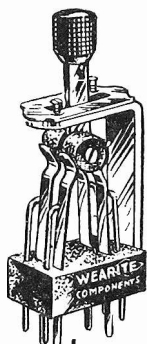
AND REMEMBER—A GOOD EARTH ALWAYS



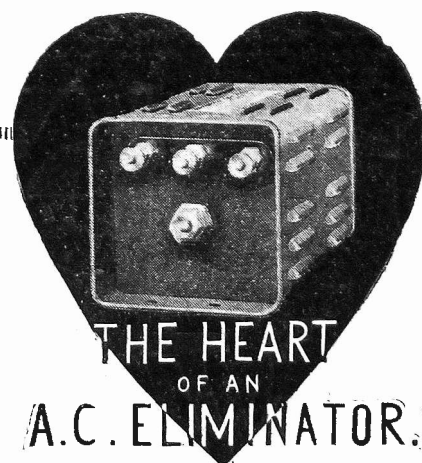
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Price 3/6 complete  
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I.11 (1-way) .. 3/6  
Also available in 2-, 3-, and  
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I.11-14



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The vital component in an A.C. eliminator is . . . the rectifier. So much depends on its proper functioning. Will its output be maintained? . . . Can it break, burn or wear out? . . . What is its efficiency? . . . questions every purchaser of an A.C. eliminator should ask of the rectifier incorporated therein.

Long life, high efficiency and freedom from deterioration or breakdown form a combination only possessed by **THE**

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See that it is incorporated in the A.C. eliminator YOU buy; or, if you prefer to build your own, send for details of our constructors' range. A 3d. stamp will bring you a copy of "The All Metal Way."

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Every set-owner who wants to get the best possible reproduction should get the May number of "Modern Wireless," which contains  
**A COMPREHENSIVE SURVEY OF  
LOUDSPEAKERS OF TO-DAY**

**CONCISE !**

**COMPLETE !**

THE MAY NUMBER OF

## MODERN WIRELESS

provides in one complete supplement a Review of Loudspeaker Technique, a Survey of All Modern Types, and details of The Link Between Set and Speaker—i.e. The Output Circuit.

See also

#### THE WORLD'S PROGRAMMES A SPECIAL SUPPLEMENT FOR THE LONG- DISTANCE MAN:

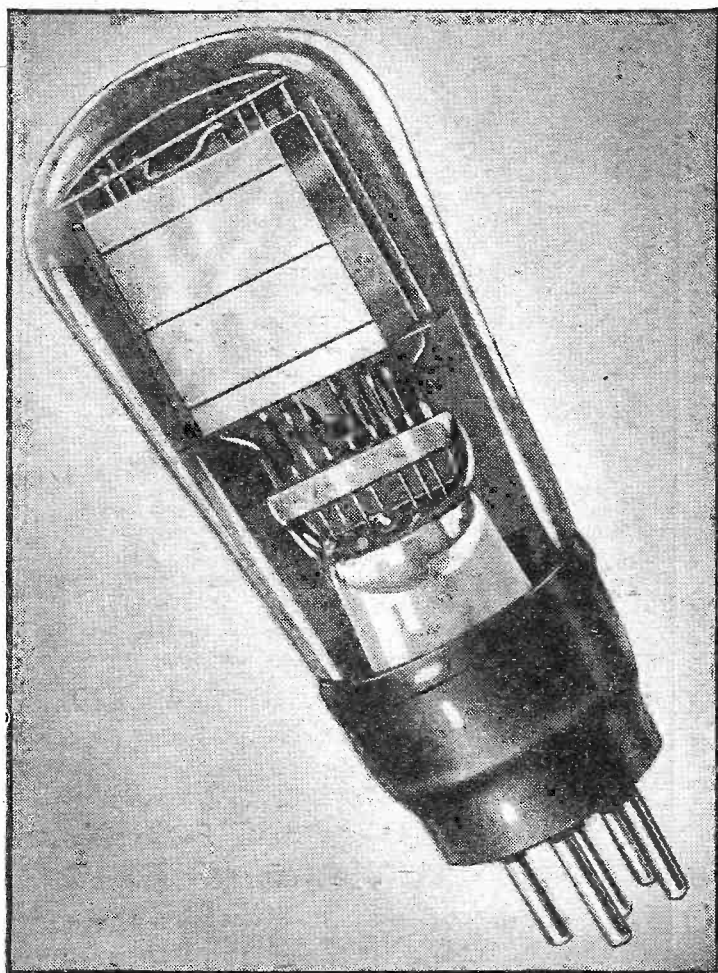
Broadcasting a Volcano!—Long-Wave Listening—Listen for Poland—Station Alterations—Those Short Waves—What the Distant Stations are Doing, etc., etc.

**The May "M.W."**

Order Now!

On Sale April 30th—1/-

# THE NEW LOW CONSUMPTION HIGH EFFICIENCY PENTODES



Mazda Valves are 100% British made and designed by British engineers.

The amazing

# MAZDA THE BRITISH VALVES

The Edison Swan Electric Co. Ltd.



## ★ FOR THE MAN WHO USES BATTERIES PEN 220

Here is the solution to the output stage problem in battery operated receivers. The Mazda Pen 220 gives an astonishingly high undistorted output for an anode current of only 5 m/a. It is the ideal output valve for portables.

**PRICE 17/6**

## ★ FOR THE MAN WHO HAS AN ELIMINATOR PEN 220A

A valve which delivers a huge undistorted power output for an anode current of not more than 18 m/a, the Pen 220A needs only 150 volts on the anode and can be made to give excellent results with 120 volts and a current of only 12 m/a. It is undoubtedly the valve for the man who wants really magnificent volume for the operation of large moving coil speakers.

**PRICE 17/6**

## EDISWAN RADIO

155 Charing Cross Rd., London, W.C.2

V.147

# VOTED BEST—35 MAJORITY

Radio Societies test "His Master's Voice" Radio—Model 435

**ON TOP FOR—**  
**SELECTIVITY, TONAL QUALITY**  
**ARTISTIC APPEARANCE . . . . .**  
**ABSENCE OF HUM. . . . .**

**T**HE finest set in its class—for selectivity, for tonal quality, for artistic appearance, for absence of hum. . . . that was the verdict given when "His Master's Voice" Model 435 was put to the test as one of six representative types of receiver at Sunderland recently.

The critics were a joint meeting of the Northern General Transport Company's Radio Club and the Sunderland Lecture and Debating Society. Each set was tested in turn. A vote was taken for the best instrument. *The "His Master's Voice" instrument gained a majority of 35 votes!*

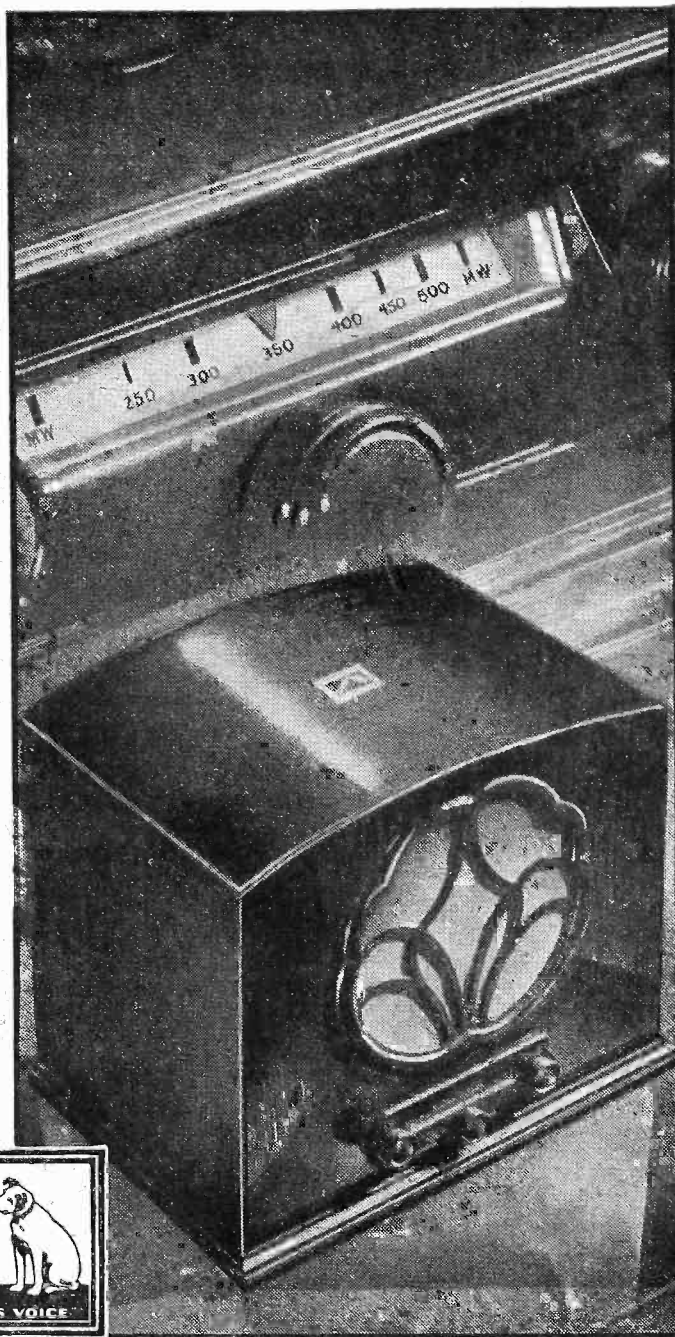
This verdict confirms the opinion of numerous press technical experts who have tested Model 435 and have found it by far the most advanced receiver of its type. "Popular Wireless," for instance, said that "it is, indeed, one of the finest 'Threes' I have tested"—and other experts were equally emphatic in their praise.

You may have this remarkable instrument on approval in your own home, without the slightest obligation. Ask any "His Master's Voice" dealer and he will gladly instal the set and leave it for you to test at your leisure. If you do not know the address of your nearest dealer, just fill in the coupon below.

**SPECIFICATION** 3-valve radio receiver and moving-coil loudspeaker in walnut cabinet. Mains operated (A.C. or D.C.). Band-pass tuning. Marconi valves. One tuning knob. One volume control—new "His Master's Voice" frictionless pattern. One operating switch—new continuous action pattern. Unique illuminated control scales, showing only what is in operation—long waves, medium waves, or the playing of gramophone records from a pick-up. Mains aerial (A.C.). Plugs for additional loudspeaker.

**42/-** down  
 and the remainder in 12  
 monthly instalments of **33/10**  
**CASH PRICE - 20 GNS.**

*This price does not apply in Irish Free State.*



# His Master's Voice

**"TRUE TO  
 LIFE" RADIO**

## COUPON

The Gramophone Co. Ltd., 353, Oxford Street, London, W.1.

Please tell me the name of my nearest "His Master's Voice" dealer who will arrange for me to have Model 435 on approval in my own home.

NAME.....

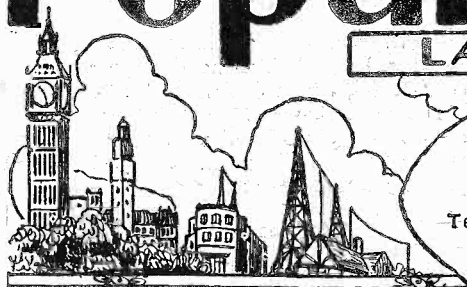
ADDRESS.....

P.W. 30/4/32



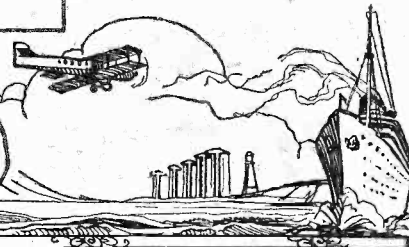
# Popular Wireless

## LARGEST NET SALES



Scientific Adviser:  
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Chief Radio Consultant:  
CAPT. P. P. ECKERSLEY, M.I.E.E.  
Editor: NORMAN EDWARDS.

Technical Editor: G. V. DOWDING, Associate I.E.E.  
Assistant Technical Editors:  
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A. JOHNSON RANDALL.



**A THROW-BACK  
"TIS OF THEE"  
CROCHET AERIAL!  
SCHOOL RADIO**

## RADIO NOTES & NEWS

**ARIEL V. ARIEL  
SOFT ANSWERS  
THOSE VANS  
PERPETUAL MOTION**

### Elimination of Interference.

I SUGGEST that the Post Office is to be congratulated on its work during the six months ended February 29th in eliminating interference with radio reception caused by trams, etc. During that period it received 6,230 complaints, and in 4,740 of these instances the trouble was remedied.

By the way, at the Ideal Home Exhibition the Post Office had an excellent demonstration of the methods used for stopping interference from various types of electrical apparatus, and the two receivers used were a G.E.C. radio-gramophone and an R.I. Madrigal.

### A Musical Throw-back.

I CONFESS that it caused a thrill of mirth to pulsate through me to read that the B.B.C. is to broadcast soon a 2,000-years'-old hymn addressed to Apollo. This hymn is, I believe, inscribed on a chunk of marble which lives in the British Museum.

I cannot imagine what this will sound like, but in all probability we shall get a Honeggerish, Stravinsky-like sensation. Be that as it may, as all the best writers put the matter, the B.B.C. cannot be robbed of its triumph in announcing "First radio performance in England"!

### "My Country, 'Tis of Thee!"

YOU would be greatly surprised if you knew of all the clippings, circulars, reports, etc., through which I plough for these notes.

I was rewarded recently for my pains by finding in a 1931 "Memoria" this stirring passage about broadcasting. (Translation) "... thanks to the special attention which the Ministry has lent to this branch, Colombia can pride itself in occupying in this matter the first place among the nations of South America." Well, Colombia, boasts one national station and seven private ones. The Argentine has at least thirty-eight!

### The Crochet Aerial.

M. L. M. (Penrith), a lady, tells me that in August, 1930, I said, "Women don't originate." I'll accept her word, but would put up this defence: it was in the "silly season."

However, my correspondent has crocheted an aerial, of circular form, with No. 30 D.S.C. wire, and asks whether that is original. It is a pleasingly feminine gesture, probably original, but (pardon,

### THIS IS A "GRAND" IDEA!



A radio set recently exhibited in London, which takes the outward form of a miniature grand piano.

mamzelle!) not particularly useful. She would almost certainly have got the same results on the receiver had she merely hung up the tangled mass of wire.

Never mind! Trim it with pink ribbon; that would be original work on an aerial. Very glad that "P.W." cheered you during your illness. Do tell us some more!

### School Lessons by Radio.

JUST as an example of the lack of contact with reality exhibited by some of those who are trying to make radio lessons part of school routine, I give the following naive remark by Mr. F. Roscoe, Vice-Chairman of the Council for School Broadcasting. "Good Broadcasting in the schools would give children a standard both of good reception and of good programmes. They would go home and tell their parents, if their own wireless set did not give good reception, 'Do you know that wireless set of ours is no good? We have a much better one in the schools. And that vaudeville and jazz you like is not half as good as the songs and music we get from Sir Walford Davies.'" How pleased the family would be!

### Are His Goods "Antiques"?

A DIARIST in a London evening paper quite naturally rejoices at having seen in a small town this sign: "Ye Olde Wireless Shoppe." Discoveries like that keep a man's heart young. But who can divine what subtlety lies behind or within this anachronism?

Is it a trap for American tourists or merely an effort to compete with "Ye Olde Bun Shoppe" opposite? Anyhow, the thing as it stands is perfect; explanations would rob it of its bloom and it would then look as suspicion-worthy as one of the myriad chairs upon which Queen Elizabeth is alleged to have sat.

### Radio Spoils the Picture.

THERE is on foot a romantic scheme to sail from Spain to South America in a replica of Columbus's ship, the *Santa Maria*. Unfortunately for the perfection of this plan, it is found that the adventurers are bound by regulations to carry a doctor and a radio installation. No doubt Columbus or his mate would have done such doctoring as was required, so that the compulsory Sawbones (or Pills) does not mar the

(Continued on next page.)

# CONTINUING ARIEL'S NEWS AND VIEWS

picture noticeably. But the radio set is a tremendous blot and I can suggest only that they should disguise it as an old oaken chest of the period.

## "Ariel" Protests Against Ariel.

THE B.B.C.'s new headquarters has been named "Broadcasting House," which is a true but inartistic name. But business is so slack that some people have had time to hold a newspaper correspondence about this unimportant point. I am not perturbed about it; they can call the place "Dirty Dick's" for all I care! But I protest against the wicked suggestion that the building be named "Ariel House"—the outside of it is already plastered with the most libellous carvings which are alleged to represent Ariel!



that the building be named "Ariel House"—the outside of it is already plastered with the most libellous carvings which are alleged to represent Ariel!

## Soft Answers.

J. P. S. (Glasgow). Thanks for card. Will C. H. B. note that O.K.N. is a commercial station at Pödebrady, Czechoslovakia? J. B. (Birmingham). Cutting received. Huge joke by an "expert," but not usable. R.S. (Cheam). What do you mean—*nom de prune*? I was properly named "Ariel" by the "Father of the Chapel" and anointed with American Cackwak—the stuff for which we send greenhorn office boys to the little bun-shop back of St. Bride's! T.L.P. (Norwich). You don't have to get a licence to work a set. It's electricity you need!

## Broadcasts Which Didn't.

THE B.B.C., with that lack of guile which so ennobles it, has been good enough to tell us (with chuckles, understood!) about some of the awful things which might have been broadcast had the B.B.C. not stood between us and the enemy.



Item: A gentleman who recited in twenty-nine lingo. But, I say, a clever chap, well worth roping in. Item: A lady "who fancied herself" on the comb-and-paper. But, I say, just as good as playing on a saw or telling us about obscene novels. Item: Someone who played the piano with her elbows. But, I say, such elbows would be invaluable for rendering Honegger's works!

## Personal Note.

WE deeply regret to announce that Mr. James Ward, a founder and director of the well-known and old-established firm of Ward and Goldstone, passed away on April 8th. "P.W." extends its sympathy to the relatives and colleagues of the deceased gentleman.

## Queen of the May-Magazines.

UNDOUBTEDLY the "Wireless Constructor," the King being "M.W." Now, this sixpenny Queen, 56 pages of up-to-the-minute radio reading, besides John Scott-Taggart's articles includes a constructional description of a super-heterodyne receiver by Victor King, which will give you all the stations in Europe to play with—separately. There is also a similar article relating to the "Pentode" Two, for thinner walletted folk, and heaps of smaller practical articles relating to your hobby.

## Those P.O. Vans.

NOT long ago I ventured to cast some doubt upon the ability of the Post Office "pirate"-hunting vans to detect the presence of receivers in houses.

## "SHORT WAVES"

### ROWDY.

In the Arctic the atmosphere is so clear that a whisper can be heard a mile away. It must be awful when two neighbours are trying to get different stations on their wireless sets.—"Sunday Pictorial."

Nature broadcasts are to be a feature of this year's wireless programmes. We are looking forward keenly to the evening when the Fat Stock prices are interrupted to allow the plaintive cry of the peewit to come through.—"Punch."

A contemporary thinks that something should be done with the people in the studio who laugh at the jokes made by comedians who broadcast.

What about giving them medals?

Sir Thomas Purves, Chief P.O. Engineer, recently suggested that credit should be given to the Post Office for curing many Scotsmen of stammering. "For," he said, "since they used the long-distance radio telephone, they have realised that for every fraction of a second lost in stuttering bang goes saxeppence."

### A USEFUL HINT.

When a crystal set produces very loud signals, an improvised loudspeaker can be made by placing the headphones in a soup bowl.

Enthusiasts must be sure, however, that the bowl is free of any soup, because the presence of such an element would cause a flood in the magnetic field.

"There are musical notes which are inaudible to the human ear," says a scientist. There certainly are many which should be, especially on our neighbour's loudspeaker.

It is, therefore, cheering to me to find in a very "live" New York radio magazine an article entitled "British Radio Hoax," in which the whole romance of these vans is very funnily but very acutely described.

However, the main thing is, I suppose, that the bluff worked. When a Government department begins to exhibit signs of imagination it is time for the public to wake up and scratch itself!

## Variety in Advertising.

MUCH as I revere the makers of modern advertisements—and I mean, in particular, radio advertisements—I think that they are rather prone to move in masses. Waves of tobacco pipes adorn galaxies of strong faces; then sheaves of cigarettes appear, held gracefully in explanatory fingers—and so on.

I wish they would break away from mugs and pipes, fingers and fags, and introduce more variety. What about "Mr. Burfee, of Burfees, Ltd., shaking hands with a Louth clear-starcher named Grasspit"? Or "Mr. Bunsnap, designer of the 'Bunsnap Push-and-come-again Three,' with his collection of hotel spoons." What a "pull" such pictures would have!

## Attack on Water Pipes.

I GATHER, in a general sort of way, from the press, that there is to be an attack on the use of waterpipes as "earths." The idea seems to be that we cause electrolytic action by using the pipes as "earths," and thus the aforementioned pipes deteriorate. 'Ow 'orrible! However, I advise you not to worry.



There are more ways of bumping off a cat than giving it a bat in the peeper with a burnt stick, and I think that "P.W." will be able to advise all de-piped readers how to get an "earth." A fat lot of electrolytic action could be caused by the currents passing to earth via a radio receiver!

## Perpetual Motion at Last.

THAT, in a general way, is a fair description of the new and wonderful "bakelite" moulding presses which E. K. Cole, Ltd., is installing in a new factory which will employ many extra hands this season. Bakelite mouldings seem to be destined for a great future, and Ekco's are the pioneers of large-scale mouldings in this country.

Think of 1,000-ton hydraulic, high-speed presses, each 35 feet high and 100 tons in weight; think of three of these on 13½ feet deep foundations, working 24 hours per day and using 5,000 units of electricity per day, and you will get some idea of the Ekco reaction to Dismal Jimmy and Trade Depression. I should like the history of this British firm to be told all over the world.

## "City of Dreadful Night!"

WHAT a dreadful background of sleepless nights seems to be associated with this story! Some time since, a certain part of Cardiff was being annoyed by "oscillation,"

and it appears that someone who had been struck by American gangsters' methods offered to put an end to the nuisance—for a certain fee. History is silent as to the response save for one instance, that of a letter to a local paper to the effect that if the "gangster" would come along one night and stop the dogs "oscillating" he would easily earn his fee!



ARIEL.



# THESE RADIO COMPONENTS

# A COMPLETE AND CRITICAL REVIEW

by  
Capt. P. P. Eckersley  
M.I.E.E.

THE first variable condenser I ever owned cost me £8. It was a magnificent affair, with vanes milled from the solid. It had ball bearings and a vane-distance adjustment. Even then the plates were known to short!

To-day the variable condenser costs only a few shillings, it seldom shorts, and its movement is smooth and easily controllable for fine adjustment. Our thanks and congratulations to condenser designers and makers!

But there still remains a great deal to be done, more particularly when the units of a variable condenser are ganged together on the same spindle.

There is, in fact, nothing very much to say about the single unit variable condenser. It is such a standard article, and its use and abuse is so well known as hardly to merit comment.

## A Personal Prejudice.

I have, however, a personal prejudice. I like to grip hold of a handle and turn the blooming thing. I hate scratching about with my finger-nails on the rough surface of the periphery of the adjustment wheel. I like those slow-motion knobs very much. I do not think it a fundamental disadvantage that one cannot sweep quickly through the range.

Of course, ideally, one has a robust handle which one can honestly catch hold of and sweep, in a turn of the fingers, through the whole condenser range while, if one is pulling in that far, far distant station lost in a deep hole between the jagged edges of two powerful jammers, one has a smooth vernier, which can be whisked round for an infinitesimal scale movement.

I need hardly say, finally, that scales must be attached to the spindle of the condenser directly, not to a handle which has an indirect connection to that spindle.

So I turn to ganged condensers because here the discriminating buyer needs to exercise discretion.

First and foremost, supposing one unit of a two-unit ganged condenser was  $\frac{1}{2}$  per cent different from another at a wavelength adjustment of 300 metres, and equal to the other unit at 500 metres. Then the

We are still dealing with high-frequency circuits. We have dealt with coils. We showed that coils have to be well-made and wound, not on "Muckite," but good ebonite or paxolin; we showed that unscreened coils ought to be big, that we could judge the efficiency of small coils by looking at the figures representing their dynamic impedance. Now for the condenser.

P. P. E.

two circuits would be exactly in tune at 500 metres, but about 5,000 cycles out of tune at 300 metres. This is a very considerable error, an error which makes its influence more and more felt as one goes down to shorter and shorter waves.

One of the fundamental disadvantages of "band-pass" is that a  $\frac{1}{2}$  per cent error makes a profound difference to the response curve. For instance, with a capacity coupled circuit this  $\frac{1}{2}$  per cent error might mean that the two humps of the band-pass response curve would, instead of just spreading the curve over the local station, actually give full tuning to two distant stations, and include the one you wanted, too!

The question remains, "Can condenser manufacturers guarantee absolute matching of condensers?" I do not think they can.

## The Use of "Trimmers."

Of course, inductances are never exactly the same, so the condenser manufacturer gives us "trimmers." These trimmers exist merely to compensate for lack of matching of inductances, but they do not ensure that, as the spindle is turned, each condenser element will retain an exact equivalence with its neighbour or neighbours. Thus, a good idea is to make one of the elements so that it has slits in the vanes and a pair of pliers can move these slits this way or that to ensure matching over the full range of adjustment. Even then does the condenser stay put to within one-tenth of one per cent? I doubt it.

But these are the things which help.

(a) *Very robust construction.* Obviously the stronger the whole device the better. Flimsy and unsound mechanical practice means variation with use and with temperature change.

(b) *Compactness.* A long spindle, for example, gives mechanical hysteresis. You turn one way towards a setting and the condenser remote from the handle lags behind the ones nearer. When you set one in tune the other is not in tune. But turning back leaves the far-away condenser more in tune, the others less. This can be observed. A badly-designed condenser shaft actually twists and flexes, giving quite incoherent results.

## Difficulty in Matching.

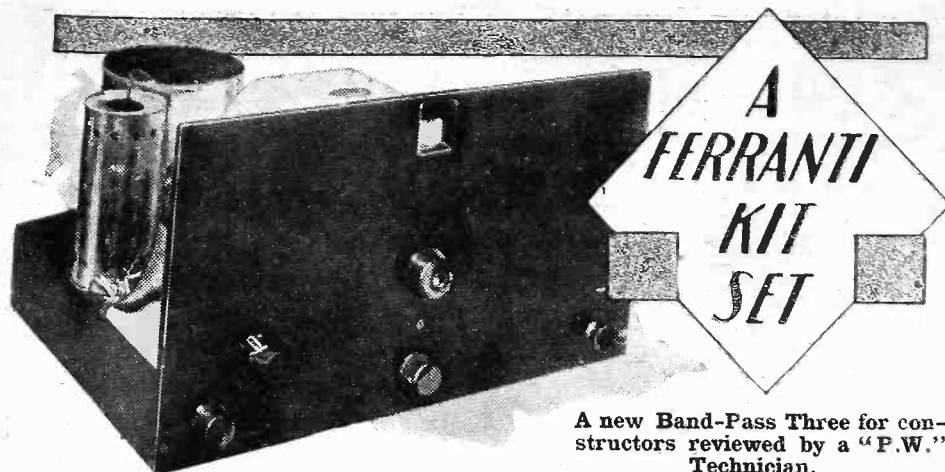
(c) *Smoothness of Movement.* Obviously, if the units are inclined to stick they will never function properly.

I doubt if absolute matching, even if once obtained, continues during the life of the condenser. With band-pass arrangements this is fatal to accurate tuning. But if you do not gang band-pass circuits you get into such a mess with tuning as to render the scheme impracticable. Ganged band-pass is perfect in theory, it may be made to work; in practice, I doubt its ability (because most ganged condensers vary) to stay put.

With cascade peak tuning this mismatching of condenser units is not so important. Things average out if you have enough circuits. This is where American practice is so good.

Of course, the Extenser condenser is a first-class device because it does away with the long-short switch. But all that I have said about condensers applies to the Extenser as to any other condenser.

In conclusion, the real importance of the ganged condenser is in its robustness and its ability to stay put. As the mechanical problems are acute the sensible receiving-set designer knows he cannot get theoretically perfect matching, so he uses three or four units of a condenser with peak tuning and knows that a little mismatching doesn't matter!



A new Band-Pass Three for constructors reviewed by a "P.W." Technician.

WE have recently received from Messrs. Ferranti Ltd. of Hollinwood, one of their new battery-operated Band-Pass Three kit sets for test. The completed receiver is illustrated in the accompanying photographs, and it is certainly a break-away in commercial kit set design.

The circuit is a three-valve combination of a screened-grid H.F. amplifier, a "grid" detector, and a single-stage of L.F. amplification, and it has several interesting features. As its name would suggest, full use is made of band-pass tuning, this being of the capacity-coupled type for medium waves, and a mixture of capacity and inductive coupling for the longer waveband. The two "band-pass" coils are tuned by two sections of a triple-gang condenser, which is totally screened.

#### Volume-control Aerial Condenser.

The actual aerial circuit is not tuned, but is coupled to the first "band-pass" circuit through a variable condenser and a small aperiodic winding. The variable condenser is intended to serve as a volume control, and although it is bound to throw out the balance of the circuits to a certain degree, it does not do so to any great extent.

The next point of interest is the method of obtaining the correct voltage on the screen of the S.G. valve. This takes the form of a potentiometer arrangement, with the "screen" tapping taken off at an intermediate point, so that it gets the right proportion of the voltage applied to the valve's anode.

This is an extremely useful scheme, as it enables a common H.T. tapping to be used for all the valves. There are, however, three H.T. positive terminals provided at the rear of the set, but in actual practice these are generally all joined together.

The coupling for the S.G. valve is by H.F. transformer, the secondary winding of this component being tuned by the third, and remaining section of the triple-gang condenser.

#### Quality is Above Reproach.

Now, regarding the L.F. end of the set; Messrs. Ferranti here use one of their famous A.F.8 transformers. And, as would be expected, the quality of reproduction obtained from the set, when coupled to a high-class moving-coil loudspeaker, is above reproach.

So as to make the set suitable to all types of loudspeakers, a double ratio output transformer is included in the anode circuit of the last valve, the ratios being 1 to 1, and 15 to 1. This is very handy, as it

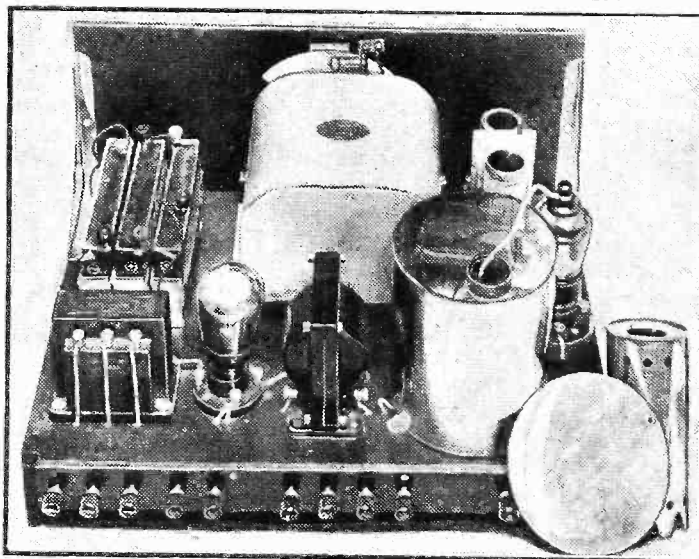
suits either the ordinary high-resistance loudspeaker or the low-resistance moving-coil type.

The set which was sent to us for test arrived already assembled and ready for use, but on looking it over we are convinced that it is a simple set to build. The "two-storey" principle is used in the construction. The baseboard, which is of wood, being raised a couple of inches or so above the lower edge of the panel.

#### A Wooden Panel is Used.

This latter, by the way, is also made of wood, but it is very nicely polished and gives the set a splendid appearance. All the smaller components are accommodated on the under side of the baseboard, while all the larger parts occupy the "upper deck."

#### A "THREE-GANG" IN ONE "CAN"



A feature of this Ferranti receiver is its simple but completely effective screening.

The set is well screened throughout, the three-gang condenser being contained in one large "can," the tuned grid coil and the detector valve are enclosed in another metal box, and the S.G. valve also has a metal cover.

#### An Easy Set to Handle.

The controls are perfectly straightforward, and it is an easy set to handle. The main tuning control is situated in the centre of the panel, and operates the triple-gang condenser. Immediately below it is the reaction knob, both these controls being clearly visible in the photographs.

On the extreme left of panel you can see two more knobs. The upper one, which also happens to be the smaller of the two, controls the wave-change switch, while right underneath it, and in line with the reaction knob is the volume control.

The only other thing on the panel is the on-off switch, which is located on the extreme right. The dial, by the way, is illuminated from behind by a small 2½-volt flash-lamp bulb.

Before going on to the actual test report, there is one other point that should be mentioned, and this concerns the valves. The makers of the kit point out that it is essential to use the exact types specified, if the best results are to be obtained.

#### Good Daylight Reception.

The particular valves fitted in the model at our disposal were as follows: A Cossor S.G.220 in the H.F. stage, followed by a Mullard P.M.1.H.L. as detector, and a Marconi P.240 (Super-Power) in the output valve-holder. Now for the results.

The set was tried out at a distance of about nine miles from the Brookmans Twins, on a fairly good outside aerial, about 70 feet long and 30 feet high. The test was first made in broad daylight and with remarkable results.

On the long-wave band all the stations of note were easily tuned in at really good loudspeaker volume. The selectivity was fair, but slight interference was experienced when listening to Königswusterhausen. There being a background of both Daventry and Radio Paris.

This latter station came through at particularly good volume, there being no possible doubt as to its programme value. The same remarks apply also to that popular Dutch station Huizen, which was very nearly as loud as our Paris friend and from which an entertaining programme, free from interference, can always be expected. It comes in quite near to the top of the dial.

Turning to the medium waveband, the daylight results were well above the average and for a straight "three" the selectivity was first-class. No useful purpose would be served by giving a complete list of the stations received after dark; nearly every station in Europe seemed to be waiting to come in, and the Band-Pass Three gave a surprising number at full loud-speaker strength.

#### An A.C. Model.

The price of the kit is £8 17s., complete with cabinet but less valves and batteries.

There is also an A.C. model available, and this is listed at £12 13s. 6d., without valves.

Messrs. Ferranti cordially invite all those readers who are interested in either of these sets, to write to them for the special pamphlets dealing with these two receivers—don't forget to enclose 1½d. for postage.



# HOW WIRELESS WOULD HAVE ALTERED HISTORY

By  
Lt Commander  
the Hon J.M.  
Kenworthy R.N.

No. 3—NAPOLEON.

AT the beginning of the year 1798 Britain found herself hard pressed in war with three strong naval Powers—France, Holland and Spain. She was holding her own, for during the long-drawn-out five years' struggle with varying fortunes, some useful naval victories had been won, and our allies on the Continent were fighting hard in the field.

But an almost unknown French general, Napoleon Bonaparte, was about to appear in the field of battle, over-run Europe, be made Emperor of the French, and shake civilisation to its foundations.

## Trouble in the Mediterranean.

Yet he was nearly thwarted by a sea-commander, Nelson. And, if some system of long-distance signalling had been in existence, such as wireless, Napoleon might have been killed or captured at sea, the French revolution might have collapsed, the Code-Napoleon of Laws never have been written, and much loss of blood and treasure avoided. If Napoleon had been caught at sea, as he might have been if wireless had been invented, the history of the world in the nineteenth century would have been quite different.

During the year 1797 the British had been forced to abandon the Mediterranean. Hardly a frigate flying the British flag had ventured through the Straits of Gibraltar. But it was known that trouble was brewing in that inland sea.

Troops and troopships were being gathered at Toulon, the great French naval base in the South of France. The nearest British force was in the Tagus, in friendly Portugal, under the command of stern old Admiral Lord St. Vincent. On April 29th a 74-gun ship, the Vanguard, joined him.

## Blockade of Toulon.

She had as her commander Rear-Admiral Nelson, who had already made a name for himself as a daring seaman. Here was just the man St. Vincent had been waiting for. Giving Nelson two more 74's and two frigates, he sent him to reconnoitre Toulon and find out what was afoot.

Nelson was delighted at the chance. He sailed straight for Toulon and, close off the port, captured a small French man-of-war.

What would have happened had radio existed in the days of Nelson and Napoleon? Many important battles would have been reversed, and there is little doubt that history would have been changed completely if rapid means of communication had then been available.

The prisoners let fall the information that in Toulon were 15 ships of the line, four others fitting out, and an army of 36,000, the destination of which no one knew. But a certain General Bonaparte was in command of the whole expedition. Nelson smelt trouble.

But his only means of informing his Commander-in-Chief was to send a small sailing-ship with the news. On land, in those days, an army could not hide its

## NAPOLEON BONAPARTE



The young Corsican officer who rose to be Emperor of France and became Dictator of Europe.

movements for long. Rumours of invasion and battles spread almost as fast as the wireless can carry news to-day. But once a fleet had got to sea and disappeared "into the blue," it was only a matter of chance if it was heard of again until it had descended on to its objective.

## Maritime Blind Man's Buff.

Nelson could only hang about and await developments. And then on May 20th his little squadron was overtaken by a furious gale. His own ship was dismasted and nearly wrecked on the rocky shores of Sardinia. Reaching shelter, the damage was repaired, and now Nelson was joined by Captain Troubridge with 11 more ships of the line. The combined squadron at once returned to Toulon.

The birds had flown. There were various rumours as to the destination—Naples, Sicily, Portugal, Ireland. But Nelson, with his marvellous intuition, formed the opinion that the expedition was bound for Egypt, with the object of eventually attacking our Indian Empire.

On the 14th June he heard that the French had been sighted *ten days before* off Sicily—13 sail of the line, 4 frigates, 200 transports, 36,000 troops, nine generals of divisions, and Bonaparte himself.

It would have been impossible, if wireless had been in use, for this huge force to have evaded battle with Nelson and his fleet. On June 20th Nelson heard at Messina that Bonaparte had taken Malta by assault, and two days later had sailed from that island for the south-east.

## "The Fog of War."

Sailing in chase, Nelson, with his fleet, passed within a few miles of the whole French force in foggy weather; each belligerent was unaware of the presence of the other. If Nelson had had a wireless signal from Malta that the French were attacking—as the cruiser "Sydney" heard by a wireless message from Cocos Island in the Great War that the "Emden" was approaching that island—he could have fallen upon Bonaparte and his fleet and army, have routed them, and probably captured the future dictator of Europe.

(Continued on next page.)

## HOW WIRELESS WOULD HAVE ALTERED HISTORY

(Continued from previous page.)

But it was not to be. Nelson sailed straight for Alexandria and Egypt. It was the only way he could get news. He reached it six days later, of course before the French with their slow-moving troopships, and found the harbour empty. What was he to do? There was no means of signalling to England, or to Lord St. Vincent in the Tagus. The "fog of war" enveloped everything!

### "A Famous Victory."

The British squadron zigzagged back to Sicily, eagerly scanning the horizon for their enemy. On July 25th, after filling up with water and fresh provisions at Syracuse, Nelson led his fleet once more to the eastward. He had nearly made up his mind to return to England in case Bonaparte, by a trick had headed for the British coasts or for Ireland.

But he determined to search once more to the East. Near Matapan he learned that *four weeks earlier* the great French Fleet and army had been seen off Crete steering south-east. Once more he headed for Alexandria. And on the 1st August, 1798, one of his scouting frigates signalled clumsily with flags "16 sail in Aboukir Bay."

*Just one month before*, two days after he had left it in puzzled despair, the French had arrived at Alexandria and had landed their general and his army. Followed the Battle of the Nile and a great victory for the British army.

Deprived of his fleet and the means for receiving reinforcements and supplies, Bonaparte, despite victories in Egypt and Syria, left his army to its fate and slipped back to France in a frigate, there to seize power as First Consul. Bonaparte never forgave the English; and when Europe lay at his feet five years later, he began the preparations for a great invasion of these shores which was to humble the last of his foes.

### Napoleon's Zenith.

The events of the intervening years need not detain us for long. They were occupied in the tremendous campaigns on land and the development of French military power, which raised Bonaparte to a height of military power only equalled in the past by Alexander the Great and Genghis Khan, the terrible ruler of the Tartar invaders of the Middle Ages.

In the process he decimated the population of France, bled her people white, ruined a Continent. He compelled England to impoverish herself to subsidise her

allies, and to maintain her army and fleet. And still more blood was to flow and devastation to be spread before the military might of the Napoleonic system was shattered.

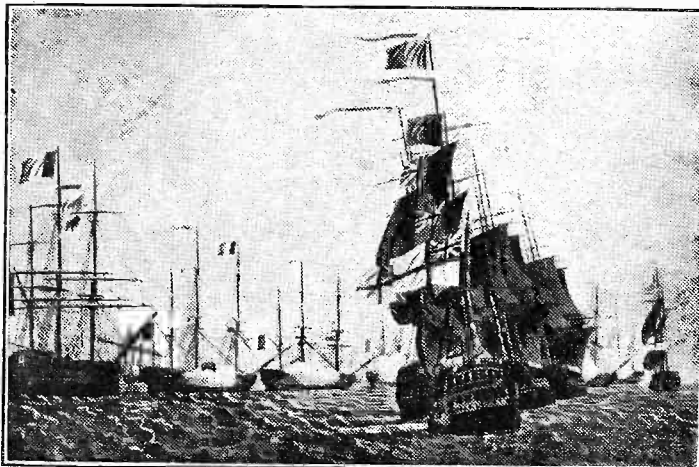
Yet, if there had been a quicker and surer method of sending long-distance messages, of transmitting news, Bonaparte would have had his military career of conquest cut short by capture, and peace would have come many years earlier.

### The Fatal Feud.

The old feud between France and Germany was deepened and embittered by these events. It led to the war of 1870 between France and Prussia, and new enmities. And from these enmities grew the quarrel between the two rival groups of powers, the one headed by France, the other by Germany, the rivalry and competition in armaments that culminated in the far more devastating war of 1914-1918, from which the world has not yet recovered.

If only wireless had been at the disposal of Admiral Nelson in 1798, the whole of the history of the next hundred years would have been entirely different.

## THE BATTLE OF THE NILE



This is a reproduction of an old painting, depicting the Battle of the Nile, with Nelson's ship "Vanguard" in the foreground.

## THE PRINCIPLES OF TELEVISION

A New Book.

THE first books on television were bought eagerly, but were usually discarded rather gladly when the readers found them to be optimistic forecasts rather than practical surveys. Now, however, we have a treatise on first principles, by A. Dinsdale, M.I.R.E., which is both interesting and informative.

It is called "First Principles of Television," and is published by Chapman and Hall at 12s. 6d. There are nearly 250 pages, about 40 photographs, and a great many sketches of apparatus with curves and diagrams to explain the various methods and systems.

### A Clear Exposition.

The author succeeds in making the subject thoroughly interesting, and his painstaking review of the optical questions involved is so well done that the essential

particulars of the various television systems are clearly conveyed to even the non-technical reader. Moreover, his facts—and he is great on getting at the facts—are so clearly and logically presented that the author gets over a clear picture of the different lines on which various experimenters have worked and are working.

### Will Amateurs Do It?

Mr. Dinsdale is so evidently a master of his subject that particular interest attaches to his conclusions concerning the possibilities of television as an entertainment medium of the future. He does not minimise the difficulties—like so many of his predecessors did—and he thinks that just as amateurs made a large number of important contributions to the development of the radio art, so they may yet contribute to the development of television.

Any amateur with ambitions in this direction will certainly find "First Principles of Television" an admirable guide to the subject.

## MOYDRUM CALLING!

Some details of the Irish Free State's new high-power station.  
From Our Correspondent.

I AM officially informed that the Irish Free State's new high-power broadcasting station is expected to be opened for service early in the autumn. Building work is now in progress on the site at Moydrum, near Athlone, which is almost exactly in the centre of the Emerald Isle.

With its power of 80 kilowatts (Geneva rating), the station should give excellent service throughout Ireland, and it is expected that the signal strength will be considerable in England and Wales. In Western parts of England and in Wales this station should be one of the strongest transmissions, as it will be nearer to listeners in these districts than any Continental station.

### Easily Heard in Britain.

The new Irish station will operate on a wave-length of 413 metres. The Dublin transmitter, which is at present using this wave-length, will be closed down, but of course the main studios will still be located in Dublin.

It is expected that the Cork transmitter will also be dismantled.

The greater part of the plant is ready for delivery by the Marconi Company as soon as the building work is sufficiently advanced for the installation of the apparatus to commence. The erection of the masts will be commenced shortly.

This addition to Europe's high-power stations will be particularly interesting on account of the intention to broadcast sponsored programmes. The station, like the present Dublin station, will be under direct control of the Department of Post and Telegraphs and the studios, as at present, will be at the General Post Office, Dublin.



# Some "Cosmic" Pointers



WE have had a "Cosmic" query which, at first sight, would seem to constitute fulsome flattery rather than a request for enlightenment on a radio problem. Here it is:

"A few weeks ago I built your 'P.W.' 'Cosmic' Three receiver, and right from the start I was able to get fine results, and have no complaints at all to make, for it is undoubtedly a magnificent receiver. But I am puzzled by the fact that it has steadily grown even better. It started fine and I could pick up programmes on all three wave-bands with ease, but day by day the set seems to grow more powerful. Surely this is not what one should expect to happen and I am wondering if 'P.W.' can suggest the reason."

You might be forgiven for thinking that our correspondent, who lives in Bradford, is finding his "Cosmic" growing "better and better every day," for the simple reason that he is acquiring operating skill, and is thus able to squeeze more and more out of his set; and that, to some extent, is no doubt what is happening.

## Not Due to Conditions.

But it cannot be due only to that, for he is insistent in later parts of his letter that certain stations come in with ever-increasing strength, and these are stations which are receivable without going so close to the edge of oscillation that they are fit subjects for knob-twiddling tests.

Again, it occurs to one that other conditions may have something to do with it, but he negatives that by bringing in his neighbour (who is also a "P.W." fan) who affirms that on his receiver, which is not a "Cosmic," reception conditions have not fluctuated within the period in question.

It is certainly an interesting problem and is a variation from normality of the kind we, and obviously our correspondent too, have no fault to find with!

But, of course, there is a reason for it—as sets do not, of themselves, "run in" like petrol engines.

It is probably due to the H.T. battery running down. We know that sounds all wrong, but we believe the answer lies there, all the same.

So much has been spoken and written about the advisability of "plenty of H.T." that many constructors no doubt find it hard to believe that better results can, in cases, be obtained by dropping the H.T. below normal standards.

Concerning a "Cosmic" which improved with age and a few notes on the subject of station "logs." It is interesting to note that since this article was written it has been reported that an enthusiast has received no less than 140 stations on his "Cosmic Three."

But this applies to the detector valve; L.F. amplifiers always thrive on "plenty of H.T." providing the grid bias is right.

As we have said before, 40 volts H.T. may please the detector more than 80 or even 60, especially on a three-band set of the nature of the "Cosmic."

Now, supposing our Bradford friend had the detector H.T. plug of his "Cosmic" inserted in, say, a 60-socket of his H.T. battery, it is conceivable that the running-down of the H.T. battery might bring the detector volts nearer and nearer to the best value for easy and smooth reaction and greatest sensitivity.

It is true that the L.F. valves would tend to get less and less H.T. too, and that this would militate against them operating at the top of their form. Inevitably serious distortion and a drop in volume would in due course result.

But you can drop 10 or even 20 L.F. H.T. volts before audibly upsetting the performance of a set so long as you start with an H.T. that gives the margin that always should exist against inevitable battery decay.

## More and More Stations.

Readers may say why did we not write to this querist, tell him all the above, and advise him to doubt the virility of his H.T. battery—and then, and not until then, present the full facts of the case.

We should have done so, but our correspondent, like so many others, did not provide his full address. But he will almost certainly read this article, so we may hope to hear from him again in due course.

Another correspondent—and this one *did* give his address—throws serious doubts on the possibility of anyone being able to tune in sixty stations on the "Cosmic" Three receiver—half the number we ventured as a possible "ceiling" for the set.

Rather fantastic (we've used the word before in the same connection!) even talk-

ing about sixty stations on a simple detector 2 L.F. set, isn't it?

And yet the present "Cosmic" record is a log of identified stations exceeding seventy in number. Most of you will remember that a letter from the holder of this record, together with his full name and address, recently appeared in "P.W."

There are no valid reasons why his feat should remain a record for any length of time; and perhaps by the time these words appear in print someone will have gone one, or even a score, better! \*

Don't let any new reader jump to the conclusion that the above seventy stations were bagged largely on the short waves; in actual fact, some sixty or so were medium and long-wavers.

This makes it pretty certain that this correspondent will himself pile up a good many more stations if he has the time and the inclination to adventure more on the high frequencies.

## A "P.W." Record.

By the way, the number of appreciative letters regarding the "Cosmic" that we have received in itself constitutes a record for a "P.W." set, as also does the remarkably small number of querists in difficulties.

And it should be remembered that we did not invite readers to communicate their results to us. We refrained from so doing for the simple reason that we were confident we had the goods to deliver and that there would be no need whatever to solicit appreciations.

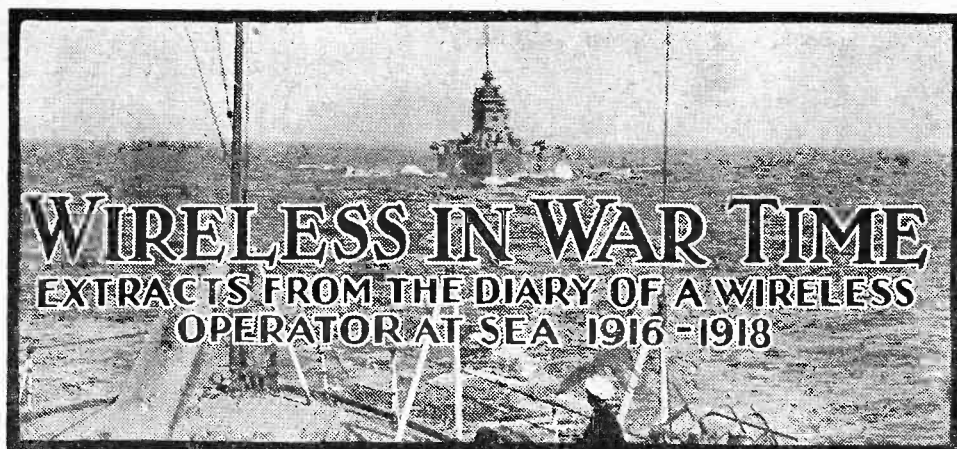
Nevertheless, we must hasten to add that we are always delighted to hear how our readers get on with our sets—though, if they do not feel we have given them anything worth writing about, we can hardly blame them for scanty postbags! G.V.D.

\* These words had barely been set up in type before that seventy had been well and truly beaten. First of all we had Mr. Lucy with his eighty, and details of this first appeared concurrently with the letter from the "seventy" man.

But both were entirely eclipsed by a performance recorded in a further letter—140 stations!

We must now be approaching the record for any set of any type! It remains to be seen whether 140 represents a record for the "Cosmic" which is destined to stand for any length of time.

Personally, we have quite serious doubts about it!



DECEMBER 9TH, 1916.—Have just received news from Cape Race that the German cruiser was last seen in latitude 48°34 north, longitude 27°37 west. Luckily she is rapidly increasing the distance between us. The Captain is relieved. It is very foggy, and is drizzling intermittently. We are due at Halifax either Monday night or Tuesday morning.

DECEMBER 10TH.—Picked up news from Sable Island. Signals are so loud that I can hang the 'phones on the cabin wall and hear them yards away. Cape Race only thirty miles away.

#### A Mysterious Disappearance.

DECEMBER 11TH.—Started to freeze hard this morning. Old T— says he will get a job as a window-cleaner rather than come to sea again. Sighted the shores of Nova Scotia at dinner-time to-day. Everybody is in good spirits now, especially old T—, who is dreaming ecstatically of other kinds of spirits.

The chief engineer was telling more yarns at dinner. One was about an Arab who was shipped as a stoker on a boat on which the rest of the stokers were Hindoos. These fellows evidently objected to the Arab's caste. Anyway, one day he mysteriously disappeared.

A search was organised, but at last the chief engineer came to the conclusion that the man had fallen overboard. He was mistaken, however, for when they cleaned the furnaces out, they found the remains of the Arab!

Twice the chief engineer has seen Chinamen throw themselves overboard. Sometimes the stokehole life drives them mad.

#### Halifax and Norfolk, Va.

DECEMBER 12TH.—Sighted the harbour lights of Halifax at four this morning. Directly we dropped anchor a doctor came aboard, also a Canadian soldier, who sealed up the wireless cabin. The "Olympic" is in dock here, having been chased by the German raider. She doesn't seem in a hurry to leave, either!

I hear we are going to call in at Norfolk, Virginia, for coal, and then straight on to Port Arthur, Texas. There is a rumour that there has been something like a revolt in London owing to the change in Government; also, that Germany has offered peace terms. There has not been a public-house open in Halifax for twelve months—which proved a staggering blow to old T—.

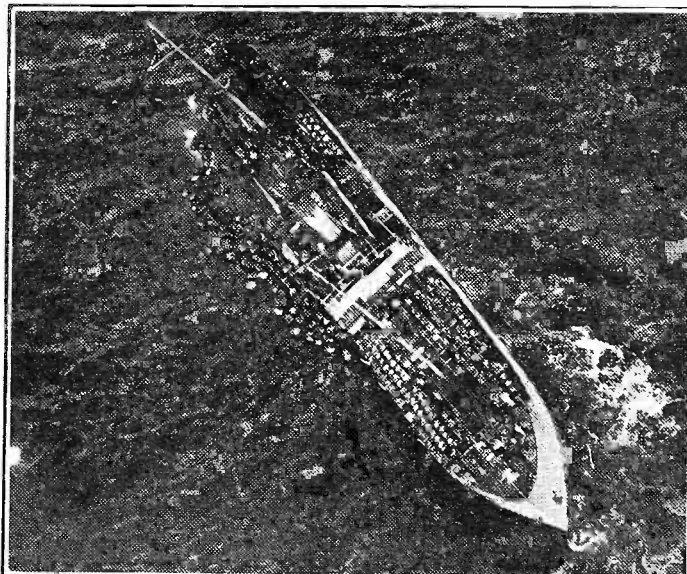
DECEMBER 15TH.—Woke up to-day to find the mercury 7 below freezing, and ice everywhere. Halifax is not an ideal place to stay in long, but I enjoyed stretching

my legs in a brisk walk ashore. The main street, although it boasts of tramcars and banks, etc., is not half as good as Dorking High Street, which it resembles in a way. Heard that two destroyers attached to this port were sunk with all hands last night outside the boom.

DECEMBER 16TH.—8.15 a.m. We were out for boat-drill just now and someone pointed out a piece of ice, or what appeared to be a piece of ice. As it came nearer, however, we saw it was a ship's lifeboat, bottom upwards. We were left to draw our own conclusions!

DECEMBER 19TH.—Picked up the pilot at 1 o'clock to-day and anchored exactly opposite the radio station at Norfolk, Virginia. The harbour lies at the mouth of the Chesapeake River. When the Customs officer came aboard, he asked us to produce our radio certificates, and next startled the captain by saying that, unless we got an

### THE TORPEDO STRIKES



A merchant vessel which has been attacked by a submarine. It is rapidly sinking and littering the sea with barrels. (British Official Photo).

emergency set on board before we left port, we should be fined 5,000 dollars. I thought this would happen, because it's the rule of the Berne Convention that all ships carrying over fifty persons must install an emergency radio outfit.

DECEMBER 20TH.—Norfolk, Virginia. This is a pretty good town, and you can get an excellent meal here for about twenty five cents—a little over a shilling. After tea, went to a film with some friends, but

found that it's the habit over here to run a show without any music at all. The programme consisted of "Oliver Twist" and one other short film. Got some excellent cigars for five cents each (about 2½d.).

DECEMBER 22ND.—Left Norfolk early this morning. Had to get up early to see about erecting the aerial, as it had been taken down in port. It had got secured at the top of the funnel, and I had to climb up the little ladder fixed at the side of the funnel to put things right. As steam was up it was not a very clean job, and it made me feel pretty giddy.

#### Christmas Eve.

DECEMBER 24TH. Christmas Eve, 1916. We are well *en route* for Port Arthur; it is just like the middle of August at Rustington, with a cool breeze playing all the time. Everybody is hanging out their washing, and I can hear old T— singing in a falsetto voice. He is in a better mood to-day and is inclined to be playful. He carries on something like this when he wants Walter, the cabin-boy:

"Walter-r-r-r-r! Come hither, sweet youth. Administer unto me, so that I may shave in comfort!" And then, suddenly changing his voice: "And if that shaving water isn't hot, I'll break your ——— neck!"

Walter fetches the water, and as it is to his "lordship's" satisfaction, he is again all honey.

"Tell me, youth, what is for dinner? Has old Philgarics (the chief steward) given us beef again? It is, is it? I thought as much! And as hard as his head, too. He wants Mrs. T— to show him how to serve a meal. It would be more than her life is worth to give me beef four times a week."

Walter is an experienced and sensible youth, and he usually says just: "Yes, sir. Yes, sir!" But he put his foot in it properly a little later.

"Ah, well," continued old T—. "I suppose I'm a silly old fool, ain't I Walter?"

"Yes, sir," says Walter, not seeing the trap.

#### Flying Fish.

"Oh, am I?" cries old T—, all bristling beard and glaring eyes again. "You get out of this cabin, my boy, damn well quick, or you'll be in hospital for Christmas."

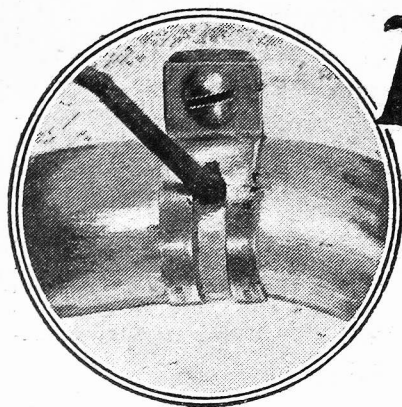
Exit Walter hurriedly, followed by a paper, magazine, a toothbrush, and a pair of sea boots.

These little incidents liveen us up now and then, and even old T— admits they do him good. Have just noticed some flying fish, but they were not near enough to examine properly.

### NEXT WEEK.

Further extracts from this fascinating record of radio experiences in War-time will be given in next week's "P.W."

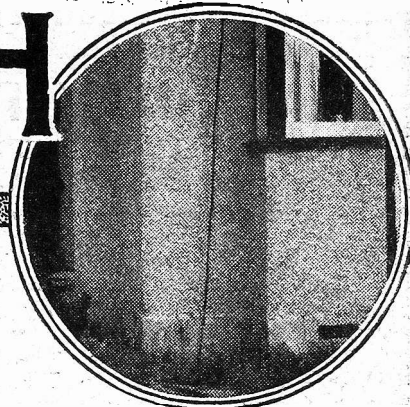




# THE EARTH WAR

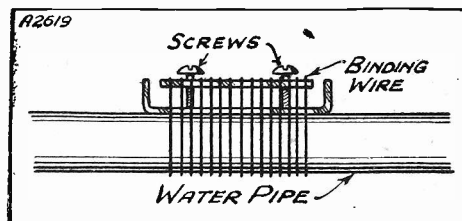
By G. H. DALY.

Some water companies object to the use of the water-pipe radio earth because, they declare, it tends to weaken the pipes. But this need not happen, as our contributor clearly shows.



PRESENT-DAY wireless was born on the day when Marconi first connected his aerial circuit to the earth. That was in 1895. Previous to this, experimenters had not dreamed of making any connection to the ground as they thought that the

## THE P.O.'s WAY



The water-pipe earth-clip used by the Post Office.

energy would naturally run away to earth and be lost.

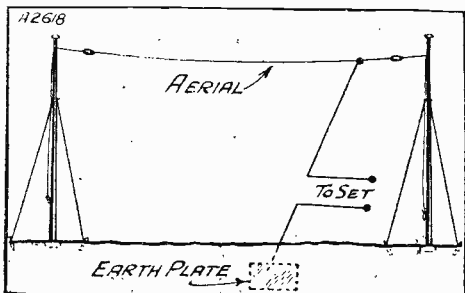
Instead of this, as Marconi remarked when receiving the Nobel prize in 1909, "the new arrangement, (earthed-aerial system) not only increased the distance over which I could communicate, but also seemed to make the transmission independent of the effect of intervening obstacles."

## Caused by Copper.

Since then everyone has earthed their aerial circuit—mostly to the water pipe—and wireless has simply gone ahead. Now, however, certain water companies are objecting to the use of their water pipes as a wireless earth on the grounds that damage is thereby done to the pipe.

As it happens, wireless listeners are not the only people affected, for the Post Office frequently use the water pipe for earthing their telephones—as a matter of fact, it is probable that we first copied the idea of a water-pipe earth from that source. In some cases also, electricity companies make use of the water pipe for an earth.

## A FAMILIAR TYPE



The most effective type of earth—if efficiently installed.

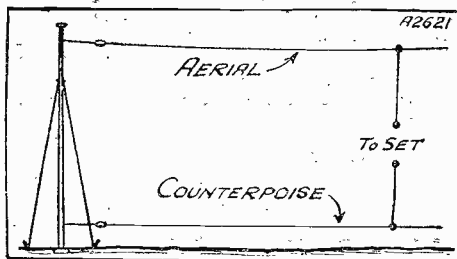
Apparently the water companies object to the use of their water pipes as an earth because the wireless listener—likewise the P.O. or the electricity engineer—generally uses a copper wire when making connection to the pipe and in time moisture and deposits in the atmosphere tend to set up chemical action between the copper wire and the lead. If allowed to continue this will tend to weaken the pipe.

## Easy to Tighten.

This is particularly the case if there is a loose connection which allows the moisture to get in between the wire and the pipe. Should the wire be wrapped tightly round the pipe however, chemical action is not likely to occur; nor will it happen if the wire is cleaned periodically, say once a year, or more often.

To ensure a tight connection, the earth clip used by the Post Office is very useful, for by means of two screws the wire can be tightened up after it has been wrapped round the pipe.

## ONE ALTERNATIVE



How a "counterpoise" should be arranged.

If a really effective job is desired, then a special collar should be sweated on the pipe, the earth wire is connected to a lug on the collar, and any corrosion which might occur will not affect the pipe. It should be added that sweating on to a water pipe is best done by a plumber or someone skilled in the work.

## Watch the Taps.

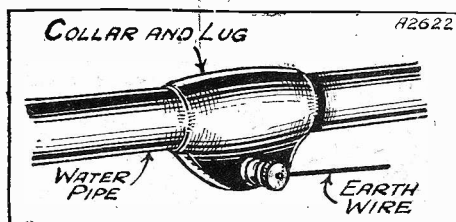
Every professional wireless engineer examines his earth periodically, as it is one of the most vulnerable yet most important links in the system, and if everyone cleaned their "earth" periodically they would obtain much better results and give the water people no opportunity of causing trouble.

One imagines that what the water companies are really up against is the clumsy earth wire which has been hastily wrapped round the pipe and forgotten for years. Naturally corrosion has taken

place and the water companies have a case. However, even the worst cases of corrosion brought to their notice cannot be so bad as to justify cutting off the wireless earth like they would the water supply.

Theoretically, at least, the water pipe is

## PROTECTING THE PIPE



If you get a plumber to fix a water-pipe connection like this, no harm can come to the pipe itself.

not the best type of earth, although it may be the most convenient available. Especially does this apply where taps are inserted between the earth connection and the mains, for the threads of the tap may be coated with some insulating compound to make a water-tight job, and thus a high resistance is set up in the aerial circuit.

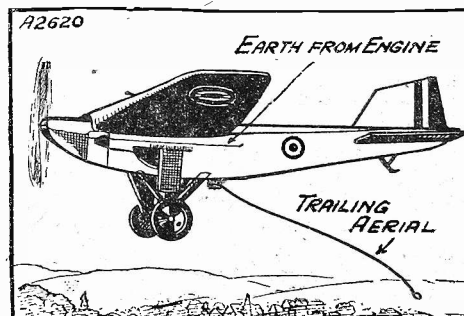
## The Buried Plate.

The most effective form of "earth" is that invariably used in the professional wireless world, namely the buried earth plate, and in this respect again, the standard Post Office earth plate is hard to beat for normal reception, at any rate.

This consists of a sheet of galvanised iron about 18 inches square, which is buried a foot or so under the ground: the plate has a tinned surface, so that it is an easy matter to solder a wire to it. If the soil in which the plate is buried is reasonably moist, this is superior to any water pipe.

A sheet of copper is better still, but not (Continued on page 230.)

## AN AERIAL "EARTH"



The engine and metal parts of an aeroplane constitute its radio "earth."

## THE MIRROR OF THE B.B.C.

By O.H.M.

## SUNDAY PROGRAMMES

## HENRY HALL SETTLES DOWN — VOICE TESTS FOR THE EMINENT — "PRODUCTIONS" PLANS.

ALTHOUGH it is true that there is no radical change of policy contemplated with B.B.C. Sunday programmes, I hear there is active discussion and growing pressure. The "Wireless Exchanges" with which the B.B.C. is doing business are naturally keen to have more week-end entertainment.

It is early yet to prophesy what may happen, but of this I am sure, that there will be no widening of the range of material tolerated on Sundays. Sir John Reith will see to that.

## Henry Hall Settles Down.

Henry Hall has now had time to acquire his studio "legs." His "fan mail" has taken on prodigious proportions, letters pouring in at the rate of hundreds a day.

improving rapidly and has already won its place in the esteem and affection of millions of listeners.

There is no doubt that Mr. Hall will develop a microphone personality, and even though this will be quite different from Jack Payne's, I am sure we shall like him as much as any dance band director.

Meanwhile, Mr. Payne is doing splendidly on his own, and will continue to do so for a long time to come. Apart from his recording, he is drawing big houses wherever he appears, and if the statement I heard is correct, he landed a very nice packet

cent of the gross receipts. His records are also going well in America.

## Voice Tests for the Eminent.

Recently there have been some shocking examples of bad microphone voices possessed by eminent talkers. I have a feeling that the B.B.C. is not as strict now as it was even a year ago to make sure that its talkers are not only masters of their subjects but also able to get over on the microphone. Anyway, there is a good deal of irritation on this score, and I commend it to the attention of the Talks Branch at Broadcasting House.

## "Productions" Plans.

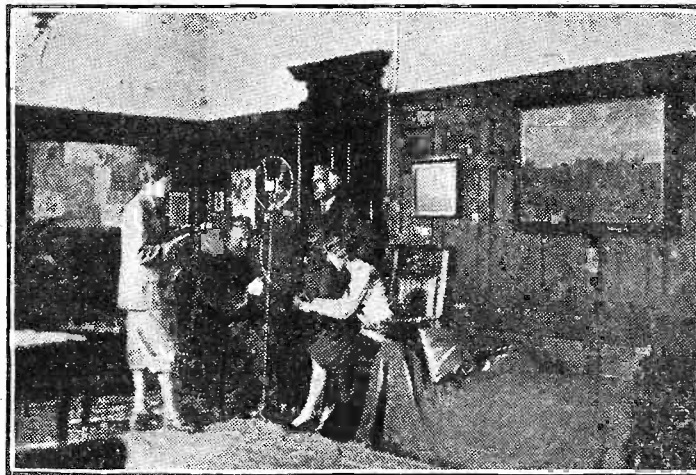
A show a day for a week will keep the Productions Department at Broadcasting House very busy during the early part of May. This, of course, includes vaudeville programmes for which Productions are now wholly responsible, two performances of the revived radio play, "Dr. Abernethy—

His Book" (produced by Howard Rose), two performances of "Little Miss Make-Believe" (produced by its author, Charles Brewer, who is specially coming to London from Birmingham), a feature programme called "Miscellany" (produced by the collaboration of C. Denis Freeman and M. H. Allen), and the musical play, "Caractacus," the characters for which include two emperors, one of them the great Nero.

The vaudeville entertainments, without giving a lot of names, promises to be well up to standard, and that in which the B.B.C.

Theatre Orchestra is taking part will introduce the "call sign" or "signature tune," built around a famous phrase from "Come, then, ring up the Curtain" ("Il Pagliacci").

## LEARNING TO BROADCAST



A group of pupils at the new radio school in Munich. The pupils receive tuition in microphone speaking.

## THE "COSMIC" BETTER THAN THE "MAGIC."

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just built the "Cosmic" Three, and must again congratulate you on a really excellent set. Last Wednesday I dismantled my original "Magic" Three, not without some regrets, and constructed the "Cosmic."

I have used both the transformers and the "antimobo" device from the "Magic" Three instead of one stage of R.C.C.

This necessitated slightly greater spacing of the L.F. components, but otherwise I have adhered rigidly to specification.

The selectivity of the "Cosmic" is very good indeed—I was able on Thursday evening to listen to the 9th Symphony from Leipzig on full loudspeaker strength with interference from the London National so slight that I could only just catch the words of Mr. Otto Siepmann's talk during the one bad fade-out that Leipzig suffered throughout the whole programme.

Again, I can similarly get Mühlacker free from the London Regional, after dark.

Selectivity is also good on the long waves, and Radio Paris and the Eiffel Tower come over well at midday.

As regards the short waves, I have not yet had much time to log a large number of stations.

I listened to the "P.W." programme from C.T.I.A.A. for some time. Most of Capt. Eckersley's speech came over at good loudspeaker strength, but fading was rather bad during Mr. Calkhurst's speech on Portugal. Judging by the oscillations, I should say that a very large number of "P.W." readers were after this station.

Moscow's propaganda also came over at very good loudspeaker strength last evening, on 50 metres.

I find that the "Cosmic" is very stable and very easy to handle, and is a great improvement on the "Magic" Three, good as that was at the time. A great asset is the inexpensiveness of the coils required—three wave ranges can be covered for the same price as good medium-wave coils for the "Magic" cost at that time. I never got long-wave coils for the "Magic."

Again thanking you and the "P.W." staff for a really super set.

I remain,

Yours faithfully,

CHARLES H. ARNOLD.

P.S.—Much regret delay in posting. Have now logged 58 stations on the medium wave-band. Am more than satisfied.—C. H. A. "Ecclesden," Steyning, Sussex.

It was no easy task to take over from such an overwhelmingly popular personality as Jack Payne.

But Mr. Hall has succeeded, and not least by his retiring disposition and quiet attentiveness to duty. The new band is

recently when he appeared at a suburban theatre, and drew record audiences which worked out very nicely for him under an arrangement by which he took sixty per

cent of the gross receipts. His records are also going well in America.

## THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

MISS SACKVILLE-WEST'S recent talk on books will doubtless do the author of "Gay Gardening" some good, while her condemnation of Aldous Huxley's latest work will achieve no less a result for the latter. Such is the paradox of criticism. Wholehearted praise and wholehearted condemnation—both methods arouse curiosity—and increase author's royalties. I think Miss West ought, in future, to have her wrist-watch with her when she broadcasts. She made it quite obvious that the studio clock was behind her, and that she had her eye on it.

After forty-five minutes of "April Foolishness," it was clear that Leonard Henry is at his best when he has not the responsibility of supervising the production of the show. Hardly anything fell

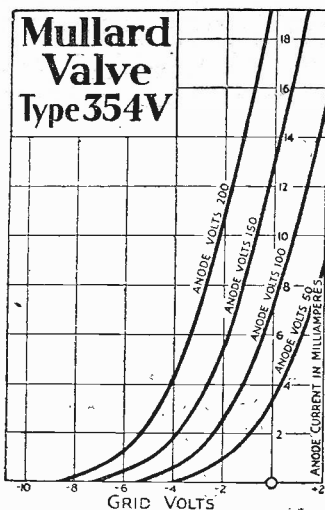
from his lips which was worthy of repetition, and as for his song, sung to his own accompaniment on the harp (?) plus a fiendish row from the orchestra—this was the worst thing I have ever heard him do. Some of the lines, too, made me wonder who had written the book of words.

It was nothing in favour of Elsie Randolph and her Merry-Go-Round Company, that they figured in the National programme the night following "April Foolishness." One had hardly recovered from the latter, which may have made one more critical; but, really, the show was a disappointment, the choice of songs being on a par with the singing, while the patter was weak in the extreme. The poorest item I have listened to for some time!

(Continued on page 230.)



# 354V



## TECHNICAL INFORMATION ABOUT A FAMOUS VALVE

The type number alone tells you quite a lot about the 354V. First of all, the symbols 4V mean that it is one of the Mullard series of indirectly heated A.C. mains valves, while the figures 3,5 indicate that its amplification factor is 35.

Your knowledge of radio technics will tell you that a 3-electrode valve having these characteristics should be an excellent general purpose valve—and that is just what the 354V is.

### FOR DETECTION.

Type 354V is pre-eminently the detector for use in A.C. all-mains receivers, and particularly for sets employing one or more high frequency amplifying stages where, operating under power grid conditions and, of course, zero grid bias, it will handle big input signals and, if followed by transformer coupling, fully load the average three-electrode or pentode output valve.

### FOR LOW FREQUENCY AMPLIFICATION.

As a low frequency amplifier, operated at an anode voltage of 150 to 200 volts and a grid bias of 3 to 4 volts, the 354V should be used as the first stage valve in gramophone amplifiers, in which position it will handle large "pick-up" voltages and give a high effective amplification.

The 354V now incorporates the new Mullard rigid-unit construction, and will be found perfectly free from microphonic trouble, even in large receivers and radio-grams with powerful built-in speakers.

## REDUCED PRICE 13/6

#### OPERATING DATA.

Heater Voltage	...	...	4.0V
Heater Current	...	...	1.0A
Max. Anode Voltage	...	...	200V

#### CHARACTERISTICS.

(At anode Volts 100; Grid Volts Zero).			
Anode Impedance	...	...	10,000 ohms
Amplification Factor	...	...	35
Mutual Conductance	...	...	3.5mA/V

#### AUTOMATIC BIAS.

If automatic bias is applied to the 354V, the biasing resistance should have a value of 1,000 ohms.

The correct Mullard valves for the P.W. "Cosmic Two" are:—

Detector . . . P.M.1HL  
Power . . . P.M.2A

# Mullard

## THE · MASTER · VALVE

## MADE IN ENGLAND

Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2  
ARKS

AS I was bold enough to predict in last week's notes, we have come now to a particularly interesting period in long-distance wireless reception. All sorts of curious things are happening, and if you do not already do so I would most strongly advise you to keep a record of your results with the receiving set during the next week or two.

Should you do this I am quite sure that you will find it a fascinating pursuit. The kind of log I suggest is this: Make a list in the order of their wave-lengths of the stations whose settings you know. Then rule off a number of columns and devote one to each night on which you indulge in long-distance work. Head each column with the date and in it make a note of the behaviour of all the stations that you pick up.

#### Make Use of Abbreviations.

As you won't have much room you will need to use abbreviations, and here are some ideas for these. For full loudspeaker strength insert "V.G.," for medium loudspeaker strength "G.," for something rather below this "M" (moderate), for volume so weak that it barely reaches loudspeaker level put "W." If you don't hear a station



Some practical distant-programme notes compiled by a special contributor who nightly searches the ether in order to obtain really up-to-the-minute information for "P.W." readers.

at all when you turn to its settings write "N." in your log against it.

Atmospherics are denoted by "X," fading by "F," a heterodyne by "H," complete jamming by "J," and spark signal interference by "S." Thus suppose that Vienna comes in at moderate loudspeaker strength with some fading and a certain amount of spark interference, the entry would be "M.F.S."

#### A Guide to General Conditions.

A log kept on these lines will show you which stations are most reliable and which are most subject to fluctuations. From it, too, you will be able to deduce which portions of the medium and long wave-band are most affected by interference of various kinds or by fading.

We are bound to have a proportion of days when atmospherics are rather troublesome, and on these long-wave reception is

very seldom worth while. Apart from atmospherics though, the long-wave stations are coming in splendidly, the great majority of them being completely reliable.

The medium wave-band is crammed with interest. By all the rules, for instance, Vienna, who

for some years now has not been a completely reliable station, should be making his summer exit. Curiously enough, this station is at the moment of writing better than it has been for months past.

#### Good Reception Maintained.

Munich, too, in the same region of the medium wave-band, shows quite a noticeable improvement instead of the decline that might be expected. On the other hand, Budapest is considerably below his best, and I have not been able to obtain more than moderate loudspeaker strength on a four-valve set for some days. To compensate for this, Sundsvall has been heard with greater strength than for a long time past! Other stations that have been well received are Strasbourg, Brno, Brussels No. 2, Milan, Breslau, Goteborg, Genoa, Hilversum, Heilsberg, Turin, Gleiwitz, Trieste, and Nurnberg.

R. W. H.

THE bulkiness of my correspondence file of late points to what the daily papers call "unparalleled enthusiasm" on the part of readers, especially new readers, in spite of the bad conditions prevailing.

Very few new stations have been logged, but of the old-stagers very few seem to be missing! Among the newcomers are Radio Coltano (Pisa, Italy), on about 43 metres: he relays the Rome programme and arrives at a strength of R.8 or so—quite a rival to Rome himself. Just above him, there is another Italian station announcing as "Radio Libya," also at very good strength considering the distance—for the station is located at Tripoli. Thanks to "J.E.A." (Acton) for some of these particulars.

#### Are Sets Too Bulky?

"G.B.W." (Alexandria) makes a very reasonable demand for smaller short-wave receivers. He quotes the abnormally minute receivers described in QST and the A.R.R.L. Handbook—a four-valver, by the way, occupies  $12\frac{1}{2} \times 7\frac{1}{2} \times 8$ ! There are two ways of looking at this, "G.B.W."

It needs some real brain-work to design a set as small as this that will not only work well, but that will "reproduce" well. That is the trouble from our point of view; I could design a set of that size for myself without much trouble, but some of the home constructors that I have met would have a hectic time trying to make it and then to get it "tamed."

It is so easy to keep on the safe side—even if at the expense of compactness—that

## SHORT-WAVE NOTES



News and views regarding an exciting and fascinating wave-band.

By W. L. S.

I am afraid I have always made my sets rather bulky. (My own single-valver, by the way, occupies  $10 \times 6 \times 6$ —not quite vest-pocket size.)

#### A Real Enthusiast!

Our old friend "W.H.R.," of Plymouth, is fast reaching the dizzy heights. Not content with winning the broadcast section of our own Competition, he has now won the "Wireless Constructor" Competition, for which he receives a Kelsey Adaptor. From "W.H.T.'s" latest log I extract the following useful details. Nairobi appears to be good between 6.30 and 7.30 p.m. on his usual wave of 49 metres odd. VK 2 ME, Sydney, as usual on Sunday mornings at 7.30 or so. PLE, Java, Tuesday afternoons—generally extremely strong. Wave-length 31.86 metres. In general, reception from the East is very good, and from the West—rotten!

I quite expected that the volcanic disturbances that have been worrying South America would have a marked effect upon short-wave radio conditions, but, except for blanketing out stations that were only just there before, it doesn't seem to have done anything!

Whenever there is an earthquake or volcanic activity one usually finds that signals from that direction behave freakishly. Generally they are abnormally strong for some days afterwards, although no definite rule can be laid down from the information in hand at present.

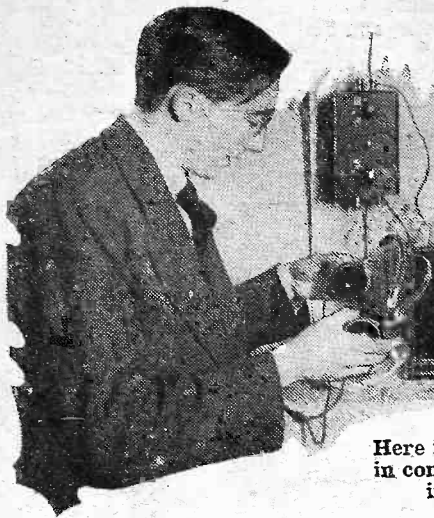
#### Interesting Times Ahead.

We are fast approaching the period of the year when radio should become really lively. For the past three years my log for April, May and June has been a heavy one, both for reception and transmission, but I also note that at this time of the year good weather seems to go hand-in-hand with good DX. As I write these notes, the most incurable optimist could not call the weather "good." But on the first sunny morning (or perhaps the second!) I shall emulate the early bird with, I hope, equally successful results.

I added the "second" in parenthesis because someone more energetic than I am generally phones me after one good morning of DX and tells me all about it. Whereupon I rise at 5 a.m. the next day, completely ruin the good DX and the good weather, hear nothing at all and go back to bed in a profane frame of mind. But it's all in the game!







# The P.W. "PHONOTRAP"

Here is an easy-to-make gadget which acts as either a wave-trap or a standby crystal receiver in conjunction with any set. It can be left permanently connected up and brought into service in either of its two capacities at any moment, merely at the touch of a simple switch.

Designed and Described by the "P.W." Construction Department.

**A**LTHOUGH the crystal receiver as a complete broadcasting outfit has almost entirely disappeared, there is still some very useful work for the crystal detector to do in a standby device such as the "Phonotrap."

The Phonotrap is a development of an entirely "P.W." idea. It may be remembered that two or three years ago we described the construction of a small wall-fixing unit for use in connection with any valve set, and which had a pair of telephone receivers hanging on a hook projecting from the side of it.

### Three in One.

So long as the 'phones were left in that position the device was inoperative. When you lifted the 'phones up and placed them on your head the valve set was automatically cut out of circuit and crystal reception possible without touching a single control or switch.

Thus you could immediately verify the efficiency of the aerial system in the case of a suspected set failure or, alternatively you could listen-in on the 'phones instead of the loudspeaker, and so save the batteries.

The Phonotrap goes one further. Instead of being completely automatic it embodies one simple switch. But the telephone receivers can be left connected all the time, and there is no need to interfere with terminals or wiring when you want to bring the Phonotrap into action.

The switch has three positions. In the one the Phonotrap is cut right out of circuit and might just as well not exist for all the interference it causes with normal reception on the valve set.

In the second switch position the Phonotrap acts as an efficient wave-trap and enables you to suppress any one medium-wave station. The third position transforms the Phonotrap into an effective crystal set so that you can pick up the telephone receivers and listen to the programme without switching on the valve set.

### A Permanent Insurance.

And let us remind you that this may be extremely useful. It provides a comfortable insurance against any fault in the valve set. Supposing right in the middle of an interesting talk or entertaining concert a valve or battery packed up—if you had equipped yourself with a Phonotrap you could at least continue to listen with the

telephone receivers so long as the station in question was one of the locals.

Again, it often happens that there are people in the room who do not want to

### WHAT IS WANTED

- 1 .00075-mfd. solid dielectric condenser (Ready Radio, Polar, Telsen).
- 1 Single-pole change-over switch (Wearite, type I.11).
- 1 Paxolin former, 3-in. diameter, 3½ in. long.
- Pieces of ½ in. plywood, as shown in diagrams.
- 1 Crystal detector (Red Diamond, semi-permanent type).
- 5 Indicating terminals (Belling Lee type B, Igranic, Bulgin, Clix, Eelex).
- 2 Mounting brackets.
- 4 oz. No. 26 D.S.C. wire.
- 1 Crocodile clip (Goltone, Bulgin).
- Glazite, Lacoline, Soldawyre, Quickwyre, etc.
- Flex, screws, etc.

listen to the radio. They needn't, but you can—on the Phonotrap.

On other occasions you will find the "trapping" powers of the little unit handy,

for there are very few sets indeed so selective that they cannot sometimes be usefully assisted by a first-class wave-trap.

The Phonotrap is designed in a form suitable for fixing on the wall, although there are no reasons why it should not be stood on the table at the side of or behind the set if desired.

It is easy to assemble and the parts do not cost more than a few shillings.

A single-pole double-throw type of switch is needed, and it is important that it should have an "off" position where the "central" point does not make contact with either of the others.

### Easily Constructed Coils.

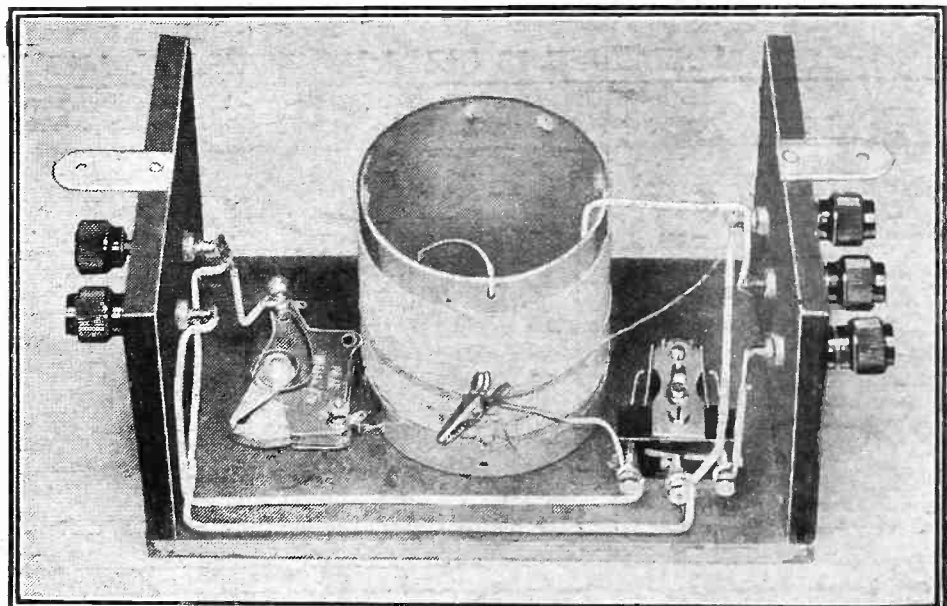
It is only a few switches which provide this "off" position and the average push-pull type will be quite unsuitable.

The coil is wound on a three-inch diameter former, and only about an eighth of an inch should separate the two windings.

The one winding comprises a straight-forward fifty turns and the other thirty-five with tappings at 15, 20, and 25. They should be wound in the same direction. You make the tappings merely by twisting small loops

(Continued on next page.)

### A MODERN USE FOR CRYSTAL DETECTORS



The Phonotrap is an insurance against both interference and set failures. It costs nothing to run, and will last a lifetime.





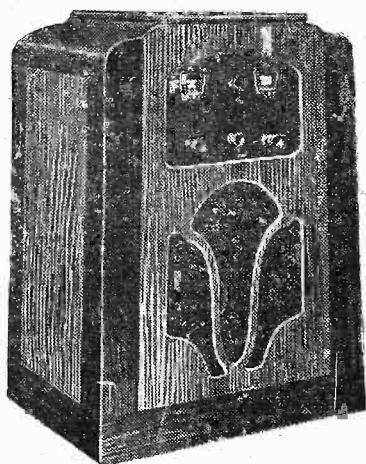
# The most efficient all-wave set ever designed

## Ready Radio METEOR III

Still bringing radio from America, Africa, Australia, into countless homes

Listeners all over the country tune in America, Australia, Africa, and other distant countries, as well as Home and Continental programmes, night after night, on the Meteor III. The Meteor III can justly be claimed as the most efficient all-wave set ever designed. Files of testimonials from more than satisfied constructors are open for inspection at our offices.

Ask your radio dealer for your free Meteor Folder!



### METEOR Console Cabinet Model

Complete Kit with Console Cabinet, as illustrated, to house set, speaker and batteries

**£5:0:0**

or 11/- down and 9 monthly payments of 11/-

### METEOR III KIT

Complete set of quality components including panel (cut and drilled), baseboard, Jiffilinx, flex, screws, plugs, etc.

**75/-**

or 9/- down and 7 monthly payments of 10/6

### METEOR Standard Cabinet Model

Complete Kit with Standard Cabinet to house set only

**89/6**

or 11/- down and 8 monthly payments of 11/-

Note these special features of the Meteor—18 to 1 Slow-Motion Control on both tuning and reaction; Extended anti-capacity reaction drive; Adjustable selectivity; Kendall loose-coupled air-spaced coils; Radio-gram Switching; R.I. Transformer; Graham-Farish and Lewcos Resistances; Condensers by T.C.C. No soldering, no cutting, no drilling—a screwdriver and pliers are the only tools you need. All the necessary wires, flex, screws, plugs, etc., are included in the Meteor Kit. Mullard Valves are recommended by the designer.



Mr. G. P. Kendall, B.Sc.,  
the famous designer of  
the METEOR III

### Choice of Recommended Accessories

#### Mullard Valves

1—P.M.2 DX	7 0
1—P.M.1 L.F.	7 0
1—P.M.2	8 9

#### Batteries

Pertrix 120 v. Super capacity	1 5 6
or	
Pertrix 120 v. Standard	15 6
or	
Pertrix 9 v. G.B.	1 3
or	
Ever Ready 9 v. G.B.	1 0

#### Accumulator

Fuller 2 v. 20 amp. type S.W.X.H.7	10 9
------------------------------------	------

#### Loudspeaker Chassis

R & A type 40 Reproducer	16 6
--------------------------	------

#### Gramophone Pick-Up

ReadiRad	1 7 6
----------	-------

#### Volume Control

ReadiRad .5 meg.	5 9
------------------	-----

#### Gramophone Motor

Collaro Type B.30 with Unit Plate and Automatic Stop	1 13 0
------------------------------------------------------	--------

# FREE

Name.....

Address.....

P.W. 30/4/32. BLOCK LETTERS—IN INK PLEASE

Ask your radio dealer for your FREE Meteor Folder. If he is out of stock, post coupon now to: Ready Radio Ltd., Eastnor House, Blackheath, S.E.3. If you also include four 1d. stamps, we will send you Mr. Kendall's latest book entitled "Ten Hows for Modern Radio Constructors." Packed full of useful information.

To READY RADIO LTD., Eastnor House, Blackheath, S.E.3.

Please dispatch to me the following goods.....

(a) I enclose (Cross out item not for which (b) I will pay on delivery (c) I enclose first deposit of applicable) £

NAME.....

ADDRESS.....

All Cash Orders of 10/- or over, post free. P.W. 30/4/32

**"P.W." OFFICIAL EXHIBITORS SELL READY RADIO KITS**

## FROM THE TECHNICAL EDITOR'S NOTE BOOK.



# Tested and Found-?

of doing all the ordinary jobs with complete effectiveness.

## GOOD WOODWORK.

Picketts are maintaining their standard of excellence, I am glad to note, from their latest Piano-Tone radiogram cabinet, a sample of which reached us some few weeks ago.

I am glad for personal reasons, because good craftsmanship is so satisfying to anyone with the slightest shred of artistic fibre in their make-ups. And in nothing but wood do you get such a complete presentation of craftsmanship pure and simple—or, at least, that is my opinion.

In a world in which so much of what we see and use is the result of duplication by machines, it is refreshing just to look upon a piece of work which has been fashioned by the cunning hands of the skilled craftsman. And I should feel grateful if I could think that my ideas were widely shared.

But to revert to the Picketts Cabinet. As no doubt I have plainly indicated, I consider this to be a fine example of cabinet craftsmanship, although I must admit I can assess such things only as an ordinary user. I am not an expert in joinery and carpentry, but I think I can discriminate fairly well between the finished products of these crafts!

## A FINE CABINET



Messrs. Picketts' excellent radiogram cabinet.

## POPULAR PRODUCTS.

USUALLY at this time of the year I find it fairly easy to keep pace with the apparatus sent in for test. But I do not seem to be able to work off my arrears this year.

Maybe there are more items sent in; alternatively, those which are may be of greater individual interest and necessitate longer reports. I haven't gone into the matter deeply, and I only refer to it in order to reassure those traders who have been anxiously waiting for their products to be reviewed that no one is forgotten, and all will have their turn.

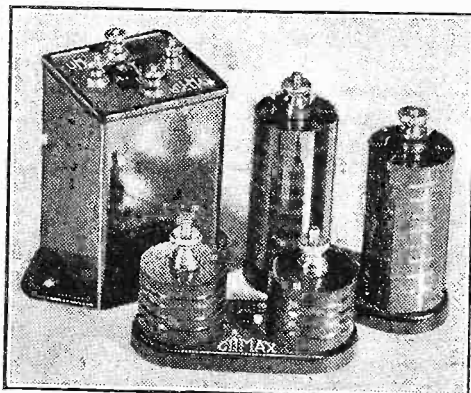
And now to business. I have three components from Climax. First of all, there is the "Mu-Max" L.F. Transformer, a workmanlike article having a 1-3.5 ratio, and selling at 5s. 6d.

It has a nickel-iron core, but can carry up to 2.5 m/a, which is rather more than the anode current found in the average detector circuit. Its inductance of 30 henries places it above quite a few of the other inexpensive transformers. And in use, within its limitations, it gives satisfactory results.

The Climax Binocular H.F. Choke is in the "de luxe" class, though its price, 6s. 6d., is not by any means forbidding. With a high inductance and an exceptionally low self-capacity, it can safely be recommended for the most critical tasks H.F. chokes have to perform.

The Bijou Climax H.F. Choke is a more "popular" model. This lists at 3s. 6d., and though, of course, it isn't equal in efficiency to the more expensive model, it is capable

## THREE CLIMAX COMPONENTS



The Climax "Mu-Max" L.F. Transformer and Bijou and Binocular H.F. Chokes.

## SAFE AND SOUND.

There is a great deal to be said for an air-dielectric differential reaction condenser, and not much for many of those which use solid dielectrics. That is from a technical point of view. On the score of cost the solid-dielectric has a big advantage.

But with the Polar Low-Loss Air-Dielectric type before me as I write, I cannot help thinking that it will not suffer greatly by this price disparity.

It costs 5s., but it does render the employment of a safety fixed condenser quite unnecessary as a precaution against H.T. short circuits, and that is something very tangible to add to its credit account.

Also, it is an excellently made component, and it has a beautifully smooth action.

For tasks where high electrical efficiency is demanded, such as, for instance, tuned circuit volume control and selectivity adjustment "bridges," it is almost indispensable, for air is the only dielectric which can be unreservedly trusted!

## PLEASE NOTE.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock and that we cannot, in any circumstances, undertake to return them, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

And readers should note that the subsequent reports appearing on this page are intended as guides to buyers and are, therefore, framed up in a readily readable manner, free from technicalities unnecessary for that immediate purpose.

## THE "PIX."

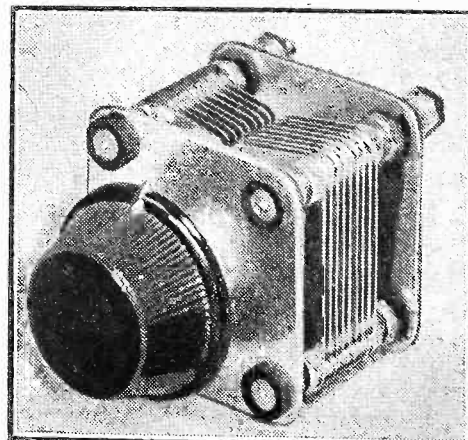
Nearly every listener I meet these days asks "What do you think of the Pix?" And they seem quite surprised at my brief answer: "Quite O.K., well worth trying if your set isn't sufficiently selective," for many seem suspicious of its claims. But they need not be, for one of the widest-used arrangements for improving selectivity is a series aerial condenser, and the Pix is a variable condenser of a convenient form for the purpose, available at a price below that of any ordinary condenser.

So that "quite O.K." is, in fact, quite a modest appraisal of its virtues.

It is of tubular construction, and has a terminal at each end, to one of which you connect the aerial lead-in and to the other a short piece of wire for joining to the aerial terminal of the set.

By pulling in and pushing out the tubular section of the article you can vary selectivity, while an excellent pre-detector volume control is also afforded. And in cases, when a high-capacity aerial is employed, it may often happen that improved sensitivity actually results.

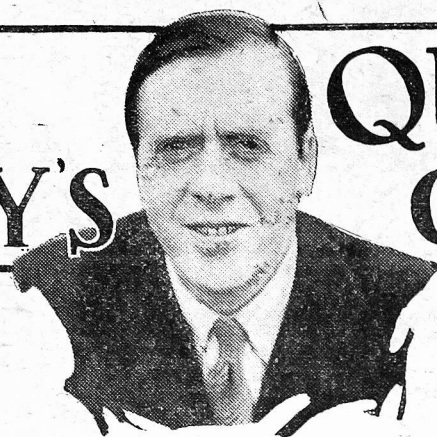
## A LOW-LOSS CONDENSER



The Polar Air-Dielectric Differential Condenser.



# CAPT. ECKERSLEY'S QUERY CORNER



Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

## That New Aerial.

B. B. (Stratford).—"I am about to erect a new aerial—there are two possible positions for same. In one case the aerial will be approximately 40 feet high with a "roof" portion of 40 feet—in the other case the aerial will be practically vertical, without any 'roof,' clear of all obstruction, and with an average height of 50 feet. Which would you imagine will give me the best results for use on the medium broadcast waveband?"

I do not think there will be much to choose between them. Its effective height you want. The vertical wire will have an effective height of about  $50 \times 0.5 = 25$ . The other about  $40 \times 0.66 = 26.4$ .

No! It doesn't matter. Particularly for reception where an ounce of valve gain is worth a pound of effective aerial height.

## Why "Transformer"?

B. W. (Hanwell).—"I should be pleased to know exactly why an L.F. transformer is known by this name. So far as I am aware the function of this component is to amplify and therefore the name seems misleading."

You cannot amplify by means of a transformer if by amplify you mean increase power. If I have 10 watts of energy given me I cannot by any conceivable means make this into 20 watts without adding another 10 watts.

True, a transformer may amplify volts; you can put 2 A.C. volts into a primary and get 200 A.C. volts from the secondary. But volts by themselves do not represent power.

If I put in 2 volts and 2 amps into the primary (in phase) I put in 4 watts. If I had a 100 per cent. efficient transformer I should have 200 volts at the secondary, but only  $\frac{1}{50}$  ampere, because  $200 \times \frac{1}{50}$  (secondary power)  $= 2 \times 2$  (primary power)  $= 4$  watts.

So I may have amplified volts by the transformer, but I have proportionately decreased the amps.

Of course, when you do not use power (appreciably) as in a low-frequency amplifier transformer you do get an apparent gain because, say, 2 volts 0 amps from one valve may be made into 6 volts input to the grid of the next valve (suitable negative being applied).

But eventually my loudspeaker demands power, and if the aerial power is 1 milliwatt and the loudspeaker wants 500 milliwatts, we've got to use amplifiers—no transformer would ever help.

So the transformer transforms the form of energy, not its magnitude. It may amplify volts or amps, but never both together.

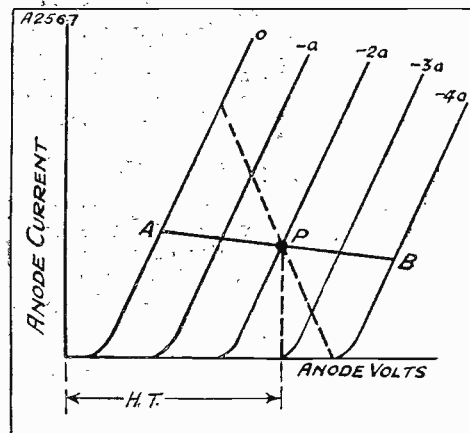
## When the Milliammeter Kicks Up.

E. T. (Cricklewood).—"The last valve in my receiver is a P.X.4. I find that the needle of a milliammeter connected in the plate circuit always kicks upwards."

"I have varied the grid bias as much as I dare, but cannot cure the meter kicking, which occurs even with very moderate volume. Can you suggest any other procedure?"

I can best explain this by the usual anode current/anode volts diagram. Let the figure

## A QUESTION OF IMPEDANCE



This sketch illustrates how a high anode impedance prevents bottom bending, as explained in the reply to E. T. of Cricklewood.

represent the usual scale the anode current along the vertical axis, and the anode volts along the horizontal axis, and let the curves be for various values of grid negative: O—(-a) (-2a) (-3a), etc.

Now suppose you have a value of grid negative (-2a) before you modulate and an H.T. volts = H.T.

Now suppose your anode impedance is such that on range from -2a to 0 to -4a the anode/current anode/volts are suc-

cisively represented by the dotted line passing through P. There is more current on the one sweep of grid voltage than on the other.

But if you increase the anode impedance the curve will be as A P B, and the current increase in the positive grid voltage sweep will equal the current decrease on the negative voltage sweep.

By increasing the anode impedance you stop bottom bending, as it is called or, as I should say, you keep the load line (A P B) symmetrical. The slope of this line is proportional to the anode impedance.

Note if you move P with a steep load-line (i.e. change your grid voltage but keep an insufficient anode impedance) you always make one half of the line longer than the other, and so the grid sweeps always make the anode current milliammeter kick upwards. Try and increase your anode impedance.

## A Queer Case!

B. M. R. (Barnet).—"Some time ago I constructed a portable receiver, the aerial being wound around the wooden framework of the set, and this then being mounted inside a metal attaché case. No results at all could be obtained with this set until it was removed from the case, when the performance was excellent."

"I should be pleased if you could explain this, as I have always understood that there is no reason why a coil should not be placed in a screening box. And, after all, surely a frame aerial is a tuning coil?"

The essential of wireless reception is some form of aerial. An aerial is an unshielded conductor stuck out from the set to pick up the ether wave energy radiated from the transmitting station.

If the aerial is metallically shielded the waves cannot penetrate the shield, and the aerial is useless. An inside aerial in a steel frame building is frequently useless for picking up the energy from the waves, because it is shielded. Thus, the aerial must be exposed and unshielded.

The aerial in a portable set is a wire wound round, and round a framework. This frame aerial is, however, exposed to the waves.

Just like any other aerial, it must not be shielded. You have shielded your aerial.

An inductance coil in a set can be shielded—sometimes must be shielded—because it does not pick up waves. Its function is to be tuned and present a different impedance for different frequencies.

ONLY IN "P.W."  
can you read Capt. Eckersley's  
replies to listeners' own problems.  
AND REMEMBER—  
Captain Eckersley's technical articles  
appear only in  
"POPULAR WIRELESS"  
and "MODERN WIRELESS."



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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every case will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be taken with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, 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.

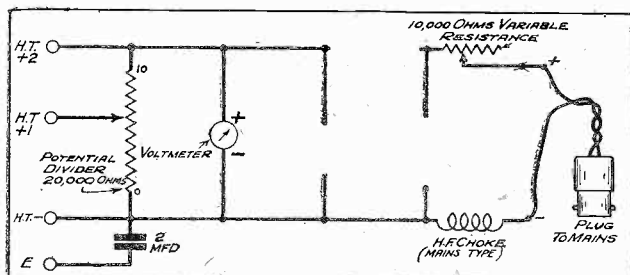
## QUESTIONS AND ANSWERS

### HINTS ON SHORT WAVES.

"JASON" (South Croydon).—"I am told that the 'Leviathan' and various other big ships can sometimes be heard on the short waves, but I have never been lucky enough to strike one of these. Could you tell me more or less the wave-lengths which are likely to be used?"

There are four different wave-lengths used by this class of vessel on the short waves: 17.05 metres; 22.68 metres; 33.95 metres; and 71.82 metres.

### MISSING LINKS, No. 33 A D.C. MAINS UNIT.



This is a simple unit for deriving H.T. from D.C. mains, but three of the "components" have been omitted. Can you fill them in correctly? LOOK OUT FOR THE ANSWERING DIAGRAM NEXT WEEK.

### ANSWERS TO "MODERATORS."

L. E. (Nottingham).—No. With that set it should be quite unnecessary to moderate, and the fault that is causing your non-selectivity would not be improved by adding a moderator coil and condenser. Your best plan is to write to the makers, asking what they can suggest—possibly they know from experience an easy cure which does not involve altering the circuit.

L. B. (Deptford).—We shouldn't bother with the Selector, but just "moderate" as explained elsewhere in these columns.

D. F. G. R. (Streatham).—No advantage, as selectivity is adequately catered for already in that circuit.

### PROBABLY THE RESISTANCE.

F. O. P. (Stafford).—"When the article on the 'Eckersley' Three was published in

'P.W.' I was using something pretty good in the detector and two L.F. line. But the description made me feel dissatisfied, and it seemed to me that the new set was just what I wanted.

"So I put it up from the how-to-make-it details in the second article, and it delivered the goods in fine style. Plenty of foreign stations every night and, what was more, no trouble at all between any one and the next one when once the handling is mastered.

"It opened my eyes as to what can be done in the way of separating stations with only a three-valve set, and even when the 'Cosmic' came along I felt I did not want to change my 'Eckersley' Three for a time, anyway.

"But now I have come across a fault in it which I cannot trace. Can you help me to decide where to look for it?"

"The symptoms are that between one week-end and the next all the strength seems to go from the set. The North Regional was only about half strength, and some of the foreigners which I had heard easily and clearly on the loud-speaker were now so weak that they were not worth listening for.

"Long waves were just as bad as medium, and instead of getting six or seven stations above 1,000 easily, almost any evening, I found I was confined to 5 X X. So far as I

could see nothing had been altered on the set at all, nor on the aerial nor earth nor anything like that.

"Being worried about it, I got a chap to come in and look at it, and he knows a good bit about wireless, and suggested that I should take the aerial to the second coil on the tuner instead of the first.

"To my astonishment this change-over seemed to put it right, for everything came out

successful and everything got back to full strength again. Naturally I could only tune on the second condenser instead of on both, but although strength is now good, the snag is that I have lost that marvellous selectivity.

"With this altered arrangement the loud programmes 'overlap,' and I feel I am not using the tuner as it should be used. What would be likely to be the matter with this, and what is the best way to put it right?"

If a careful examination of the wiring of the unit shows that it is intact and has not received accidental damage in some way, we should suspect that the coupling-resistance has become faulty. This would certainly be rather an unusual fault, as such a resistance should last indefinitely, the current it being required to carry being very small. But if a fault does develop in a resistance, the symptoms are exactly as you describe.

So it would be well worth trying to see if this is the cause of the trouble. All you have to do is to fix a high resistance of very roughly the same value (that is anything from, say, 50,000 to 250,000 ohms) in the place of the present resistance.

## HOW ARE YOUR RESULTS NOW?

Perhaps the switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

Full details, including 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 to have 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.

Possibly the connecting of this in parallel with the original resistance would cure the fault. Or it may be necessary to undo the present resistance and place another (such as a low-value grid leak) in its place.

You will find that if you use a low resistance, such as a low-value grid leak, in place of the original resistance, projecting through the hole in the screen, you get a little extra strength but some of the selectivity is lost, so it might be just as well to experiment with several resistances before finally wiring up the new arrangement.

### USING A DUAL-RANGE COIL UNIT.

J. R. (Cricklewood).—"I have a dual-range aerial coil (Telsen), and would like to try this in the 'Comet' Three if this is possible, and should be glad if you would advise me through 'P.W.' how to wire it up."

The aerial lead which went to the .001-mfd. max compression condenser now goes to either 1 or 2 on the dual-range unit. The .002-mfd. max. type of compression condenser that was formerly joined to the .0005-mfd. tuning condenser is not now required, and can be removed and at the same time the wiring to the fixed plates of the differential reaction condenser and to the three-point switch can be disconnected, and joined up as follows:

One of the contacts on the three-point switch goes to No. 4 terminal on the unit. Another contact on the three-point switch goes to No. 3 on the unit.

The remaining contact on the switch goes to earth, to one side of the differential reaction condenser fixed plates (F2), to the moving vanes on the .0005

(Continued on page 230.)

### "P.W." PANEL, No. 69. WAVE-CHANGE SWITCHES.

The choice of a wave-change switch is always a matter of importance, as any inefficiency here will reduce results permanently.

Be sure to purchase the correct type of switch—there are many kinds, apparently similar, which are not interchangeable.

In general, a strong positive "click" is desirable as indicating good contact. And the switch points should be of the type kept clean and bright by use. Other advantages to watch for are well-spaced contacts, strong terminals, and easy and efficient panel-mounting.





**12<sup>1</sup>/<sub>6</sub>**

**5<sup>1</sup>/<sub>6</sub>**

## *The Mighty Lissen Power Pentode and the Lively Lissen Detector*

You can use these valves in any set with one stage of L.F. amplification and get better results from your set than ever the original designer dreamed of. The lively Lissen Detector Valve brings in the foreigners like magic. It adds amazingly to the range of any receiver. The Lissen Power Pentode, whose magnification factor is more than 90, gives volume such as you have never heard before. Many more stations, and all loud and clear, crisp and enjoyable to listen to—that is what these two valves give you.

### **LISSEN P.T. 225**

The Lissen Power Pentode Valve—P.T.225—converts any set with one stage of L.F. amplification into a fine, full-volume "Pentode-output" receiver. This valve puts new power into your loud-speaker, and new brilliance of tone, too. Use it instead of a power valve and at once you get an amazing step-up in volume. And it takes no more current than the power valve it replaces—its H.T. consumption is only 7 m/A.

Ask for Lissen P.T.225. Price

**12<sup>1</sup>/<sub>6</sub>**

### **LISSEN H.L.210**

The Lissen Detector Valve—H.L.210—liven up your tuning, gives you extra range, greater sensitivity. It is so responsive that it brings the foreign stations in like magic. Not only this, but it passes a crisper, more powerful signal on to the L.F. stage of your receiver, and you get louder, clearer radio altogether.

Ask for Lissen H.L.210. Price

**5<sup>1</sup>/<sub>6</sub>**

# **LISSEN VALVES**

*A Brilliant British Best!*

**LISSEN LIMITED    WORPLE ROAD    ISLEWORTH    MIDDLESEX**

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 228.)

tuning condenser, to Nos. 6 and 7 on the coil unit, and to L.T. — filament, grid bias + etc. as before.

The other fixed vanes of the differential reaction condenser should be connected to No. 5 on the unit. Finally, the fixed plates of the 0005-mfd. tuning condenser and the 0003-mfd. grid condenser, which are joined together, should be taken also to the No. 8 terminal on the coil unit, and this completes the wiring.

### THE EFFECT OF HEAT ON A RESISTANCE.

S. L. J. (Morpeth).—"I had often noticed that a resistance tended to get a little warm when current is passing through it, but I did not know before to-day that the value of a resistance increases with its temperature. Is this always the case?"

All ordinary resistances increase with an increasing temperature, and conversely at very, very low temperatures all resistances become more conductive. It is thought that if metals were brought to a temperature of absolute zero, they would prove to have no electrical resistance at all, but such a condition has not yet been obtained in practice.

### MODERATING "THIS YEAR'S TITAN."

B. A. (London, N.10) asks how medium-wave selectivity can be improved on "This Year's Titan." As there appears to be a large number of other readers requiring the same information, the wiring for this is given below:

At present aerial goes via switch  $S_2$  and  $C_2$  to A terminal on the coil unit, and this is joined by a flex to one of the tappings on the coil.

The moderator coil and condenser are inserted between this flex and the rest of the circuit, so undo the flex from its coil winding terminal or socket (leaving one end of it still joined to A) and join this flex to one end of the moderator coil, and to one side of the moderator condenser.

The other side of the moderator condenser goes to one of the S terminals on the coil unit—that terminal which is nearer to the tapped end. If you cannot see which is this end, try it first on one and then on the other S terminal when the rest of the wiring is complete.

Now join the other "end" of the moderator coil to the tapping on that unit which was formerly carrying the flex (aerial) connection from A terminal.

The arrangement will result in a very great increase in selectivity when operated as already explained in the moderating articles.

## TECHNICAL TWISTERS

No. 111

### THE ECKERSLEY TUNER CAN YOU FILL IN THE MISSING LETTERS?

In principle the Eckersley Tuner consists of two sharply tuned circuits coupled through a . . . . .

The first of these circuits is fed through a . . . . . aerial condenser which governs selectivity, and the setting of this condenser therefore affects the . . . . . of the first circuit.

In size the two coils are unusually . . . . . and to prevent unwanted coupling they are separated by a . . . . .

The overall selectivity is very high, and the second circuit is not affected by other adjustments, so it is usual to . . . . . the tuner's second circuit and not the first.

Last week's missing words (in order) were: Longer, smaller, maintained, deteriorate, charging.

## THE LISTENER'S NOTEBOOK

(Continued from page 220.)

There was a tremendous puff for England, as a holiday resort, in a recent Copenhagen Sunday morning programme. I was expecting to hear a talk about Gladstone, but instead, a Dane, who evidently knows his England well, went into ecstasies over our countryside, and urged his fellow-countrymen to take a holiday here. He particularly emphasised that such a holiday meant little of London, or such places as Oxford. His praise of our villages and inns rivalled even S. P. B. Mais at his best.

I sympathise with those long-suffering listeners who, for geographical reasons, are forced to listen to the London Regional's programme of music night after night. No

### YOUR BIT TOWARDS ECONOMY

Have you ever thought how difficult it is for a newsagent to order just the right number of copies of any particular paper each week?

You can make his task much easier if you place a regular order with him. You will not only help him to order correctly and avoid waste, but you will make sure of getting your copy regularly each week.

wonder some of them are crying out for Chess talks! Their preference for such is probably because these would be given in the real spirit of the game, and would not take as long. Anything for a respite from music, music and music, they say.

I wouldn't dare to question Evelyn Scotney's claim to international fame as a soprano, but when one cannot tell whether she is singing "I heard a Piper Singing," or "Nel Quest'Occhi" (for I know the music of neither song), it makes one wonder why patrons of celebrity concerts don't insist more on hearing the words as well as the tunes.

Professor James Ritchie's first of his new series of Nature talks augured well for the future. Both matter and manner combined perfectly to produce a talk of exceptional interest. No less pleasing was the professor's delightful touch of humour which he introduced into his remarks.

What was the big idea behind "Arrest in Africa"? "Geography as she is taught" do I hear you say? Perhaps you are right, for I couldn't see anything else. There was certainly no story in it, although one was always threatening to develop. There were, I confess, one or two good songs, and once again the effects department had a real good time, particularly in "the wild and terrible din of the jungle's" scenes. The train, of course, came out again—this time in Nairobi.

Mr. E. L. Watson's talk on "Singing Mice and Other Small Deer" was in point of fact, a discourse on a singing shrew and almost every conceivable small bird to be seen in Britain. Why this title, then? And the title itself is intriguing. Do singing mice and small deer belong to the same genus of animals? I'm no naturalist, but I've my doubts about it.

## THE EARTH "WAR"

(Continued from page 219.)

so hard-wearing and is more expensive, and of course, the bigger the sheet the better. A biscuit tin, copper tube, or something similar is usually equally effective. If possible the earth plate should be buried directly underneath the aerial lead-in. This will ensure the earth wire being as short as possible, and conform to the wireless requirements of the aerial system.

For instance, the aerial system can be regarded as a condenser; the aerial itself forms one plate of the condenser, the air is the dielectric, as with an ordinary air condenser, and the ground, particularly that immediately below the aerial, is the other plate of the condenser. Thus, the nearer the earth connection is to the ground immediately below the aerial the more effective will be the wireless set.

### Those Dry Earths.

Some people complain that their buried earth is not so good as the water pipe, although they may have buried quite an elaborate affair. This is generally because the soil in which they have buried the plate is of a particularly dry and insulating nature. Some parts of the earth's crust are quite good insulators, and this insulation is increased if the ground is dry. Wetting the earth will cure the trouble, and if possible the earth plate should not be buried under the eaves or porch of a house, but in the open where it will receive plenty of rain. In sensitive sets, by the way, a long earth wire will tend to cause oscillation, but it is better to have a long earth wire rather than an "earth" buried in dry soil.

The type of ground upon which the house is built is, of course, very important from the wireless earth point of view. For example, Zenneck's theoretical calculation shows that the particular wireless waves which will travel for 700 miles over wet soil will only travel for 55 miles over very dry soil.

### Counterpoise Connections.

In a similar way this applies to the "earth," for dry ground offers much greater resistance to the oscillatory currents in the aerial circuit than does damp ground.

Of course, a connection to the earth is not altogether necessary. Aeroplanes manage without it by using the system known as the counterpoise.

To use a counterpoise it is only necessary to run another aerial wire along the ground or floor and connect it to the earth terminal on the set. The best results are usually obtained when the counterpoise aerial is immediately below the ordinary aerial, provided the latter is fairly high up. The counterpoise principle is also useful sometimes for cutting out bad electrical interference.

Then, of course, there is always the loop or frame aerial to fall back upon should the worst come to the worst. But this is hardly likely, for investigation will undoubtedly show the water companies the error of their ways, for there can be no serious harm to the water-pipe if reasonable care is taken. At the same time it is an ill wind that blows nobody any good, and if the water companies' attitude makes us bury our "earths," or even pay more attention to them, then the "war" has done some good after all.



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# PLAYER'S



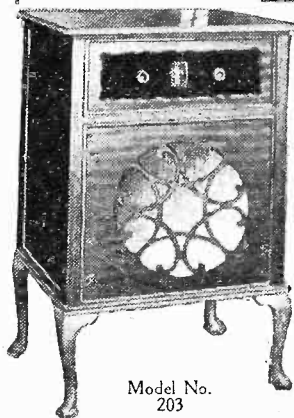
Smokers make doubly sure by getting Quality and Quantity in the Cigarettes



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Model No. 203

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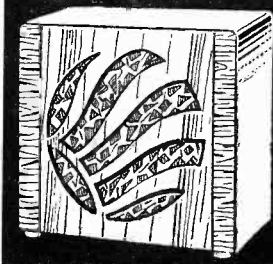
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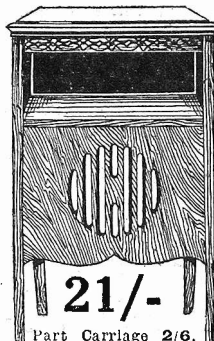
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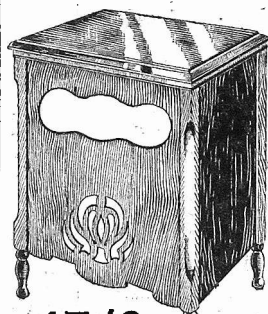
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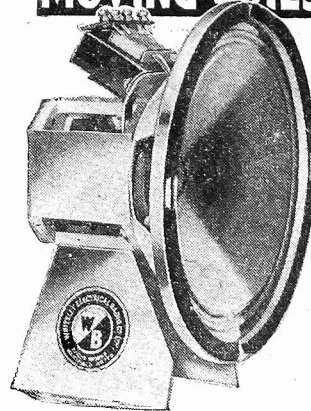
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## TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

### Mains Power Valves.

I AM often asked about mains power valves with directly-heated filaments as compared with those having the popular indirectly-heated type of cathode. Some readers seem to think that the indirectly-heated type gives less hum and noise, but in actual practice I think that the directly-heated type has been so improved that really there is not much to choose between the two. The directly-heated type of power valve uses a thick filament, and this goes a long way towards levelling out the electrical variations which would cause a hum.

The electrical connections I have mentioned in these Notes some little time back, so I need not refer to those again. As regards the indirectly-heated type, it is obvious that this, if properly constructed, should cause very little hum; and, in point of fact, the better types of these valves now on the market are remarkably efficient in this respect.

### Background Noises.

Of course, I do not think it is fair to say that a mains-driven receiver is ever *quite* as free from background as a battery-driven one—I mean, naturally, when the batteries are in proper condition and there is no crackling and so on, due to run-down or defective batteries. It is not so long ago that the background of hum with an A.C. receiver (or a D.C. one, for that matter) was quite pronounced, but nowadays this has been smoothed-out so as to be almost imperceptible.

Theoretically the current supply from the A.C. can never be quite as smooth as that from a battery, but what really matters in actual practice is whether any remaining hum is perceptible; if it isn't, then the mains-driven set can be regarded as perfect from this point of view.

There is another point I should like to mention about directly-heated and indirectly-heated mains valves, and that is the question of their relative characteristics. You will often find that the anode-current/grid-bias characteristic of the indirectly-heated valve is more curved than the corresponding characteristic for the directly-heated type.

This means that if we take two valves representing these two classes and having the same impedance and the same amplification factors, there will be a difference in the maximum power output, the directly-heated type, other things being equal, actually having a greater possible power output.

### Pick-up Adjustments.

I don't know whether you've noticed that pick-ups are not always properly adjusted as regards the position of the armature and needle. I was examining a pick-up the other day which was very badly out of

adjustment in this respect, the armature being quite to one side, so that it was much more inclined to move in one direction than in the other when vibrating.

I have not used this particular pick-up long enough to know what its effect on records may be, but one would imagine that, inasmuch as the track on the record is fairly symmetrical about the mean line, this lopsided pick-up would tend to damage the track on that side on which the needle was difficult to move. It is worth while to overhaul your pick-up from time to time to make sure that the movement is quite free and that the mean position of the armature is really the geometrical mean position. At the same time, you should make certain that the armature is quite free to move and that no dirt has become lodged in such a position as to obstruct it.

### Needle Clearance.

When the pick-up is enclosed in a metal or bakelite cover, as many pick-ups are to-day, you might think that this question of the entry of dust would not arise, but as a matter of fact it is just in those cases that I have found the danger to be greatest.

In one pick-up in particular which I use frequently the needle-holder emerges through the metal cover with an extremely small clearance around it, and more than once I have found this clogged up with fluff, presumably due to particles of hair and dust being thrown up from the record and possibly also due to occasional wiping over of the pick-up and adjacent parts with a duster.

### Low Frequency Oscillation.

Talking about pick-ups, by the way, you will often find that a high-pitched whistle is produced when you touch any part of the pick-up; sometimes, curiously enough, this whistle occurs when you do *not* touch the pick-up, and ceases or is reduced when you touch it. This kind of thing doesn't usually happen in a commercially built radiogram, but is more likely to happen in a home-made or experimental layout, and particularly where long leads run from the pick-up to the amplifier.

It can usually be entirely overcome by connecting an earth wire to the metal cover or to some integral metal part of the pick-up. A convenient way of doing this is to connect the pick-up electrically to the tone-arm or pick-up arm, the latter being in turn connected to earth.

### Whistling Pick-ups.

Even if the whistle is only slight, or is not noticed at all, it is still well worth while trying the earthing dodge mentioned above, because you may be getting distortion without the actual interference of the whistle. A properly earthed pick-up is very much easier to handle and much more stable in operation.

Incidentally, the pick-up leads should never be any longer than can possibly be helped, and, if the tendency to oscillation is very bad, it may even be necessary to wind a piece of earth wire around the pick-up leads so as to form a rough shield, or to use metal-sheathed flex, as is done in many commercial radiograms. Remember, however, that the pick-up is in the grid circuit, and earthing and shielding here (as elsewhere in the circuit) means a certain loss in sensitivity, so you should not go to the other extreme and overdo things.

(Continued on next page.)

## TECHNICAL NOTES

(Continued from previous page.)

### Troublesome Switches.

What a lot of trouble can be caused by an insignificant little component like an on-and-off switch! Many switches in use to-day have a blade or plunger which can turn on its own axis: that is, if you turn the knob, you turn the plunger at the same time. If there is the slightest particle of dirt or grit between the plunger or the leaves you get all sorts of crackling when the switch is touched.

A week ago I had a lot of trouble with a set, not owing to crackling so much as owing to the set sometimes going completely off. Of course, the switch was suspected, but as soon as it was examined it behaved itself perfectly, and in that way disarmed suspicion!

After endless trouble with different parts of the receiver, including frequent examination of the fuse (it was a mains-operated set), I came to the conclusion that it must be the switch, and on taking this out and readjusting it the set worked perfectly, and there was no further trouble.

It seems rather ridiculous that all this annoyance can be caused by what ought to be a simple, straightforward component like an on-and-off switch. Some makers are now putting out switches in which the actual plunger is not cylindrical, and cannot rotate. This design strikes me as much better.

Certainly it seems that when you fit a simple thing like a switch you ought not to have to worry as to whether it will do its job or not.

### Radio in Industry.

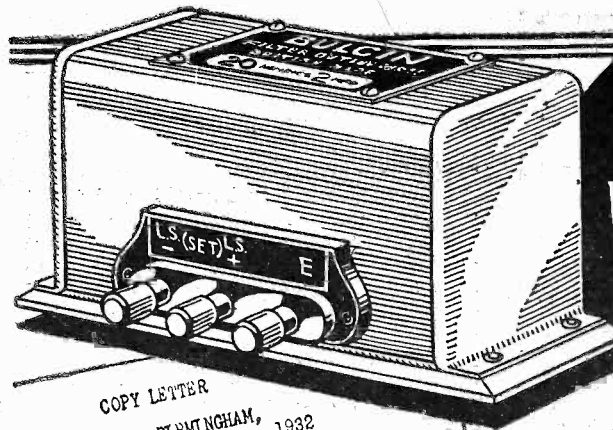
I daresay that you know that high-frequency alternating currents—often produced by valve oscillators—are used for an increasing number of industrial and other purposes, altogether apart from their uses in radio. One of the best known of these uses is in the small electric furnace.

An interesting development in this connection has recently been made in connection with the hardening of steel. It has been known for a long time that if steel is treated in certain ways with nitrogen, so that the surface layers of the steel form a compound with the nitrogen, the steel is case-hardened.

The methods which have hitherto been used, however, only produced an extremely thin case-hardened skin. It has now been found that by the use of high-frequency oscillations during the nitrogen treatment, the nitrogen can be made to penetrate to a skin depth of as much as 20 to 30 times as great as the former process.

So that although the steel is still

(Continued on next page.)



**Greater  
Volume &  
Purity**

COPY LETTER  
BIRMINGHAM,  
12th February, 1932  
Messrs. A. F. Bulgin & Co., Ltd.,  
Abbey Road,  
Barking, Essex.

Gentlemen,  
With reference to the Choke and Condenser, which you supplied a few days since, the results are so excellent and the improvement in the tone of the loudspeaker so marked, that I feel it is only right that I should communicate my thanks.

My speaker is a large cone, and since the introduction of your Choke and Condenser, the quality is equal to the best moving coil speaker that I have ever heard.

I am, Gentlemen,  
Yours faithfully,

A new Combined Filter Choke and Condenser which can be fitted IN 3 MINUTES between receiver and loudspeaker. Made with heavy core and windings so essential for modern valves.

BULGIN ALONE GIVES ENTIRE SATISFACTION. AS THIS REMARKABLE TESTIMONY TESTIFIES. ORIGINAL MAY BE INSPECTED.

Send 2d. postage for 75 pp. Catalogue giving full details.

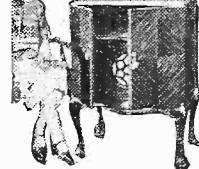
No. L.F.9.  
**17/6**  
COMPLETE



**A. F. BULGIN & CO. LTD.**  
Abbey Road, Barking, Essex.  
Telephones: Grange Wood 3266 & 3267.  
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METEOR 3 KIT	£3/15	6/10	11 of 6/10
EXIDE H.T. Accum., 120v.	£3	6/-	9 of 6/8
BLUE SPOT 66R & CHASSIS	£2/2/6	5/6	9 of 4/5
BLUE SPOT 100 U	39/6	5/8	7 of 5/4
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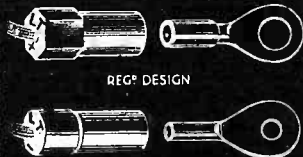
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**SUNDAY GRAPHIC**  
and Sunday News



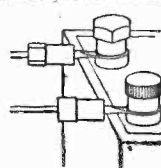
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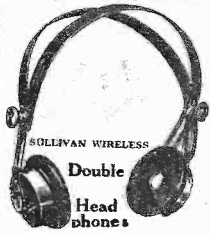
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**9d.** per pair, complete in carton with instructions.



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**MICROPHONES.**—Public Address W.E., £20; Broadcast No. 5, £3 5s.; Home Recorders, pedestal, 12/6; pendant, 6/6; transformers, 3/9.

**LOUD SPEAKERS.**—Moving coil, 6v. for Battery Sets, 25/-; 220v. D.C., 35/-; 110v. A.C., 52/6; 200/250v. A.C., 55/-.

**2,000 METERS** of all ranges, at cut prices.

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**MARCONI WAVE TRAPS, 15/-**; Wave-meters, 190/3,000 metres, 70/-; Igranite Unittune plug-in Coils, 2/-.

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**"RED DIAMOND" DETECTOR**

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Can be mounted on brackets or through panel. Once set always ready. Not affected by vibration. Each one tested on broadcast before despatch.

**TECHNICAL NOTES**

(Continued from previous page.)

case-hardened or skin-hardened, the "skin" is very much thicker.

**How Does It Work?**

It's funny what curious things interest people sometimes. A little while back I mentioned in these Notes something about a reader who had "discovered" that a wire connected to the grid of a valve and allowed to trail in the groove of a gramophone record would enable the sound from the record to be reproduced through the wireless set. I said that this was all news to me, and that I would like to know anything which readers could tell me about it.

I have had quite a lot of letters from readers, some of whom say that if you use an ordinary acoustic gramophone and connect the needle by means of wire to the grid of a valve you will get the same result. Another reader ventures an explanation which is roughly as follows:

**A Reader's Explanation.**

He says: "The gramophone record is made of material of high-insulating properties. If such a substance is rubbed, static electricity is generated. Therefore the wire in passing along the grooves generates static charges corresponding to the recorded sound.

"These charges may be very small, but nevertheless, sufficient to cause changes in the grid circuit. If an ebonite panel is rubbed, and the tags of a pair of headphones are passed over the surface, clicks will be heard in the 'phones for similar reasons."

I can understand about the clicks in the headphones due to the frictional electricity on the ebonite panel and this, in fact, is well known. But all I can say about the wire in the record track is that I tried this out and was unable to get any result!

**Stabilising Condenser.**

To obtain stability in a set it is often an advantage to connect a condenser across the power valve; this has the effect of cutting down the high frequency passing through the loudspeaker leads, and in addition it tends to lessen the strength of the upper tones, which is often a good thing. A suitable value of fixed condenser is .001 or .002 microfarad, and this should be connected from filament to anode.

Remember that this condenser may be called upon to withstand fairly high voltages; this is true even with a battery-operated set and even more important when a mains-unit is used, because the voltages may be sometimes much greater than the usual operating value. If a breakdown should occur in the condenser it may cause a short-circuit of the supply which, of course, would be a serious matter.

**When a Condenser Becomes "Groggy."**

It is true that if a condenser is getting "groggy" you will probably have warning of this by reason of crackling and other noises, so that you need not wait for a complete breakdown to take place. There are, unfortunately, a number of cheap and very inferior fixed condensers on the market, which are not given any reliable test at all, and it pays to give a little extra for a fixed condenser and get one which is tested for a good safety margin.

**G.B. with Mains Valves.**

When using mains valves it is very important—contrary to the impression which many people seem to have—to use grid bias, and this of the correct value. I have several times found that trouble has occurred in mains sets due either to an improper value of bias or to no bias being used at all. This applies particularly to the screen-grid valve.

If the bias applied to the valve is less than a certain amount, which is usually round about 1-volt negative, grid current will be allowed to flow, with the result that the tuning will be broadened and the amplification of the valve will fall below its maximum value.

**Impedance and Magnification Factor.**

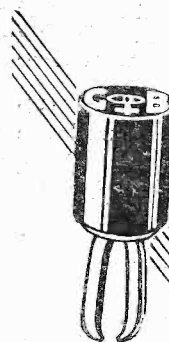
The bias to be used, of course, depends very greatly upon the type of valve which is used and also upon the screen-grid and anode voltages. Generally a bias of about 1 to 1½-volts negative will be sufficient, though in some cases this may go as far as 3-volts negative.

If the bias is increased, the effectiveness of the valve is lessened, and although in some ways this is a disadvantage it has the corresponding counterbalancing advantage that the set may be rendered more stable; if there is a tendency to instability this is a point which is worth bearing in mind.

If you wish to increase the bias for any reason and want to avoid the consequent interference with the impedance and magnification factor, you can sometimes, not always, do this by increasing the screen-grid voltage.

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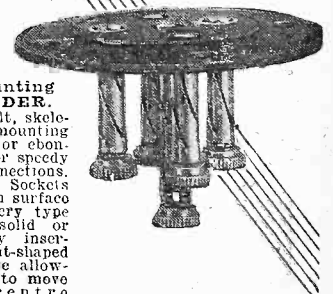
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ON PAGE 214

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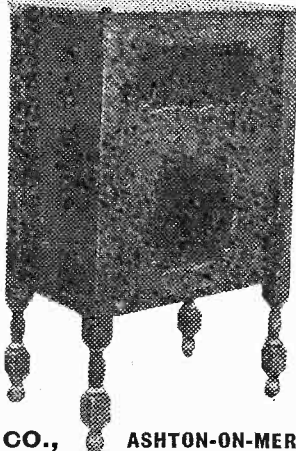
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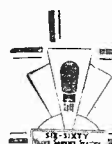
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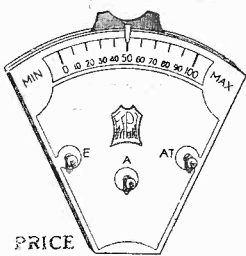
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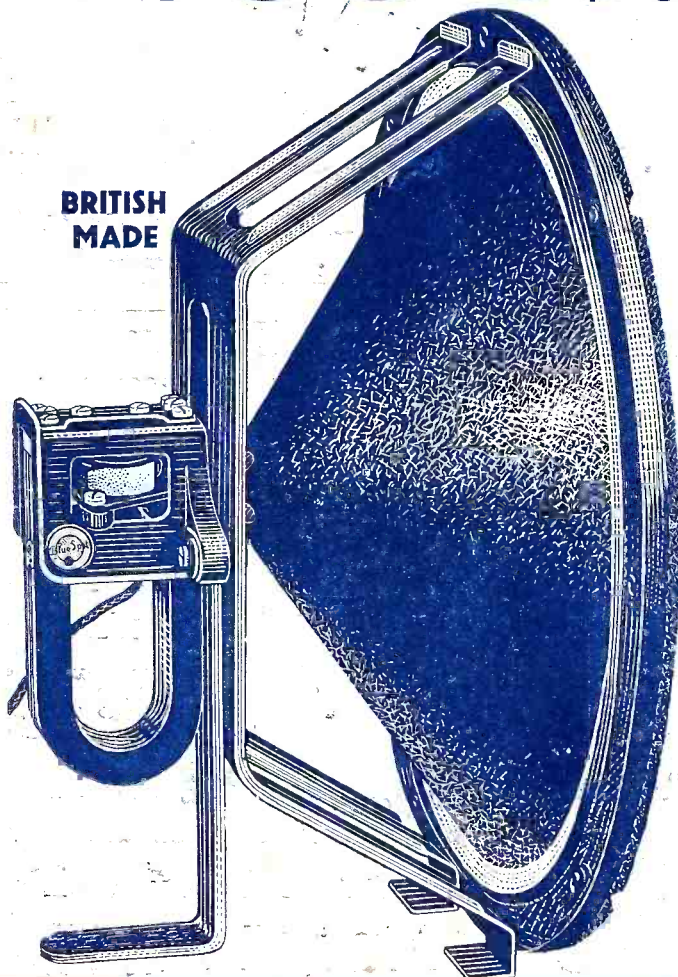


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