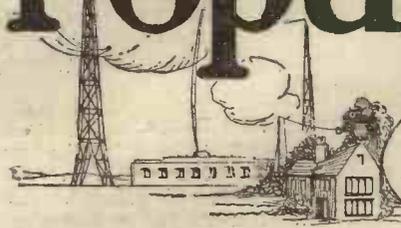
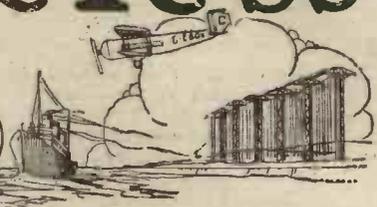


Popular Wireless



Scientific Adviser:
 Sir OLIVER LODGE, F.R.S.
 Chief Radio Consultant:
 CAPT. P. P. ECKERSLEY, M.I.E.E.
 Editor: NORMAN EDWARDS.
 Technical Editor: G. V. DOWDING, Assoc.I.E.E.
 Assistant Technical Editors: K. D. ROGERS,
 P. R. BIRD, G. P. KENDALL, B.Sc.,
 A. JOHNSON RANDALL.



AMPS MEMORIAL
 AN X-STOPPER?
 A STOLEN JOKE
 COCKTAIL PROGRAMMES

MORE BIRD LORE
 "MY DAY'S WORK"
 STRAIGHT TALKS
 REVOLUTION PREDICTED

RADIO NOTES & NEWS

The Year Wags On.

APRIL, the poet's stand-by! The birds of the district line up and guffaw while I plant a few groes of seeds. I can hear a woodpecker boring his panel. My starboard neighbour has moved his L.S. definitely into the room nearest his garden. I think that he has been inspired by Sir J. C. Bose's work on the effect of noise on plants! I have decided that the piece of wire tied to the may tree will serve as an aerial for yet another year. My son has planted one turnip seed in a box of earth and appears to be disgusted with the slow working of Nature! Cambridge is bound to win!

Memorial to Ampere.

THROUGH the generosity of the brothers Behn, who are the heads of the International Telephone and Telegraph Corporation, the old home of André Marie Ampere has been bought and entrusted to the French Society of Electricians as a memorial to the man whose name is immortalised by being used for that of the unit of current. Strangely enough, this event also marks the inauguration of an electric light service in the same village. Despite the inspiration of Ampere, they have stuck to oil and candles up to now!

An X-stopper Would be Better.

AS the scientists have failed so far to produce a 100 per cent "atmospheric" eliminator they now propose to rub it in by warning us of the approach of the pests. At the Stockholm meeting of the International Geodetic and Geophysical Society which is to be held in August, a proposal will be made to the effect that reports of daily magnetic disturbances shall be transmitted on short waves. Well, I hope that they will make the bulletins human. "Whirlpools will be washed out to-morrow at 7.45," etc.

"Canning" the King's Speech.

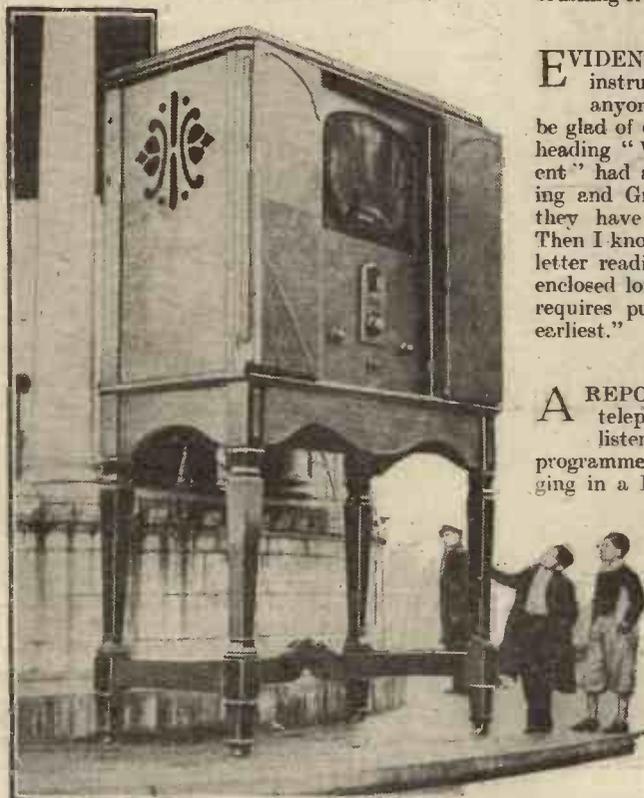
WONDERFUL what we can do nowadays! The King opens the Naval talk with a speech, which we convey in a fraction of a second to the uttermost parts of the earth, including, of course, the U.S.A. In America they record the speech, as received, on dictaphone cylinders, which are sent to London. Thus His Majesty can,

if he desires, sit back and hear how he "got over." No doubt the cylinders will find a home at the British Museum.

A Stolen Joke.

AN American scientist has discovered that the man who annoys the neighbours with his loud speaker is the same that reads aloud the captions of cinema films and hums the "theme song" at the

NOT A NIGHTMARE!



These kids must have thought they were dreaming when they saw this gigantic set standing up against the wall at a radio exhibition!

"talkies." I would add that this must be the fiend who explains the whole plot of a play to one before the overture is finished, and gives away the secret of the detective story for which one has paid seven-and-sixpence. I have stolen the following from the "Telegraph and Telephone Age." "It's a toss-up between the movies and the radio nowadays—sick of one kind, and half-a-dozen' of the other."

"Ideas, Unlimited."

WHATEVER one may think of the would-be get-rich-quick, one must admit that their brains keep working. By the early days of March this year no less than 7,288 applications had been received at the Patent Office, covering devices for doing all kinds of things, including the impossible. Great is the optimism of the inventor, especially when he thinks there is money in an apparatus "for brushing crumbs from a dumb-waiter."

New Apparatus?

EVIDENTLY there are some types of instrument which are novel, and if anyone knows about them we should be glad of details. For example, under the heading "Wireless," the "Irish Independent" had an advertisement, "Decarbonising and Grinding In Valves." No doubt they have All-Gas-Mains working there. Then I know that S. G. Brown's received a letter reading, "Will you kindly overlook enclosed loud speaker as I am told that it requires pumping up and return at your earliest."

Cocktail Programmes.

A REPORT from the Hague states that telephone subscribers there can listen to any one of three radio programmes by pressing a button and plugging in a L.S. or a pair of 'phones. The subscriber has the choice of Hilversum, Huizen, and what they call a "Cocktail programme," consisting of a mixture of Dutch and foreign items. More than 400 of the devices have been fitted and orders are pouring in, of which preference is given to those from the sick and aged. This seems like a real advance in radio-exchange development.

The First Church Broadcast.

THIS note reminds me that the distribution of sound to telephone subscribers is by no means a new idea. Nevertheless, it is rather astonishing to learn that church services were broadcast many years ago. There is some little doubt as to the date of the first church broadcast by line telephone, but St. Michael's, Chester Square, with its claim for 1909 is beaten by St. Paul's, Manningham, Bradford, where 'phones were installed
 (Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

before 1886 and the services "broadcast" to Sheffield and Birmingham.

More Bird Lore.

UP to now, no further light has been shed upon the truth about Turin's nightingale. Those interested in feathered life may be interested to be reminded that Ljubljana, which transmits on a wavelength of 574.7 metres, uses a cuckoo call as an interval signal. Strictly speaking, they ought to use the jay's call, but as the station's name is pronounced something like Loubliana, the j's are silent!

The Set That Failed

OR the man who refused to make the "Magic" Three! There, with the title of this note you have the name of the drama which was enacted at Leigh-on-Sea recently, where on a piece of vacant land was found a box labelled, "This box is haunted and is most unlucky." The box contained a grid battery, two other dry cells, some coils and a couple of handles such as are used with galvanic "shockers." It is

SHORT WAVES.

The B.B.C. hopes to broadcast the roar of Niagara Falls. Another natural feature of the American continent to which we would gladly listen-in is the silence of the great open spaces.—"Punch."

INTIMATE TALK.

An ex-wireless announcer is to publish his reminiscences. Behind the B.B.C.—"Sunday Pictorial."

We have been told that a man living on Mars could pick up a garden-roller and jump across the street with it.

It is to be hoped that those who are still trying to establish radio communication with the planet will take heed.

"There's one great advantage about ownin' a wireless set, and that is that yer can shut it out," remarked Marcus. "Come ter think of it, there's a lot of people in the world wot's the equivalent of atmospheric and other noises wot interferes with the enjoyment of the rest of us. Inceridental, a relative of mine, when she 'eard I'd got a wireless set, said, innozent like, 'Ah, now yer'll be able ter listen-in next time yer broadcast, Marcus.'"—"Empire News."

"Of course," writes a correspondent, "the real radio fan doesn't want to listen-in. He spends his whole time in picking up stations." Is it possible that he's being sarcastic?

In these days of mechanical ice-boxes, radios and electric washing machines, what is home without a motor?—"Life."

The radio's laws

The licence holders give,
For they that live to please.
Must please to live.

"Yorkshire Evening News."

REMEMBER—Grid bias batteries are not grocers; they don't have to supply currants.

perfectly clear! Misled by the Sunday "experts," someone tried to make a super-het. but was unable to buy wave-lengths to fit the box, or amps with the right kind of volts attached. He is now probably wandering about Exmoor clad only in a copy of a certain Sunday newspaper!

"My Day's Work."

MR. JACK KELLY, a fellow-citizen with a pleasant, whimsical voice, broadcast a talk from London, entitled, "My Day's Work." As a joke or a Surprise Item that might have been fitting,

but I do ask the B.B.C. to sit back and look at the matter rationally. The "Day's Work" series was happily conceived, but estimable as the man and his calling (!) may be, I hold the view that even the leisure time of listeners is too valuable to be thrown away in the study of the art of bric-a-brac buying—to put it nicely. Mine is, anyhow! I heartily wish that the B.B.C. programme people would cultivate a sense of proportion.

Perils of Publicity.

A STORY is current to the effect that in the U.S.A. two popular broadcasters whose jobs are to advertise, indirectly, a certain make of toothpaste, one day altered the time of their transmission, whereupon over 100,000 infuriated listeners threatened the sponsoring company with a boycott of its toothpaste. One report facetiously declared that the complainants threatened never to clean their teeth again! So this radio advertising game is not without its dangers.

Straight Talks from Australia.

THIS brings me naturally to a point raised by L. B. (W. Australia), who sends me a clipping from a paper wherein great praise is given to the Dutch and Americans for their excellent re-broadcasts of the King's speech, and the other kind remarks are reserved for 5 S W. Now, L. B. wants to know why we do not close 5 S W and buy a station from Holland, adding that 90 per cent of the Australians use Dutch valves, the implication being that they do so because of the success of P C J.

Sorting the Facts.

LET us admit that P C J is, as was intended, a valuable advertisement for its proprietors. But it does not advertise his receiving valves, and as British valves are beyond doubt quite as good as foreign ones, I do not believe that the average Australian would deliberately select a Dutch valve in preference, merely because P C J sometimes beats 5 S W. There would be neither rhyme nor reason in it.

Then it must be remembered that no manufacturer here is allowed to broadcast, and the B.B.C. does not "sell ether time." So it is up to patriotic Britons to help each other in spite of, and because of, these handicaps.

Definition of Music.

MR. HENEQUIN'S remarks about the 261 metres transmission have produced a good deal of activity amongst our correspondents and the general opinion seems to be that the tuning arrangements of many receivers require looking into closely on account of the 95 metres difference between the two wave-lengths. In regard to his comments upon the B.B.C.'s idea of the music with which our souls should be fed, J. K. (London) hacked out a phrase worth repeating. "The average stuff served up as music is like pagan discords played at the sacrificial altar to drown the howls of the victims."

A "Magic" Three Test Report.

TO those whom it may concern! W. L. W. (Co. Kildare) obliges us with a report on the results obtained from his "Magic" Three. Summarised, the report shows the reception of 35 stations at L.S.

strengths varying from "weak" to "powerful." Twelve came in at "average," which denotes "room comfortably filled"; twelve more were "strong," or "very strong"; the remainder were either "weak" or "powerful." Twenty were Continental stations, including Barcelona, Toulouse, Madrid, Rome, Lyons, Oslo, Milan, Vienna, and Budapest.

More Details.

THE panel was 21 in. x 7 in., the components being well spread. Valves: P.M.5X, P.M.6, and P.M.256. H.T. 90 volts on detector and 150 volts on others. Batteries: Exide and "Ever-Ready." Coils: Lissenagon, and Igranic. Condensers:

THE "5s. BROOKMANS REJECTOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just completed your 5s. Brookmans Rejector, and am pleased to say it completely knocks my local off the dial, which is only a quarter of a mile away.

Not having tried your previous Brookmans Rejectors, I did not think it could be so efficient. It does not cause any loss of volume, but brings the Midland Regional programme in much stronger.

Thanking you for introducing this amazing device.

Yours truly,

H. CROCKER.

Swansea, Glam.

P.S.—If you wish you may use the above in any of your publications.

T.C.C., Pye, Dubilier, and Ormond. Mullard leak, Varley choke, Lissen resistance. Transformers: Gecophone and Ferranti. Aerial: 100 ft., 45 ft. high both ends, solid copper. Earth: 15 ft. 1/4-in. copper wire soldered to water system. All connections 18 gauge round tinned wire, well soldered. Go ye, and do likewise!

New Wireless Appointment.

WIRELESS men all over the world will learn with interest of the retirement of Commander Loring, Inspector of Wireless Telegraphy for the Post Office, and will join me in wishing him luck in the new appointment he has taken in the world of commerce. A gentleman and a "sport"! The promotion of Lieut.-Col. C. G. Crawley, M.I.E.E., to the position vacated by Com. Loring is a matter of congratulation—for him, and for all else concerned.

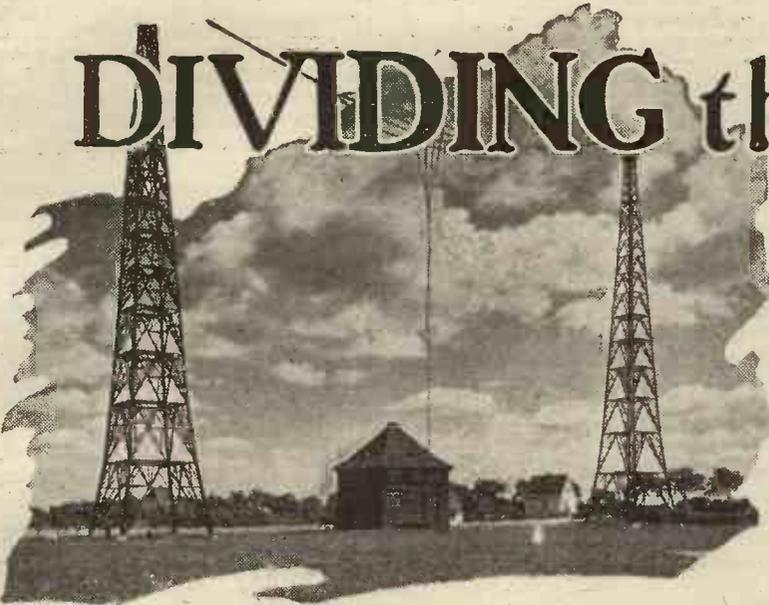
Revolution Predicted.

IT gave me a considerable shock to learn that Professor V. Karapetoff, of Cornell University, has predicted the finding of a wave motion with a velocity greater than that of light. Now I understand what our grandparents felt when the Darwinian theory of man's descent was announced! Well, I hope that the new velocity (if any) will work out to a nice round figure. If this revolution actually occurs won't there be a lot of mathematics to be explained away?

The Latest Radio Book.

THE Annual Report of the Radio Research Board is now available, and if you want to know what they have been doing, thus keeping yourself abreast of British radio progress, the three shillings and sixpence charged for the book might be much worse spent. All the latest about short waves, signal fading, Heaviside layer, etc., is contained therein, and it may be purchased at H.M. Stationery Office, Adastral House, W.C.2. ARIEL.

DIVIDING the ETHER



by
SIR OLIVER LODGE FRS
PART 4.
IDEAL CONDITIONS

This is the fourth and final article of a short series by Our Scientific Adviser, in which he has been dealing with the problems that have arisen owing to the present crowded state of the ether.

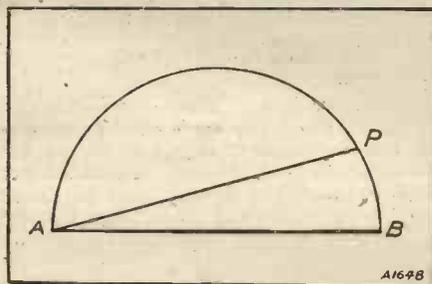
IT has been shown that damping is a proper correlative of resonance, and requires just as close attention. Hitherto plenty of attention has been paid to tuning, too little to the damping that ought to accompany it.

A receiving circuit must not be continuously damped, as by too much resistance, for then it would not respond sensitively at all. A strong disturbance of a there-or-thereabouts sort of frequency would suffice to stimulate a damped circuit.

Checking a Vibration.

It would, for instance, be eminently qualified to respond to a broad wave-band, provided it was one of sufficient energy.

No, what we want is neither continuous damping nor continuous resonance. We want momentary sensitive response, followed by immediate effective damping. We want a free vibrator which shall immediately



A diagrammatic representation of the effect of resistance on an oscillatory circuit.

cease to be free. We want a sudden pulse of excitement, and then a sudden check.

Now there are two ways of checking a vibration, when excited by a wave in tune with the vibrator. One is to damp the vibrator directly a specified part of the wave ceases. The other is to throw the vibrator out of tune directly it has done its work, so that on the ordinary principles of interference the vibrations shall be killed by the arrival of an opposite phase.

We have no control over the wave itself at the receiving end, and we do not want it, but we have control over the vibrating

properties of our own receiving circuit. Whether we could get sufficient control to keep it in tune for the purpose of picking up a certain group of waves, and then throw it momentarily out of tune, in order that it may immediately be able to receive another group of waves of different amplitude, is a problem for inventors.

I hear a vague rumour of something called a Stenode being put on the market, which may for all I know aim at something like the solution of this problem. I have no knowledge of that, one way or the other.

But knowing the docility of electrons, and the ingenuity which can be and has been applied to them, I shall not be surprised if some such device is sooner or later forthcoming. It may be on the principle of curbed signalling, automatically applied, or it may be on the principle of momentary damping.

Indeed it is just possible that the two may be connected. For the natural frequency of a receiving circuit is not exactly the reciprocal of the geometric mean of capacity and inductance. It is influenced to a small extent by resistance also; being given, as Lord Kelvin showed so long ago as 1853, by the expression:

$$\sqrt{\left(\frac{1}{CL} - \frac{R^2}{4L^2}\right)}$$

or, as it may be expressed geometrically, by the third or vertical side of a tall right-angled triangle, of which

$\sqrt{\frac{1}{CL}}$ is the hypotenuse and $\frac{R}{2L}$ is the short base.

Or we may put it this way: Represent the natural frequency of an oscillating electric circuit, of negligible resistance, by the diameter of a circle, like AB.

Then, to bring in resistance, tip up one end of this diameter till it is a chord AP, so that the amount of tip PB corresponds

to the resistance, being in fact $\frac{R}{2L}$; while

$$AB \text{ was } \frac{1}{\sqrt{(CL)}}.$$

Then, on the same scale, the length of the chord AP represents the new or modified natural frequency of the circuit, being rather less than the undamped frequency AB.

An Opposite Phase.

Hence, it is just possible that a sudden increase of resistance, insufficient to damp the receiver deleteriously, might throw it sufficiently out of tune (when the received oscillations are as rapid as anything like a million to a second) to bring an opposite phase to bear upon it in an exceedingly short space of time. I can imagine a circuit so arranged as to be very selective, and at the same time reproduce faithfully all acoustic frequencies.



The forest of posts being erected at Wallington, near Baldock, for the huge G.P.O. Trans-oceanic telephony station.

A CHAMPION OF THE CRYSTAL.

Some Interesting Light on the Valve v. Crystal Controversy.

By THE EDITOR.

A STRONG supporter of the crystal has responded to our invitation, extended in a recent article in POPULAR WIRELESS, to readers to give their views about crystal reception in preference to valve reception.

A Kettering correspondent asks us to imagine two men with about the same cash to spend on their hobby. One wants perfect quality and good volume, and so he has a set with three valves or so.

The other finds his pleasure in reception with, perhaps, less volume and less perfect quality, so long as he gets reception free from the awkwardness of being tied to his set by headphones, especially in view of the fact that he wants to use his set quite a lot—perhaps for an average of six or seven hours daily, not only for himself but for others in the family.

Matter of Expense.

"Now, if your experience is like mine, or if your readers have had experience like mine," writes our correspondent from Kettering, "you must come across many who, starting off with a valve set to get results as desired by the man who wants perfect quality and good volume, must sooner or later find the matter of expense crops up, and that some listeners have to ration themselves as to the amount of listening done because accumulator and H.T. batteries run away with money.

"Possibly for that reason one often finds people with good sets who don't make much use of them beyond listening-in for an hour or two because of the constant need for L.T. and H.T."

Our correspondent says he is using a Reflex set which has a crystal and a Pentode valve—probably all wrong theoretically, but, as he points out, his room is small, his sister is rather deaf, and his mother is confined to another room, and from this particular set he receives well enough to work two loud speakers and one pair of headphones.

In his opinion, his outfit gives comfortable reception of speech, music, etc., anywhere in his room when the other loud speaker and 'phones are in use, and when one loud speaker and the headphones are switched out of use, he maintains he could not desire better reception and that he could not do it for anything like the same cost with a three-valve set.

The Crystal Adjustment.

Our correspondent suggests that it has always appeared to him that the exaggeration about the crystal question is in such statements as that it is unreliable and that, for example, a Reflex set is unstable and that a crystal soon goes off in such a set.

"I am not even a user of the Carborundum detector your correspondent speaks of, which would no doubt be more permanent than my galena and cat's-whisker," he writes. "I rarely touch mine, but statements in the papers would lead one to think that my crystal needs adjusting at least once each night.

"Is it not simply that one is overcome by the temptation to try and get reception a little louder? I have got to know just what my set should sound like, and I leave it alone and it does not vary. In any case, touching a cat's-whisker once a week is not hard work compared to taking an accumulator to be charged more frequently, as I should have to do if more valves were in use.

"Not only economy, but simplicity is gained by the ease of tuning when there is not reaction to deal with."

Summing up, our correspondent maintains there must be many people who, if they knew it, would like a set which would just let them escape the tyranny of headphones without the cost necessitated by several valves.

"There is a big gap between the expense of a crystal headphone set and a big volume

KEEN CONSTRUCTORS.



These lads are all keen radio enthusiasts—and they are all blind. Members of the Worcester College for the Blind, they take an active interest in radio, physical jerks, etc., and in 86 games of chess played against other schools they won no less than 83 times!

loud-speaker set, and I think many would like something in between."

On the face of it, it seems that our correspondent has got just what he wants for the particular conditions under which he has to listen, and we are rather inclined to agree that in this case our Kettering reader—who, by the way, says he can hear Oslo, Radio Toulouse, Radio Paris, Eiffel Tower, Rome, Königswusterhausen, Langenberg, Hilversum, and Huizen rather weakly on the loud speaker, but certainly excellently with the headphones—has got just the suitable combination for his requirements.

No doubt our readers have seen a good deal in the papers lately about the latest experiments conducted by the Marquis Marconi. It appears that the Marquis has been experimenting in connection with the transmission of small quantities of energy strong enough to close the circuit of the electrical lighting system of the Sydney (Australia), Exhibition.

Many newspapers have seemed to jump to the conclusion that this experiment means that Marconi transmitted enough energy by wireless to light all the lamps at the Sydney Exhibition. The fact is, of course, that he has been experimenting with some form of short-wave transmission which enabled signals to be sent out from his yacht, the Elettra, and which, when picked up in Sydney, were amplified and probably made to operate a delicate relay which, in turn, brought into operation a further series of electrical relays controlling the electric light main power switches at the Sydney Exhibition.

"Sensational Statements."

It is a pity that some of the newspapers don't take more care in reporting these experiments, for the Marquis Marconi himself would be the first to repudiate the sensational statements which have been made, and which seem to suggest that he has devised a system for transmitting sufficient energy by radio *actually to light electric lamps at a distance of 9,000 miles.*

The control of a local circuit by radio at a distance is, of course, experimentally well known, but it appears that Marquis Marconi has devised a practical, and probably commercial system which may have far-reaching effects, and it has been suggested by the Marquis Solari that by this new system it will probably be possible not only to light and switch off all the lamps of a city, but also to stop and re-start trams, railways, etc., linked up with a certain determined network.

As the "Times" points out, the applications of this principle may, therefore, be innumerable, and many technical problems will be solved.

SOME USEFUL HINTS.

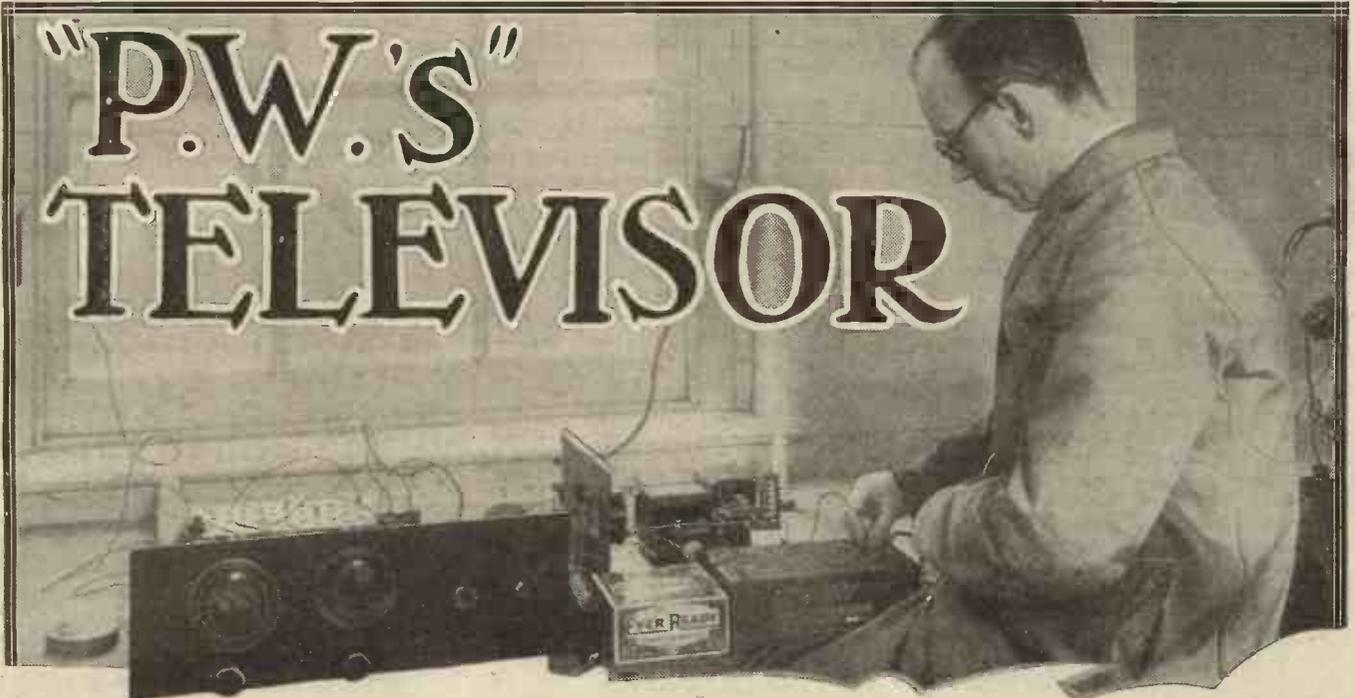
Do not attempt to use a moving coil loud speaker without a baffle board, or much of the available faithfulness and naturalness of reproduction will be wasted.

For grid control in a short-wave set, or for "holding down" an H.F. valve, a potentiometer of about 400 ohms is usually required. But for volume control the resistance of a potentiometer must be half a megohm or thereabouts, so that the 400-ohm type potentiometer is quite unsuitable for this purpose.

On no account must H.T. leads be allowed to fall into the set or accidentally to touch any of the other wiring, as this is a sure way of shorting the battery and burning out valves.

Always make a habit of disconnecting the H.T. battery before you change over wires or use a screwdriver inside a receiver.

It is unsafe to have leads connected to the battery unless those leads are firmly connected to the set at the other end, so if the lead has to be undone always disconnect the battery end first.



THE news that one of the very first standard Baird televisions produced was to be sent to us for test and that the Research Department was thereupon to fit up a suitable receiver and amplifier and endeavour to produce pictures was the cause of some little excitement in Tallis House recently.

The machine duly arrived, and what it looks like you will already have gathered from photos which have appeared in "P.W." It is quite a large affair, measuring some 3 ft. long and 2 ft. 6 in. in height, and its metal casing has a crystalline black finish.

It contains an electric motor driving the usual perforated aluminium scanning disc, the synchronising mechanism, a special neon lamp, and a large lens to increase the size of the picture.

Looking at it from the front you observe first an opening to the right in which the picture is seen, then near the middle a knob for the "framing" adjustment, which is to enable the operator to locate the picture properly in the field of view after synchronism is effected.

Looks Quite Simple.

To the left there is another knob which controls the speed of the motor. It is with this that the initial adjustment is made to obtain synchronism. There is nothing else to be seen in the front, and one's first impression is that here is a machine which should be simple enough to work.

Next came the question of the sort of amplifier and receiver required to operate the televisor, and we turned with interest to the blue-print of one of the Baird television receivers. This was found to consist of an entirely mains-operated three valve circuit, with a screened grid H.F. valve, anode-bend detector and super-power pentode, with resistance capacity L.F. coupling.

The H.T. provided for the pentode appeared to be of the order of 400 volts, which seemed at first glance pretty rough treatment for such a valve, but it must be remembered that in operation the neon

Here is our official report upon the tests we have so far carried out with the Baird Televisor.

By G. P. KENDALL, B.Sc.

lamp is placed in series in the anode circuit. This lamp is of comparatively high resistance, and so drops the voltage actually reaching the valve very considerably. Quite apart from the large power required to produce a good image and effect synchronism, this is one of the principal reasons why high voltages are so necessary for television work.

Our first concern was to find the correct adjustment of the universal-driving motor to suit our mains voltage, and for this we used a hastily improvised receiver and proceeded by trial and error until we got

indications that some rough degree of synchronism was being obtained.

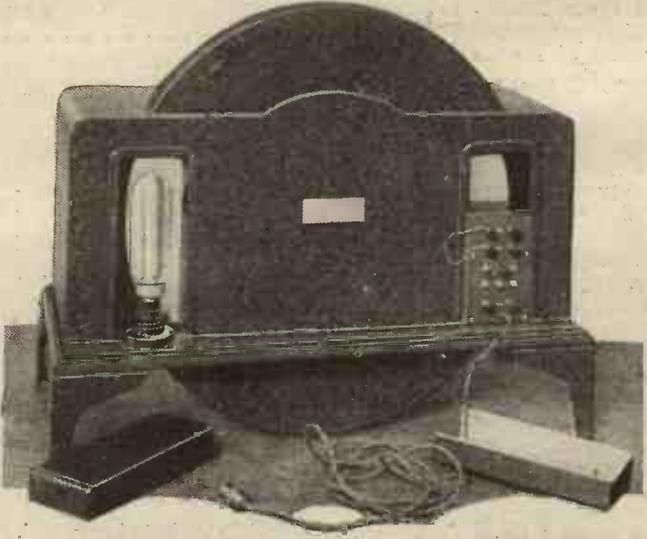
The images so obtained, of course, were poor and crude, besides being "negatives," but this did not concern us at the moment. All that we were seeking was the correct motor adjustment, and this was only to be obtained by rather laborious trial, since the working instructions only arrived some days later, and meanwhile there were quite a number of alternative voltage tappings to choose from in the motor circuit, quite apart from finer control of speed given by the knob on the front of the machine.

More Power Required.

This much accomplished, we turned to the receiver and amplifier circuits, and tried out an arrangement modelled on the blue-print which we have mentioned. With this we began to obtain better results, but observing that every increase in the power available for working the neon lamp improved matters, we decided to go further and assembled an outfit of closely similar characteristics but considerably greater output.

This consisted of an S.G. H.F. stage and an anode-bend detector, followed by a multi-stage resistance-coupled L.F. amplifier, with a valve of the L.S.6 A. type in the output position. This is a very large valve, and when given 400 volts H.T. will deliver quite a lot of power. We tried it first with 300 volts, and then went up to 400, with a decided improvement.

THE BACK OF THE TELEVISOR.



The rear of the televisor has two compartments, which, when the covers are removed disclose, (left), the neon lamp and, (right), the input-motor voltage terminals.

(Continued on page 92.)

LATEST BROADCASTING NEWS.

EASTER PROGRAMME ARRANGEMENTS.

A QUEEN'S HALL RELAY—
PAUL ROBESON AND VAUDEVILLE—B.B.C. CHAIRMANSHIP STAKES—OUTSTANDING ITEMS.

THE broadcast programmes on Good Friday, April 18th, will conform to the accepted principles of dignified solemnity to which listeners are accustomed on that day. Transmission will begin on the National wave-length at 10.15 a.m. with the daily service, and after the reading of the shipping forecast at 10.30 from Daventry (5 X X), there will be no further programme until 3.30 p.m., when a concert of suitable music will be given by the Wireless Military Band, under the direction of Mr. B. Walton O'Donnell. The concert will go on until 5 p.m., when there will be twenty minutes of poetry reading, and followed, until 6.30, with a concert by the Wireless String Orchestra.

A Queen's Hall Relay.

A fifteen minutes' sports bulletin will precede the broadcasting of a service from Windsor at 6.50 p.m., and the evening programme from 7.45 until 10 p.m., with the exception of an interval for the general news bulletin at 8.45, will be devoted to a "Parsifal" concert, relayed from the Queen's Hall.

The London and Midland Regional programmes will not begin until 3.30 p.m., when there will be an hour and a quarter of chamber music, followed by a concert by the Gershom Parkinson Quintet until 6 p.m. An interesting item will be a relay from Leipzig of part of Bach's "St. Matthew Passion" which, beginning at 6 p.m., will continue until 7.45, when an orchestral concert will be heard from the Birmingham Studio.

Paul Robeson and Vaudeville.

On Good Friday afternoon, Manchester listeners will hear a concert in which the Northern Wireless Orchestra, the Georgian Male Voice Quartet, and Clyde Twelveteens will take part. Most of the programme will be devoted to the works of Francis Couperin, and the programme also contains Gade's Fourth Symphony in B Flat.

The evening programme on Good Friday for listeners in the Western Region will consist of a relay from the third concert of the Cardiff Musical Society when the National Orchestra of Wales will give a performance of Handel's "Messiah" at the Park Hall. Among the artists are Megan Thomas and Olive Kavann.

On Easter Sunday morning, between 10.30 and 11.30 a.m., a service, relayed from Canterbury Cathedral, will be broadcast on the National wave-length, and the evening programme from all stations that day will consist of a Grieg Concert, conducted by Percy Pitt.

The holiday programmes, on Easter Monday call for no special comment. An hour and a half of vaudeville and an orchestral concert conducted by Sir Henry Wood are the main evening items for National

listeners, while the London and Midland Regional will broadcast a musical comedy programme, half an hour's recital by Paul Robeson, and a concert of chamber music.

B.B.C. Chairmanship Stakes.

Punters were disturbed this week at the definite report in a newspaper that Lord Lee had denied that there was anything at all in the rumour that he was to succeed Lord Clarendon as Chairman of the B.B.C. There is an uncomfortable feeling that the winner will be among the "others" which have been carrying 100-1 against.

Bækers of Mrs. Snowdon have strengthened her market from 100-6 to 8-1; while Lords Passfield and Eustace Percy have declined to fittics. Lord Cecil, Major Atlee, Sir Arthur Stanley, and Sir John Reith each retains a considerable following.

SHE HANDS OUT SWEET MUSIC!



This is Madlle. Stepanov operating a "Theremin," the "musical instrument" that works by utilising hand-capacity howls!

Outstanding Items.

A talk on the special sports and old customs associated with Easter will be broadcast to Northern listeners by Mr. W. Cumming Walters on Saturday evening, April 19th.

A one-act comedy entitled "The Fourth Proposal," by F. Morton Howard, will be heard by London and Midland Regional listeners on Wednesday, April 16th.

Aberdeen listeners are to hear a rehearsal of the fourth edition of the Aberdeen student's revue, "Northern Lights," between 10.45 and 11.15 p.m. on Thursday, April 17th. The revue is to be produced in His Majesty's Theatre, Aberdeen, on the following Monday.

Another "One Man Revue," by J. H. N. Craigen, containing an "opening chorus" and a playlet requiring four or five voices will be heard by Glasgow listeners on Thursday, April 17th.

A concert by the Band of the Royal Ulster Constabulary will be broadcast to Ulster listeners from the Belfast studio on Saturday, April 19th. It is interesting to recall that this band, which was once directed by Dan Godfrey before his appointment to the Grenadier Guards, was formed twenty-four years ago when, out of fifty volunteers, only two had any previous experience as players.

Miss Doreen Jenkins, who has just been appointed harpist at the Belfast station, comes of a talented family, three of which, including herself, gained a scholarship at the Royal College of Music. During the coming-of-age celebrations of the Earl of Dumfries at Cardiff Castle she played to the family every evening in the banquetting hall.

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.
By "PHILEMON."

(Who is deputising for Mr. Cecil Lewis while the latter is in America.)

Holidays.

HOLT MARVELL'S introductory talk to the new series on "Holidays At Home and Abroad" was a first-rate example of what a broadcast talk should be—but isn't always. It was lively and to the point, full of humour and sound sense. He also embellished it with a swear word or two!

Holidays seem yet a long way off; but half the fun is in planning them, and one can't begin too early. I hope the subsequent "guides" on this subject will take Holt Marvell's hint and talk not romantically about cities and scenery, but practically about trains and hotels and the habits of the people, and "where it is safe to drink the water."

Hot Water.

Holt Marvell, and he ought to know, said, "Almost everything you say in the Studio

gets you into trouble with somebody!" He himself seemed to expect trouble from the "See Britain First" Society, for he didn't spare his criticism of British hotels.

I rather like these men who ask for trouble of this sort. There is a bit too much censoring and trimming of opinions for the sake of the tender stomachs. It is odd that it is usually the grumblers who have money for stamps to spare! I suppose a biff in the eye is more worth three-ha'pence than a pat on the back! Such is life!

Lord Balfour.

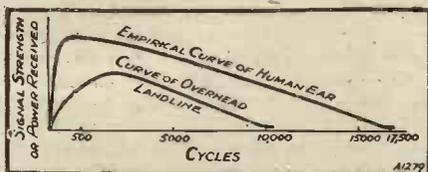
Mr. Arthur Nicolson's tribute to his former chief, Arthur Balfour, was a little gem of its kind, simple and sincere and affectionate. By contrast with it, the official effort, spoken on the evening of the day of the funeral at Whittinghame, and including a full-dress reading of Wordsworth's

(Continued on page 92.)

WIRE OR WIRELESS

JUST fifty years ago the universal topic of conversation in London was the marvellous new invention which enabled people to talk from one end of the city to the other over an ordinary piece of wire, and in the few offices where it was installed all the staff came and watched the uncanny thing at work.

So the telephone came to London, where it was regarded as the last word in modern inventions, and our grandfathers nodded their heads wisely as they remarked that man had reached the limit of invention.



How the overhead landline affects the transmission of musical items.

Yet the other day, by a further development of the same invention, i.e. the wireless telephone, a conversation was carried on successfully between London and the Antipodes.

Thus the world's most advanced method of communication is by means of wire and wireless. By this combination subscribers in Europe can talk to North or South America, or even Australia, and we are all familiar with the great S.B. networks of Great Britain, France, Germany, and the U.S.A., whereby programmes are sent along hundreds, in some cases thousands, of miles of landline to different broadcasting stations.

Submarine Speech ?

If a patent just issued to Dr. MacLachlan and Mr. W. Smith turns out to be a practical success, then at no very distant date we shall have telephone cables running along the widest ocean beds and the landline system will still further be extended until it covers all the world.

In view of the important part which telephone lines now play in all branches of wireless communication it is interesting to study the relation between wire and wireless telephony.

The purpose of both systems is to carry speech and frequently music, and it is necessary to know something about both of these factors before going further. The average person can hear sounds ranging in pitch or frequency from about

Ought our broadcast stations to use a radio link instead of landline between transmitter and studio? Some interesting facts about landline distortion are given in this article.

By G. DALY.

20 vibrations or cycles per second (which is an extremely low note) up to about 16,000 vibrations or cycles per second (which is an extremely high note).

This is not the complete range, however, for there are people who can hear all the notes from 17 cycles right up the scale to 30,000 cycles. Such hearing is not often met with, but anyone who has heard the shriek of a bat has heard a note of 30,000 cycles.

For ordinary conversation a range of frequencies from 600 to 1,200 cycles is sufficient, and for music from 42 cycles to 4,000 cycles. So what we have to do is to see how faithfully wire or wireless telephony will reproduce these frequencies which represent speech and music.

How the Frequencies Fare.

It may be said right away that theoretically the pure ether which is the universal carrier of wireless waves will pass all the frequencies which we can create exactly and with no distortion at all. On the other hand, the best landline in existence will not pass any frequency much above 10,000 cycles. This is due to the constants of the line, principally capacity, which cause the strength of the notes to diminish in intensity as the scale is ascended. Thus, a high note of 10,000 cycles will only be a quarter of the strength of a low note, say, of 100 cycles. And so from a frequency point of view wireless should

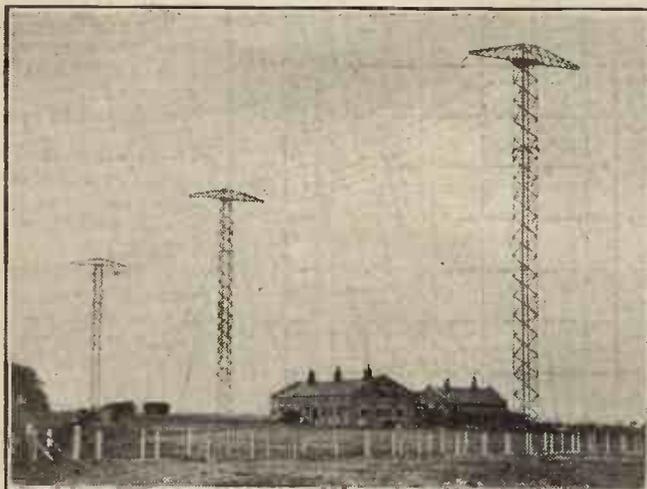
always be superior to landline transmission.

In the case of the landline the best of these will not carry any note much above 10,000 cycles, and some underground cables will not pass any note above 2,600 cycles. The best type of landline for music, i.e. the heavy overhead type, is subject to weather conditions, and all telephone lines are prone to noisiness and induction.

The advantages are: freedom from atmospheric disturbances, except in the comparatively rare cases of bad magnetic storms; excellent quality where good landlines are available; clarity and lack of background; and, of course, secrecy.

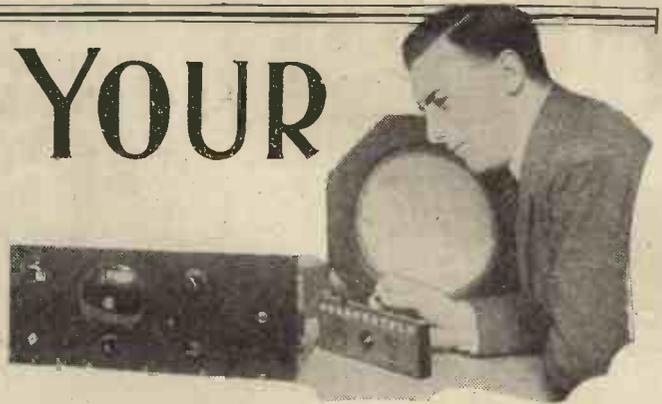
Where Wireless Scores.

In the case of wireless we have the disturbances introduced by the atmosphere and ionised layers, such as fading and distortion, atmospheric and interference. All frequencies are passed fairly evenly, however, and although from 30 to 10,000 cycles is considered to be sufficient for the complete sound range, as, for instance, in broadcasting, no distortion need be expected on higher or lower frequencies as far as wireless is concerned. The limit is set principally by the microphone and loud speaker, for neither of these has yet reached the perfection of even the wireless transmitter, and no wireless transmitter is, of course, absolutely perfect.



Recently the Beam system has been used with great success for inter-continental programme relays, the quality of reception being remarkably good.

ADJUSTING YOUR GRID BIAS



Correct values of grid bias are necessary for good quality, and the use of meters is the scientific method of checking G.B. voltages. But, you will ask, "Suppose I have not any meters?" In that case you will find this article on the subject very helpful.

By A. S. CLARK.

THE importance of having the correct grid bias on L.F. and power valves, cannot be over emphasized. In fact, without bias you cannot hope to get good quality, no matter how elaborate and expensive your set is.

A very cheap set with proper valves and grid bias can sound far superior to a super set in which the grids of the L.F. valves are at the wrong potentials.

Of course, the best way of testing whether your valves have the right grid bias is by means of a milliammeter which is inserted in the H.T. + leads. Meters, however, are expensive, and to some would not be of use once the grid-bias taps were adjusted to the correct values.

Quite a Simple Method.

Fortunately, it is not absolutely necessary to have meters for the above purpose, and there are several other ways in which grid bias can be adjusted to approximately the right value. Although I say approximately, it is sufficiently correct for all ordinary purposes.

The most scientific manner is to obtain the voltage value from the valve characteristic curves. Such curves are practically always given with valves, and Fig. 1 shows what could be a typical graph for a power valve.

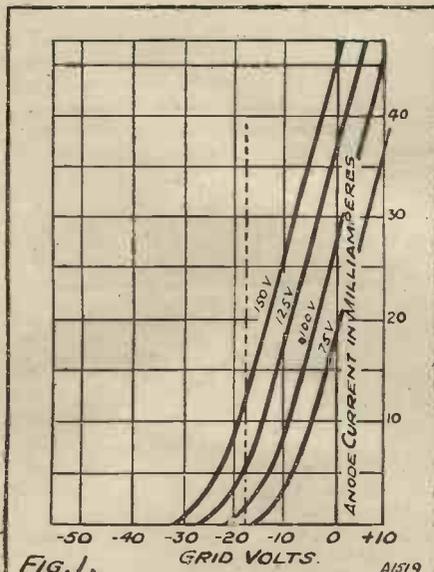


FIG. 1. Most valves are supplied with copies of their characteristic curves which should always be kept for reference purposes.

It will be noted that there are several curves, one for each different anode voltage. First of all, you must choose the curve for the voltage as near as possible to that which you are going to use. For purposes of explanation we will assume this to be 100.

Now draw a perpendicular line through the point where the curve begins to bend round. The correct grid bias will be half the value shown along the bottom line between 0 and where the perpendicular line cuts it.

In the case of an R.C.-coupled stage,

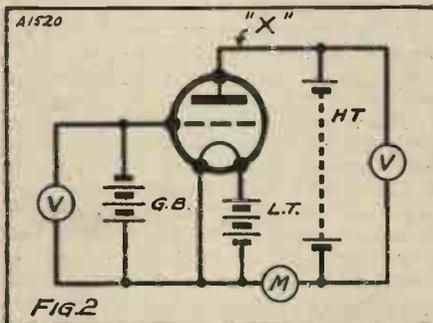


FIG. 2. This is the type of circuit with which valve curves are taken, and it will be noted that no resistance or inductance is present between the plate and H.T. battery.

when there is a high resistance in the plate circuit of the valve, the value of the grid bias may be a little less than that indicated by the curve. The reason for this is that the curves are taken with a circuit somewhat similar to Fig. 2. In practice, there will be a resistance at the point "X" which will cause a voltage drop, and therefore will have the effect of shortening the straight part of the characteristic. The drop may be neglected in the case of transformer primaries, loud speakers and L.F. chokes.

Saving the H.T.

Some makers mention the correct grid-bias voltages for certain H.T. values, and in that case there is, naturally, no need to work it out.

It is possible to adjust the grid bias entirely by trial, but it is then necessary to depend upon the ear to detect distortion in the results. But, after all, it may be argued that if the distortion is so slight that the ear cannot detect it, then it does not matter!

A point which must be remembered is that the higher the grid bias the less the H.T. consumption. It is, therefore, desirable to use as much grid bias as possible consistent with good results. When the voltage

is too high you will notice either a decrease in the strength of the signals, or distortion on loud passages, which may be of a high or low frequency.

All you have to do, therefore, is to increase the negative voltage on the grid until one or both of the effects just mentioned are detected.

Never move the grid-bias plugs with the set switched on, otherwise you may ruin your power valve. When the grid bias is removed the anode current suddenly jumps up, and not only is this bad for the H.T. battery, if one is in use, but it may also affect the emission of the valve.

Remember this Rule.

There is a simple method of calculating the approximate grid-bias voltage mathematically. Divide the anode voltage by twice the magnification factor of the valve.

The magnification factor will be found on the valve box or on the slip showing its characteristic curves. With this scheme it is desirable to allow a little in the case of R.C. stages, as in the first method described.

Grid bias is usually associated with L.F. stages, but with modern screen-grid valves it will sometimes greatly improve results. A separate grid-bias battery is desirable for the H.F. valve or valves, and the method of connecting it in circuit is shown in Fig. 3.

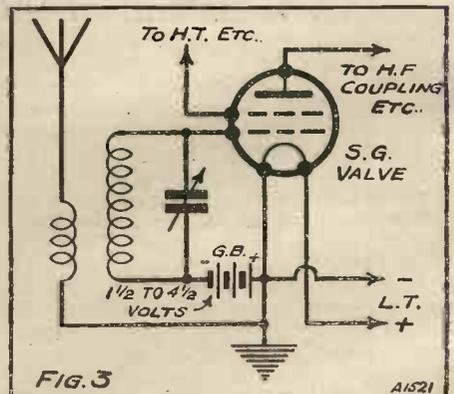
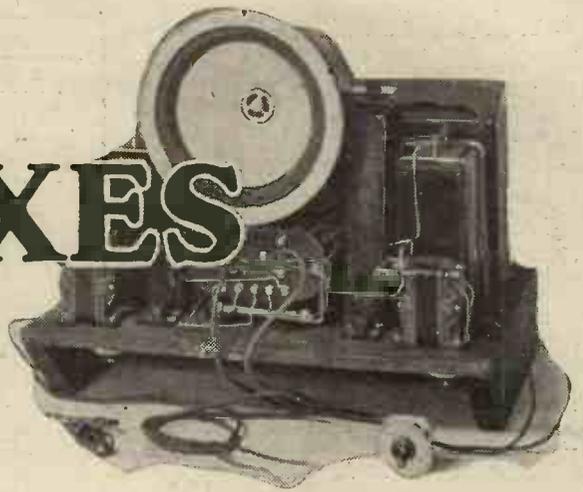


FIG. 3. Even H.F. stages often benefit by the application of grid-bias, which should be inserted in the manner shown above.

In this case adjusting the voltage is carried out entirely by trial, the voltage which gives loudest results on distant stations being employed. It is not necessary to switch the set off when adjusting grid bias on H.F. valves.

READ
"MODERN WIRELESS."

CURRENT COMPLEXES



Have you ever wondered how a loud speaker can deal with dozens of musical notes AT THE SAME TIME? Or how the current in your valves' anode circuits handle all the different low frequencies and yet remain but a single current? If so, you should find this article particularly interesting and helpful.

By "PENTODE."

WE visualise the perfect loud speaker as the one capable of handling all the audio-frequencies equally well. Of course, there is no such instrument, but there are many nowadays that do their work pretty well.

You can probably understand how a loud speaker can deal with any audio-frequency separately, but do you know, or have you ever wondered, how it is that they deal with a whole medley of frequencies such as are encountered in the reproduction of orchestral music?

As was recently explained in an article in "P.W." the diaphragm of the loud speaker moves in accordance with the varying magnetic influences of the electromagnet placed near it.

Mixing the Notes.

It might not be the actual diaphragm that is influenced in this way; the magnetism may be playing on an armature which, in its turn, is connected to a diaphragm, but that does not affect the main principle. The magnetism, the power of attraction, will, or should be, fluctuating in exact synchronism with the current fluctuations in the anode circuit of the last valve of the set.

If there were just the one frequency, the current would be rising and falling evenly, as shown in Fig. 1. Fig. 1 also can represent the backwards and forwards movement of the armature or diaphragm of the loud speaker.

In the case of a pure note of a lower frequency, there would be a slower rise and fall of that anode current and a slower backwards and forwards movement of the loud-speaker diaphragm, as at Fig. 2. But

supposing both Figs. 1 and 2 frequencies are being dealt with simultaneously.

Speaking in terms of rises

and falls of current per second, there would be first of all the lower frequency and, superimposed on this, the rise and fall of the higher frequency.

Only One Current.

Look at Fig. 3. You can plainly see that as the current comparatively slowly falls (the first illustrated half-cycle of the lower frequency), there are simultaneously little

additions to and subtractions from the current caused by the higher frequency.

There are not two quite separate currents being dealt with; it is the same current rising and falling and the effect of combining these two frequencies is to give you a current which fluctuates as shown in Fig. 4.

Splitting the Second.

To put it more precisely, you can say that at any moment in time the strength of the current will be represented by the sum of the effects of the two frequencies. When there is a vast medley of frequencies, the current variations are incredibly complex, and Fig. 5 gives only a vague idea of what actually happens.

The point to remember is that the movement of the loud-speaker armature

or diaphragm follows these current variations. In order to illustrate this more clearly I must divide the second up into 10,000 parts, and I will call each of these tiny parts of a second a "moment." Just as there are sixty minutes in an hour and sixty seconds in a minute, so there will be 10,000 of our newly invented "moments" in a second.

Following the Frequencies.

The loud speaker is working, but we must start somewhere, so you can say that at the first moment we begin our investigations the diaphragm is attracted to the electromagnet to an extent depending upon the amount of current flowing in the anode circuit of the last valve.

The next moment the value of that current changes to a value due to the combined effects of, let us say, fifty frequencies. The moment after the current may fall slightly and the armature diaphragm be less attracted because, although perhaps a score of frequencies are tending to add to the current, as many more, and some of perhaps greater strength, are tending to subtract from it.

The following moment there may be a still further decrease of current to some degree, although the pattern of frequencies has changed. For the next five or six successive moments the current may still

be falling, although its falling may not be even, but in tiny jerks.

It certainly sounds somewhat vague and rather involved, and I am not too sure that even my artificial division of time has explained it. Nevertheless, so long as you start with the idea that there is only the one current, and that at any moment of time the value of that current depends upon the sum of the additions and subtractions caused by all the frequencies being dealt with, a little thought will enable you to get a clear idea of what happens.

No-Confusion.

Do not think too much of electricity in terms of amperes. It is convenient to call a flow of electricity a current, but it must not be forgotten that amperes represent the quantity of electricity flowing in a certain time. Bearing this in mind, it will make it less difficult for you to visualise how both an alternating and a direct current can flow through the same circuit combining into one flow of current, and how the A.C. and D.C. components subsequently can be separated.

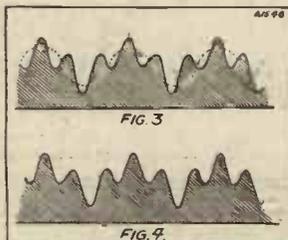
Supposing there were a circuit in which there flowed ten milliamperes of direct current. Now, alternating current is current that flows first in the one direction and then in the other. What would happen if we sent an alternating current of five milliamperes (R.M.S.) into the same circuit?

In the first half-cycle the A.C. would flow in the one direction and add to the direct current, and then in the subsequent half-cycle the A.C. would change its direction and the current flowing during that period would be equal to the value of the D.C. minus that of the A.C.

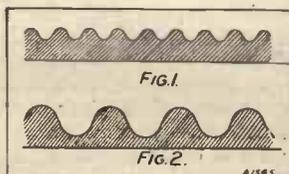
But this is the vital point.

We have what appears to be not A.C. and D.C. mixed up, but merely D.C. that fluctuates in value at a certain frequency. You might say that there is no current there that changes its direction of flow, and quite rightly, but this is only because my example shows D.C. whose value is much greater than that of the A.C.

I must amplify this point in a future article, if I can.



What happens when two frequencies are being handled at the same time.



How the current rises and falls evenly for a single frequency. Fig. 1 represents a higher frequency than does Fig. 2.



FIG. 5.

Something of an idea of what occurs when there is a whole medley of frequencies is given by this illustration.

THE "BROOKMANS REJECTOR"

Dear Sir,—I hope you are not tired of hearing about the "Brookmans Rejector," for I feel that I shall have to thank you for a little marvel which does more than I ever thought it would, also because I do not remember reading of its use in Newcastle.

In a few words, I am within a mile of 5 N O's aerial, and yet I can cut him out and get lots of Continentals, including Radio Toulouse, Langenburg, Oslo, Budapest, Hamburg, Frankfurt, Rome, Turin and Prague, of which Radio Toulouse and Rome come over at full loud-speaker strength.

The two Brookmans Park stations come through fine, although fading a little.

My set is the "P.W. Four," except that both L.F. valves are transformer coupled and incorporates a switch for cutting out one valve, and which your Technical Dept. checked over for me a week or two ago when I built it. I may say that my outfit is an all "P.W." one, for my loud Speaker is made from the series of "how to make" articles about fourteen months ago, and is built up round a "Blue Spot" unit.

Trusting I have not bored you with this letter and wishing "P.W." every success.

I remain,

Yours faithfully,

Newcastle-on-Tyne. R. G. HARRISON.

ORDINARY WAVETRAPS USELESS.

Dear Sir,—Just a word in praise of your "Brookmans Park Rejector de Luxe." I made up the rejector out of my scrap: 3 old Polar variable condensers -0003, 1 -0003 fixed condenser, and 2 old Daventry XX coils, basket pattern, and wired up as per your instructions.

As I am only three-quarters of a mile off Manchester station, I can easily cut it out and bring in any other station, British or Foreign.

May I also say that Manchester is like a lot of howling dogs at times, but I have no trouble.

My set is a 3-valver (straight).

May I also mention I have tried every well-known make of Wave trap, and they are useless when so near this terrible Manchester station.

Yours faithfully,

Manchester. C. HAMILL.

THE "MAGIC" FOUR.

Dear Sir,—Perhaps you would be interested to know my results with the "Magic" Four.

With a 30-ft. aerial on the roof, 60 ft. lead-in passing through two rooms, I get on the loud speaker—Kansas (F), Huizen (G), Lahti (G), Radio Paris (H), Königswusterhausen (G), Eiffel Tower (H), Warsaw (G), Motala (G), Kharkov (F), Kalundborg (G), Moscow, Popoff (F), Hilversum (V G), and one other at (F), which I think is Leningrad.

Medium waves: Ljubljana, Budapest (G), Munich, Riga, Vienna (G), Brussels, Milan (G), Oslo (G), Prague, Daventry (V G), Sunferopol, Langenberg (G), Lyon, Moscow, Rome (G), Belgrade, Madrid, Berlin (Witzleben), Dublin, Rabat, Katowice, Berne, Bucarest, Frankfurt (G), Wilno, Toulouse (G), Hamburg (G), Algiers (G), Stuttgart (G), (2 L O off),

CORRESPONDENCE.

THE "BROOKMANS REJECTOR."

THE "MAGIC" FOUR—THE "MAGIC" THREE—FORCEPS FOR RADIO—"MAGIC" ON SHORT WAVES.

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

Graz (G) (2 L O off), Barcelona, Brno, Posen (G), Naples (I think), Grenoble, Petit Parisien, Breslau, Göteborg, Dresden, Radio Vitus (?), Bordeaux-Lafayette? (another good station), Kosice, Turin (G), Bratislava, Königsburg, Barcelona-Catalana (G), Moravska-ostrava (G), Leipzig (G), Horby (G), Toulouse (P T T), Nürnberg (G), Munster, Cologne (G), Luxemburg, Flensburg (?), and four others.

I have not given the ultra-short waves a fair trial yet. This makes 73 stations logged.

H=huge volume, V G=very good, G=good, F=fair.

Those not classified are poor to fair. 5 X X, Brookmans Park (1 and 2) are terrific, although 261 is not so strong as 356. Algiers I consider one of my greatest captures, as by bringing the small series condenser on A I into action it comes in at good volume clear of London.

How's that?

In conclusion, my set is in a room 15 ft. by 15 ft., and (F) fair volume must be comfortable listening without ear strain, so you can judge my other degrees of volume!

I would recommend all "Magic" Three's to convert to "Magic" Four's, as when the new conditions are in force they will have nothing to trouble about or desire further.

Thanking you for a fine set and paper.

Yours faithfully,

GEORGE WARD.

Chelsea, S.W.3.

THE "MAGIC" THREE.

Dear Sir,—I have read nearly all the complimentary letters you have published up to now concerning the achievements of the "Magic" Three, but below I give you one which for results, considering the snags, will compare favourably as a top-liner. My permanent address is in Manchester. Not a Class A district for distant receptions, and 12 ft. from my set is the wall of an electric power

station. I am enclosed on three sides with electric trams! I do not get any interference now from the power station. I get more foreign stations than ever before with 2 Z Y working, and its working is simplicity itself.

The differential detector arrangement is as smooth a reaction as any I have handled, and more powerful than a good many 4- or 5-valve sets. In fact, T.M.T. is the T.N.T. of radio, and that's powerful enough for

Yours truly,

G. R. PALMER.

Belfast.

P.S.—Hope this will help to convert others to a sensible set.

FORCEPS FOR RADIO.

Dear Sir,—Your correspondent, Mr. Wite, has undoubtedly "spilt the beans" regarding "Spencer Wells'" forceps, and I fear would burst into song. I have had a pair of what are apparently the "sinus" variety for some years and they are one of my most cherished weapons. I would not think of answering a service call without them. I have found from long experience that although some factory-built receivers are marvels of compactness, they are the very devil to get at when something goes wrong with the innards.

Some little jobs, which with the aid of the forceps have been executed in a few moments, would have entailed practically dismantling a set in their absence.

By all means write them down as one of the most useful of wireless tools. Mine were given to me by a friend connected with the "sawbones" business, and although I rarely see him nowadays I am not likely to forget him while they remain in my possession.

Yours faithfully,

"WIRELESS DEALER."

Highams Park.

"MAGIC" ON SHORT WAVES.

Dear Sir,—I notice in your valuable paper that some of your readers are commenting on the lack of details of the "Magic" Three's efficiency on the ultra-short wave-band. I append a list which I have received on the speaker and phones: W 8 X K, (Pittsburg), 62.5 metres; Radio LL (France), 61; Bergdorf (A F L), 52; W 2 X E (Richmond Hill), 49.2; Madrid (E A R), 43; Quebec (Canada), 32; W 2 X A F, 31.48; Zeesen (Germany), 31.38; Eindhoven, (P C J, Holland), 31.4; 7 L O (Nairobi), 31; W K 2 M E (Sydney), 28.5; G B X (Rugby), 27.50; W 6 X N (Oakland, California), 23.35; W 2 X A D, 19.56; W 2 X K, 17.34; H S P (Bangkok, Siam), 16.9; P H I (Huizen), 16.88; P L E (Bandong), 15.94; G B X (Rugby), 15; Rocky Point (New York), below 15 metres. I receive others, such as amateurs and transatlantic telephones, etc. Many thanks for such a fine circuit.

Yours faithfully,

H. HUXLEY.

Leamington Spa.

I RETURN to the ever-present problem of short-wave interference from other sources than radio, without apologies! It is all-important for the future of short-wave working that we should know rather more about it than we do now, and that we should find out whether anything can be done to combat it from the "receiving" side, as distinct from the "transmitting" side.

First I should like to lay out a few facts as I have come across them recently.

1. The interference is divided between two kinds of sources—mains-operated devices and motor-vehicles.

A Noisy Aeroplane.

2. The former is undoubtedly the more troublesome of the two to those situated in an area in which electric light mains are laid on. Naturally, listeners situated in the country, miles from the nearest mains, have not experienced these joys at all.

3. Nothing whatever appears to have any effect upon the interference caused by bus magnetos, car ignition systems, etc.

4. Mains interference is certainly worse when the short-wave receiver is operated from the mains unless an elaborate H.F. filter is devised and used.

5. Also it is generally worse when an earth is used. If you can use your short-waver without an earth it generally appears beneficial to do so.

SHORT-WAVE NOTES.

By W. L. S.

It is fairly obvious that nothing can be done at the receiving end about "non-mains" disturbances, which are undoubtedly picked up by the aerial and amplified "to taste." Apropos this last remark, it is interesting to note that I was listening recently on 20 metres when a large French air-liner passed directly over at a height of about 300 feet, and I distinctly heard the disturbance caused by its magnetos.

General "Mush."

It was quite loud when the plane was overhead, and continued audible for about half a minute, during which time the plane had probably travelled nearly a mile.

Regarding the general "mush," which is the kind of interference that is with us all the time, a very interesting suggestion by a friend of mine raised my hopes of getting rid of a proportion of it. Incidentally the results dashed them to the ground again, but the idea is worth mention.

He suggested that "mush" consisted of a series of high notes, similar to "needle-scratch," and that a filter arranged to cut off in the region of 4,000 cycles would do much to eliminate it. Now "mush" certainly does sound very much like needle-scratch, but the fact remains that I have not been able even to reduce it by any kind of filter I have tried. Even the use of an extra stage of amplification and a large loud-speaker of the "woofy" class has done nothing whatever in this direction.

Pentodes for Short Waves.

It appears from this that the mush is a compound of all kinds of noises, including harmonics of commercials, spark stations and all the other poisonous noises previously mentioned!

I believe the pentode has fallen into disrepute somewhat, particularly at the hands of short-wavers (including, by the way, my humble self). The reason in my own case is that I get all the amplification I want (and sometimes more) from a triode.

The pentode does strike me, though, as having a distinct use for those in "dead spots" who cannot get very much volume from a straight detector and mag., and don't want to use a three-valver. If anyone can tell me why so few people use them, I should be glad. The answer, I am quite prepared to be told, is 25s.!

The "MAGIC" THREE ON SHORT WAVES



ONE of the very special attractions of the original "Magic" Three was that it brought successful short-wave reception for the first time within the reach of the average listener.

It did so by virtue of two facts; first, by combining a super-efficient broadcast receiver with an equally good short-waver, it removed the necessity of building a separate short-wave set, and, secondly, its ease of operation made it unnecessary for the operator to spend a good deal of time laboriously acquiring the special skill needed in the handling of the average short-wave circuit.

The Series Condenser.

This year's version of the "Magic" Three naturally embodies this same attractive feature, and we regard it as such an important one that we are devoting a separate article to the necessary notes to enable you to get the best results out of the set on short waves. Space is somewhat limited, so let us get down to business at once.

First of all you must understand the use of the special short-wave aerial terminal, which is marked A_2 on the blue print. The idea is that you shall transfer your aerial lead to this terminal when working on short waves, and the effect is to bring the small condenser C_3 in series with the aerial circuit.

In this way you can be sure of getting good reaction effects, without flat spots due to the characteristics of any particular aerial. If you do encounter flat spots they will only be slight ones and you can shift them by altering the adjustment of C_3 . As a rule you will be able to keep this at maximum, but if you have any slight difficulty in getting adequate reaction at any point on the tuning dial, just reduce C_3 a little and the trouble will disappear.

Choosing Coils.

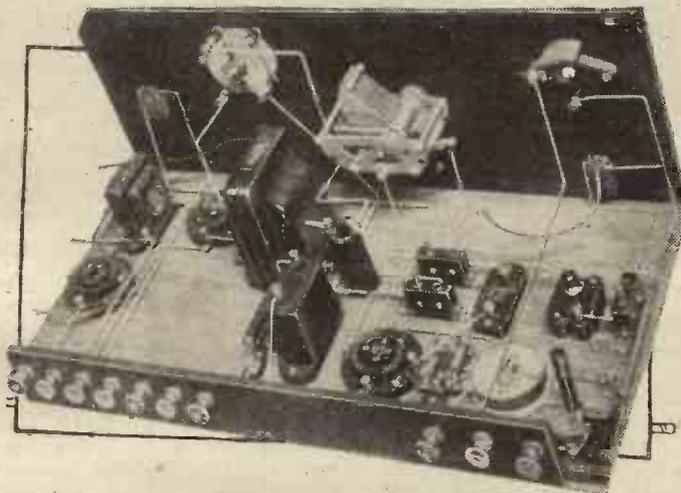
By the way, when you are working on short waves it is as well to cut out the rejector circuit by placing switch S_1 to the "on" position. The rejector does not, as a rule, have any effect on short-wave reception, but it is just as well to cut it out and make sure that it is not interfering in any way. You will not need it, of course, to prevent the local coming through, unless you are absolutely under its shadow.

The "Magic" is exceptionally efficient on the short waves, indeed, one of its very special features is that it brings the short waves within the scope of the inexpert amateur, as it handles so well "down there." In this article some useful hints on operating the receiver to get America and Australia are given.

By THE "P.W." RESEARCH AND CONSTRUCTION DEPT.

Now we come to the question of coils. You want some of the special short-wave plug-in type such as those produced by Messrs. Igranic, Atlas, DX, etc. For wave-lengths between about 18 and 35 metres you require a size No. 4 in the L_2 socket, and a No. 6 for reaction, or even a No. 9,

TUNE IN AMERICA!



Most constructors of the "Magic" Three get so many stations on the broadcast band that they do not feel the need of going on to the short waves for programmes. However, they shouldn't forget that there is a great thrill to be got out of tuning in the four corners of the earth.

if your detector valve does not oscillate easily. It is as well to try both sizes, and see which gives you the best control of reaction.

Remembering that on the ordinary broadcast and long-wave bands the coil L_2 is of the X type, you may wonder what is to be done on short waves, since the type of coil to which we have referred is not provided with tapping points.

Well, it is quite a simple matter. You place on the end of the flex lead which normally goes to the tap on L_2 a tapping clip of the crocodile variety, and with this you can make connection to any desired turn on the bare wire short-wave coil. This clip will also serve, obviously, for making connection to your X coil.

The 30-60-Metre Band.

The position of the tapping on the short waves is not, as a rule, at all critical, and you will generally get quite good results if you just put the clip somewhere about the middle of the coil. Take care, by the way, that the clip does not touch more than one turn at a time. To make certain of this it is just as well to bend the desired turn outwards a little so as to be clear of the others.

The other interesting band of short waves is from about 30 to 60 metres, and this you will be able to cover if you put a No. 6 short-wave coil in the L_2 socket and a No. 9 in the L_3 holder. In this case, by the way, it pays to experiment a little bit with the tapping on L_2 , so try one or two other turns as well as one somewhere near the middle.

You need not be afraid of damaging your coil by bending these various turns outwards a trifle, since you will find that doing so will not hurt them a bit, because the actual amount of bending required is very slight.

Picking Up The Yanks.

These two combinations of coils, you will find, will cover the wave-lengths of practically all the interesting short-wave broadcasting stations, and it will not be long before you find the dial readings for some of the stronger ones, and many an interesting evening you will have listening to their transmissions.

The European ones, of course, you will find come in pretty regularly every night, but success in picking up the American short-wave stations is somewhat dependent upon conditions, so do not be disappointed if you

do not succeed in picking up 2 X A F or 2 X A D the first evening you try for them. When they do come in you will probably find that they are remarkably strong, and you will discover what a real thrill it provides the first time you hear a strong transatlantic accent emanating from your loud speaker.

(See also note in "Radiotorial.")



YOUR AERIAL AND EARTH



Some interesting facts about the construction of an efficient aerial-earth system.

By E. C. CRAVEN, B.Sc., A.Inst.P.

SO much has been written about the subject of aerials that it might be thought that there was little left which might usefully be said. It is impossible, however, to avoid being struck by the large number of aerials erected which are apparently of perfectly preposterous design.

One particular form quite common is an acute V with the top wire horizontal and having the lead in directly under the free end and only a few feet lower. In many cases such erections are no doubt the result of lack of experience, or of the mistaken idea that the more wire put up the better the results will be.

On the other hand, possibly actual trial has shown that the form adopted gives results on the local station superior to more conventional types.

Those Local Conditions.

There are two reasons why this may be so. The first is that the wave front of the transmission is perhaps badly deformed. The electric field in the wave front of a theoretically ideal transmission is perfectly vertical, and the voltage generated in the aerial is proportional with the vertical distance from the free end of the aerial down to the receiving set.

Actually there is a slight tilt forward of the wave front due to the drag of the earth on the foot of the wave, but this is unimportant in amount. Very often, however, from local causes which have often been mentioned in "P.W." the actual wave front may be badly distorted.

No doubt many readers with frame aerials have noted that whilst the directive properties of the latter may be quite marked on certain transmissions, on others the signal strength varies but little with the frame aerial setting.

The Value of Experiment.

This indicates that the wave form is badly distorted, and if the apparently poor design of outdoor aerials already mentioned be based on experiment arising out of such circumstances there is nothing to be said against it. It is making the best of a bad job and must be left at that.

It must be obvious that such an aerial designed to fit the vagary of a local transmission will hardly be at the same time best fitted for the reception of distant transmissions. Some few years back the DX merchants writing to "P.W." with curious unanimity used to finish as follows: "My aerial is a very poor one, consisting of four yards of clothes line wire badly screened by the local gas works and the Crystal Palace"—or words to that effect.

Since this ending no longer appears it may be taken that it is at last recognised that a

poor aerial is not a matter for pride, but is a misfortune, if not worse.

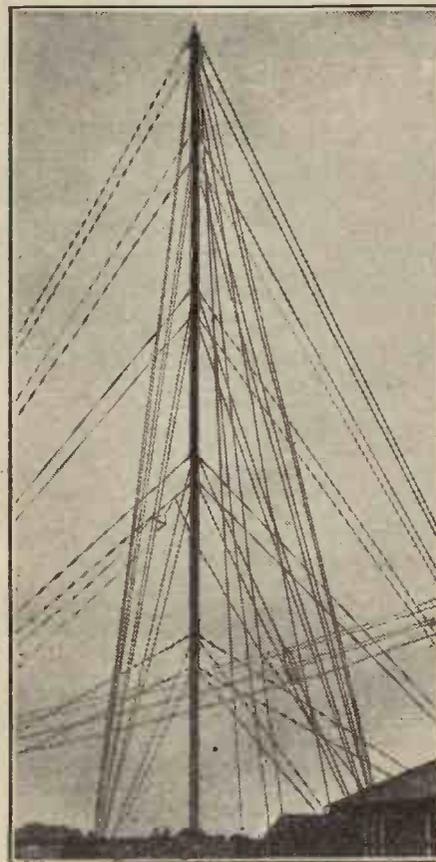
The second reason for the adoption of bad designs is that a large aerial will steady an unstable set, i.e. one which is prone to oscillate on slight provocation. Many people like to erect the full 100 feet of wire, despite the fact that the bulk of the length so employed is in the "roof" of the aerial and in general adds nothing to the voltage at the aerial terminal of the set, but merely adds inductance and capacity.

The large capacity to earth of a long aerial has a damping and steadying effect on that class of set which would be hopeless on a vertical aerial of the same effective height or a frame aerial.

In such cases the rule of "look to your set" applies.

Turning now to the subject of earths, if

AS FIRM AS A ROCK.



There is no need for you to guy your aerial mast to the extent shown in this photograph of a Continental station's aerial support. But all the same a steady aerial mast will keep you free from many minor troubles.

your set works better when the earth terminal is held, or if the set will receive with the aerial disconnected, the chances are the earth lead is too long.

The latter effect may also be due to direct pick-up by the coils or wiring of the set, which is an equally bad fault and bound to militate against the effective cutting out of the local station.

Here again the fact of a set working without an aerial is not a matter for pride, but a sign that improvement can be effected.

Keep Your Earth Short.

When the earth wire is long it acts as an aerial and delivers signal voltage to the set. Owing to the natural cussedness of things this voltage is always opposed to the aerial input. I once had a curious example of this when running a crystal circuit from a local oscillator. The only available earth was very long, and it was found that at a certain degree of coupling of the oscillator search coil, the opposing E.M.F. in the earth lead was just equal to that induced into the aerial and no current flowed.

When the search coil was screened a certain voltage was shown in the circuit. With the screen removed and the earth lead taken away double this voltage was indicated.

The moral would appear to be to keep the earth lead short. If this cannot be done a multiple earth might help since one lead might be lucky!

THAT AERIAL.

If you are troubled with so-called "fading," make sure your aerial is not swinging across a gutter pipe or similar metal conductor, as this is quite sufficient to cause the trouble.

A short-wave receiver often works better on a small indoor aerial than on the ordinary aerial used for broadcasting.

When using a crystal set it is essential to get as much energy as possible in the aerial, and for this purpose an outdoor aerial is generally very much to be preferred to an indoor one.

Generally the best site for an indoor aerial is underneath the rafters, but a long hall or passage-way will often give good results; or as a last resource the wires can be stretched round a large room.

CAPT. ECKERSLEY'S QUERY CORNER



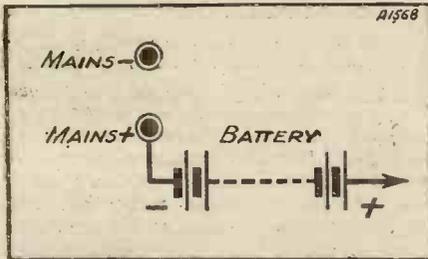
INCREASING THE MAINS VOLTAGE—WHEN THE SET “TALKS.”—USING 2-VOLT VALVES—DO YOU ROB YOUR LOCAL?—INTERFERENCE FROM THE NEIGHBOURS’ SET.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by “P.W.” readers. But don’t address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

“Increasing the Mains Voltage.”

D. M. (Seven Kings).—“My set is a simple detector with two stages of resistance coupled low-frequency amplification intended for good quality reception of my local station. It derives its high tension supply from the 220 v. D.C. mains. I should like, however, to increase the voltage for the output valve to 250.

“I have a high capacity 30 v. H.T. accumulator. Is it possible in any way to



This diagram illustrates the above answer to a Seven Kings reader’s question.

use this battery in conjunction with the mains to obtain a higher voltage without risk of damage to the house lighting circuit?”

Yes, of course, connect it in series as shown here.

You had better see that some local bye-laws do not prevent your doing this, but this is the way it goes.

When the Set “Talks.”

M. C. (Streatham). “I have a three-valve set, the L.F. side of which is resistance-transformer coupled. The set works perfectly, but I notice that when I disconnect the loud-speaker altogether, I can still receive the broadcast programmes very faintly. Why is this?”

Two possibilities occur to me. If you undo one side of your loud speaker the currents of modulation may feed into the speaker very feebly by capacity effect.

You can do an amusing thing by putting one finger on the loud speaker connection, the other on the loud-speaker terminal on the set. The loud speaker will give you results little dissimilar from normal. You are passing the currents of modulation through your body. (Before you do this, however, be sure your output is not connected direct to H.T. +, or that you are standing on an insulating floor.)

The second suggestion is that your set is “talking.” This commonly occurs with transformers and output chokes. The vary-

ing currents excite forces on the iron, which moves in sympathy with these forces and so creates a noise.

Just the same way a transformer for house alternating electric supply current hums. But if you have no transformer the condensers may do the same thing. Seems to me I have exhausted most possibilities, but the principle is the same whatever makes the noise—varying electric forces cause variation in the mechanical parts of some apparatus and thus makes a noise.

Using 2-Volt Valves.

L.M. (Dulwich).—“Should a filament rheostat be used on 2-volt valves? Or is it better to use the full two volts on the filaments?”

If, for any reason, you want to desensitize the circuit by dimming the valve filament, by all means use a rheostat. But there’s no necessity, and 2 volts on a 2-volt valve is a fairly accurate guess at what the makers want you to do.

Do You Rob Your Local?

W. M. C. (Newcastle).—“I imagine that only a limited amount of energy is radiated from the aerial of a transmitter, and that receivers tuned to the wave-length of the transmitter only function by virtue of absorbing a small proportion of energy.

“Has it ever been ascertained what number of receiving aerials can be energised by a transmitter? And is it possible for so many receivers to be tuned to a transmitter, so that complete absorption of all the available energy occurs?”

A most interesting question showing that W. M. C., at any rate, doesn’t fall down over the principle of the conservation of energy. If it wasn’t so late at night, and I hadn’t such a terrible lot of work, I’d sit down and recalculate, as I did four years ago, how many aerials it would take to make an appreciable reduction of aerial current at 2 L O.

It would, I remember, take more than the whole of the population of London, concentrated in a very few miles of Oxford St., appreciably to alter the old 2 L O current from when they tuned in to when they simultaneously switched off their aerials.

It is said that the signals on the outskirts of London are weaker slightly, because of the many aerials tuned in. But it’s never been well proved that this or water pipes or steel frames are the cause.

Anyway, it’ll take a lot of ‘em to do any

harm to Brookmans Park current, and the B.B.C. would be disgustingly rich if there were enough and if they all paid licences. Thank you for your question.

Interference from the Neighbour’s Set.

H. A. G. (Walthamstow).—“Two tenants occupy the house next to mine, and one of them operates a three-valve receiver on an outdoor aerial. The other has a portable set employing five valves. There are, therefore, eight valves in close proximity to my own three valver. Will any adverse effect be caused to my reception on account of this?”

It has never been really very definitely established whether one aerial “pulls” another very seriously when they are reasonably far apart. The portable set won’t upset you much, anyway; but the

TESTING TELEPHONES.



Put one tag between the lips and rub the other with a key. You will hear scratching sounds in the ‘phones if they are O.K.

other set if worked very near reaction and if its aerial is very close to yours (matter of yards, I mean), then there might be an effect upon the setting of your tuning.

It’s not so much that neighbouring aerials take away the signal, they usually upset tuning—a readjustment of your tuning usually restores a good signal if the neighbouring aerial has stolen it.

The trouble comes when the two of you chase one another’s adjustments about. But these effects presuppose an aerial separation not greater than a few yards at one point or another of the aerials.

NO single design of receiver can possibly be expected to suit everybody; neither can any one type of mains H.T. unit. As a matter of fact, there is less chance of meeting the needs of everyone with a mains unit than with almost any other kind of wireless appliance; hence our decision to produce not one "Safe-power" unit, but a series of them.

A.C. Models to Follow.

We have started with a very simple and comparatively small one ("Junior"), intended definitely for small and medium-sized receivers, and now we come to what we regard as the standard design. This is the one which we expect will suit the majority of mains users, since it is suitable for practically any receiver, with the possible exception of one type which we will mention in a few moments.

It is, again, an instrument for direct current mains, for we propose to complete our series of D.C. units before starting upon the alternating current side of the question. This we are doing, by the way, because reliable statistics have shown that there are considerably more users of D.C. than A.C. in this country at the present moment, surprising as that fact may seem.

True, the process of conversion to A.C. under the standardising scheme is proceeding steadily, but we understand that it will take some years before the proportion is seriously altered.

The problem confronting those whose mains are being changed over to A.C. is one which we are not forgetting, and we shall include in our series a special

device to meet the case. This conversion unit will enable all those who now have satisfactory D.C. mains units to avoid the expensive business of scrapping and re-building, because they can keep their existing instrument and just connect it up to the converter.

Now let us look over the "Senior" design and see how it is arranged. First, there is the same scheme of voltage adjustment and measurement as that in the "Junior" model. Briefly, this consists of a master controlling resistance R_1 and a volt-meter which shows the voltage on the maximum H.T. terminal (H.T. + 2, which supplies the L.F. valves).

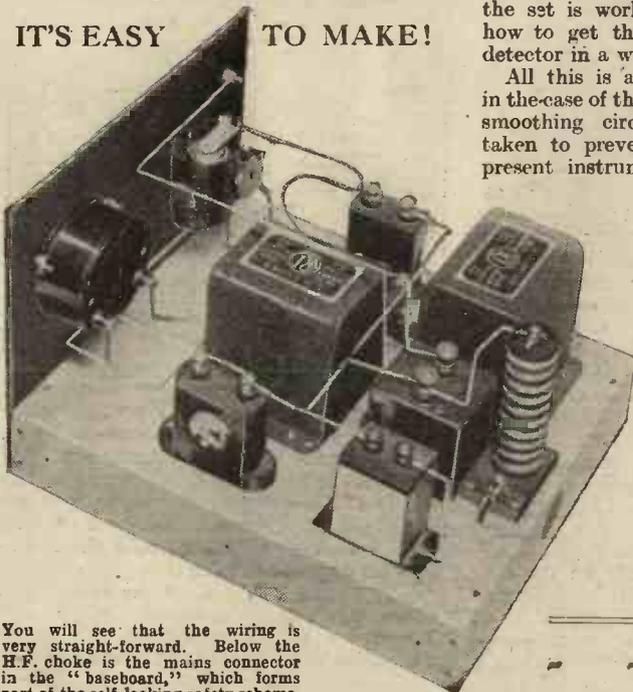
Voltage Adjustment.

The idea is to adjust the resistance until the meter shows the correct figure for your L.F. valves (usually 120 or 150 volts) when

THE "SENIOR" SHOPPING LIST.

- 1 Safe-Power Senior metal box, and panel, 10 in. \times 8 in. (Magnum, or Ready Radio, Keystone, Paroussi, etc.).
- 1 0-250 or 0-300 scale voltmeter (Ferranti, or Sifam, Weston, etc.).
- 2 L.F. smoothing chokes of about 20 to 40 henries (R.I., or Ferranti, Varley, Wearite, etc.).
- 1 20,000 ohm tapped potential divider (Bulgin, or Igranie, Wearite, Cimax, etc.).
- 1 10,000 ohm power potentiometer R_1 (used as variable resistance) (Varley).
- 1 Heavy duty H.F. choke (Wearite).
- 1 4-mfd. condenser, 200 working volts rating at least (T.C.C. or Lissen, Dubilier, Hydra, Ferranti, Mullard, etc.). NOTE.—In some makes a 4-mfd. unit is rather tall and may touch the lid. In these cases two separate 2-mfd. units should be placed side by side and connected in parallel.
- 3 2-mfd. condensers, same working voltage (Lissen and Dubilier, or Ferranti, etc.).
- Wire, screws and nuts, 4 insulated terminals, flex, etc.

IT'S EASY TO MAKE!



You will see that the wiring is very straight-forward. Below the H.F. choke is the mains connector in the "baseboard," which forms part of the self-locking safety scheme.

the set is working, and then you can tell how to get the correct voltage for your detector in a way we shall explain later.

All this is almost exactly the same as in the case of the "Junior" unit. It is in the smoothing circuits and the precautions taken to prevent motor-boating that the present instrument mainly differs and is considerably more elaborate. First, note that we now have a cascaded double filter circuit consisting essentially of the two L.F. chokes and the condensers C_1 and C_2 .

This ensures ample smoothing for the detector valve supply, which, of course, is where it is most needed. The L.F. valve or valves are to be fed from the H.T. +2 terminal, and this is tapped back into the filter circuit at an earlier point, where the first choke and con-

The P.W. "SENIOR"



THE PERFECT SOLUTION

Here is a unit that banishes battery bother for silent power to the plates of your valves, at the right and always ready. It is the outcome of P.W.'s supply, and sets a new standard for low cost and power valves are easily within the scope of this special

Designed and

THE "P.W." RESEARCH AND

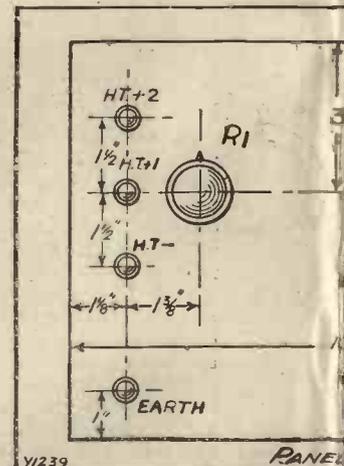
denser C_1 alone are giving smoothing. This we have found a very desirable scheme, because this amount of smoothing is ample for the L.F. valves, and excellent anti-motor-boating effects are thereby obtained.

Preventing Motor-Boating.

If you examine the circuit, you will see that the currents from the H.T. +1 and H.T. +2 terminals are prevented from interacting with each other by the second choke and the by-passing effects of the condensers C_1 , C_2 , and C_3 . In practice, this is an exceedingly effective scheme, and it is very difficult to persuade any ordinary set to motor-boat when working on such a unit.

Another important difference between this unit and the "Junior" one is the provision for stopping H.F. disturbances which may be wandering around on the mains from getting through into the set and causing trouble. This is not likely to happen

HOW THE PA



Y1239

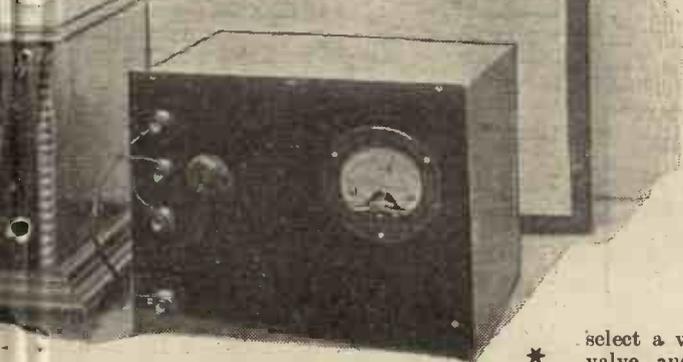
PANEL

No difficulty about panel drilling, is there a sensitive high-resistance component, but in the circuit that it tells you just as well want to know about the voltages de

SILENT! SIMPLE! SAFE! AND

SAFE-POWER

OR



TO THE H.T. PROBLEM.

ever. Joined to D.C. mains it provides smooth, right voltage and in the right quantities. Reliable research into the problems of satisfactory power high efficiency. Big sets with power or super-lendia H.T. Supply Unit.

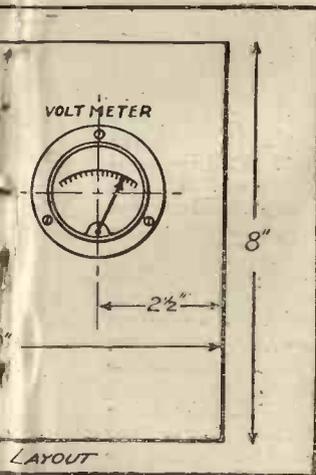
Described By CONSTRUCTION DEPARTMENT.

with small and medium-size sets; hence nothing was done to stop it in the "Junior" unit.

Stopping Wandering H.F.

With large and sensitive sets, however, matters are far otherwise. Many mains are found to be carrying an H.F. component due to sparking at the brushes of motors and other electrical machinery in the neighbourhood, and this usually shows up as a pronounced hum or crackle which is not removed by ordinary.

ANEL LOOKS.



The voltmeter is not the usual expensive low resistance one, so arranged as the most expensive voltmeter all you hoped at the unit's output terminals.

removed by ordinary. L.F. filtering methods.

What is wanted in these cases is something which will stop H.F. currents, and the desired effect can almost always be obtained by placing our H.F. choke in one or other of the mains leads.

The choke must be of a type designed to carry the fairly considerable currents involved, and it usually has the best effect in the negative lead (it behaves rather differently from an L.F. choke). Sometimes, however, it may be better in

the positive lead, and in some acute cases a choke in each lead may be necessary. These points we will explain a little more in detail when we turn to constructional matters.

The Detector Voltage.

Observe that the necessary lower (and adjustable) voltage for the detector is given by the terminal H.T. + 1, and the control here is obtained by means of the potential divider marked R_2 on the diagrams.

This is a device with a series of tappings brought out to numbered terminals, giving a graduated series of voltages. By placing the flex lead from condenser C_3 under the appropriate potential divider terminal the desired voltage is brought out to terminal H.T. + 1 on the front of the unit.

In this way you can quickly select a voltage which suits your detector valve, and we will give you some figures presently which will help you in finding the

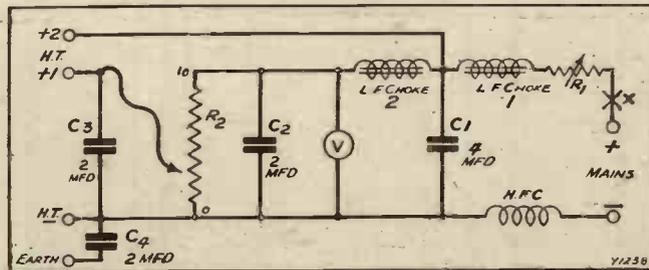
you really want separate H.T. tappings for the detector and the screening grid of the S.G. valve. Those who require a unit of this rather elaborate type should wait for the next in the Safe-Power series.

Sets of any ordinary size can be run from the present model, of course, even if they include a screened-grid valve, a simple little expedient getting round the difficulty of separate voltages for the detector and screening electrode. What you do is to run the detector and screening electrode from the same tapping on the unit (the adjustable one, of course), and set the voltage to a good compromise for the two valves. This is usually quite easy, for modern S.G. valves usually want about 70 or 75 volts on the screening electrode (assuming 120 on the plate) and that is a figure which suits most detectors quite well.

Simple and Effective.

This expedient works admirably for medium-sized S.G. sets. To be explicit, this is how you would arrange things: the plate of the H.F. valve and the L.F. or power stage would be run from H.T. + 2, the master resistance R_1 being set to give 120 or 150 volts thereon. (This voltage is shown on the meter so long as the unit is working.)

THE "SAFE-POWER" SENIOR'S CIRCUIT.



You will see that the circuit is fundamentally simple, the voltages being varied by R_1 , and by the position of the flex clip from H.T. + 1. The point marked X near the + mains point is the alternative position for the H.F. choke, to suit some mains, as explained in the article.

right adjustment. This scheme, in conjunction with the provision of the master resistance R_1 and the voltmeter, enables you to find out exactly where you are, and takes all the element of guesswork out of mains operation.

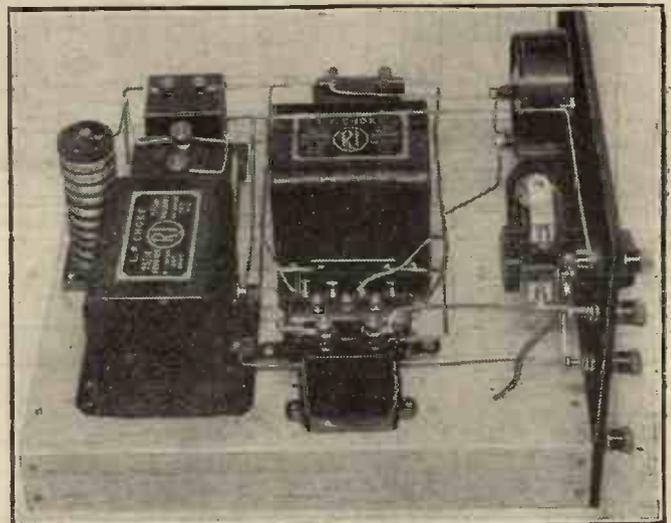
Before we go any further, let us be quite clear about a point we mentioned just now, i.e., the special type of set for which this unit is not quite suitable. The type in question is the large set with a screened grid H.F. valve, and perhaps two L.F. stages. For such sets as this you really require a unit with a greater number of separate H.T. positive tappings.

The point is that for a large S.G. set

The detector and the screening electrode of the H.F. would both be run from H.T. + 1, a suitable voltage being found by trial. This may sound a little troublesome, but in practice you will find it takes only a few minutes, because the choice is limited to just three of the tappings on the potential divider. These are Nos. 6, 7, and 8, and it is only a matter of trying the flex lead from condenser C_3 on each in turn and noting which gives the best results.

This test is necessary, by the way, because (Continued on next page.)

HIGH TENSION AT LOW COST!



In the foreground is the C_3 smoothing condenser, and immediately behind it is the potential divider R_2 . The terminals on this are numbered as shown in the wiring diagram overleaf, and a flex lead from the condenser is fixed to the required terminal before "putting the lid on." Simple isn't it? And SAFE!

PLENTY OF POWER!

THE "P.W." "SAFE-POWER SENIOR."

(Continued from previous page.)

the figures given below are for the voltages available on each tap of the potential divider when a detector valve alone is drawing current from H.T. + 1. The voltages will all be a little different when this terminal is also supplying the screening electrode, and since the actual

screen current varies greatly with different makes of S.G. valves, so will the voltages be different—hence the need for actual trial.

Connecting Up The Unit.

While we are discussing this question of voltage control, let us get a perfectly clear idea of the method of adjustment to be used with the Safe-Power Senior unit. Probably the reader will have grasped the gist of it already, especially as it is exactly the same as in the case of the Junior edition, but it may be as well to put it all quite briefly in the form of working instructions.

First of all, of course, you must connect

to the set, and the markings on the terminals tell you all you want to know about that, except that you must take the earth lead off your set and put it on "E" on the unit. Now, with the proper grid bias on your L.F. valves, switch on and note that you are getting results of some sort (keep R₁ set to midway value for this).

If there is no sound at all, undo the mains connector at the back and put it on again the other way round, so reversing the polarity. Now turn R₁ until the voltmeter reads either 120 or 150 volts (according to the rating of your power valve). That tells you that the H.T. + 2 terminal is giving the right output under working conditions, and you can proceed to adjust H.T. + 1 (intended for the detector) until the best results are obtained.

Potential Divider Voltages.

As a general guide, we give below the voltages on each terminal of the potential divider when it is supplying a detector. These are exactly the same as for the Junior model, since the same make of divider has been used again.

Here are the figures: When the voltmeter is reading 150 volts and the set is working, you will find that you get approximately 45 volts from terminal 2 on the potential divider, 54 volts from terminal 3, 65 volts from No. 4, 70 volts from No. 5,

THE "P.W." "SAFE-POWER JUNIOR"

for smaller sets was fully described in "P.W." No. 406.

MARCH 15th, 1930.

80 volts from No. 6, 95 volts from No. 7, 110 volts from No. 8, and 125 volts from No. 9.

Under the alternative condition, when the voltmeter is showing 120 volts you will get the following approximate figures available on the potential divider: 40 volts from No. 2 terminal, 50 volts from No. 3, 55 volts from No. 4, 60 volts from No. 5, 75 volts from No. 6, 82 volts from No. 7, 90 volts from No. 8, and 105 volts from No. 9.

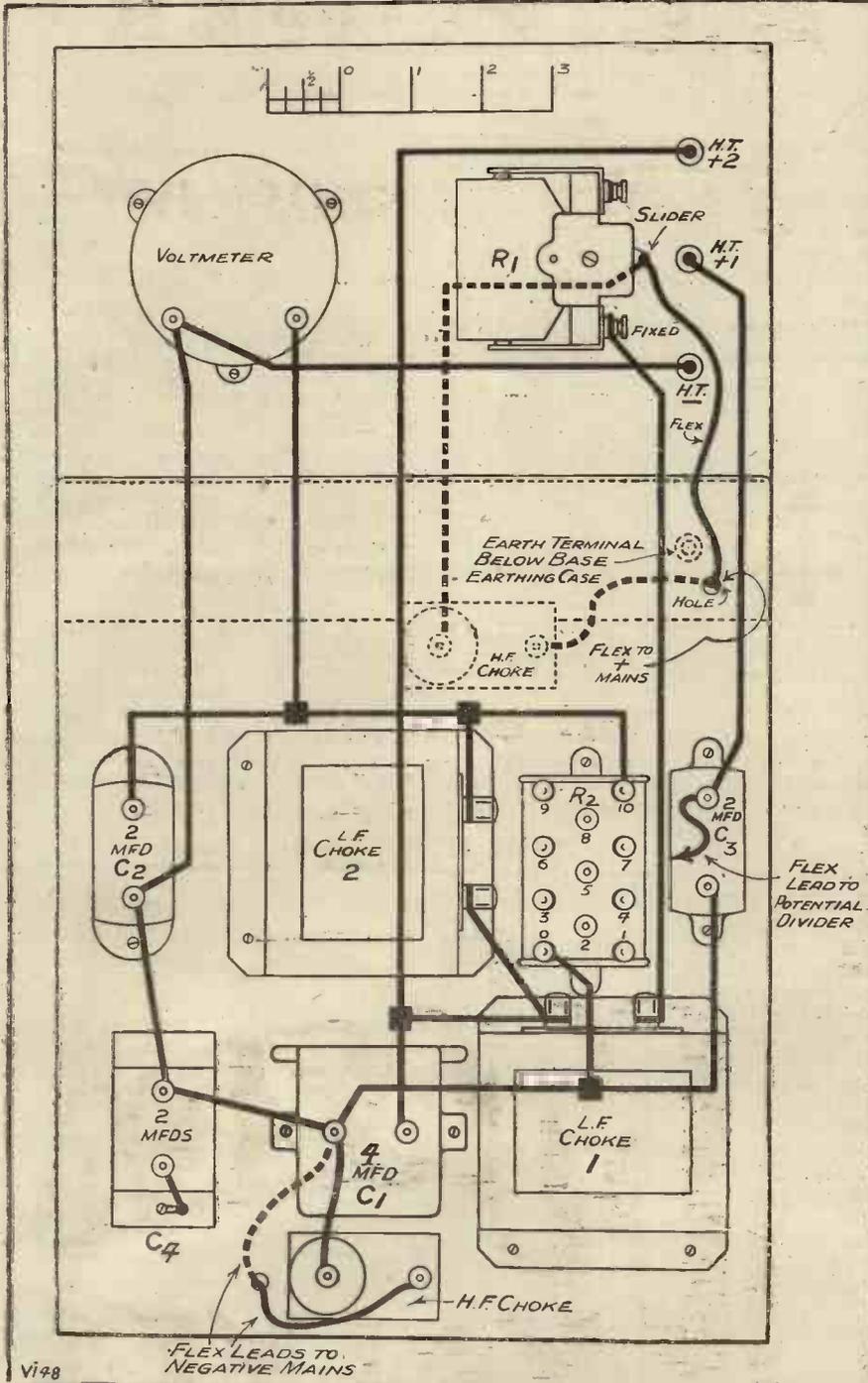
Let us just remind you about the safety mains connection device used in all the "Safepower" series. Inside the metal base at the back is mounted a lamp adapter, and the idea is to furnish your lead from the mains with a lamp socket. This is placed upon the adapter, to reach which it passes through a hole in the metal. Hence you cannot take the cover off without first disconnecting.

The Input Leads.

The flex leads marked on the diagram alongside as going to the mains, by the way, really go to the connection points in the adapter we have mentioned.

Constructionally, you will find the unit a very simple job, for all the parts are fixed down with small screws and nuts, and the aluminium drills delightfully easily.

Now about the alternative schemes for the H.F. choke. In most cases the scheme shown in full lines will suit. Sometimes it will be better in the positive, when it should go in as shown dotted, with the negative straight to C₁ (also as dotted). Sometimes again, you will want a choke in each lead, but this is very unusual.



Vi 48

This shows the connections, etc., at the back of the panel. The dotted lead coming from the slider of the resistance R₁ to a ghostly-looking H.F. choke, shows how the connections would be modified for very bad mains in which an H.F. choke was required in the + lead. Probably you won't have to bother about that, but will follow the heavy black "wiring," as explained in the article. The other dotted line (in the foreground) is fully explained too, and here again you will probably follow the black wiring and ignore the dots.

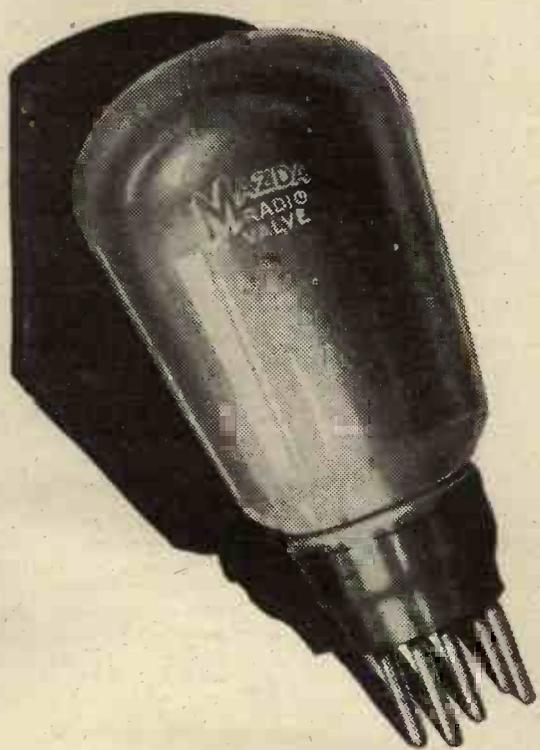
A GREATER POWER . . . OUTPUT THAN ANY OTHER A.C. POWER VALVE! *and twice as sensitive*

The only way to improve a set fitted with Mazda A.C./S.G. and A.C./H.L. valves is to use a Mazda A.C. Power valve in the output stage.

These valves are indirectly heated, so that freedom from hum is completely assured.

The A.C./P. valve combines a large power handling capacity with great sensitivity. It is roughly twice as sensitive as the ordinary filament valve, and thus its use doubles the sensitivity of the set.

Where more power output is required an A.C./P.1. valve should be employed.



PRICES	AC/HL	- 15/-
	AC/P	- 17/6
	AC/P1	- 17/6
	AC/SG	- 25/-

The Amazing

MAZDA VALVES



THE EDISON SWAN ELECTRIC CO., LTD.,
Radio Division,
1a, Newman Street, Oxford Street, W.1.
Branches in all Principal Towns.

V.30.

EDISWAN

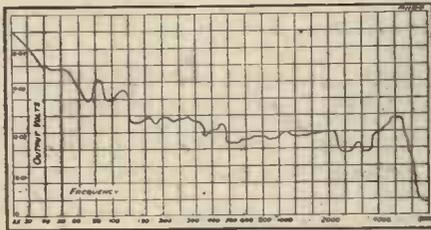
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



NEW BURNDIPT PICK-UP.

In the ordinary way the response curve of a loud speaker attached to a radio-gram outfit must be something of the shape of a mountain peak. There may be a moderately flat top, but inevitably there will be a sharp falling off at each side. The reasons for this are fairly plain to see. The needle of the pick-up is moved from side to side by the wavy grooves in the record. In order to get a decent length of playing the grooves



This is the output curve of the new Burndept pick-up.

have to be fairly tightly packed together, and their waviness is limited by this. But to get proportional power with the low notes, the waves would have to be much greater than is possible in the circumstances.

By means of auxiliary apparatus or amplifier correction, it is possible to bring up the low notes, but the higher ones generally present greater difficulties. If you make your high notes too good, you will bring up scratch.

"Needle Armature" Type.

The new Burndept pick-up tackles both problems right at the root and, as you will see by the accompanying curve, hands to the first valve bass emphasised to a considerable extent, and high notes that are to a less extent exaggerated, for these to be ironed out towards the ideal straight line by the normal high and low note loss occasioned by the normal operation of the amplifier and speaker.

The falling off of the pick-up curve just below 5,000 cycles is deliberately arranged so that scratch can be reduced.

This new Burndept pick-up is sold only with its own tone-arm, because the makers claim that only by this means is it possible to ensure absence of tone-arm resonance which causes a tendency to jump the grooves at low frequencies and is a common source of distortion.

Also by providing a tone-arm with a definite length and a definite angle between

the pick-up and a line joining the needle pivot and the needle point, it is possible to obtain correct alignment, and the most suitable vertical angle between the needle and the record.

The Burndept pick-up is of the needle armature type, and thus its moving parts are reduced to a minimum. It is much smaller than any other pick-up that I have seen, and the results it gives are, I think, better than any other pick-up I have yet tested. It brings the record side of the radiogram outfit well into line with the best that radio can do.

I find it uncannily realistic in this respect, and have discovered new virtues in many of my old records. It is far less sensitive than the average pick-up, and I find three valves essential for its successful operation. Some pick-ups give an output of as much as one volt, but the average of the Burndept is about 1/50th of this. I consider this rather an advantage, because savage volume controlling when using three valves does not become necessary. The input approximates that of average broadcasting.

PRACTICAL ELECTRICIANS' POCKET-BOOK.

In the 1930 edition this makes its 32nd appearance. It is a very useful book, and the new edition contains several new sections, a number of completely revised sections, and an enlarged and up-to-date section on radio. There is a central station data table giving the supply voltages for every area of importance in Great Britain, and these the mains unit enthusiast will find extremely useful. There are chapters on batteries, domestic appliances, cinema equipment and

a detailed index of 1,000 entries. Its price is 2s. 6d.

ELECTRADIX RADIOS.

I have been looking through the new list issued by the above people. There are some 72 pages crammed with illustrated details of all sorts of fascinating gear—some new, and some surplus service gear at very low prices.

It is mostly radio and electrical, but there is a quantity of stuff that is neither. There is a particularly fine assortment of electric motors and electric generators.

WHEN YOU ARE BUYING—

8.—FIXED CONDENSERS.

These components often have particularly important tasks to perform. Frequently they act in sets as barriers against the full H.T. pressure. Generally speaking every fixed condenser used in any set should be capable of standing up against a fair voltage without breaking down and should have a very high insulation resistance.

Such qualities are present in all fixed condensers due to the leading manufacturers, but beware of the unbranded variety sold by the junk-shop radio store at "give away" prices.

Those condensers used in mains sets and units need to be very efficient and you should buy those that are marked as having been tested at voltages at least double that of your mains.

Some "paper" condensers are every bit as good as "mica" dielectric types, but some are very "weak-kneed."

Grid condensers especially must not be "leaky" or they may upset the operation of the valves.

If you do not solder make sure the condensers have terminals and not only soldering tags.

PARTS FOR THE "TITAN."

The "Titan" Three, above most other sets, demands components that are above suspicion if it is to give those fine results of which it is capable.

The "Titan" coil and the H.F. choke are two of the most critical components.

It really does pay to get a kit of parts all complete from such people as Ready Radio, for it saves time and trouble, and ensures that everything is just as it should be.

We have examined a representative Ready Radio kit of parts for the "P.W." "Titan" Three, and find them to be completely satisfactory.

The 1930 Ready Radio "Titan" coil is excellent.



A Ready-Radio "Titan" Three kit of parts.

REALISTIC RADIO

By WISH WYNNE.

In this interesting article a very popular broadcaster chats about radio in general, and microphone humour in particular.



HAVE you ever thought, as you listened to a wireless comedian, of the difficulties which beset the path of those who try to be funny through the medium of the ether?

It is not so very easy, and the size and diversity of the audience is one of the main obstacles. For, after all, to make, or to attempt to make, a whole nation laugh is a feat at which the heart of even the most determined theatre manager would have wilted—before broadcasting came. It is a problem with which he was never faced. A theatre or music-hall manager was always able to determine, with some degree of accuracy, roughly the sort of person who would visit his theatre, and therefore provide him with the sort of fare which he could be expected to appreciate.

The manager of a palace of varieties knew that a not too polished humour of a certain type, perhaps with a trace of vulgarity, would be likely to suit the taste of his clientele. Those responsible for the provision of the programme at a rather more sophisticated West-End theatre would feel the necessity of giving their patrons something less obvious, more subtle, more satirical, perhaps. In other words, audiences at various theatres were of a fairly clearly marked type.

“Real Life” Humour.

But what a vast difference there is in the case of a wireless audience! Representatives of every conceivable class of men and women are listening; people with one sort of a sense of humour, people with another entirely different sort, and yet others with no sense of humour at all! How to please them all—making due allowance for the limitations imposed by the microphone—that is the terrifying problem which faces the radio comedian. Remember, these are not people who have paid money for seats in a theatre for the express purpose of hearing him. They are strangers, many of them. They are casual listeners, and quite possibly hostile.

I believe that there is only one way in which he can hope to interest a majority among this mixed population of listeners. And that is by basing his humour on the things they all know, the experiences they have all felt, the incongruities they all recognise, the comedy in which they have all played a part—in short, on real life.

Gestures Cannot Help.

Of course, what so many listeners and artistes, too, fail to remember, is that as far as broadcasting is concerned, the human comedy has to be conveyed absolutely and solely in words. Grimaces, a comical appearance, or gestures, convey nothing. People

frequently remark that the laughter in the studio when a vaudeville turn is on seems often out of all proportion to the humour of what is being enacted. When this does occur it can only mean that the artiste is relying for his effect on something other than mere-verbal humour, and has therefore not fully appreciated the nature of the medium in which he is working. The perfect radio comedian (he has not appeared yet) would raise just as many laughs from an unseen audience in a studio at the other end of the building as he does from those who are actually in the room with him.

The “Underground” Lovers.

But there is no doubt that, having fully mastered the technique of radio humour, the wireless comedian of the future will have to rely on the comedy of everyday life for his material. There is no other hunting-ground where he can find material suitable for so diversified an audience as that composed of the millions of wireless listeners.



A recent photograph of Miss Wish Wynne.

After all, the field is immense. At some time or other, we are all funny to other people, and never more often than when we imagine we are being most dignified. The commonest and one of the most richly humorous sights to be seen in a London street is a row between two enraged taxi-

drivers. It is not funny to the participants, but to almost everyone else it is, simply because they are not personally involved. A pair of absorbed lovers sitting in the Underground train in the morning, arm linked in arm, and oblivious to those around them, would probably resent the suggestion that their utter absorption in each other is funny.

Comedies of the Street.

But it is—to others who are not in the same blissful stage of love's young dream. In years to come they, too, will be amused at others who will be acting exactly as they are acting now. A ride in an Underground train or in a tram should provide a radio comedian with enough humorous material, familiar to almost everyone, for a lifetime.

Amusing absurdities and incongruities surround us at every turn. Life is full of them. Unfortunately, however, the audience which enjoys these real-life comedies is necessarily small, composed as it is of the few people who happen to be on the spot at the time and are thus able to enjoy them. It is the privilege of the comedian to make it possible for large numbers of people to share the joke by re-enacting it for their benefit with suitable additions.

So that there is every opportunity for the coming of a genius of radio fun. Broadcasting is waiting for the man or woman who will master its technique and reveal to the countless listeners the full richness of the human comedy in a manner at once unique and completely satisfying.

We are All Funny!

There is little or no danger of hurting people's feelings. The most dignified among us must realise that at times we are the object of mirth to others. If we are at all human we do not resent being laughed at sometimes. Nor does a little healthy laughter hurt the most solemn institution; on the contrary it benefits therefrom.

This comedy of the difference between people, the fact that we are amused at their funny little ways, at their curious manner of speaking, at their conventions and at their clothes is at the root of the appeal of all the great laughter-makers from Chaucer to Dickens. They all realised that if the cat amuses the king, the probability is that the king also amuses the cat!



RADIOTORIAL

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 care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lilie, 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 specialities described may be the subject 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.

FILTER CIRCUIT FOR THE LOUD SPEAKER.

D. J. (Romford).—"I do not know much about wireless, but I find that my H.T. batteries were running down far too fast for my pocket's comfort. Speaking to a friend about it he told me that, owing to the long leads I had got all over the house, I ought to use an output filter circuit.

.. If you think this might help me with the

"P.W." TECHNICAL QUERY DEPARTMENT

How's the Set Going Now ?

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

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

Full details, including 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 free and post-free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

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

trouble I can very soon put it in if you will tell me what the connections are, and what sort of extra components, etc., I shall need?"

The additional wiring is very simple and the extra components needed will be one good low-frequency choke (20 henries or so), one large fixed condenser (2 mfd.) of really good quality, and two terminals ("loud speaker") for the new output. The fixed condenser must be of good quality, as it will have to stand the full voltage of the H.T. battery across it, and consequently any leakage here would be fatal to the success of the scheme.

To wire up, examine the inside of your set and you will find that the plate socket of the last valve holder is connected to one of your loud-speaker terminals, and the H.T.+ of the battery is connected to the

other terminal. Disconnect your external loud-speaker leads from these two terminals altogether, and in place of them wire up the choke across this part of the circuit.

Place the large 2-mfd. condenser at some convenient spot just close to the choke and from one of its terminals run a lead to that side of the choke which is now connected to the plate of the valve. The other side of this condenser goes to one of your new loud-speaker terminals, and the other new loud-speaker terminal goes to L.T.—or H.T.—. (You will find that these two are joined together so that it does not matter in the least to which it goes.)

This is all the alteration that is necessary and it will completely prevent H.T. leakage due to poor insulation of the "long leads," which will now be joined to the new loud-speaker terminals.

SWITCHING OUT AN L.F. VALVE.

B. J. (Leatherhead).—"The last valve is connected to the preceding one through a low-frequency transformer, and I want to switch out this stage altogether and to keep the last valve in circuit, but to couple it up to the output of an R.C. stage which precedes the last amplifying stage. Can you give me a simple method of doing this with a single-pole double-throw, and an on-off switch?"

At present the grid connection of the last valve is made to O.S. and the grid connection on the valve before that is to an H.F. stopper, .25 meg.; the other side of this being joined to the grid leak and to the coupling condenser. Where should I wire the switch for changing over from all valves to the position where the last valve but one is off?"

Disconnect the grid of the last valve from O.S., and join it instead to the centre of the single-pole, double-throw switch. One side of this is joined to O.S., and the other side to the G. terminal of the preceding valve holder (leaving the other connections to that point still in place.)

The only remaining alteration is to break one of the filament leads to the last but one valve, and insert the on-off switch in series there.

It will be seen that the output from the R.C. valve is undisturbed. When the S.P.D.T. switch is thrown over to O.S., the set works exactly as before. For the "valve-out" position the on-off switch is opened to break the filament circuit, and the S.P.D.T. switch is thrown over to bring the R.C. stage output to G. of the last valve.

Before switching over the power valve to the R.C. stage, the grid bias to the latter should be increased to that required by the power valve. Do not forget that the grid bias will have to be altered, but that this should not be done when the valves are alight. They must be switched off while any alteration to the grid-bias battery is being made.

There are so many disadvantages to switching out L.F. stages in this way that we cannot give the necessary connections without adding a warning that in general we do not approve of such switching, and that although it can be made to work, the practice of switching out L.F. valves is one that we deprecate.

G.B. & H.T.

E. M. (Nuneaton).—"Is it a fact that a grid-bias battery when run down makes the H.T. battery run down quickly, too?"

Yes, the effect of insufficient negative grid bias in nearly all cases is to impose an extra drain on the H.T. battery.

It cannot be too clearly emphasised that for economical H.T. maintenance the correct negative grid bias is an absolute essential. To a large extent the steady drain upon the H.T. battery depends upon the grid-bias voltage which is being applied to the valves in question, particularly in the case of low-frequency and power valves.

If super-power or pentode valves are being run it is absolutely vital that the full negative grid bias recommended by the makers of the valve for the H.T. voltage employed should be impressed upon it, or otherwise a heavy and totally unnecessary drain is being imposed upon the battery all the time the set is in use.

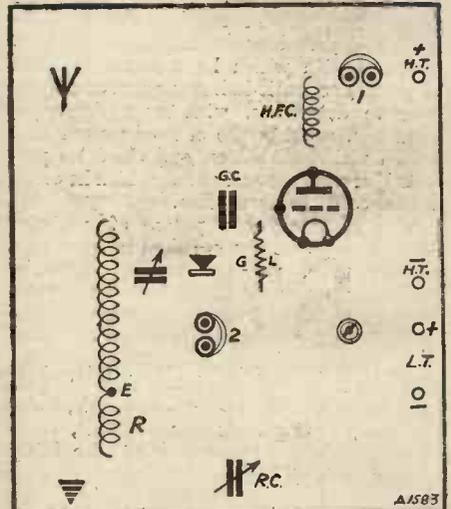
A QUESTION OF SIZE.

D. T. B. (Chichester).—"Do I need a double capacity battery for a three-valve set or will one of the ordinary 60-volt type do?"

You do not give us enough details for us to answer this question as fully as it deserves, but it seems very unlikely that you could run a three-valve set from such a small battery.

There are two things to watch in connection with the H.T. supply to a three-valve set and these are (a) the voltage, and (b) the current supplied. The voltage, of course, will depend upon the requirements

POPULAR "WIRELETS" No. 6



Here are the "components" for a straightforward one-valve set, using condenser-controlled reaction. It will be seen that a second pair of phone terminals and a crystal detector are included, the idea being that these can be joined across the tuning circuit so that the set will act as a crystal receiver when the battery is away "on charge."

Can you "wire-up" this circuit?

(Look out for the answering diagram in POPULAR WIRELESS next week.)

of the valves you are using, and in all probability you will find that the valve manufacturers (who ought to know) recommend more than 60 volts for the last valve! 120 is a much more usual figure. If preceding valves require a lower voltage this can be supplied by an extra H.T. lead plugged in at any convenient point on the battery.

Apart from the H.T. voltage you must make sure of the (anode) current to be taken from the battery. The current required by your valves can either be measured by a milliammeter in the H.T.—lead, or it can be calculated from the valve maker's curves. If it is 5 milliamps or less, an ordinary-sized battery will probably be O.K. If it is between 5 and 10 milliamps you will require a double-capacity battery, and if you attempt to supply such a set from a small battery you will find that this deteriorates very quickly.

THE "MAGIC" THREE ON SHORT WAVES.

A final point in connection with this set (described on a previous page this week) concerns easy tuning on the short waves. You will observe that the tuning condenser in the set is .0005 mfd., which is necessary to cover the ordinary broadcast and longer wave-

(Continued on page 90.)

Turn MUDDLE into MELODY



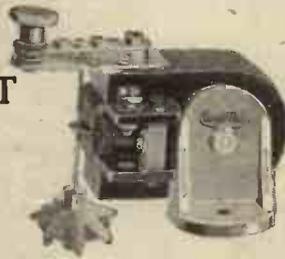
The WATMEL WAVE TRAP

DO you find it difficult to separate stations? If so, fit a Watmel Wave Trap between your aerial and the set, and it will make reception clearer and more powerful. All interference will be eliminated no matter what length your aerial is.

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The BALANCED ARMATURE UNIT

Genuine four-pole unit. Highly sensitive. Perfect reproduction of both high and low frequencies. Will handle large volume without overloading, and is particularly suitable for operating linen diaphragm speakers as well as cones.



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These Watmel Condensers are first-class, well-made, neatly finished jobs. The prices are extremely reasonable. They are just the things that everyone has been looking for.

00004-0009, 1/- (With Clips, 1.3)
001-004, 1/6 005-006, 2/6

★ Send for our Folder No. B.90 showing you how to make up a fine loud-speaker; also folder and Blueprint for building a modern 3-valve Set.



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All-Electric facilities for your Set

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Incorporating the Westinghouse Patent Metal Rectifier. For Alternating Current 200/250 Volts. 40/120 Cycles.



The latest feature in All-Mains Units

No Alterations Necessary

Without any alterations whatever to your present Set, providing you have Electric Light in the home, these new "ATLAS" Units will provide from the Mains all the H.T. and L.T. supply necessary for your Set at a cost of a few pence per month.

Combining H.T. Battery Eliminator and Low Tension Trickle Charger, these new "ATLAS" Units, Models A.C.86 and 84X, incorporate the Westinghouse Patent Metal Rectifier and give every facility for making your Set in every way equal to an expensive All-Mains Set. Model A.C. 86 (illustrated), for Alternating Current, provides 3 H.T. Tappings—one fixed of 150 Volts and two variable 0/100 Volts and 0/120 Volts respectively, and gives output of 150 Volts at 30 m/A. On the Low-Tension side, facilities are provided for maintaining the charge of either 2, 4, or 6-volt Accumulators. Price 10/- down and nine monthly easy instalments or

CASH PRICE, £8 . 15 . 0

10/- DOWN

brings either of these "ATLAS" Units into your home. The balance you pay in easy instalments. They are fully guaranteed for twelve months and are absolutely safe.

MODEL A.C. 84X. This is a cheaper Model suitable for any Set requiring up to 15 m/A. output, and provides two fixed H.T. Tappings of 90 and 120 volts respectively, and one variable of 0/100 Volts. The Trickle Charger on this Model provides for maintaining the Charge of 2-volt L.T. Accumulators only. Price 10/- down and 6 monthly easy instalments, or

CASH PRICE, £6 . 17 . 6

Can be obtained from any good wireless dealer, or direct from the makers.

"CLARKE'S" ATLAS ALL-MAINS UNITS

Ask your Dealer for Folder No. 49, or POST THIS COUPON TO-DAY

Messrs. H. Clarke & Co. (M/cr.), Ltd. (Dept. 3), Atlas Works, Old Trafford, Manchester.

Please forward your Folder No. 49 and particulars of your easy payment scheme.

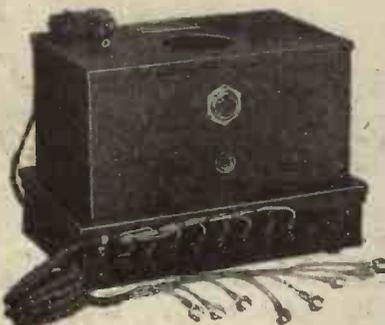
NAME.....

ADDRESS.....

in unsaled & stamped envelope

Please use BLOCK LETTERS. (P.W.5.)

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converts an
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"MUSIC MAGNET"
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ALL-ELECTRIC SET
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Make this change and effect a saving of nearly £4 a year, by dispensing with batteries.

Cash Price £7:7:0 (or 14/6 down and 11 similar monthly payments).

Send for full particulars.

Made in one of the most modern radio factories in Great Britain.

GARNETT, WHITELEY & Co.,
Limited,
Lotus Works, Mill Lane, Liverpool.

Caution

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 88.)

band, but is a little large for use on the very short waves.

It is quite possible to handle this on short waves with a little care and the aid of a really good vernier dial, but a lower capacity is pleasanter to work with. You can obtain something like the effect of a smaller variable condenser by connecting in series with the one in the set a fixed condenser of suitable capacity and arranging for it to be short-circuited when you are using the set for ordinary broadcast work.

This is how you set about making this little modification. Note that there is a lead from the coil to the fixed plates of the variable condenser. Break this and insert in series with it a fixed condenser of .0003 mfd. (.0005 will also serve), and provide this with grid leak clips. Then to short-circuit the condenser all you have to do is to insert in the grid leak clips a short piece of metal rod or tube, or at a pinch a little piece of wooden rod wrapped in tin foil.

This short-circuits the condenser when the set is wanted for ordinary broadcast work.

WHAT DO YOU THINK ABOUT THIS?

A Sheffield reader of "P.W." who was keen on "reaching-out" built a two-valver specially for long-distance work. The circuit was supposed to be very "smooth," with easy reaction control, using an X coil in a variation of the Hartley circuit.

On first tests, though everything appeared to be connected exactly as per theoretical circuit, the set oscillated violently all the time.

L.T., H.T., and valves were O.K., and all connections sound. Turn-numbers of coils O.K., and the coils were in the right coil-holders. Can you guess WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

Last week's puzzle from a Leicester reader was discovered to be an H.T. Battery fault. In the wet battery he used, one of the brass caps on the carbon rods had become loose, due to corrosion, making intermittent and at times imperfect contact.

By removing the shorting bar you have the lower tuning capacity in circuit, which makes the set easier to handle on the short waves.

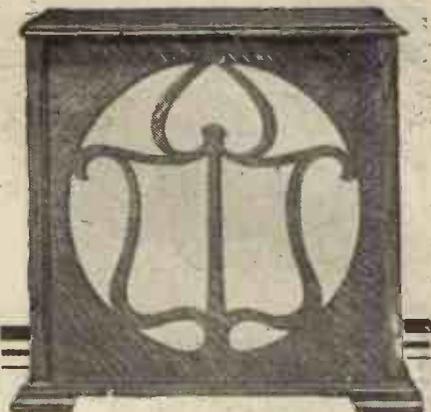
The Choke's Impedance.

M. W. M. (Chesterfield).—"What is the simple formula for calculating the approximate impedance of a low-frequency output choke at any given frequencies?"

The impedance $Z = 2\pi FL$ where F is the frequency second and L the inductance in henries, and π has the usual mathematical significance. The value of π is 3.14, so that the formula can be simplified down to

$$Z = 6.28 \times F \times L$$

It will be seen that in order to calculate impedance for a given instance it will be necessary to know the inductance in henries of your choke. It varies with the current flowing through the choke, so if you are applying to the manufacturers for information regarding this you should inform them of the output valve you use, etc., so that they will be able to give you the inductance figure at the current taken by your output valve.



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12 poles, double magnets, 4 coils.

36/-

Wates Star Double Cone Chassis (Patent No. 309214) with brackets for mounting.

12/-

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'PHONE: TEM BAR 6195.

M.B.

HEADPHONES REPAIRED 4/-

Transformers 5/- Loudspeakers 4/- All repairs re-magnetised free. Tested, guaranteed and ready for delivery in 24 hours.

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Bargain list free.

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CURRENT FOR YOUR MOVING-COIL SPEAKER.

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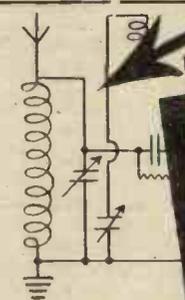
WESTINGHOUSE

METAL RECTIFIER.

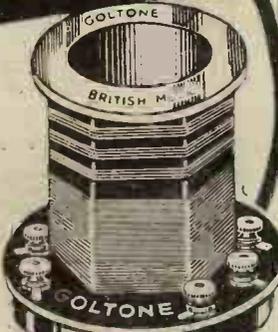
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MOST EFFICIENT
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From all first-class Radio Dealers. Refuse substitutes. If any difficulty write direct.



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H.F. and G.P. ... 6/-
Super Power ... 7/-

Ask your Dealer for Particulars

FOR THE LISTENER.

(Continued from page 74.)

tiresome poem "The Happy Warrior," was elaborately dull.

Broadcasting a Talkie.

Talkies will never make good broadcasting material, for the intervals during which nothing is seen or heard are too long. But it was an interesting experience to broadcast excerpts from the Paramount film "The Love Parade." It showed what a tremendous advance the talkies have made.

It gave us some charming songs, and provided many of us with an opportunity to hear those delightful players, Jeanette MacDonald and Maurice Chevalier. It was also an excellent advertisement for the film which I for one now simply must see.

B.C.

Leonardus Henry, in a comic broadcast from the Amphitheatre Café, Rome, two thousand years ago, was very amusing and made excellent sport with all the Latin tags and phrases which everybody knows. I liked the way he conducted his lively chorus with a "unus, duo." He was well supported, and altogether it was a good little show.

"P.W.'s" TELEVISOR.

(Continued from page 73.)

Under these circumstances we found that we were beginning to get images of better detail, and the synchronising was improving. True, it still required very considerable care and delicacy in the manipulation of the control on the machine, but, once achieved, synchronism was often maintained for considerable periods, say ten minutes or so, without further attention.

These periods would probably have been longer still but for the fact that we had to contend with a good deal of crackling and banging noises due to lifts and other electrical machinery in the building. These, in addition to spoiling the picture momentarily, were very apt to send it out of synchronism.

All our first pictures were "negatives," i.e. all the light and shade was reversed, but on discovering that what was wanted was a phase reversal, we added a stage to the amplifier, making three in all, and so obtained a correct "positive" image.

What we got then was usually a picture of somebody's head making sundry grimaces, trying on hats, and so forth. The face appeared to be about the size of a penny, and there was a considerable amount of detail during the better periods. Indeed, it would have been quite possible to recognise a person one knew.

There was a good deal of flicker (rather trying to the eyes) and the picture was rarely still for long, but floated gently up and down. Occasionally it went right out of synchronism and a good deal of laborious and delicate manipulation was often needed to bring it back.

Our general impressions were that an improvement in the method of making the synchronising adjustment was badly needed, that something of the order of 400 volts H.T. was necessary for reasonable success, and that the small size of the image and the very limited number of persons who could see it simultaneously were grave drawbacks.

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Stations!

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The best Screen Grid in
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Super DETECTOR

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FORVOLT ·075 amps.

A super sensitive detector for anode-bend or leaky-grid rectification.

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"1930" LOG (Mid-Line) CONDENSER



In four Capacities:

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- 00035
- 00025
- 00015

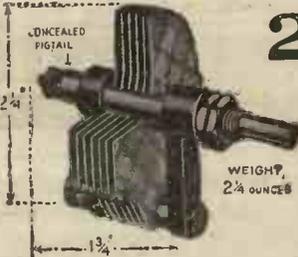
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each.

WEIGHT **4 1/2 OUNCES** *Double spacing of vanes for Ultra Short-wave work.

"MIDGET" Reaction CONDENSER

CAPACITIES •0002 & •0001 MFD.



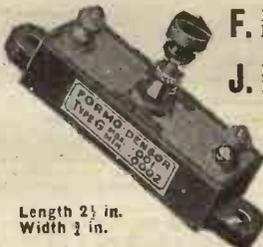
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THE FORMO COMPANY,
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THE LATEST BAIRD TELEVISION PLANS.

By K. D. ROGERS.

ON Tuesday, March 25th, the Baird Co. held a television demonstration at their premises (in Long Acre, to introduce officially the final production model of the Telesistor.

This model is, of course, that with which the "P.W." tests have been carried out, and is now available to any member of the public at a price of 25 guineas.

But let me make this clear, to avoid any misunderstanding. What you get for the 25 guineas is the Telesistor only. That is, the motor and scanning disc, the neon lamp, lens, synchroniser and controls, all combined in a neat crystalline finished case.

This does NOT include the receiver necessary to pick up the television broadcast, or the H.T. equipment required (and on Tuesday the Baird Co. was using 600 volts). These latter items are obtainable, or will be, in A.C. receiver form for a sum which, added to the above Telesistor price, brings the cost up to just under £50.

I am assured, however, that the Telesistor will work from an L.S.5 A output with 250 volts. Perhaps, but from personal experience with our own model, I would prefer 400 or more for a bright picture and to hold the synchroniser. But that's beside the point; what I want to tell you is of the future plans for the Telesistor.

Dual-Wave Television Station.

A special television experimental station has been licensed to operate inside broadcasting hours on 155 and 49.5 metres, and it is hoped that this will increase public interest among constructors and experimenters, to whom, says Mr. Cripp, the Sales Manager, the Baird Co. look for first support.

The future plans are, therefore, to sell the telesistors, either whole or in kits of parts, and the A.C. sets, also to broadcast preliminary programmes from the new station when this is erected. Such are the immediate aims of the Baird Television Development Co.

Meanwhile, until the new station, whose power is to be 1.5 kw., is erected, the B.B.C. experimental dual-wave transmissions are in operation, outside broadcast hours.

The public is now definitely able to purchase Telesistors, and can therefore judge for itself whether or no television is a practical proposition as an entertainment. It is yet in its infancy, how fast will it grow, and to what heights of achievements will it attain? The Gates at Long Acre are at last unbarred—the verdict rests with you.

TECHNICAL NOTES.

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

Changing the Speaker.

WHY is it that when changing from one type of loud speaker to another, using a mains unit for H.T. and L.T. supply, the A.C. hum should be clearly audible with one of the speakers although practically (Continued on next page.)

So easy!

BIRMINGHAM,
2nd March, 1930.

Dear Sirs,
Thank you for the kit of parts for the Titan Three which arrived safely. I had the set built the same day by using your non-soldering links and the results are absolutely wonderful.

My young nephew is wanting a kit and will be writing to you in the next few days.

Again thanking you for your prompt service.

I am, Yours sincerely, H. T. J

1930 TITAN THREE

KIT A less valves and cabinet £5:11:0
or 12 EQUAL MONTHLY PAYMENTS of 10/3

KIT B with valves less cabinet £7:16:0
or 12 EQUAL MONTHLY PAYMENTS of 14/6

KIT C with valves and cabinet £9: 6:0
or 12 EQUAL MONTHLY PAYMENTS of 17/3

1930 MAGIC THREE

KIT A less valves and cabinet £6:16:0
or 12 EQUAL MONTHLY PAYMENTS of 12/6

KIT B with valves less cabinet £8: 9:6
or 12 EQUAL MONTHLY PAYMENTS of 15/9

KIT C with valves and cabinet £9:19:6
or 12 EQUAL MONTHLY PAYMENTS of 18/6

CELESTION LOUDSPEAKERS ONEASYTERMS

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Price £3:15:0 Cash

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SUNDAY GRAPHIC

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Terms to Trade.
TRANSFORMER REPAIR CO., "Repairs" Dept., 214, High Street, Colliers Wood, London, S.W.19.

TECHNICAL NOTES.
(Continued from previous page.)

inaudible with the other? This is the problem put to me by a reader who explains that, at first, he was using a cone-type armature-driven speaker, which gave excellent results with the mains unit, employing a half-wave valve rectifier; on replacing this speaker with a moving-coil instrument of the permanent-magnet type he got improved reproduction but a noticeable A.C. hum.

A.C. Hum.

There are various factors which affect the question of A.C. hum in an all-mains receiver, and in the present case, inasmuch as the hum was brought into evidence by merely replacing one speaker by another, it is evident that the cause is associated with the loud speaker, and therefore I need not go into the various other causes which sometimes have to be considered. In this case it would appear that the impedance of the second loud speaker was much less than that of the first, and this would be quite sufficient to account for the effect described.

You have to bear in mind that the impedance of the loud speaker often helps considerably the other impedances or inductances in the circuit, and aids in keeping down ripple or hum. If the D.C. current is not sufficiently smoothed before being applied to the set this will in general become more evident with a sensitive speaker such as the one described.

If the mains unit is a home-made one I would suggest that an improvement could be made by using a full-wave valve rectifier instead of the half-wave one, and also increasing the values of the smoothing chokes and condensers.

A Power Valve Precaution.

Why is it advisable to switch off the H.T. voltage before adjusting the grid-bias value with a power valve? A reader wants to know whether this precaution is important, and whether any serious damage might be done by ignoring it.

The features which broadly distinguish a power valve from other types of valve are its high filament emission and its comparatively low impedance; in other words, its ability to pass a heavy anode current. Now, the anode current which actually passes, under given values of filament current and H.T. voltage, will depend very largely upon the grid-bias voltage applied. If this is reduced the value of the H.T. current will be increased.

In changing the value of the grid bias the usual method is to pull out the plug from the grid-bias battery and to insert it in a different position. When the plug is disconnected from the grid-bias battery there is no applied voltage to the grid of the power valve, and if the H.T. voltage is still "on" it is clear that a heavy current may flow through the valve which may damage the filament seriously, not to mention damage which may be caused in other parts of the circuit in components externally connected.

Be Kind to Transformers.

For these reasons it is important to switch off the valve whilst the change in grid-bias voltage is made. Personally, I always
(Continued on next page.)

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THE RECOGNISED DETECTOR FOR ALL CIRCUITS USING CRYSTAL RECTIFICATION.
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Can be mounted on brackets or through panel. Once set always ready. Not affected by vibration. Each one is tested on broadcast, before despatch, and is perfect.

"RED DIAMOND"
2-WAY COIL HOLDER
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Parallel working. Fine adjustment. Worm-driven. Coils cannot fall. Easy movement. Perfect finish. By Insured Post 4/6.

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By Insured Post 1/5. Perfect fitting. Large terminals for easy wiring. Ebonite bushes for all purposes in stock. List on application.

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are EASY to build with this handsome "KLIPAX" cabinet. It's exceptional value, too, at £8.10.0 (in figured Oak), £5.5.0 (in Walnut).
HEIGHT, 3' 6".
WIDTH, 3' 0".
PANEL, 18" x 6".
DEPTH, 1' 6".

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Full illustrated list from:— **KLIPAX CABINETS** 7, Tudor Grove, London, E.9



TECHNICAL NOTES.

(Continued from previous page.)

find it preferable, in using a powerful L.F. amplifier, to switch off by the filament rather than by the H.T. (at any rate, by the filament first), as this gives a more gradual reduction of the H.T. current, and is kinder to transformers and such-like components.

The Main Topic.

One of the main topics of conversation amongst listeners continues to be the question of the separation of stations now that the Regional Scheme is in operation, so far as Brookmans Park and the Midlands are concerned. I have already referred to this matter in these Notes during the past few weeks, and have described arrangements by which the separation can be easily effected.

The manufacturers have been quick also to come to the aid of listeners, and there are already many sets on the market which have all the necessary selectivity, as well as various devices on sale at very reasonable prices which may be added to existing sets with perfectly satisfactory results.

No Background.

In most cases it has actually been shown that, even when quite close to the Brookmans Park transmitter, it is possible to receive alternative programmes from distant stations, not only perfectly easily, but without distortion or background.

There are also, of course, all-electric receivers which will separate the Brookmans Park transmitters and receive a variety of distant stations without interference.

In short, the difficulty due to the new arrangement of transmitters is now more imaginary than real, and listeners should have no trouble with the new scheme. A "P.W." "Brookmans" Rejector, will, of course, deal with the trickiest of "swing-over" problems.

The Crystal Users.

A curious feature of the new arrangement of transmitters is that it has revealed what a large number of listeners still use crystal receivers. This section of the listening community have perhaps had a rather special reason to readjust themselves to the new conditions. Consequently queries from crystal users have been very plentiful.

Many crystal users complain that their crystal sets are not working up to standard, and want to know whether this is due to the new transmission conditions in any way.

As a matter of fact, the probability is that attention has now been focussed upon the question of efficiency and crystal users should give their sets an overhaul which may be long overdue.

A Necessary Overhaul.

The number of things that can go wrong with a crystal set are fortunately comparatively few. If you have a good circuit, properly connected up, good aerial and earth, efficient coil, a good crystal, and a proper pair of headphones, there is little else that you require.

When the set "goes off," of course, the first thing to look to is the crystal contact as this naturally varies from time to time with different conditions. But I need not say

anything further about the crystal, as every crystal user is fully aware of the need for occasional readjustment.

The aerial and earth connections, however, which are vitally important, are sometimes overlooked, and if things are not up to standard it is a good plan to examine both the aerial and the earth (especially the latter) very carefully to see that there are no corroded or broken connections. As regards the aerial, the insulators should be examined and cleaned.

Headphones.

The telephones are scarcely likely to deteriorate (unless they have been removed from the set and used with some other set, for example, a valve receiver). But at the same time it is not a bad plan to remove the covers and make sure that moisture has not caused any trouble inside.

Remember, that with a crystal set you rely entirely upon the energy received in the aerial-and-earth system, and this is not boosted up in any way. Therefore, it is essential that every available ounce of this energy should be conserved and utilised, and this emphasises the need for an occasional, careful overhaul of the earth and aerial.

A Matter of Opinion.

Many readers have asked me from time to time whether I consider that the electrical reproduction of records—that is, using an electrical pick-up and reproducing through a loud speaker by means of a low-frequency amplifier—is superior to the unamplified reproduction from a gramophone using a soundbox in the ordinary way.

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

I am afraid that my view does not agree with that of most people, for I prefer the reproduction from the unamplified gramophone—that is, assuming that the best conditions are secured and particularly that a good soundbox and a good sound-chamber are employed.

Admittedly the electrical pick-up method enables greater volume to be obtained, but inasmuch as the electrical method introduces several additional devices, it is obvious that the opportunities for distortion are correspondingly multiplied.

I suppose I shall be accused of heresy for saying so, but I have yet to hear electrical amplified gramophone reproduction which is superior or even equal to the non-electrical unamplified reproduction from a really high-class instrument.

Wear and Tear.

Nevertheless, the fact remains that a large section of gramophone users prefer the electrical method, probably on account

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- (1) Usually the moving plates of a condenser are connected to earth to avoid
- (2) If your moving vanes are not making good contact, why not fix a connection to them ?
- (3) Condenser leads being in the tuned circuit, must be kept
- (4) Dust on your condenser vanes may cause

(Look out for the missing words next week)

The missing words last week (in order) were : Positive, Negative ; Right, round ; Positive ; Adjust.

of the greater volume which is obtainable, and no doubt also because with a proper pick-up and needle the wear on the records may be made much less.

An ordinary unamplified gramophone resembles in some ways a crystal receiver, in that there is no external source of additional energy. The sound which is produced from the ordinary gramophone is entirely due to the operation of the sound-box by the movement of the record, just as the sound in the crystal receiver is entirely due to the energy received in the aerial-earth system.

With electrical gramophone reproduction, inasmuch as additional energy is supplied after the pick-up from the record, it follows that the actual pick-up energy may be made quite small, and any deficiency subsequently compensated by means of the low-frequency amplifier. Therefore, the actual work which the record has to do upon the needle may be made much less with the electrical pick-up than with the ordinary soundbox.

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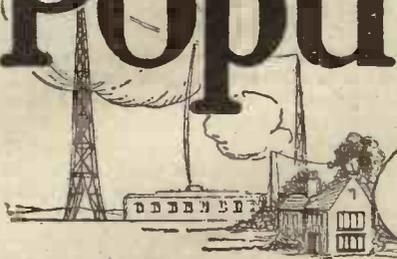
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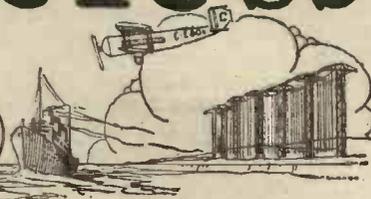
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1930's LUCK
 "MAGIC" FAMILY
 NAVY NEWS
 "MAINS" JUICE

CANADIAN STAR
 "DON'T DO IT"
 PREOCCUPATION!
 NEEDLE GOSSIP

RADIO NOTES & NEWS

A Countryman's Diary.

STEADILY, but oh, how slowly, the sap is rising in the big elm; every leaf bud is a-quiver with expectancy! Rapidly, and oh! how steadily, the damp is rising in the butt of my aerial pole! Every insulator is sagging. Not yet has the swallow dared, or the cuckoo, but nests are merrily a-building in the coppice. Not yet has Smithers borrowed my ladder, or the pliers—but he will! His spring set is jerrily a-building.

Luck of the Year.

I SHOULD'N'T be surprised if 1930 is known as the 10 metres year, and distinguished besides for its greatly improved long-distance relays. I believe that the last-mentioned are destined to be very popular because they give the listener a sense of power of which, as a contemporary of the men who make them possible, he may justly be proud. Soon there will be no such thing as parochialism, outside of certain Government departments. I wonder why more use is not made of the "Beam" system for these relays. I have seen many letters from very distant parts, praising the work of the "Beam" in the distribution of the King's speech.

The "Magic" Family.

I BELIEVE that the "Magic" family, especially the Three, have beaten the "Sydney" Two in popularity. The stream of letters expressing the utmost pleasure and satisfaction from its results seems to show no signs of drying up, and I wish to thank all those readers who have addressed letters on the subject to the Editor and me, for it is quite impossible to reply to them separately, either by mail or in these Notes. Surely there can be no sceptic left in the land, except the man who gets the grids connected to "earth," or who sees no special difference between pcs. and neg.!

News from the Navy.

H. B., serving on a warship now in Spanish waters, says that in one fair-sized town in Spain he failed to find a single shop which stocked radio parts! And in Malaga the local station was shut! Yes, although I like Spain, and know something about the Dons, I cannot pretend that they are not backward. But then H.B. says that the radio-telephone sets of British men-o'-war have microphones consisting

of ordinary Graham mouthpieces! Also that the naval standard of capacity is still the "jar." As to the first, perhaps there is a reason; a delicate "mike" may be useless at sea. As to "jars," amongst arbitrary units one is probably as good as another.

Irish and Scotch English.

MY little "dig" at the Irish member of the B.B.C.'s pronunciation committee has put the fat into the fire, indeed. Ninety-nine Irishmen hasten to say that the best English is spoken in Dublin; four hundred Scots inform me that (1) Greenock and/or (2) Aberdeen, is the fount of English undefiled. I doubt the accuracy of both statements, though I find pleasure in

hearing the speech of educated people from all three places. (Now they will tell me: "There are no uneducated people here!")

A Matter of Propriety.

A Scotsman defending Burns and an Irishman trying to support G. B. Shaw are two sorry spectacles. R. C. M. K. (Co. Down) seems to think that I have disparaged the author of "Saint Joan" because I claimed to speak English better—not "better English"—than an Irishman. Loose thinking! Inspired, no doubt, by the Irisher's traditional thirst for a fray, offence or no offence. He tells me to improve my written English before "advancing any pretension to superior English speech," and puts his finger on some of my colloquialisms. (As if the glorious "Saint Joan" has none!) I am not going to turn these Notes into "The Child's First Reader" to please an Irishman who is not Hibernian enough to appreciate my mixed metaphors. Why should I?

—AND IT ALL
 STARTED
 FROM A
 CRYSTAL!



Six years ago, when at school, he made a crystal set, and then he got "valve fever" and made bigger and bigger sets, giving more and more volume. This outfit is a seven-valve Radiogram receiver, with two double-spring motors, and two 12-inch turntables. The volume of sound is said to be "equal to three bands"—and yet it was a spare-time job!

"Mains" Juice
CAN it be that a considerable number of listeners hold the opinion that any kind of battery is better than "mains" juice? (Forgive "juice," Mr. R. C. M. K.!) Reynolds' Radio Riter says, "I should give away all my D.E. 2-volt valves and have a multi-number of 6-volt, a good moving coil loud speaker, and both H.T. and L.T. from batteries, wet or dry. That would be perfection, so far as wireless can, . . ." Fancy preferring L.T. from dry batteries to a nice steady supply from a handy little wall socket!

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

Canadian "Star" Station.

F. E. (Ohio, U.S.A.) tells me that C J R X, the station of Messrs. Jas. Richardson & Sons, Ltd., Winnipeg, has resumed operations after some seven months' silence. Wave-length, 25.6 metres; power, 2 k.w. It transmits from 23.50 G.M.T. daily except Sundays, and relays C J R W. It is pleasing to learn from F. E. that he considers 5 S W to be "more consistent" than P C J. He tells me, too, that K D K A is now working on about 49 metres; that V E 9 C L, the Canadian Marconi Co.'s station at Drummondville, frequently broadcasts records on 46.5 metres; that 2 X A F often talks to 2 Y A (Wellington) through 2 M E; and that R A 97, Khabarovsk, Siberia, on 70.1 metres is received well in the Western U.S.A.

A Royal "Fan."

THE lady sitting opposite to you will probably like to hear that Princess Mary is an enthusiastic listener, and has a "portable" without which she never travels far. This instrument is similar to the one owned by that mighty shikari, the Prince of Wales, and is contained in a nice dark leather case. I have no information as to what are H.R.H.'s favourite items, but as she generally lives in the heart of the country it is safe to assume that her selection is fairly catholic.

"Pulling the Long Spark."

J. E. S. (Salford), who wants to know how the Leyden jar got its name, says that in the days when enthusiastic electricians used to take off their silken vests in order to produce electricity by friction, Sir William Armstrong borrowed someone's central heating apparatus and a hay fork and got sparks six feet long from the electrified steam. Passing hastily along the car I would remark that in all probability the discoverer of the properties of That Jar must have wished he could baptise it with a pagan name! However, J. E. S., when you invent a self-announcing hydrometer you can call it the "Salford tube."

"Don't Do It."

IT is amazing that there should still be ignorance amongst listeners on the subject of oscillation, when one considers the efforts of the B.B.C. and Capt. Eckersley to educate us. Nevertheless, I met a man a few nights ago who, after talking learnedly about Bohr's electron theories, suddenly asked me: "If your neighbour's loud speaker annoys you, isn't there something you do to stop him—some trick which makes his receiver howl?" I said: "Do you do it much?" "No," he replied, "but I often try."

The Missing "Magics."

I AM coming to the conclusion that there exists a widespread plot to steal copies of "P.W." containing "Magic" Blueprints. From many parts I have received sad letters from men whose copies were lost, stolen or strayed, the latest is from a Scots marine engineer, writing from Port Said but with a home address in Aberdeen! We must put Edgar Wallace "wise" to this plot. My engineer friend has made a

"Titan" Four, and with it received 2 L O at good loud-speaker strength when his ship was near Port Said, say 2,000 miles away. Perhaps he can do without the "Magic" now?

Another Marine Radio Company.

THERE has been formed the International Marine Radio Co., registered as a private company, capital £60,000, in £100 shares, to carry on business connected with owning, operating, selling, etc., telephone and telegraph apparatus in the U.K. or elsewhere. Seven of its fifteen directors are American. It will be rather interesting to see what marine work the Company intends to do. I seem to smell ship-to-shore telephony!

The "Blind Alley" Again.

"SPARKS," in a letter typical of many which I receive, wants to know what future there is for the marine wireless operator, and whether I can suggest a shore opening for him. Frankly, it is difficult to advise him. Shore positions within the service are few and rarely vacant; generally speaking, they would be reserved for the older and more experienced men, not for

SHORT WAVES.

"Sunday on the Wireless." It is obvious that no person can listen to two programmes at one and the same time."—Letter in Daily Paper.
"Oh, can't they? Come and try our set."—"Punch."

"I am bringing pressure to bear upon the B.B.C. to adopt my own programme, which, I trust, will put an end to all this grousing. Here it is. Paste it in your hat, and raise the hat every time you meet a man with gnashing teeth and a broad cast in his eye."

TO-DAY'S WIRELESS.

- 3 p.m. Bach Cantata.
- 4 p.m. Professor Bonehead: "Should Earwigs have Perforated Ear Drums?"
- 5 p.m. Russian Poetry.
- 6 p.m. Washing-up News.
- 6.30 to 8 p.m. Items of Oscillation.
- 8 p.m. to 10.30 p.m. Bagpipes Music on a Foggy night.

And if, after this, you don't know which is switch, don't blame me.—"Sunday Chronicle."

The man who said he would have to wait until the dictionary was enlarged before he could put his thoughts into words must have been a radio fan.

"I feel I must award the biscuit once more to Mr. G. A. Atkinson, for saying that what the B.B.C. knows about the film public could be covered by a full stop with room to spare."—"Vox."

A man went into a radio store to purchase some aerial wire.

"How long do you want it?" asked the assistant.

"As long as they broadcast," replied the customer.

"I see," smirked the assistant; "5 X X, sixteen hundred metres, let's say five thousand feet; that will be five pounds. Anything else, please?"

"Dublin gives more gramophone recitals than any other station on the air. Now that the Irish harp has fallen on evil days, is it true that Ireland intends claiming the gramophone as its national instrument?"—"West Australian Wireless News."

HILVERSUM AND HUIZEN.

The Dutchmen have two stations fine, With programmes very pleasin'.
Now one of these is Hilversum
And t'other one is Huizen.

And every now and then they swop
Their programmes for some reason,
So Huizen then is Hilversum
And Hilversum is Huizen.—
"World Radio."

two-year men, I suppose. For confirmed bachelors of simple tastes I should think the life at sea would be suitable for many years.

On Coming Ashore.

I DO not see that operating fits a young man, directly, for much more than telegraph work or certain positions with radio manufacturers. Indirectly, the sea life is priceless to a fellow anywhere between 18 and 24; it rounds off those corners. My advice, if you intend to get out, is that you should do so after a few years, saving and studying all you can in the meanwhile. Don't leave it until you have discovered that you want to "settle down," but decide now. "Sparks" might try his luck with some of the big telegraph, telephone or cable companies.

Preoccupation in Excelsis.

MADAME PAULINE BARKER tells an amusing story of her father, Frederick Barker, the British composer. His fiancée noticed one day that he was wearing two collars, and as that is a luxury (!) which even the newly-and-vulgarily rich are willing to forego, she ventured to draw his attention to the fact. Bringing his mind back to the material world, the musician ran his hand round his neck and said, "Ah yes, no wonder the studs were a job to put in!" And no wonder he needed a wife to look after him!

S O S.

MR. W. ASHBY, 10, Succoth Place, Rushden, Northants, emits a cry that "shivers to the tingling stars," because, having made up the "Antipodes Adaptor" from our Blue Print he is badly in need of that number of "P.W." which contains details of the coils for 20, 40 and 60 metres and the working of the set. Will someone be good enough to help this fellow out, please? The number is out of print. W.A. is prepared to pay for the paper, postage, customs dues, ullage, wastage, poundage, stamp duty, income tax and necessary liquid. N.B.—He now subscribes to "P.W." Once bitten, etc.

Gramophone Babble.

FROM a valued reader at Dover comes a cheery letter of comfort and advice in re gramophone troubles. His method of inducing the motor to run at a proper and constant speed is to remove all the glue and birdlime with which the makers coat it and to substitute vaseline. Well, my sewing-machine oil did the trick, but I expect that in the hot weather I shall find most of it on the floor of the case; hence vaseline is duly noted. But I hope to live long enough to find out why the makers embed these motors in Stockholm tar and semi-liquid rubber.

Needle Gossip.

THE same reader warns me solemnly against the use of "permanent" needles, assuring me that I might as well apply a pneumatic drill to the records at once. I am inclined to agree, though I would welcome an authoritative opinion as to the effect of the "Tungstyle" type, which I like. I am advised to use "loud" round steel needles for heavy work, spear-pointed for dance bands and the like, and "soft" for trumpets, harps, saxophones, etc. But why no mention of fibre? I find that it is excellent for pieces such as Rachmaninoff's Concerto No. 2 for piano and orchestra, in C minor. And the wear must surely be very light!

ARIEL.



SUPPOSE you have a loud-speaker response curve which is straight up to 10,000. Suppose you have a resonance curve, i.e. a high-frequency response curve which goes dropping down as the side-band frequency increases. Suppose you want this same "perfect" quality we hear so much about. What are you to do?

It is possible to check against the failure of linearity of one part by a counter non-

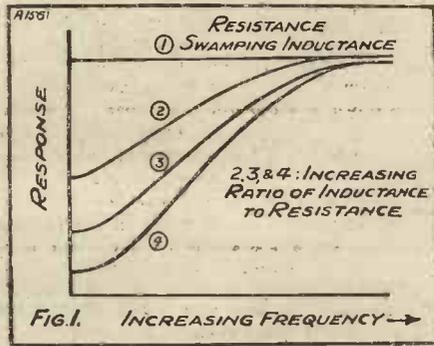
* * * * *

You know how difficult it is for the loud speaker to make every instrument sound *true*—drums like real drum, and brass with the true brass ring. In this absorbing article Capt. P. P. ECKERSLEY, M.I.E.E., our Chief Radio Consultant, shows how a loud speaker can be made to give varying treatments to high notes by arranging special valve couplings in a set.

* * * * *

the valve with ever so many alternating volts, you would not see any *change* of volts between anode and filament of the valve.

Connect an impedance, however, between anode and high tension, and the volts between valve plate and earth will vary in sympathy with and at some ratio to varying volts on the grid. As you vary the impedance between limits, the magnification of the circuit varies also, and increases



How combinations of anode resistances and chokes can give you more of those high notes.

linearity of another. For instance, in the case above, it would seem advisable to make a low-frequency response curve the inverse of the high frequency, and as rising side-band frequency means less high-frequency response, so it should mean more low-frequency response.

L.F. Response.

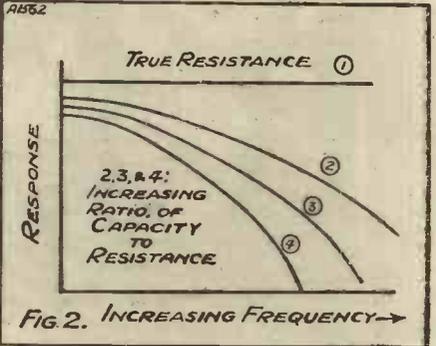
The subject of this article is the low-frequency response curve, and the possibility of making it tip up one end or hump or droop when, how and where we will.

The first circuit I ever saw designed to give a non-linear low-frequency response was due to Captain Round. In general, the magnetophone, as patented by Mr. Sykes and developed by Captain Round, tended to exaggerate bass. It was, therefore, necessary for the low-frequency part to put this right in some sort.

I cannot quite remember the exact circuit in the Marconi-Round-Sykes gear, but the un-

derlying idea of what Captain Round called "differentiation," is the fact that an inductance has a greater and greater impedance as the frequency increases—the voltage across the inductance is, in fact, measured by the product of $2\pi \times$ the frequency, the inductance, and the R.M.S. current.

Now the magnification of the valve circuit depends, between limits, upon the impedance in the anode circuit. If you connected your high tension straight on to the anode, and assumed the high-tension source to have no effective internal resistance, and you belaboured the grid of



With the help of condensers you can make the low notes predominate.

THE HIGHER HARMONICS.



The higher harmonics are particularly important when brass instruments are dealt with. It is these very "high notes" that give them their distinctive qualities.

ing the impedance from a small to a large value increases the magnification.

Thus, supposing you have a valve-anode circuit which contains resistance and inductance in series, and make the resistance somewhat small compared to the valve impedance. Now the impedance of the anode circuit will obviously increase with increasing frequency, because the total impedance is the vector sum of the impedances of the resistance and the inductance. The latter increases with increasing frequency.

Ratio of Resistance.

Thus, Fig. 1 might represent the magnification of the device at various frequencies and in different conditions of the ratio of inductance impedance to resistance. Increasing the ratio of resistance to inductance obviously swamps the effect of the latter, and you get in the limit a straight line; vice versa decreasing the ratio of resistance to inductance obviously allows the latter full

(Continued on next page.)

HANDLING THE HIGH NOTES.

(Continued from previous page.)

play, and you get the magnification rising with frequency.

But, of course, there is a limit to increasing magnification with increasing valve-anode impedance, and so the curves tend to flatten at high frequencies, because whatever the (large) value of the impedance of the inductance at high frequencies, above a certain limit the magnification remains the same (maximum) value.

We can also play with condensers. A condenser, for instance, between anode and earth and in series with a resistance has a decreasing impedance with an increasing frequency. So we can, with this connection, or a similar one, make a falling characteristic and cut off high frequencies. Everyone

frequency amplifier. One can make the circuit give all kinds of quality, the announcer may lisp, the lady who has "just played a Necturne" may be made curiously masculine, and the full orchestra as thin as a dictaphone, and all by juggling with values.

In spite of this, such circuits want very careful handling, because they are apt to give curious transient phenomena and spoil detailed clearness of music and speech. But carefully and quantitatively they are worth experimenting with.

RE-CONDITIONING A VALVE.

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

IN this short article I am going to deal with the old question of the re-conditioning of a dull-emitter valve which

THE PEOPLE WHO MAKE THE NOTES.



There is a vast amount of "high-stuff" in a dance orchestra. The clarinets and soprano saxophones particularly develop very high harmonics which must be given adequate treatment if the band is to retain its "brilliance" when passed through a radio set.

knows the old trick of removing needle scratch in a gramophone pick-up, by using a shunting condenser.

All we are doing is making the high frequencies disappear by shunting them away with a condenser which has a low impedance to high frequencies. The impedance of a condenser is the reciprocal of the product of $2\pi \times$ the frequency and the value of the condenser. So that increasing frequency makes this product larger and its reciprocal therefore smaller.

So in Fig. 2, depending upon whether we use much or little resistance to swamp or to let the condenser have full play, we get falling characteristics.

Getting the Hump.

By combining resistance inductance and capacity we may hump the response characteristic where we wish. The reader knows, of course, that a circuit having inductance, resistance and capacity is a resonant circuit, and humping the characteristic may be obtained by choosing a point of resonance where we want it.

Inductance-capacity circuits may give all sorts of desired response curves in a low-

has lost its emission owing to the accidental application of an excessive filament voltage. This is a question which is often raised, and perhaps it is only right to point out that there is no *really* satisfactory or certain method of restoring such a valve.

Renewing the Filament.

At the same time, inasmuch as the valve is of very little use in the condition mentioned, no great harm can be done by attempting to revive it because, even if the attempt does not come off, you are at any rate no worse off than before. The usual instructions are to run the filament of the valve at a distinctly higher filament current than the normal, but *with the H.T. disconnected*.

Then gradually reduce the filament-heating current until it is rather below the normal and continue the heating for a further lengthy period, again, however, without any high-tension applied. If the high-tension voltage is applied across the filament-anode circuit this treatment will only aggravate the trouble. The valves should then be allowed to rest for a few days before putting into service again.

The treatment will be perhaps better understood if we know what purpose it is intended to accomplish. As you know, the emissivity of a dull-emitter filament is due to the presence on the surface of a layer of thorium or thorium compound.

New Lease of Life.

I am speaking here of the basic type of dull-emitter filament, although there are in these days a great variety of modifications; the principle, however, is more or less the same.

As the active material at the surface of the filament is gradually used up, the electrons being removed under the influence of the applied high-tension voltage, the active material (it is believed) diffuses from the interior of the metal and renews the necessary layer at the surface.

If the filament is considerably overheated whilst the high-tension voltage is "on," the active material at the surface and in the vicinity is instantly removed. By heating the filament for a long period *without* any high-tension voltage applied, the active material is given an opportunity of distributing itself once again and a supply becomes available at or near the surface of the filament.

This is the generally accepted explanation (although the action of the dull-emitter filament is not thoroughly understood), and it will enable you to appreciate the importance of removing the high-tension voltage during the reconditioning process.

J. H. T. R.

DO YOU KNOW THAT—

Terminal shanks, soldering tags, and similar points should be filed and tinned before a set is completely assembled, as the operation is much easier at this stage than when all the components are screwed into place.

If a panel has become slightly bent by leaning up against a wall it can often be flattened by warming it, and placing it between flat boards on which a heavy weight is standing, until the ebonite has cooled.

Do not throw away your old panels, for you will find that terminal strips and similar handy accessories can be turned up from them with very little trouble.

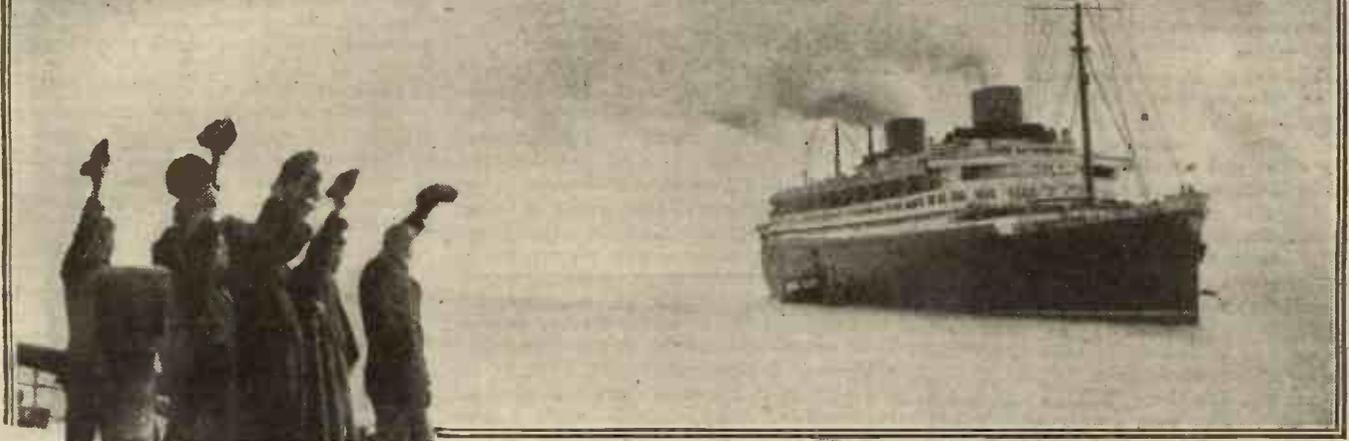
When drilling ebonite remember that the drill will tend to wander unless, after the exact point has been marked, a centre punch is used to give the drill a start on the panel.

If you use an H.T. mains unit from D.C. supply and your positive main is earthed, be careful in touching your aerial and lead-in wires, especially if the ground is damp, or you may receive a very unpleasant shock.

In cases where the aerial and lead-in are found to be "alive," due to the use of an H.T. mains unit, a simple method of overcoming the difficulty is to insert a large fixed condenser between the aerial wiring and the aerial terminal.

When using the mains to supply H.T. to your set, there are a great many advantages in using a loosely-coupled aerial-earth system.

RADIO on the "EUROPA"



BY "P.W.'s" SPECIAL CORRESPONDENT.

THE launching of the new German liner, s.s. "Europa," caused a considerable amount of interest in this country, both from the point of view of marine architecture and also because the vessel embodied many new developments and improvements in engineering.

It was therefore with a great deal of pleasant anticipation that I took advantage of an excellent opportunity afforded me of inspecting this liner while she was in the Solent on her maiden trip from Germany to America. I must confess, however, that I got no further than the wireless cabin, and, in fact, became so engrossed there that I nearly lost the tender which was waiting to take me to Southampton.

Very Fine Equipment.

The chief wireless officer, Herr Gerstung, was very justly proud of the fine equipment under his control, and seemed only too pleased to give me all the information I required. The entire transmitting and receiving apparatus has been installed by the Telefunken Company; there are, in all,

seven receivers and four transmitters, excluding the receiving and transmitting gear fitted to four of the motor lifeboats.

The main operating room, which is large and extremely well arranged, contains five

300 to 3,000 metres are employed for long distances, while the short-wave transmitter works on 15-90 metres.

Uninterrupted reception and transmission are possible on three lines at the same time. The transmitters and receivers do not interfere with each other, although both are situated in the same cabin, and the aerials are fixed to the same mast. The long-wave reception gives the Duplex operation special interest, as there is only a very slight difference between the transmission wave and the reception wave.

Three Main Receivers.

The three main receivers consist of: one three-circuit receiver with filters; one short-wave receiver for 10-150 metres with high-frequency amplifier; and one alarm receiver, operating on 600 metres. This latter is working continuously, and is independent from all other apparatus. Three valves are employed for C.W. reception, and four for I.C.W. All the valves are, of course, of Telefunken make.

(Continued on next page)

On her first trip—

A WORLD'S RECORD!

That is the proud distinction of the "Europa," the new German vessel that recently wrested the Blue Riband of the Atlantic from the "Bremen."

In this article some exclusive details of her radio equipment are given to "P.W." readers.

receivers and three transmitters—the main transmitter for long-wave communication using 3 kw. in the aerial, a short-wave transmitter of 700 watts, and a third transmitter of 200 watts. Wave-lengths of from

THE WIRELESS ROOMS OF THE WORLD'S WONDER SHIP!



Magnificently equipped in every detail, the "Europa" excels especially in the palatial appointments of her radio rooms. These are the envy of the wireless operators of the Atlantic, for not only is all the apparatus of the latest type, but the rooms are spacious and well-situated. On the left is shown a short-wave transmitter, while to the right is a long-wave transmitter and receiving apparatus.

RADIO ON THE "EUROPA"

(Continued from previous page.)

The range covered is over 3,000 miles, and this enables the "Europa" to get in touch with America as soon as she leaves Germany, and vice-versa. Constant communication on short waves can be established with Germany, England, America, etc., at any time, and on long waves about two-thirds of the voyage across.

Regular Communications.

The stations with which the "Europa" mainly works are:

Germany ..	Norddeich ..	Call sign K A V
England ..	Portishead ..	" " G K V
France ..	Le Havre ..	" " F F H
Holland ..	Scheveningen ..	" " P C H
Canada ..	Louisburg, N.S. ..	" " V A S
America ..	Chatham, ..	" " W I M
	Mass	(for 600 metres)
America ..	Chatham, ..	Call sign W S C
	Mass	(for long waves)

For short-wave working, practically any station can be communicated with.

In addition to the main operating cabin, there are two large power cabins containing generators, accumulators, etc.; the usual cabins for receiving and dealing with radio telegrams; and a Press cabin, solely employed for a special news service.

High-speed Creed automatic transmitters and Recordé receivers are installed in this cabin; and Herr Gerstung, when showing me these, said that a speed of 250 letters per minute has been attained. The normal speed, however, at which any average operator can work is about 160 to 200 letters per minute.

Telephony is used extensively throughout the ship, and a special installation in the main operating cabin enables the operators to get in direct communication with the captain, the chief officer, etc., thereby obviating the delay which would ensue if the line were connected through a switch-board.

The power used for wireless telephony is from 100 to 200

watts, and the regulation wave-lengths allotted are 160-190 metres. The "Europa" is one of the few liners on which passengers, even when in mid-Atlantic, can speak to their friends in practically any country in which this service has been provided, and a special sound-proof telephone booth is installed.

The Emergency Set.

An emergency set of the Spark type is carried, and is attached to an entirely independent battery so that, even if the supply of electric energy from the central station should fail, the work of this transmitter would not be interfered with.

Herr Gerstung explained to me at some length that a Spark transmitter is purposely employed in preference to a more modern set, because it covers an exceptionally broad range; and as it would naturally only be used in cases of distress its main objective is to make itself heard in every possible direction. A more modern set, being more sharply tuned, would not be so effective as regards S O S calls.

I was then taken to inspect the motor lifeboats, four of which are fitted with complete wireless gear in the form of two-valve receivers and Spark transmitters, working on 600 metres. A two-wire aerial is fixed to the bow mast of each boat, and power is supplied from 24-volt 100 ampere hour accumulator batteries. If necessary,

these accumulators can be charged from the boat's motor, which is enclosed in a water-tight compartment.

An emergency Diesel dynamo is installed on the very highest promenade deck, and supplies enough electric current to provide for all the lighting on board, as well as the entire wireless gear. In cases of flooding, therefore, this dynamo can be used until practically the whole of the ship is under water.

There are, in all, six operators on board—four officers and two men. The quarters allotted to the wireless staff are exceptionally comfortable and spacious, and consist of five cabins and a private bathroom.

These cabins adjoin the operating-rooms, and are entirely shut off from the rest of the ship by means of two doors, thus forming what might be termed a "self-contained" wireless apartment on the upper promenade deck. Doors are also fitted between the sleeping quarters and the operating cabins, so that no sound can penetrate to disturb the rest of the operators.

Outstanding Results.

I asked Herr Gerstung whether he had achieved any outstanding accomplishments with the wireless apparatus installed on the ship, and he told me that while the "Europa" was on a trial cruise off Norway she spoke by wireless telephone to one of her sister ships, the s.s. "Bremen," which was just outside New York—a distance of nearly 3,000 miles.

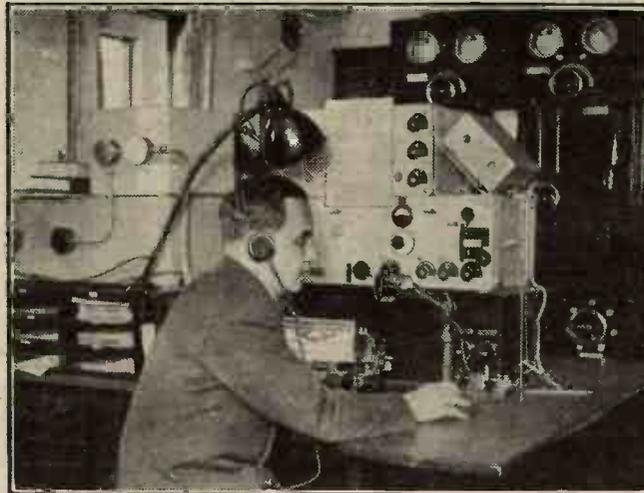
About the same time the "Europa" also managed to get into telegraphic communication with her other sister ship, the s.s. "Columbus," at a distance of approximately 5,000 miles. The "Columbus" was, at the time, on her "round the world" cruise.

The chief wireless officer also told me that December last the "Bremen" succeeded in establishing direct communication (on short waves) with Commander Byrd at the South Pole.

In conclusion, the wireless officers of the "Europa" made one request—that they might be allowed to compliment the English coast stations on their excellent organisation and service, which, in their opinion, is the very best in the world!

M. V. W.

A 'PHONE CALL ON THE "EUROPA."



The received Morse messages are not written out, but are typed direct by the man wearing the 'phones. The operator on duty when this photograph was taken talking by telephone to the officer on the bridge as the vessel was preparing to leave Southampton on her record-breaking run.

Do not be too surprised at getting a shock from the inside of your H.T. mains unit when this is switched off, as very large condensers are employed in these units and one of these may be holding a charge quite sufficient to provide a nasty shock.

The voltage of an H.T. battery is best ascertained when it is "on load," that is to say when it is supplying current to the set in the normal way.

A MAINS UNIT HINT.

If your set gives a loud hum when connected up to a mains unit, remember that the fault may not lie in the instrument but in the fact that you have placed it too close to the set.

FOR YOUR NOTEBOOK.

One of the best rough and ready methods of overcoming motor-boating is to reverse the primary or secondary of the second low-frequency transformer in the set.

Now that high value grid-bias batteries are used (20 volts or so), remember that these values are sufficient to burn out valves, if accidentally connected across the filament.

The reason that the voltage of an H.T. battery appears inaccurate if the battery has been standing idle is that such a battery tends to recuperate when it is not being used, and thus is able to provide a higher voltage for a test than when in operation.

AN ABSORPTION METER.

When using an absorption meter on short waves, remember that the further the instrument is taken from the set the sharper are the readings obtained with it.

Do not neglect the adjusting screw on your loud speaker, as the exact distance of the permanent magnet from the diaphragm (controlled by this) is of great importance in getting maximum sensitivity.

LITTLE HOWLS

An article about a very curious effect which readers may have noticed, but which so far does not appear to have been dealt with in print either in this country or in America.

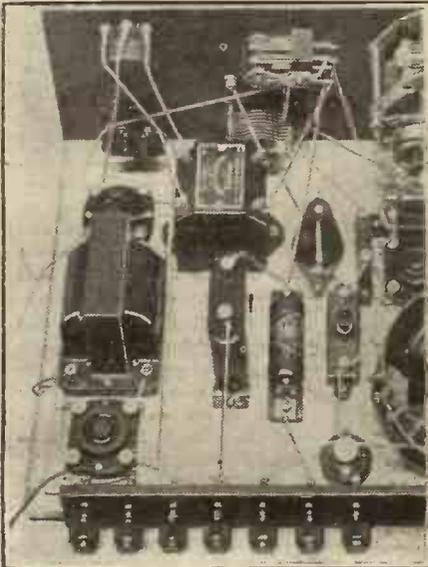
By P. R. BIRD.

HAVE you ever kept a little pet howl? No, I do not mean a pet owl; I mean H-O-W-L, of the radio-set variety.

In case you have not heard of the cult, I must tell you that quite a large number of listeners have a little pet howl "all their very own." Some are quite proud of their little howls, and consider them "all their go"! But others would be very glad if they *would* go! The ordinary car-splitting howl everybody hates, but little howls are quite diverting.

I knew one Crouch End enthusiast who got a little "purrr" every time he switched

HOME OF THE HOWL.



It is generally the L.F. end of the set that howls inhabit, and one of the surest ways of dislodging them is the use of a decoupling resistance and condenser, as shown in the foreground of this photograph.

on. It was quite a distinctive "purrr," with the emphasis on the r-r. And what amused him was that switching off had no such effect. But every time he switched on, "purrr" went the set, with a perky "here-we-are-again" sort of air which he found vastly amusing.

Another case I knew was that of a chap in the City who had a very nice little rheostat howl. A very rare type, this, and he was very proud of it. This was in the days when we used rheostats for our detector valves, turning on the current carefully so as to bring the set into action slowly. As he turned his rheostat on from 0 to 10, he nearly always got a little preliminary "purrr" just before the set went into action!

In both the above cases, and in many others similar to them, the set appeared to work quite normally in all other respects, and consequently the owners were pardonably puzzled as to where the "purrrs" came from. The cause of such little howls is usually so well concealed that, unless one has a hint as to the origin of them, there is little hope of getting on their tracks.

In practice it will be found that nearly every little howl is a member of the L.F. instability family. If you can remove the tendency to L.F. instability, you will often find that it takes the little howl away with it.

Short Life and a Gay One!

Anti-motor-boating devices of all kinds are one of the best means of promoting L.F. stability, and consequently a set which has an anti-mobo device incorporated does not often develop a little howl. Sets with output filter circuits, too, are comparatively free from little howls, because of the decoupling effect so provided.

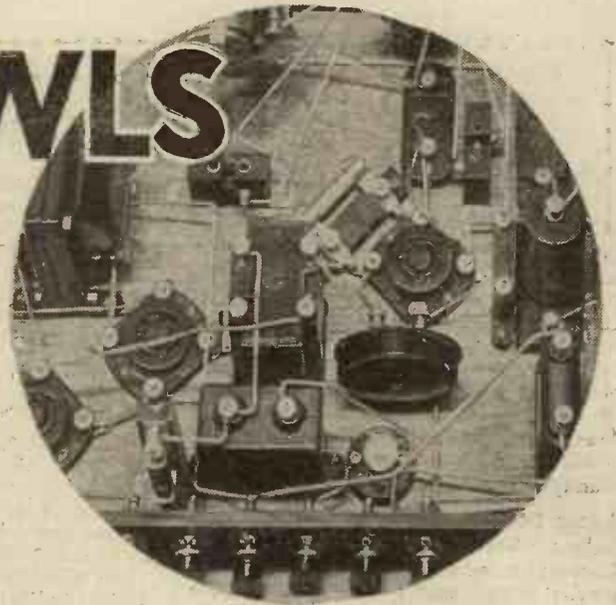
An H.T. battery which is on its last legs, or an H.T. mains unit which is called upon to supply more energy than it is designed to give, is a fruitful source of L.F. instability, and it is in circumstances like these that little howls are frequently found lurking. Two of the best and most easily tried cures for L.F. instability where L.F. transformers are employed are (a) the reversal of the leads to the secondary terminals of one of the L.F. transformers, and (b) the shunting of a high-resistance, such as a grid leak, across one of the secondary windings (.25 meg. is a suitable value).

From a theoretical point of view, the interesting thing about the little howl is why it should have such a short life. Why should a normally well-behaved set be subject to these short outbreaks? If it howls, why doesn't it howl all the time?

A Rheostat Rarity.

It will be found that the trouble takes place during what may be called a "transition period." When the set is properly "on," there is no howl. When the set is properly "off," no howl. But what about half-way?

Half-way between these two conditions, when the filaments are half warmed up, or the bypass condensers half-charged, then the set may behave quite differently from when it is "full on." And it is in this very fleeting transition period that the little howl is born—to die!



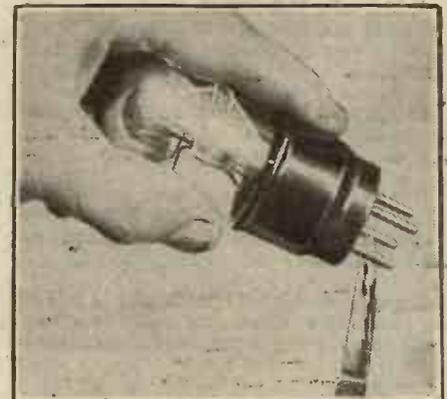
If you have seen any of those new A.C. heated valve sets working, you may have noted that when switched on nothing happens for quite a minute. Sometimes it is two minutes before the programme appears! This lag is due to the fact that the "heater" must be warmed to the proper degree before the valve can function.

It is true that an ordinary valve does not take anything like a minute to "come to life"; but, nevertheless, there is a certain time lag between switching on and full efficiency, and during this period the valve's characteristics may be far from normal. In fact, they may be sufficiently unusual to give rise to a little howl.

How It Happens.

Similarly, if big condensers are used across the H.T. supply, these will be charged every time the set is switched on, and this extra charging current could easily upset a receiver that was not too stable. Or, apart from the set itself, an A.C. mains supply may yield a peak voltage before the full load of the set is taken, and this extra H.T. may cause a momentary howl before the set "settles down." So in a not-too-stable set one of these freak conditions, or a combination of several of them, is quite sufficient to make the set let out a little howl.

IS IT THE VALVE?



Bad contact at a valve-pin can give rise to extremely puzzling effects, so an occasional overhaul is always worth the moment's trouble.

POWER BY RADIO?

By THE EDITOR.

A word in season about the newspaper reports that have appeared in connection with this important topic.

THE trials and troubles of great men are many—especially when we consider the ease of inventors. Their troubles are often due to non-technical writers; and the recent accounts of the experiment of Marquis Marconi illustrate this point. Many newspapers, at home and abroad, have given the most fantastic and inaccurate descriptions of these experiments.

Sydney Signals.

As readers of "P.W." will be aware, Marconi carried out an experiment which is already quite well known—namely, the actuation of a relay by radio. That relay, at the receiving end, actuated another, and so on, until, finally, after a series of relays of different sizes, capabilities, etc., had been dealt with—due, of course, to the original delicate relay first affected by the transmitter's code signals—a relay sufficient to control the power required for lighting 3,000 lamps at the Sydney Exhibition, was in turn affected, thus causing a switch to close and the lamps (lit from local power) to be turned on. In Marconi's own words—as published in a message from him to the "Daily Mail":

"Here, in simple language, is what I did. Using a transmitting apparatus no bigger than a small wardrobe, I pressed a handle and sent out a signal, or impulse. The signal was picked up by the beam wireless station of Imperial and International Communications, Ltd., at Somerton (Somerset), and transmitted by land line through Radio House, London, to the beam station at Grimsby.

"From Grimsby the signal was sent on to the wireless station at Rockbank, Victoria, Australia, and there again passed over land lines to the Town Hall at Sydney.

"Paper" Progress.

"At the Sydney Town Hall it operated what is known as a relay—a delicate pin or needle operated by a weak current—and that actuated the switches turning on local power.

"The impulse travelled at least 14,000

miles, and, as it flashed through space at the rate of 186,000 miles a second, it took but a fraction of a second to get from Genoa to Sydney."

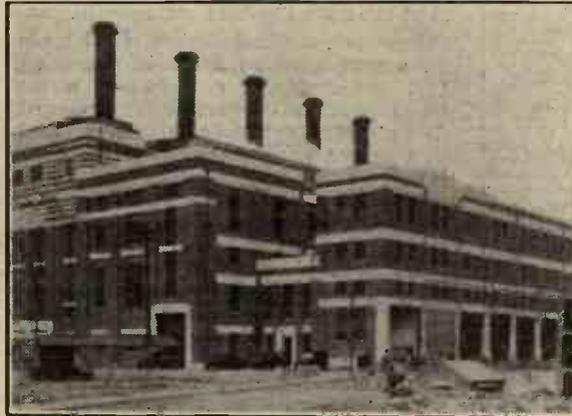
The Facts.

That is Marconi's own description of the experiment. And yet we have noticed paper after paper giving an account of this experiment in a way which suggested that Marconi sent actual power by radio of such degree that he lit the lamps by wireless!

Transmission of power of the magnitude required to light 3,000 lamps is—to-day, at any rate—impossible; and most scientists would not hesitate to say that Marconi's experiment in no way indicates that a "discovery" has been made which will make the actual transmission of power practicable in the near future.

Marconi himself would be the first to deprecate the inaccurate and silly printed

A MODERN POWER HOUSE.



This is the Hams Hall Generating Station at Birmingham in which Ferranti, Ltd., recently installed some gigantic transformers.

versions of his experiment. But he is abroad and cannot correct his lay eulogists. But

others can—and we are glad to see that the Editor of our contemporary, "The Wireless World," has already published a letter in several newspapers which has done a good deal towards giving the layman the true facts of the case.

Most radio engineers will agree that there was no novelty and certainly no "invention" in connection with the experiment. It was, in short, an interesting demonstration—which, incidentally, should arouse the G.P.O. to the efficiency of the beam stations. But "stunt" writers will not be denied, and Marquis Marconi will doubtless have a bad shock when he reads some of the exaggerated, and some of the totally inaccurate, descriptions of his experiment—though he will doubtless laugh later on when he reads the inevitable paragraphs and articles which have appeared forecasting a "near future" when electric wires will be out of date and London will be lit by radio!

London Lit from Labrador!

Lord Morris, the war-time Prime Minister of Newfoundland, is reported in the "Daily Mail" as follows:

"The discovery points the way to the future when there will be no electric wires and all current and electric power will be transmitted directly through the air in any direction and quantity desired.

It is, to my mind, almost staggering.

"If the Marchese Marconi is sound in his prediction, it is no flight of the imagination to forecast that the undeveloped power of the Grand Falls, on the Grand River, Hamilton Inlet, Labrador, may in the near future light the streets of Chicago and London and run their omnibuses and motorcars.

"The distance from the Grand Falls to London would be only one-fifth of the air distance or space that, by his latest discovery, the Marchese Marconi has annihilated."

Comment is superfluous, but we hope Lord Morris now realises the absolute impossibility of his forecast having anything to do with Marconi's relay experiment.

A flash lamp bulb mounted in the base of an old valve and plugged into the valve holder makes a very handy tester for checking L.T. connections.

Do not point your loud speaker towards your set or place it too close to the receiver, as it is very easy to build up a howl in this way.

If your detector seems to work just as well without a grid leak as with one, it is possible that there is a leak across the valve holder or on the base of the valve.

Generally speaking, it is inadvisable to modify the circuit of a portable set except to a very small extent, owing to the fact that there is no space to spare in such a set.

Radio apparatus to be used from the mains should be protected by fuses in both leads of the supply.

PRACTICAL POINTS FOR LISTENERS.

When holding small taps such as 8BA, it is often a convenience to use a telephone terminal for a tap wrench instead of the comparatively clumsy tool supplied for the purpose.

When a fixed condenser is used to isolate the earth lead from H.T. units, etc., the condenser should preferably be incorporated inside the radio apparatus.

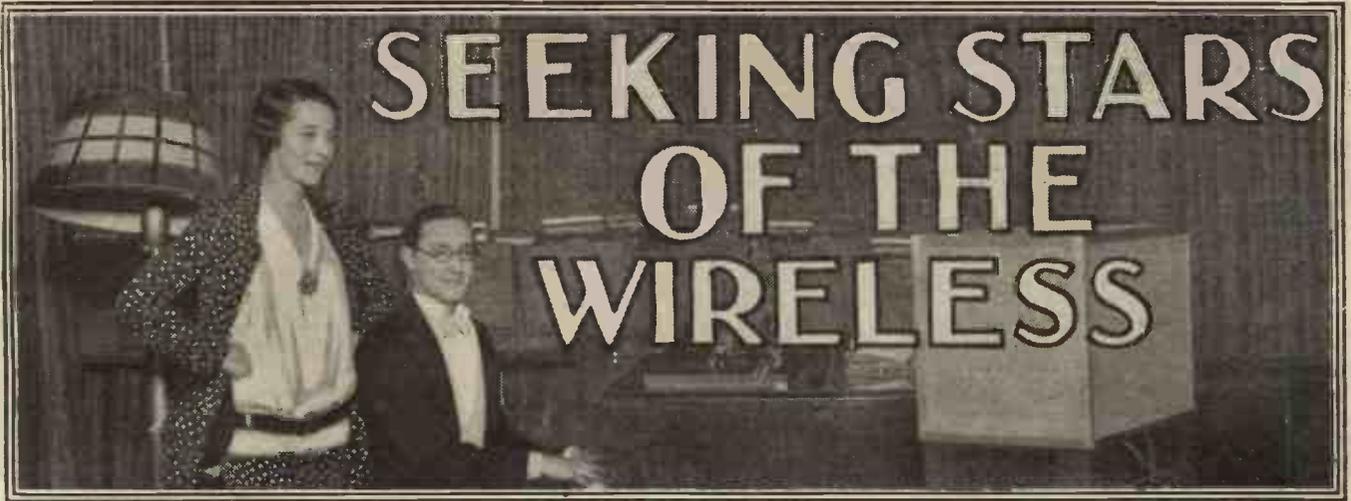
So effective is the potentiometer control of grid bias in the detector of a short-wave set that it is now usually regarded as a necessary modification of such a circuit.

When telephones or loud speakers are joined to radio apparatus which derives its power from the mains, they should be connected either through a double winding transformer, or through a circuit which has a condenser in series with each of the loud-speaker leads.

Generally speaking it is not worth attempting to obtain grid bias from a mains unit, as the trouble is greater than that of buying a battery occasionally.

If you suspect the insulation of an L.F. coupling condenser try disconnecting the H.T. from the preceding valve plate, when a decrease of anode current in the following valve will indicate a leak existing across the condenser.

When a set is changed to short wave working it is often an advantage to change the value of the detector leak to a greater figure to increase sensitivity.



In a little room in Savoy Hill, upon several days of the week, you will find a man listening by a loud speaker to programmes the public will never hear.

He listens a minute, then speaks into the telephone: "Is the mike near enough?" or maybe, "Tell the lady she need not sing again!" and with a stroke of his pencil on a sheet of paper dashes the hope of some wireless aspirant to the ground or perhaps lifts it to the clouds.

He is the man who conducts the auditions for vocalists and instrumentalists, and in his hands lie the fates of hundreds who seek admittance into the wireless programmes.

Generally Useless.

Generally, the programmes to which he listens are wholly bad. In one afternoon, twenty people may have to face a microphone test, and of these only one may be found good enough for a place in the morning programmes, and, eventually, for a seat in the sun of public favour.

Some of the performers may be of doubtful merit. These will be heard again and again, taught the technique of the microphone, and thoroughly tested.

Others, such as pianists, may be good but may not be selected for the programmes. There are so many applicants in this line that the standard has of necessity to be unduly high.

At one time the percentage of finds was much less. Nowadays, if a vocalist or instrumentalist wishes to have a wireless test, he or she must fill in a form and have it signed by two people eminent in the musical world. Formerly, however, anyone could have a microphone test without formality.

The result was an extraordinary rush. Servant girls, typists, and people who wished merely to see the studios faced the microphone day after day.

Peculiar Cases.

One middle-aged lady declared that she had been a great success in the days of Queen Victoria, and sang in a quavering voice most pitiful to hear.

Another lady produced an instrument resembling a ukulele and sang with great verve, but in a voice calculated to harden the

The B.B.C. is always alert for new microphone talent, and auditions play a big part in the routine at Savoy Hill. Here are some experiences of this part of the interesting work of broadcasting.

By A STUDIO OFFICIAL.

hearts of both highbrows and lowbrows alike.

After one verse, the studio official said, "That will be all, thank you!" but the lady was most indignant. "Oh!" she cried, "I can go on like this for hours," and the official had difficulty in preventing her.

Eventually, he was forced to grant her an extra five minutes, whereupon she produced a child from the corner of the studio who, upon a toy drum, then proceeded to accompany her in a duet!

Vaudeville Auditions.

The vaudeville auditions of the present day are of necessity run in the same open manner, for talent of this nature does not always have to be coached or taught.

The more peculiar performers, however, seem to have learnt their lesson. No longer do acrobats and jugglers write to

Savoy Hill to tell us that their turn is most suitable for the radio.

The nervous individuals who appear before the microphone nowadays are generally more serious. None the less, the vaudeville auditions are not more successful than those run on the musical side. Not one in a hundred "gets there" and the search for new talent is weary indeed.

Notable "Finds."

Still, if a man or woman does score a success on the radio, it often means fame and fortune. Flotsam and Jetsam, Tommy Handley, Mabel Constanduros, Clapham and Dwyer, these have been amongst the more romantic finds of the B.B.C., and were all introduced to a much larger public than that to which they had hitherto been accustomed.

At one time the microphone drew its stars from the stage. Nowadays, the stage is beginning to draw its stars from the microphone.

But the pace is hot! If the artiste who makes a mark in variety programmes is to retain his success, he must constantly be on the look out for fresh material. Unlike his brother of the ordinary halls, he cannot repeat a joke for three years.

It is when he fails to find fresh material that the wireless "star" sometimes fails.

For talks the standard is different. It is often desired to give a topical talk by someone in the public eye, and if that person consents to broadcast he does so whether his voice is really suited to the microphone or not.

"Sizing-up" Speakers.

With the other speakers, those comparatively unknown men who submit manuscripts of their talk, conditions are somewhat different.

If the manuscript is found to be suitable, the applicant will be given a voice trial, and only if the result is good will he be accepted on the spot.

Finally, there are the Children's Hour auditions, which are quite distinct.

These are held by the Uncle who is in charge of the Hour, and who knows his own requirements. And let it be whispered that although these auditions are sometimes considered unimportant, the Hour organiser has made more than one find.



Tommy Handley, who is here seen with Miss Heather Thatcher, can be reckoned as one of the most successful of all "mike" discoveries. He retains his popular appeal and his freshness in a manner that is almost unique.

LATEST BROADCASTING NEWS.

THE B.B.C. v. F.A.

**RUNNING COMMENTATORS—
SCOTTISH HEADQUARTERS—
HERE AND THERE IN FUTURE
PROGRAMMES—THE BUDGET
BROADCAST.**

FOR the second year the B.B.C. and the Football Association have failed to arrange a running commentary on the Cup Final at Wembley. It is a sad state of affairs that some independent ruling cannot be obtained, because, after all, the chief sufferers are the millions of listeners who cannot be present to see the great game.

Whether or not one agrees with the attitude adopted by the B.B.C., it is certainly to the credit of the officials at Savoy Hill that they are again doing their best to keep listeners informed of the progress of the game by making arrangements as last year for different people to describe the game at intervals of about ten minutes.

Running Commentators.

The people concerned are Mr. H. B. Brenan, Col. R. W. Geddies, Mr. D. McCulloch, Mr. Robert Holmes, Mr. J. K. Rankin, Mr. C. J. Nesbitt-Dufort and Capt. H. B. T. Wakelam, and they will be present at the stadium as ordinary spectators. A flat has been taken at Wembley where a microphone will be installed, and here the commentators will make their way at 3.20, 3.35, 3.50, 4.5, 4.20, 4.35 and 4.45.

In this way it is hoped to give a fairly comprehensive description of the play, although the actual events will be described a few minutes after they have taken place. Such breaks in the description as must occur while waiting for the arrival of the commentators will be filled with dance music from the studio. Incidentally, it will be about the last microphone appearance of Mr. H. B. Brenan, who is leaving the B.B.C. for a better job.

Scottish Headquarters.

It is expected that the transfer of the headquarters staff of the Scottish Region from its present premises in Glasgow to the new Scottish Broadcasting House at Edinburgh will be completed within the next six months.

The B.B.C. has taken a building in Queen's Street, Edinburgh, which was formerly the old Queen's Hall—at one time a most important concert hall.

Already considerable progress has been made with the work of adapting the building to the requirements of broadcasting, and the concert hall, when fitted, will be one of the finest broadcasting studios in the country. A number of smaller studios will be constructed, and there will be plenty of space available for office accommodation.

Here and There in Future Programmes.

An entertainment entitled "Pleasure," presented by Clifton Shave, will be relayed from Grove Park, Weston-Super-Mare, for broadcast throughout the Western Region on Tuesday evening, April 22nd.

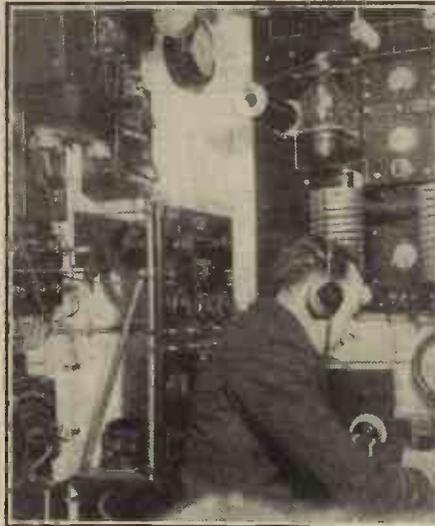
A special afternoon concert by the National Orchestra of Wales, with vocal

items by William Worsley (baritone), will be broadcast from Cardiff and Swansea on St. George's Day, April 23rd.

The band of the 2nd Battalion of the Cameronians (Scottish Rifles), which has just returned from a long period of service in India, will take part in the group programme for Scottish listeners on Thursday, April 24th.

The Banff Ladies' Choir, one of the principal choral bodies of the North East of Scotland, is taking part in the Aberdeen Musical Festival on Saturday, April 26th, and opportunity has been taken to invite the choir to give a half-hour's recital in the Aberdeen studio.

LINER'S LONG-DISTANCE LINK.



This view shows the wireless operator and cabin of the liner "Jervis Bay." By means of short-wave radio the liner kept in touch with Australia every day of her voyage to Plymouth, thus creating a record.

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.
By "PHILEMON,"

who will long be remembered for those wise and witty broadcasts entitled "From My Window."

Invalid Wireless.

I HAVE just stopped running a temperature; and for about a week I have been having all kinds of adventures in the queer corners and by-ways of the programmes. How odd and out of place somehow the wireless sounds at eleven o'clock of the morning!

It doesn't suit the cool and tidy room, with the bed-clothes trimmed and ready for the doctor. When I heard him coming the first morning, I switched off, guiltily, as if I didn't want to be caught at it!

Off the Beaten Track.

As a rule, of course, I scarcely ever dare glance even at the morning programmes, for they look so unappetising, and cold-meaty! But I now assure you that you may get more interest and quiet amusement out of a topic like "Children's School Lunches" than out of many a Point of View or Surprise Item! One afternoon "Pond Snails in the Aquarium" came like a glorious oasis in a rather dreary desert. And had it not been for that tonsillitis I

An interesting broadcast has been arranged for listeners to the London Regional transmitter on Thursday, May 8th, when Bach's "Magnificat" performed by the choirs of Havant, Horndean, Petersfield, Sheet, Steep and Waterloo will be relayed from the Petersfield Musical Festival at the local Drill Hall.

The soloists are Lesly Duff, Ann Wood, Steuart Wilson and Arthur Cranmer, and the performance will be conducted by Dr. Adrian Boulton.

Picturing "The Final" for the North.

Whether or not Huddersfield Town is successful in defeating the Arsenal at Wembley in the Final Tie for the English Cup Competition on Saturday, April 26th, Lancashire is determined to participate in this important event.

The broadcasting authorities at Manchester have arranged for that famous family "the Browns of Owdham," and some of their friends to be visiting London for the great annual festival, and the evening programme that day will include a description of the trip—the journey on the train, their opinion of "The Final," and a possible visit afterwards to Madame Tussauds.

Altogether it should be a humorous programme, particularly if any effort is made to describe how Bill and Sarah and the rest are able to get back to Manchester in the little time available between the finish of the festivities and when the programme is timed to begin.

The Budget Broadcast.

A highly important broadcast is fixed for National listeners on Tuesday, April 15th, when Mr. Philip Snowden, Chancellor of the Exchequer will explain his Budget proposals, as outlined to the House of Commons on the previous night.

should certainly have missed Mr. Courtney Page on "Pruning Roses." So I have much to be thankful for!

The Darkest Hour.

I put it somewhere between 6.30 and 7 p.m. in a sick man's diary. "Absolute doldrums. Day is over, night hasn't come. And I record with fervent gratitude that it was at this deadly hour, and for a whole week, that Mr. Hely Hutchinson played Bach's English Suites to me.

I have never enjoyed piano music so much. The Suites are themselves so gay and light-footed, with such open space and clean scent about them, and Hely Hutchinson is so young and so blithe. He seemed to me to play them to perfection.

A Soldier's Reminiscences.

Sir Ian Hamilton is one of the younger of these elderly gentlemen who "look backward." He sounded young and vigorous enough for another Gallipoli campaign. He has a thin, reedy, very pleasant voice; also a pretty wit.

(Continued on page 124.)



CAPT. ECKERSLEY'S QUERY CORNER

RESISTANCE-CAPACITY COUPLING—
MORSE INTERFERENCE—FROM
POWER TO PENTODE—WHAT IS
“DAMPING”?

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, comments upon radio queries submitted by “P.W.” readers. But don’t address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Resistance-Capacity Coupling.

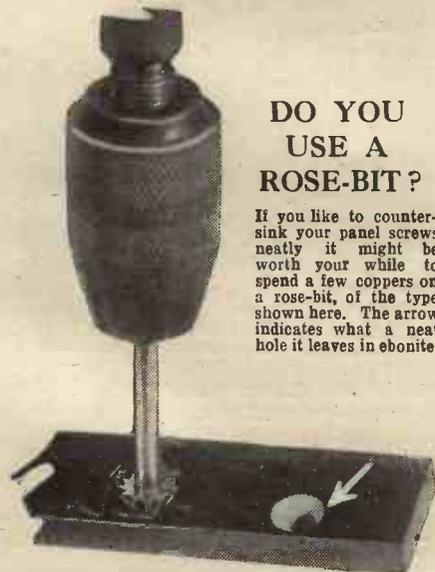
L.D. (Moray Firth).—“Can you tell me to what position in a set I might apply the use of an R.C. valve? I find that either H.F., general purpose or special detector valves are invariably quoted as being suitable for the detector positions in receivers. In what type of circuit is an R.C. valve used?”

The R.C. valve, as its name implies, has been specially designed for resistance-capacity magnification. From its characteristics we see it has a moderately high impedance of the order of 50,000 ohms and, therefore, with, say, 140 volts anode potential and 100,000 ohms series resistance, it should be effective in the stage immediately following the detector—but don’t overload it!

Morse Interference.

C.M.V. (Eastbourne).—“Nearly ever since broadcasting started, I have been the owner of a wireless set, but, until recently, my reception has been somewhat spoilt owing to my inability to eliminate a very high-pitched morse station which seemed never to cease working.

“In my locality ships also caused considerable interference, but by listening exclusively on the long waves, I overcame this and was only troubled by this one Morse station.



DO YOU USE A ROSE-BIT?

If you like to counter-sink your panel screws neatly it might be worth your while to spend a few coppers on a rose-bit, of the type shown here. The arrow indicates what a neat hole it leaves in ebonite.

“The recent sudden cessation of this interference has given me great satisfaction, and aroused my curiosity. Can you give me any explanation? I have done nothing to my set!”

No! But fortunately someone’s done something to the Morse station even to the extent of moving it on to its right wave-length!

You see, at the Washington conference Daventry 5 X X was given an exclusive wave—all the nations agreed not to interfere with Daventry by working on a too-close wave-length. The Washington conference was held in 1924 or 5, I forget which. One of its decisions has apparently been put into effect—well, well, such is progress!

Your interference, by the way, had nothing to do with the excellence or otherwise of your set; you had no redress.

From Power to Pentode.

J.M. (Harrow).—“I possess a low-resistance moving-coil loud speaker which normally works with a 25 to 1 step-down transformer from a power valve. Would it be O.K. if I replaced the power valve by a super-power pentode?”

That depends on the transformer you have got now. If the impedance of the primary of the output transformer is reasonably large compared to the impedance of the pentode at all frequencies transmitted by the loud speaker, then the transformer is all right, but I should doubt if the transformer you are using has the correct impedance.

As I have no quantitative data I recommend you to write to the makers of the transformer quoting the impedance of the pentode you might be going to use.

What is “Damping”?

P.B. (Fulham).—“What does the term “damping” really mean? The expression is used in connection with the effect an aerial has on tuning, and the effect a valve has on a tuned circuit. I have even seen it mentioned in reference to gramophone pick-ups.

“I understand that damping indicates losses, but then a grid detector is said to cause damping and is also often said to be more sensitive than anode bend which, I am told, does not cause damping.”

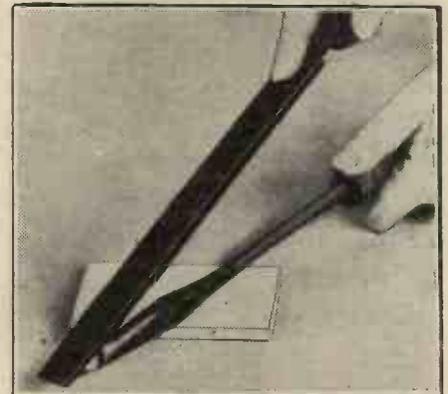
The term “damping” is frequently wrongly used because people assume it has only to do with resistance. When we set anything into oscillation, a pendulum or an electric

circuit, by giving it a kick (foot or electric) the oscillations start dying away. The rate at which they die away is proportional to what we call the “damping.”

The actual damping factor is proportional, in the mechanical case, to the resistance to swing, divided by the inertia of the mass that is swinging. In the electrical case, then, damping is proportional to resistance divided by inductance.

If, therefore, you have any added resistance to a given electrical circuit, you in-

KEEP THE IRON CLEAN.



If you want a file for cleaning the soldering iron when tinning it, don’t choose a very fine one, as this will get clogged very easily.

crease the damping and you increase the rate at which oscillations die away. If you want, as with a valve circuit, to keep the oscillations going, you’ve got to put more energy into the oscillatory circuit as it has more damping, but you’ll be helped if the inductance is larger. It’ll be a big effort to keep a pith ball swinging in air, or a lead weight swinging in treacle!

If you have a large damping, too, you have “flat” tuning. If you have a pick-up with little inertia and lots of “stick” in its movement you have high damping. If you have a grid-leak detector this puts an extra apparent resistance across the oscillating circuit and adds damping.

If you have anode bend detection, so that no grid current flows, you have no increase in apparent resistance, and so you have less damping (with the same given inductance in each oscillatory circuit) than with grid-leak detection when grid current flows.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



COLUMBIA MAINS SET.

THE Columbia radio receiver does not incorporate a pick-up switching arrangement and, in the circumstances, this may occasion some surprise among "P. W." readers.

But the idea held by the Columbia Graphophone Co., Ltd., in regard to radio-gram outfits is very sound.

If you want to run records electrically as well as receive broadcasting, the Columbia people provide you with their radio set as it stands coupled to a power amplifier. The



The Columbia Set has a drum drive for tuning.

whole is built into a fine cabinet with a moving-coil loud speaker.

Therefore, there is no compromise necessary and the performance of the radio section is unimpaired.

"P. W." readers who have experimented with radio-gram outfits will have learnt how difficult it is to wangle the L.F. side of an ordinary set, so that it will cope adequately with the record and prove as effective as ever for radio work. And the purchaser of a complete set is handicapped, for he is unable to make all those minor adjustments that every constructor does as a mere matter of course.

The Columbia policy is very sound, always remembering that they are catering for a somewhat different class than that which embraces the man who is lucky enough to be able to build his own set. The particular Columbia table model radio set sent along to us for test is a 210 D.C. mains type in walnut. The accompanying photographs give you a very good idea of the appearance of the instrument. Personally,

I like it very much. It comprises three screened-grid valves, a detector and one L.F.

The Columbia people have gone all out for stability and purity with moderately low gain stages—an American principle which is an admirable one from all angles in a commercial set. The smoothing in the Columbia is complete, for there is not the faintest whisper of hum. The set is remarkably selective, and the quality of reproduction is as good as anything I have heard from any commercial outfit coupled to our best moving-coil loud speaker.

Altogether I consider the Columbia set a very fine proposition.

With anything at all of an aerial, you can get all you want in the way of foreigners without difficulty, and the set retains its stability and clear-cut output at all times.

TUNGSRAM PUBLICATIONS.

I have recently received copies of publications giving full details and prices of the whole range of Tungfram valves, and photo-cells. These are products of the Tungfram Electric Lamp Works.

GOLSTONE PUSH-PULL SWITCH.

Judging by the letters I receive I am sure there are quite a large number of constructors who still do not realise the importance of such small components as valve holders, coil holders, or switches. Any one of these, if faulty, can cause just as much trouble as faulty larger components, such as a variable condenser or L.F. transformer.

For instance, all sorts of cracklings and scrapings come within the province of the on-off switch, which is not up to "scratch," and, talking of on-off switches, I may say I like the latest Goltone switch.

The price of this is a mere 10½d., but it includes bakelite mouldings and nickel fittings that you would expect to find only in a de-luxe model costing twice as much. It is a one-hole panel-mounting component, and its action is as good as it could be. The switching is easy and definite, and the contacts are completely self-cleaning.

THE EASY-WAY.

I have just received my copy of the latest edition of the Peto-Scott Easy-Way catalogue. It covers all the leading makes of radio apparatus and there are also full details of kits of famous sets, such as the "Magic" and "Titan." The hire-purchase details of each are given.

LISSEN PUBLICATIONS.

Two new Lissen publications deal respectively with improving the selectivity of the Lissen S.G.3 receiver, and with the details of the Lissenola Transportable Regional Receiver—an all-electric A.C.

set which certainly seems to be a most attractive proposition, both in performance and in price.

THE NEW LISSEN TRANSFORMER.

The Lissen people are now in production with an L.F. transformer embodying a core of nickel-iron alloy. Such a core enables very considerably improved magnetic qualities to be obtained with a much smaller bulk of core. Other incidental advantages are lower self-capacity and lower resistance.

WHEN YOU ARE BUYING— (9) AN ACCUMULATOR

Remember that, very often, Ignition Capacity ratings of capacity are given. The Ignition rating is generally half the "Actual" rating.

A cell rated at 20-ampere hours (A.H.) "ignition" has an "actual" capacity of 10-ampere hours. When a cell is not marked either "actual" or "ignition" it might be either.

The ignition rating gives an indication of a battery's capacity when subjected to only small discharges for short periods.

You can get an idea as to how long an L.T. accumulator should last per charge by dividing its "actual" ampere-hour capacity by the total current consumption of the valves it serves.

Accumulators should have acid proof terminals of fairly large dimensions, and the acid solution should be easily visible through the cell cases or vents, so that the acid levels can be seen at a glance.

Accumulators are now obtainable with jelly-like dielectrics instead of acid solutions. They are mostly every bit as good electrically and much cleaner in use.

Further special characteristics of this special material should contribute to the preservation of wave-form.

The new Lissen L.F. transformer has a ratio of 4 to 1, and it uses it. That is to say, it enables high amplification to be obtained with low conversion losses. The component is contained in a tasteful bakelite moulding, mottled brown in colour.

The terminals are neatly disposed towards



The Columbia Set Mains Voltage-adjusting Resistance is supplied in the form of a separate unit.

the base of the component. I notice that only two fixing holes are provided, an excellent idea, for two are quite enough and, indeed, it is seldom that four holes get used in such an accessory.

This new Lissen transformer is naturally quite light and very compact, and should achieve as great a popularity as the majority of the other Lissen productions.

The most sensitive Detector Valve on the market

AND ABSOLUTELY NON-MICROPHONIC



The Amazing

MAZDA VALVES

The most efficient detector valve in the world, and absolutely free from hum.

The Mazda A.C./H.L. valve has been designed specially for anode bend and cumulative grid detection, the ideal for power detection.

Examine its characteristics and you will understand why it is so efficient.

CHARACTERISTICS.

Filament volts	4.0
Filament amps.	1.0
Amplification factor	35
Mutual conductance	2.6
Anode resistance (ohms) ...	13,500
Anode volts	200

MAZDA AC/HL PRICE 15/-



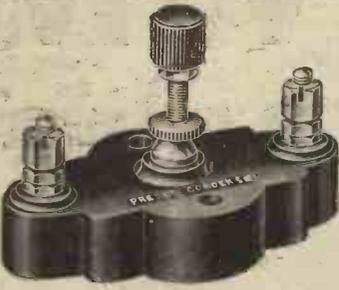
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RADIO-GRAMOPHONE CABINET
 YOU ARE LOOKING FOR

INSTALL A
"LANGMORE"

and have your Gramophone, Wireless Set, Loud-speaker and Batteries all in one Cabinet. These Cabinets are 3 ft. 2 ins. high x 21 ins. wide x 15 ins. deep overall, and are very strongly constructed of selected Oak and Plywood.

THE TOP SECTION. Size 4 1/2 ins. high x 18 ins. wide x 13 ins. deep, gives ample accommodation for Gramophone and Pick-up.

THE CENTRE SECTION. Size 10 ins. high x 18 ins. wide x 14 ins. deep, is for the Wireless Set, to take a panel either 18 ins. x 7 ins. or 18 ins. x 8 ins.

THE BOTTOM SECTION. Size 15 ins. high x 18 ins. wide x 13 1/2 ins. deep, gives accommodation for Loud-speaker and Batteries.

The whole of the back is enclosed by double doors, so that all parts are easily accessible. ALL are fitted with Hinged Top, Heavy Baseboard, etc.

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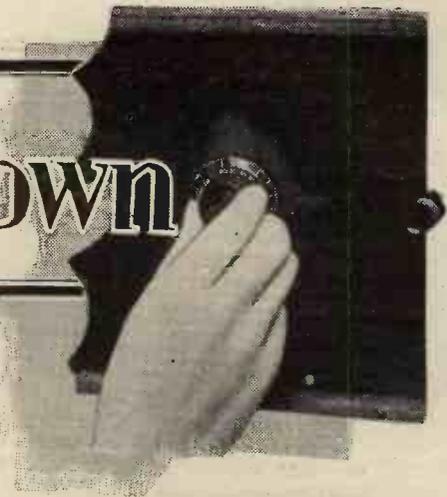
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THE MISCELLANEOUS TRADING Co., Ltd.,
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Keep that Volume down



A very large number of listeners must be seriously overloading their valves now that the high-power broadcasters are at work; indeed, quite apart from these it is probable that overloading is one of the commonest of set faults. You should read this article and ask yourself whether your set can be expected to give quite undistorted results at the volume you generally extract from it.

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

YOU are overloading your valves; thousands of you are, and your results will be scratchy, raspy, and generally torn about until you stop doing it.

I know that so many of you folk are guilty of this cardinal radio sin because, when writing to me, so many of you give away the secret with delightful naïvete.

You say you have a Det., 2 L.F. (or it may be an H.F., Det., 2 L.F.) which gives you enormous volume but—and here it is a very big “but”—according to your own words, the valves you use aren’t capable of dealing with anything like “enormous volume” without overloading like anything.

They Can’t Stand It!

Those ordinary little power valves, and fairly ordinary little super-power valves, can’t give “enormous power” outputs without bending badly under the strain. If they could, our real super-power valves, needing their 300 and 400 volts on the plate, would have no job to do in the household set of even the most ambitious kind.

Therefore, either a lot of you are overloading your valves, or you are exaggerating, that is obvious, and being “P.W.” readers, the latter does not apply!

I grant you one man’s “enormous volume” may be another man’s whisper, but between the extremes these imply lie those myriads of ordinary folk such as you and I.

And when we refer to “enormous volume” we mean something pretty loud; something above the strength needed for an ordinary-sized room.

What is wanted is not “enormous” or “terrific” or “tremendous” volume, but comfortable volume. Microphone speechmakers should not be bellowing at you from the loud speaker—this should be operating at just about the strength attained by the nicely modulated human voice *au naturel*.

You may want it just a trifle louder for band music, but not much.

Now, to get this comfortable volume needs fairly good valves in a fairly good set of a fairly powerful

nature. You have to grade your volume by your standing in these regards.

If everybody did this, by the way, there would be few sets working at anything above whisper strength!

However, I maintain that a pure whisper is much more to be proud of than a distorted shout, and I expect most people will agree with me.

Overloading may occur in any of the valves; yes, even including the H.F. valves. When it does happen in an H.F. valve rectification occurs and there may be some considerable distortion. And this will be magnified by each successive valve.

This is a point to remember. Any overloading in an “early” valve will create distortion that the later valves will amplify. And this distortion will be just as noticeable if not more so than that due to serious overloading in the last (power) valve. And this even if the initial distortion is comparatively slight.

One of the most useful characteristics of a good valve is that one which gives a clue to its input possibilities in comparison with its amplification factor.

But the vital point is not so much what the valve will handle in the way of energy fed on to its grid, as what it will give out in undistorted form for a given input. And this quality is denoted primarily by its amplification factor.

Secondly comes the relation of the impedance of the valve with that of the coupling device or loud speaker which figures in its anode circuit.

Obviously, it would be better to feed a little into a valve that amplifies a lot than to feed a lot into a valve that amplifies but little and cannot deal with its big input without showing signs of distress.

The Commonest of Complaints.

The subject of valve-overloading has been dealt with in detail previously in “P.W.” and it will be dealt with again, for it is, as I have hinted, one of the commonest of complaints.

In the meantime, you will want to know what I suggest as a cure for it. Will you feel pained if I say “Don’t overload”? Anyway, just don’t do it, is all the advice I will give you now.

You see, it is so easy to overload valves and so hard not to, especially when one has such powerful locals as Brookmans Park close at hand.

Londoners particularly, or at least many thousands of them, have never had such energy vibrated into their aerials before, and overloading really must be most widespread.

The thing to remember is that it takes a really ambitious set (400 volts H.T., and so on) to produce “terrific volume,” and adequately to fill even a fairly large drawing-room needs pretty hefty gear.

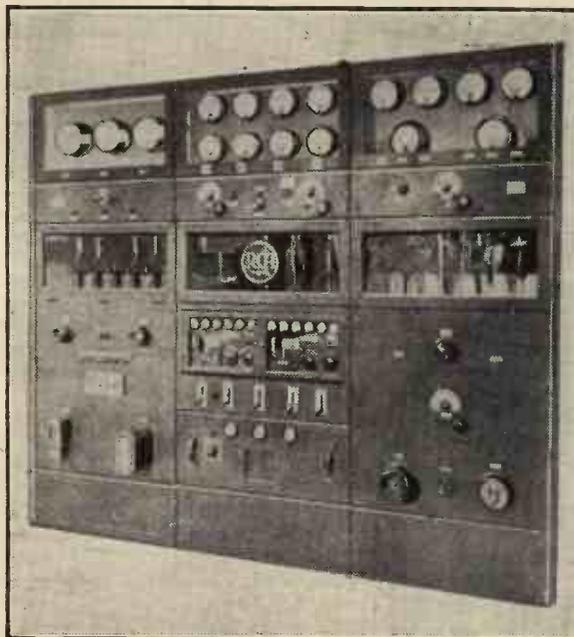
The Golden Rule.

If you haven’t got hefty gear, volume-control your set like anything, either with a conventional resistance control or by detuning. Very few sets indeed will run “full out” on Brookmans Park at a few miles distance. Even two-valvers are likely to overload. And three-valvers—!

With two or three volts input to the first valve you might knock up around about 100 for the last valve, and this, as Euclid would say, is absurd for anything but a very big super-power type.

The golden rule is to keep the input to the first valve down so that no subsequent valve gets more than it can handle. That takes some doing, as I have said, but “little and pure” really is better than “big and distorted” in regard to a set’s output.

ROME STOPS ROAMING.



This is the crystal control panel at the new 50 kw. broadcasting station at Rome, which can easily be picked up in this country on 441 metres. (It calls “Radio-Roma.”) The crystal control keeps the wave-length very steady, and prevents “wandering.”

WHENEVER there is present in our test rooms an air of suppressed excitement or enthusiasm, it is a sure sign of "something doing" in the set line.

And "Tiny" Two was by no means an exception to the rule, in fact, to say that the tests of this little wonder set provoked enthusiasm would be to put it far too mildly.

Take a look at the pictures of it—imagine a "set" slightly larger than a packet of tea, capable when used with an average type of aerial of giving respectable loud-speaker results at twelve miles from Brookmans Park. What could possibly be more deserving of the title of "portable"? Would it be possible to fit a two-valve set into a more confined space? Frankly, we doubt it!

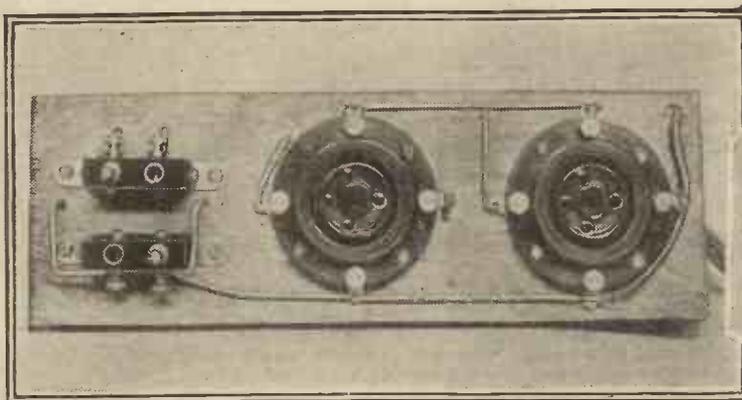
Convenient to Carry.

Admittedly, in giving you an idea of the size we have omitted to take into consideration the accessories required. But even with batteries, aerial and earth equipment, and 'phones (for use with which the set is primarily designed), the whole outfit can be packed with ease into a small picnic attaché case no larger than would normally be used for the transport of sandwiches and the thermos.

The necessity for rigging up a temporary aerial whenever it is desired to use the set out of doors may at first appear to be something of a drawback. Yet if you are in search of a set which can truly be defined as portable and not, as is more often the case, transportable, it is hardly possible to include any more than two valves.

And when you think about it, it is not really such a very difficult job to sling a length of wire over a branch of a convenient tree, is it?

In any case, in our estimation it is far better to have to carry out this small operation than it is to arrive at your point of destination in a semi-exhausted and decidedly hot condition, as a result of having carried through the broiling heat of a summer afternoon a set which can be

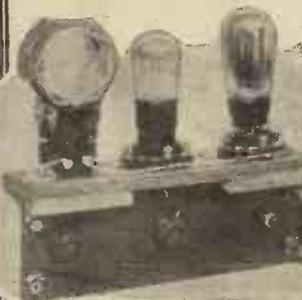


Looking down on the main baseboard we see just the two valve holders and the coil holders.

claimed to be entirely self-contained. Without a doubt, "Tiny" Two is the ideal set for the summer months. It is portable; for its size exceedingly efficient, and on those occasions when it is not desired to use it out of doors, providing you are reasonably close to your local station, it is capable of pleasing loud-speaker results

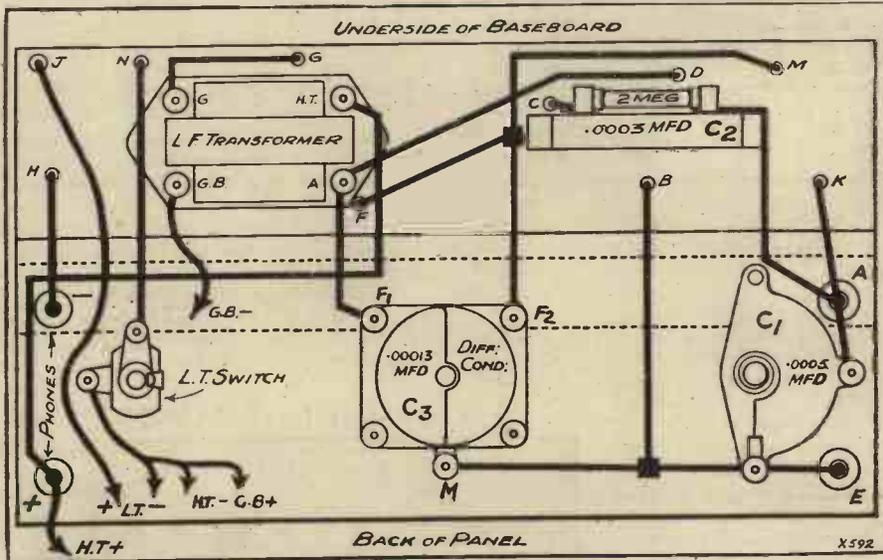
because it is our last desire that "Tiny" Two should be regarded in any way as a "joke" set. Such very

BUILD T



Going away for Easter in touch with radio happiness you can do with a small away in any odd corner. The "Tiny" Two fills give you the local on a convenient corner, or in a s your holidays, or on con THE "P.W." RESEA

NO TWO-VALVER COULD BE SIMPLER TO WIRE.



AN IDEAL HOLIDAY SET.



Here we see the "Tiny" Two in holiday guise, packed up in a small attaché case, ready for road or river.

merely by coupling it up to your ordinary broadcast aerial and earthing arrangements. Selectivity.

Even with a portable we imagine that a certain amount of interest attaches to the circuit employed—at least, to those of our readers who are technically minded, and in any case, we are inclined to think that it might be advisable to give this question consideration if only of a brief nature,

definitely is not the case. The circuit is based on a thoroughly sound and well-tried arrangement similar in many respects to the circuit employed for our famous "Magic" Two receiver.

In these days of Regional conditions and the accompanying need

- THE**
- One "Brookmans" type
 - denser, .0005 mfd. (Rea
 - One differential reacti
 - .0001, .00013 or .0001
 - or Lissen, Ormond, D
 - Radio, Formo, Magnu
 - One L.T. switch (Wear
 - Lotus, Igranic, Benja
 - Keystone, etc.).
 - 1 L.F. transformer (R
 - or similar very small
 - Lissen, Igranic J, Lotu
 - 1 .0003 grid condenser a
 - leak (Lissen or Duk
 - Mullard, etc.).

THE SET YOU WAN

THE "TINY" TWO.

(Continued from previous page.)

The top wooden piece to which the panel is secured at right angles accommodates on the top the valves and coil holders—the relative positions of which can be obtained from the appropriate diagram—and on the underside, the grid leak and condenser and the L.F. transformer.

The Wire to Use.

In view of the portable nature of the set, and the exceedingly confined space into which it is fitted, you would be well advised to carry out the wiring with connecting material having an insulated covering. It is unlikely that you will encounter many

Place a No. 50 coil in the grid socket—i.e., the one marked L_1 —and in most cases a No. 35 or 40 coil will suffice for reaction.

With your 'phones connected up, it should now be possible, by tuning with the variable condenser C_1 , to hear strong signals from your local station.

The test to make certain that reaction is satisfactory should not be conducted with the set tuned to the local station, but at positions higher and lower than the setting at which it is tuned in. This procedure is in order to avoid causing interference with your neighbours' results.

If oscillation seems quite satisfactory you can proceed to pack the whole equipment into the case and wait for the first fine day (we hope you will not have to wait too long!)

The final outfit will naturally require to include about 50 ft. of rubber-covered wire which can be slung into position as an aerial, and a further 6 ft. or so for the earth lead. This latter at the end remote from the set can be attached by a clip to a wire fence or by means of a brass stair rod or similar article can be arranged as an earth merely by pushing the metal rod into the ground. At the set end, both of these leads should be equipped with plugs.

"X" Coil Connections.

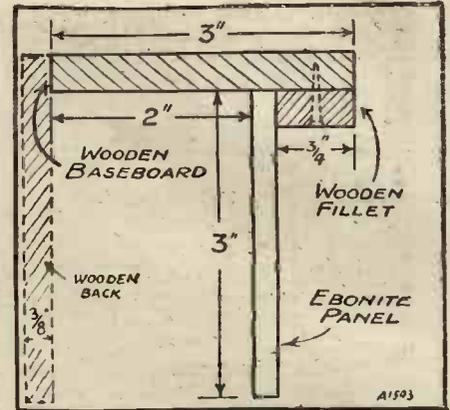
To use an "X" coil with the "Tiny" Two when the set is being operated with the home aerial and earthing arrangements, it is merely necessary to insert the coil (a No. 60 "X") in the socket marked L_1 .

The aerial lead should then be attached direct to one of the terminals on the coil, the normal aerial socket being ignored.

As we mentioned previously, when using a normal broadcast aerial and earth, it is quite possible that a wave-trap may be found necessary at short distances, in order to obtain complete separation of the twin regional transmissions. Any of the recent "P. W." Rejector designs will be quite suitable for this purpose.

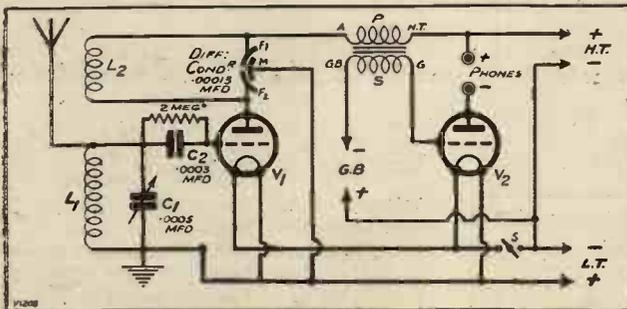
The fitting of a trap is quite a simple matter, and the connections and operation should be carried out in the following manner. First disconnect the aerial lead

LITTLE CONSTRUCTION REQUIRED.



This sketch shows how the panel, baseboard, and back are fitted.

SIMPLE BUT SURE!



Though the circuit is not elaborate, the results are positively amazing.

difficulties in the wiring operation because, for one thing, it is so very simple, and also because the positions of the various leads are clearly shown in the diagram and photos.

You may not clearly understand the various letters which are shown on the diagrams, and therefore, before leaving this subject we would just add that these are merely to indicate a wire passing through the wooden top-piece.

A Preliminary Try-Out.

For instance, a wire shown as passing through the wood at H is shown emerging by the same letter in the other diagram, and so on.

The battery connections are made by means of four flex leads which, for convenience and to preserve a tidy appearance can be plaited together. Each lead, L.T. +, L.T. -, G.B. - and H.T. +, should be about 24 in. long and at least 18 in. of this total length can be plaited. At the end remote from the set, the L.T. - lead becomes common to L.T. -, H.T. -, and G.B. +, to each of which points it should be joined.

Before you commence to pack this set into its carrying case, give it a try-out as it stands. Join the leads to the appropriate batteries (60 volts will suffice for H.T., and 2 volts is to be preferred for the L.T. on account of the smaller battery required), insert a valve of the "H.F." type in the holder marked V_1 , and a valve of the L.F. type (small "power," for loud-speaker work) in the remaining holder.

Next join your outside aerial to one side of a .0002 fixed condenser, the remaining side of which should be connected direct to the aerial socket of the set. The earth-socket can be joined direct to earth.

at present joined to one of the terminals on the "X" coil, and join this lead instead to the "input" side of the wave-trap. (This "input" will probably consist of a terminal or socket marked "aerial.")

The remaining terminal on the trap, which will probably be marked "to set" should now be connected by means of a piece of flex wire direct to one of the terminals on the "X" coil.

Final Adjustments.

Tune the set to the station it is not desired to receive, and then slowly adjust the trap until the signals from this station disappear, or almost completely disappear.

Next Week!

Full details of

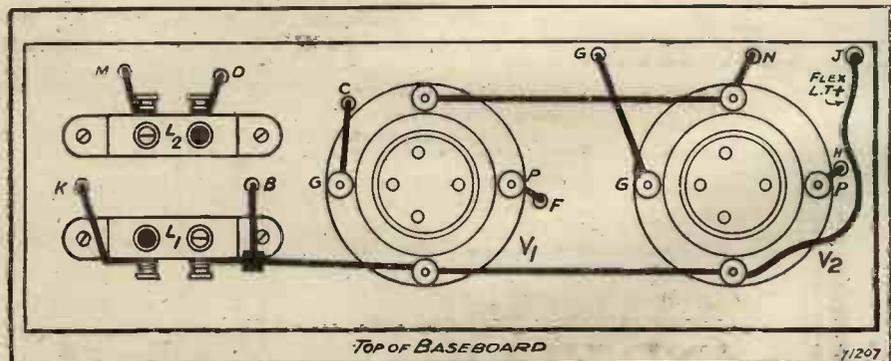
THIS YEAR'S "MAGIC" FOUR

—The Senior Member of the famous "Magic" family.

ORDER YOUR COPY NOW

With the signals thus "wiped out," the trap need not again be touched, and to receive the other twin transmission it will only be necessary to re-tune with the condenser on "Tiny" Two.

TINY IN SIZE BUT A GIANT IN PERFORMANCE!



Here we see the valve holders and coil holders wired up. The baseboard fits above the panel and at right angles to it.

**THE
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WITH THE
FINE PERFORMANCE**



The new B.T.H. pick-up has been specially designed to give fine tonal quality throughout the whole musical range. The degree of damping has been very carefully balanced so that unwanted resonances are avoided on the one hand and record wear is avoided on the other. The B.T.H. pick-up is used in the best known makes of radio gramophones—good reason why you, also, should make use of the undoubted advantages of the more music—less wear pick-up.

PRICE 45/- COMPLETE

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**“THE MORE MUSIC — LESS
WEAR PICK-UP”**



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can obtain
your High
and Low
Tension from
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—and it's much more efficient

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10/- DOWN**

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Why tolerate the time, trouble and expense associated with Dry Batteries and the re-charging of Low Tension Accumulators? Providing you have Electric Light in the home the new "ATLAS" Units Models A.C.86 and A.C. 84X will save you pounds, and assure you of High and Low Tension supply from the Mains for years to come.

H.T. Battery Eliminators and Trickle Chargers combined, these instruments give every facility for making your Set in every way equal to an expensive ALL MAINS SET. Model A.C. 86 (illustrated), for Alternating Current, provides 3 H.T. Tappings—one Fixed of 150 Volts and two variable 0/100 Volts and 0/120 Volts respectively, and gives Output of 150 Volts at 30 m/A. On the Low Tension side facilities are provided for maintaining the charge of either 2, 4, or 6-Volt Accumulators.

Price 10/- down and 9 monthly easy instalments, or

CASH PRICE £8 : 15 : 0

MODEL A.C. 84

This is a cheaper Model suitable for any Set requiring up to 15 m/A Output, and provides two fixed H.T. Tappings of 90 and 120 Volts respectively, and one variable of 0/100 Volts. The Trickle Charger on this model provides for maintaining the Charge of 2-Volt L.T. Accumulators only.

Price 10/- down and 6 monthly easy instalments, or

CASH PRICE £6 : 17 : 6

**“CLARKE'S
ATLAS”
ALL-MAINS UNITS**

These instruments have NO LIQUIDS, NO VALVES and NO MOVING PARTS and are absolutely safe in use and fully guaranteed for twelve months. They can be obtained from any good Wireless Dealer.

Ask your Dealer for Folder No. 49, or POST THIS COUPON TO-DAY

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Messrs. H. Clarke & Co. (M/cr.), Ltd., (Dept. 3) Atlas Works, Old Trafford, Manchester.

Please forward your Folder No. 49 and particulars of your easy payment scheme.

NAME.....

ADDRESS.....

Please use BLOCK LETTERS. (P.W. 6)

SHORT-WAVE NOTES.

The Vagaries of D X Work—What a Log Shows—Some Queries—
Short-Wave Juggling.

By W. L. S.

ONE or two of my readers have written this week about reception conditions in general, and it is rather surprising that, while the writers apparently agree about nothing else, they all have this in common—that they consider the conditions for the reception of Australia and New Zealand exceptionally bad this year.

Certainly I do not think they have been too bright as yet, compared with the February-March period last year. But there is another period commencing in June when they usually arrive again quite well.

What the Log Shows.

Incidentally, one is well repaid for keeping a detailed log when one looks back and summarises it after two or three years. I have been reading up all my entries since early in 1927, and very interesting reading they make.

Taking the 20-metre wave-band, for instance, one can pick out very definite "peaks" in the strength of signals from various parts of the globe, and can, I should imagine, predict with some accuracy the "cycles" of conditions to come during the next few years.

The following facts stand out exceptionally clearly:

(a) That the only time when one can really consistently receive the 6th and 7th districts of the U.S.A. is during the period from April 28th up to the end of June, although last year they continued to come over well until the end of July.

(b) That the Antipodes are best in the early mornings during February, March, June and October; but that for afternoon work (across Asia instead of across South America) January appears to be best.

(c) That whereas New Zealand is best in the early mornings Australia is often better during the afternoons.

(d) That a prolonged spell of generally bad conditions is usual from early October until the end of the year or the early part of the following January.

(e) That South African signals are not heard except between 4 p.m. and 7 p.m., generally speaking, and during that period at various times of the year do not appear to be governed by set rules.

Best for 20 Metres.

Generally, the spring and early summer is undoubtedly the best period for 20-metre working, and the bad period during the winter appears to be quite a fixed rule.

The 40-metre band, of course, obeys quite different laws; in general, when conditions on one band are good the other follows suit. There are, however, occasions when one band is good and the other useless. Regarding the 10-metre wave, we none of us know enough about it to say anything at the moment.

* * *

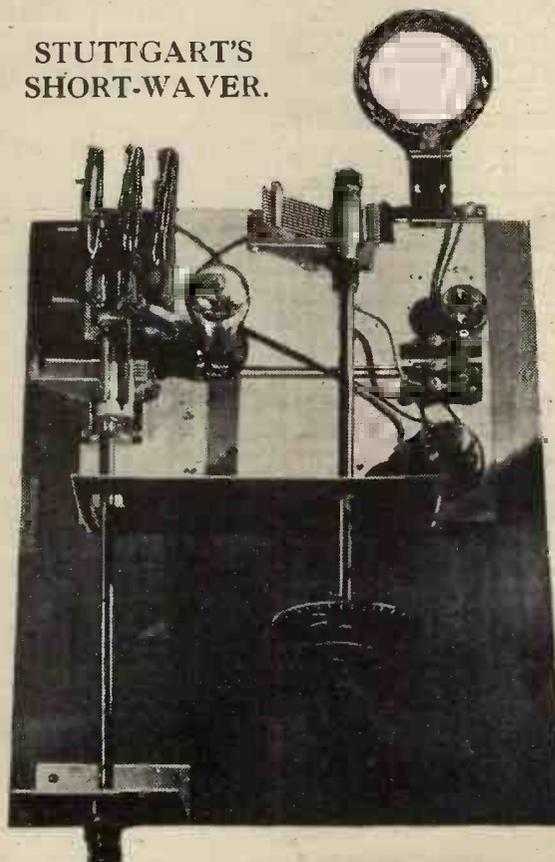
Has anyone heard a broadcast station relaying the National programme on about 31 metres? A Hampshire reader reports such a station, who appears to work when-

ever 5 S W is not on. The same reader has heard the "Elettra" on about 26 metres, and also recommends the new German station (Zeessen?) on 31.3 metres as a "dial setter" after altering the receiver.

Can any reader identify 3 R O on 25 metres?

The "Majestic" apparently works on 33 or 34 metres with G 2 I V and G 2 A A. Sydney, working with Rugby, G B P and G B X, comes over well on his 28.5 metre wave, using the call V K 2 M E.

STUTTGART'S SHORT-WAVER.



The simple short-wave receiver used by Stuttgart for picking up American broadcasts for relay purposes.

And now to return (without apologies, as usual) to the everlasting subject of outside interference. A reader who says he has had experience of the short waves "ever since there have been any" (!) sends on some useful notes. He lives near a district post-office with a particularly active fleet of mail-vans, and therefore knows quite a lot about the subject.

He has found all along that an inductively-coupled aerial circuit gives far greater freedom from this class of outside interference than a capacity-coupled arrangement, and the surprising point is this—that with the latter very popular arrangement he finds the interference worse as the coupling condenser is made smaller.

This probably seems absurd at first, but I can quite believe it; I have had troubles with a broadcast receiver with a small series aerial condenser, which, even when tuned to 360 metres, picks up motor-car ignition noises. I am not attempting to explain this, but perhaps someone else can do it for me.

This reader finds that by using an "X" coil he does not receive any interference, although with the same coil and the aerial capacity-coupled to the end he gets all that is going in this way.

Short-Wave Juggling.

Mr. Fred Easter, of Cincinnati, has been good enough to forward a cutting concerning the tests between V K 2 M E and W 2 X A F graphically entitled "Four Short Waves Juggled at Once," it makes interesting reading. The four stations working at once were W 6 X N (Oakland, Cal.), W 2 X A F, V K 2 M E and Z L 2 Y A (Wellington).

Apparently the operators got considerably mixed up, with the result that the Schenectady announcer made topical remarks intended for Oakland about snow-shovelling, only to be asked in a plaintive voice from Wellington (N.Z.) "What is snow?"

Later on, Oakland could not receive W 2 X A F direct, but the trouble was surmounted by the kindness of V K 2 M E, who re-transmitted him. Thus his signals travelled right across the American continent once and across the Pacific Ocean twice!

Quite Clear!

To quote the last paragraph, "2 Y A at Wellington, New Zealand, transmitted on its long-wave to Sydney and was re-broadcast by V K 2 M E on a short-wave. W 2 X A F's broadcast of V K 2 M E's re-broadcast of 2 Y A was heard by Wellington, and V K 2 M E addressed Wellington by way of W 2 X A F, the voice travelling twice across the Pacific and the American continent to reach Wellington, 1,200 miles away." It seems quite clear to me!

Since the "average listener" would be missing all the fun, moreover, W G Y went on the air on his usual 790 kilocycle channel and re-broadcast the whole affair up there for the

edification of broadcast listeners.

REMEMBER THAT—

Undoubtedly the best way to make a satisfactory connection to a large metal earthing plate is to cut along part of one edge and bend this up so that it reaches above surface level, where it can be inspected.

* * *

If you have trouble from your aerial swinging and tending to break the strands at the lead-in tube, you will find that a bit of springy brass or phosphor bronze soldered to the aerial will overcome the tendency to wear.

**Over 10,000
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Service**



Dubilier Paper Condensers have been positively proved to give life-long, reliable service of the highest efficiency. Under a continuous test in our factory they have outlasted 10,000 hours. That is why Dubilier Condensers are used wherever efficiency over long periods must be maintained and a breakdown would be fatal.

Obtainable in a wide range of capacities and voltages; also in "blocks" for Battery Eliminator construction.

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SAVE
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YOU have made your own Wireless Set and saved money on it—and enjoyed it all the more because you did make it. Why not go a step further and make your own batteries and save money on them, too?

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Not by any means. The work is easy and pleasant. It can be commenced on your kitchen table and it is so simple that the family can help. But where you will gain—and gain a lot—is in the fact that the batteries manufactured by our Patent Methods are far and away more efficient and longer-lasting than the average factory-produced article. This is proved by independent experts' tests. Besides, you will know there are no "defects" to let you down at critical moments.

You will find the work so fascinating that you may want to go further into this profitable business. Why not make your friends' batteries, too?

NO EXPENSIVE MACHINERY.

No previous knowledge or skill is necessary. No expensive plant or machinery is required. You need only simple hand tools and presses. Most of these you can make yourself at a very small cost! Very little instruction is necessary and we will give you that FREE!

WE GUARANTEE YOU PROFITS!

Once you and your friends see how Highly Efficient our batteries really are, and how easily you can make batteries to equal the best you can buy, you and they will never want to use any other kind. Therefore you can see that you will have no difficulty in disposing of what you make. Many "Popular Wireless" readers who are now making our batteries find that repeat orders and new orders come in faster than they ever

imagined; so fast, in fact, that sometimes the combined efforts of the entire family fail entirely to cope with the immediate demand. If, however, you are unable always to sell all you make, we will buy sufficient of your output to guarantee you a weekly profit, providing this same reaches the required standard of efficiency, which is easily attainable, and we undertake to continue your training FREE until that Standard is reached! Could anything be more definite or more fair?

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Sir,—Please send me at once and FREE,
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RADIOTORIAL

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

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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 specialities described may be the subject 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.

ADDRESS WANTED.

M. J. H. (London, E.)—You failed to enclose your address, so we cannot reply to your letters until this is received.

CURIOUS L.F. HOWL.

P. L. A. (Folkestone).—"I was very interested in what appeared in 'P.W.' about a set working all right when it was out of its cabinet, but howling as soon as it was put in. I know from experience that spacing is important as you said, but spacing does not account for a fault like the one I have just had.

"P.W." TECHNICAL QUERY DEPARTMENT

How's the Set Going Now?

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

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

Full details, including 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 free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

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

"It is simple enough, too! The set was a Det.-2 L.F.—transformer-coupled. Everything was wired up O.K., but when I joined up the batteries and switched on it howled. There seemed to be no reason, it just howled.

"Being a believer in the spacing stunt, I eventually rebuilt it, and put more room between the L.F. transformers, but when I connected up it still howled. Finally, I was getting desperate when I found out that by reducing the grid bias on the first L.F. valve from

3 volts to $1\frac{1}{2}$, I could stop the howl. The length of the lead remained almost precisely the same. Nothing else was altered at all yet when I tried it dozens of times it always happened—3 volts a howl, $1\frac{1}{2}$ volts no howl.

"I think this is one of the cases where even 'P.W.' will be seeking an explanation, for you will see that when the grid bias is reduced from 3 to $1\frac{1}{2}$ volts, the valve actually takes more current than before, and consequently any battery coupling effects should be increased by bringing down the bias, instead of stopping the howl as happened in this case. I suppose it is just one of those cases which nobody can explain at all, but I thought I would like to let you know because it just shows that things sometimes happen for which there appears to be no reason at all."

We were very interested in your account, and it is certainly a peculiar fault, but we can hardly agree to the statement that it cannot be accounted for. As a matter of fact, we think that the explanation is perfectly simple, and although you exonerate battery coupling we are virtually certain that this is the cause of your trouble.

Battery coupling need not take place only in the high-tension battery, as you assume. In your case, it appears to be taking place in the grid battery.

If you trace out the grid circuits of the two stages you will find that the grid of the second valve goes to the secondary of the transformer and via this to one end of the grid-bias battery, the other end of which goes to filament. The grid of the first L.F. valve goes to its secondary, the other end of that being joined to the tapping on the same grid-bias battery, and thus to filament also.

You will see that if that grid battery is acting as a resistance (which may happen in the case of an old battery) that part of it between G.B.+ and the first L.F. valve is common to both grid circuits, and so can cause mutual coupling. It might easily happen under certain conditions that the value of resistance represented by 1½-volt tapping would be insufficient to cause instability; but when 3 volts were tapped in, a defective high-resistance cell might be brought into action, and the operating conditions would be altered with the effect you mention.

A ONE-VALVE FAILURE.

L. C. F. (Kingston-on-Thames).—"With the extra power from Brookmans Park and the improved aerial arrangement which you suggested, I found that I did not really need the fourth valve, but can do very well on three. I have been keeping the other valve for some months to act as a spare, but finding I had the parts on hand, I thought the other day that I would utilise it for a one-valve set for my mother. It did not take long to knock-up, but, to my surprise, I couldn't get it to oscillate. What is likely to cause a failure to oscillate?"

There are numbers of factors which will affect oscillation, and the first thing that we should do is to put the spare valve into your own set and try the other one in the one-valve to see if this makes any difference. If not, and providing your circuit is O.K.,

there is no doubt that it is one of the components or the wiring that is causing a trouble which persists when different batteries, aerial and earth, etc., are used.

The likeliest thing of all, of course, is the connections to the reaction coil. Try the effect of reversing these, and then, if necessary, try another reaction coil, as the one you have in use may be faulty, or may have an insufficient number of turns. If the reaction coil cannot be changed, try joining a .0002 mfd. or .0003 mfd. fixed condenser across the reaction condenser, to make sure that this is not too small.

We advise you, too, to pay particular attention to the contacts of the coil holder, and at the valve sockets. If none of these seem defective, probably you have a faulty grid condenser. The easiest way to ascertain whether this is the case is to try another fixed condenser of .0002 or .0003 mfd. (either variable or fixed will do), temporarily joining this up in the place of the one you are using at present.

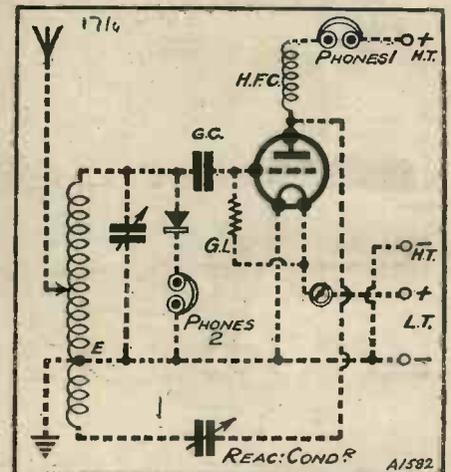
A dud grid leak is another likely cause of failure to get reaction. Sometimes the use of too low a value will prevent a set from oscillating. The grid leak, like most of the components and accessories, is best tested under working conditions by comparing it with the results from a similar component which is known to be O.K. in action.

If you proceed in this way to eliminate component after component by comparison with others known to be O.K., you cannot fail to trace the fault. (Remember carefully to examine the sockets and contacts of your six-pin coil holder, or the plugs and sockets, if plug-in coils are being used.)

IMPROVING CRYSTAL-SET RESULTS.

C. D. (Stratford-on-Avon).—"Raising the aerial made a great difference, and has convinced me that much may be done on the lines

POPULAR "WIRELETS," No. 7



The dotted lines show the connections of the 1-valve given in last week's "Wirelet." It will be seen that a crystal and extra 'phone terminals are provided across the tuning condenser, so when the L.T. Battery is being charged the 'phones can be moved from 1 to the "Phones 2" position, and you then have a crystal set. To return to the valve instead, you simply replace the 'phones in the "Phones 1" position.

of improved pick-up. The next thing I want to tackle is the earth. Which kind do you recommend?"

The ideal to be aimed at is a good connection by means of a large buried surface in close contact with damp soil, the earth wire being as short and as direct as possible. If the set is placed so that you can take a fairly short lead direct to the main water pipe, this will make a very good earth system, and we should advise you to utilise it.

Preferably the connection should be made just above the point where the pipe enters the ground, and you must be sure to make really good contact with the pipe. One excellent method is to utilise an earth clip specially provided for this method, and if possible you should solder the earth lead itself to this clip.

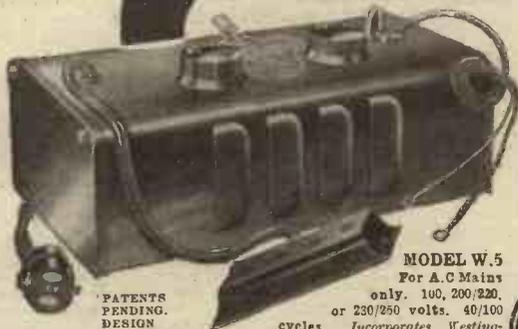
Remember that to preserve good contact cleanliness is essential, so that on no account should a clip be attached to a pipe which is dirty. You will find that even a rather inaccessible water pipe can be cleaned quite well with a little strip of emery cloth, so do not be satisfied until you have got a bright patch two or three inches long all the way round the pipe, to which the earth clip can be clamped.

Where a suitable water pipe is not available, or where a better connection can be made by means of a

(Continued on page 120.)

**THIS NEW REGENTONE COMBINED UNIT
MAKES ANY SET 'ALL-ELECTRIC'
—EVEN A PORTABLE**

**It fits Inside
any Portable**



PATENTS
PENDING.
DESIGN
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MODEL W.5

For A.C. Mains

only 100, 200/220,

or 230/250 volts. 40/100

cycles. Incorporates Westing-

house Metal Rectifier on H.T. and L.T.

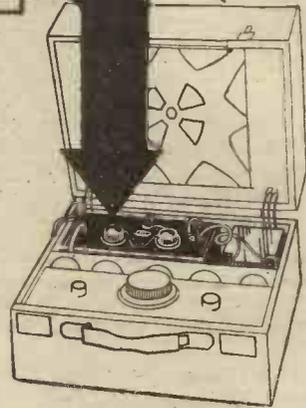
side. H.T. Output: 120 volts at 15 m.a. H.T. Tappings: 2 variables (one S.G.) and one power. L.T.: Trickle Charger for 2-, 4-, or 6-volt accumulators. Size 9 in. x 5 in. x 3 1/2 in.

—and it is equally suitable for all popular 2-, 3-, and 4-valve Receivers. H.T. absolutely ripple-free; L.T. Accumulators always fully charged; special design for sensitive receivers; all this in a handsome earthed metal case small enough to fit inside any portable. Westinghouse Metal Rectifier incorporated on H.T. and L.T. side. Guaranteed for 12 months. Dependable—trouble-free, low initial cost —negligible running cost **£5:17:6**



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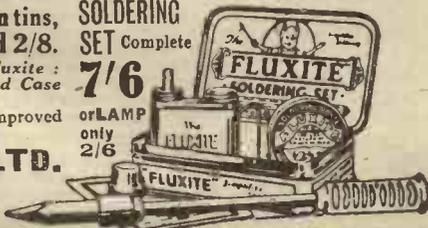
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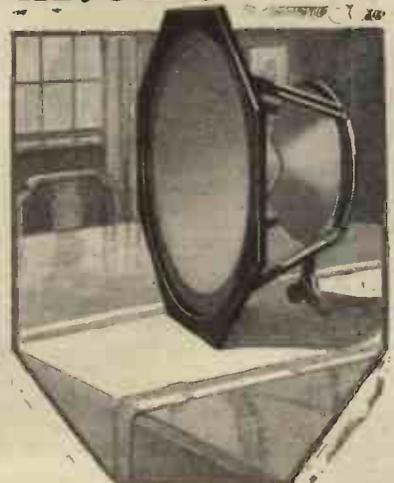
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M.C.3.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 118.)

short lead to a buried earth plate, try and ensure that contact will be good by this means *whatever the weather conditions*. As dissimilar metals will react upon one another, the best way is to obtain a really large sheet of metal, such as is used for roofing sheds, and

TECHNICAL TWISTERS

No. 5—FIXED CONDENSERS

CAN YOU FILL IN THE MISSING
LETTERS ?

- (1) The capacity of a fixed condenser always remains
- (2) The substance between the plates of a fixed condenser is called the
- (3) In most fixed condensers used for radio this substance is or
- (4) For high-frequency circuits fixed condensers can be used ; but to pass low frequencies the condensers must be

(Look out for the missing words next week)

Last week's missing words (in order)
were Hand Capacity ; Pigtail ; Short ;
Crackling.

upon the long side of this cut and bend up a strip which will reach up from the buried plate to the surface.

The earth wire from the set can then be taken to this strip, and as the joint will be above ground, it can be inspected and kept in good order.

Do not forget that the earth lead should be of fairly stout gauge wire, similar to the aerial, excellent results being obtainable with the No. 7/22 gauge wire. When this is used, the ends of the lead can be spread out and each wire soldered separately. Another good plan is to run the earth wire down to the earth plate through a pipe or similar conduit, down which water can be poured in dry weather, so as to keep the soil surrounding the plate thoroughly moist, and thus ensure good conductivity between the metal and the earth.

THE "MAGIC" THREE.

"TELEGRAPHIST" (Devonport).—"Having been out to China I missed 'P.W.' giving particulars of the 'Magic' Three, but I have heard such good reports of this that I want to build it before my next trip. Unfortunately, I could not get the back number, so shall be glad to know if there is a blue print of this, and if so, what issue and how much ?"

A blue print giving full constructional details of an up-to-date version of the "Magic" Three was given away with "P.W." No. 404, March 1st issue, 1930. [NOTE.—Back numbers of "P.W." which are still in print can be obtained from a newsagent, or direct from The Amalgamated Press, Ltd., Back Number Department, Bear Alley, Farringdon Street, London, E.C.4 Price 4d. per copy, post free.]

ADVANTAGE OF INTERCHANGEABLE PRIMARIES.

N. R. (Hunstanton).—"Among the advantages claimed for the set which I am thinking of building is that the primary of the high-frequency transformer is interchangeable. In what way is this better than the ordinary type where the primary is not interchangeable ?"

Theoretically there are several advantages about the method but in practice it boils down to giving an easy control of the degree of selectivity or volume on any desired station, or of sulking one's set to different conditions.

With the usual arrangement a fairly large primary gives a high degree of amplification for signals, which are not particularly strong. For situations in which really sharp tuning is required to avoid several powerful transmissions a small primary is better on account of the much greater selectivity obtainable, although this is at the expense of a little volume.

A further advantage is that as the primary is usually quite a simple winding on an easily accessible former it is usually possible to wind the desired number of turns for yourself, after experiment has shown the type of winding which will give best results. If it is not desired to do this, different size primaries may easily be obtained from the makers of the coils, so that in any case the method affords a very convenient way of adjusting the strength of amplification to the conditions under which the set will be used.

THE USE OF A NEUTRALISING CONDENSER.

F. S. L. (Jersey).—"What I am not able to understand is why a neutralising condenser should be connected between the A₁ terminal and the lead which goes to the tapping of the aerial X coil. As the first valve is a detector it seems strange that a neutralising condenser should be necessary at all, for I understood that neutralising was only necessary in the case of H.F. valves.

"Would another condenser do instead of a neutralising condenser ?"

It quite often happens that a "neutralising" condenser is employed for purposes other than neutralising in a set such as you have mentioned. Until the necessity for neutralising came along it was not the habit of manufacturers to make very small condensers, but as soon as there was a demand for these for neutralising methods it was found they could be employed very advantageously in many other positions as well.

One method for which they proved very successful was to give very loose coupling between the aerial and grid circuits. For though an ordinary condenser will loosen the coupling and improve selectivity, the smaller the capacity inserted in this place the greater is the effect.

As a neutralising condenser has a very much smaller capacity than one usually finds available for the constructor, it is often used in short-wave sets or certain other cases where very loose aerial coupling is required.

OBTAINING REACTION WITH R.C. COUPLING.

M. M. (Harrogate).—"Thanks to a tip in 'P.W.' I found the trouble was the primary of the low-frequency transformer broken down. Not wishing to buy a new one, and having an old R.C. unit in stock, I wondered if this could be employed in place of the primary, and looking through my back numbers of 'P.W.' (a good plan that!) I found the very question raised.

"So I put the unit in place of the transformer, and to my delight got signals through at once without further expense. There in only one snag, and that is that now that the R.C. unit is taking the place of the primary I found that oscillation and reaction is not half as good as formerly.

"As soon as the battery gets a little low I am unable to make the set oscillate at all. Is there anything I can do to improve this ?"

In all probability you will find that a small fixed condenser (.0001 mfd. or so) connected across the coupling resistance will enable you to get reaction results satisfactorily. If you have such a condenser try connecting it with one side to the A or P terminal of the R.C. unit and the other side to the H.T. + terminal.

Do not use too big a condenser, as sometimes a neutralising condenser is quite enough to give the necessary extra control. In most cases, however, the capacity required is about .0001 or so, so if you have a condenser of this value or a semi-variable we should certainly connect it in the position indicated above.

SHORT-WAVE HINTS

T. T. S. (Derby).—"Recently I have tried my hand on the short waves and am already an enthusiast so far as keenness goes, but badly lacking in knowledge.

"The short-wave hints by W. L. S. are very helpful. Does he write in any other magazine ? Could you persuade him to deal with the point as to whether it is possible for a pentode to be used in a Det.-L.F. short-wave set.

"I should very much like to do this, but do not know whether there is anything about the pentode which makes it unsuitable for short-wave work."

The pentode is simply an improved valve for low-frequency amplification, and as a short-wave set employs exactly the same methods of low-frequency amplification as an ordinary set, there is no reason whatever why a pentode should not follow a short-wave detector.

As a matter of fact, W. L. S. has already advocated this for use in cases where a two-valve set does not give the necessary power, and as probably he will have more to say upon the subject in future, we advise you to watch his articles both in POPULAR WIRELESS and in "Modern Wireless."

REMOVING HUM FROM NOISY MAINS UNIT.

W. A. N. (Beckenham).—"I think it was a month or two ago, and in 'P.W.' that I saw details of a simple unit which could be added to a mains unit where H.F. and rough mains were giving humming trouble.

"I meant to keep the article as at the time I was thinking of moving to new rooms, but somehow in the change-over I have lost it, and I find that the new mains are not only noisy but they have a bad reputation with other mains-set users. I am particularly reluctant to try and alter the eliminator as it is built into the set in a complete cabinet form, which I do not want to alter if there is some little unit I can add to give the mains the extra smoothing before they enter the present smoothing arrangement.

"Can you give me the connections for a unit that will help get rid of this H.F. ripple ?"

Such a unit employs two H.F. chokes (if necessary of the heavy duty variety, though for small sets up to, say, three valves, and where L.T. is not supplied from the mains, ordinary H.F. chokes of good quality will do), and two fixed condensers of 2-mfd. each or more. These four components, together with plug socket connections, etc., for the mains leads, should be placed in a totally enclosed box, the chokes being sufficiently well spaced to prevent magnetic interaction.

The arrangement is very straightforward, all that is necessary being to take the present leads from the mains to your set, the input of the new unit, the output of which will now take the place of the mains. It is, of course, necessary that all wiring should be carried out with extreme care, and it is best that an electrician should see to this part of the business.

The connections are very simple, the mains being taken to one side of each H.F. choke. The remaining side of the first H.F. choke goes to one side of the first 2-mfd. condenser and to one side of the unit's output.

Similarly the second choke's remaining side goes to one terminal on the remaining 2-mfd. condenser, and to the other output terminal on the new unit. The only additional connection is a wire which connects the vacant sides of the two 2-mfd. condensers together and to a new earth terminal on the unit. This can be taken either to a direct earth or to earth on the set.

It will, of course, be understood that the condensers used must be of irreproachable quality and capable of standing up to the full voltage of the mains so as to allow an ample safety factor.

WHAT DO YOU THINK ABOUT THIS ?

A Burnley reader of "P.W." built a high-quality 4-valve set, using all first-class parts. His aim was distortionless reproduction, and by careful choice of components, correct voltages and valves, etc., he got extremely good results from a cone loud speaker with baffle board.

One day a "rattle" was noticed on certain loud piano notes. Later this got worse, until almost any loud note would cause a distinct and unpleasant rattle.

Batteries, coils, wiring, aerial and earth, and valves were all tested and found O.K., and the milliammeter in the last valve's plate circuit did not show distortion kicks.

Can you guess

WHAT WAS WRONG ?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

The trouble with the Sheffield reader's set (which was described last week) proved to be due to X-coil connections. Reversing the leads to the X-coil holder cured it completely, as with the previous connections the coupling was via most of the turns, instead of through only a few turns.



Gentleman:
"Excuse me Madam would you mind if I smoked a . . ."

Player's Please

Lady:
"Certainly not, I'll have one with you."



N.C.C.821

Well! Who was right?

REMEMBER that terrific argument you had with John the other night? Neither of you would give in, and so it went on for hours and hours. But who was really right after it all? You don't know, do you?

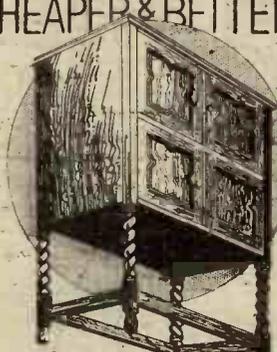
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	GPR 4 2		.095	40,000	32	R.C.
	GPR 9 3.5-4		.09	22,000	14.5	H.F. Det.
EACH Post id.	GPR 10 3.5-4		.09	10,000	9	L.F.
	GPR 11 3.5-4		.09	44,000	41	R.C.
	GPR 17 8-6		.14	20,000	17.5	H.F. Det.
7/6	GPR 18 5-8		.14	11,000	9.5	L.F.
	GPR 19 5-8		.14	75,000	41	R.C.
EACH Post id.	GPR 20 2		.15	6,000	7	Power
	GPR 40 4		.15	6,000	7	"
	GPR 60 8		.15	6,000	7	"
SUPER POWER 12/6	GPR 120 2		.3	3,000	4.5	Super Power
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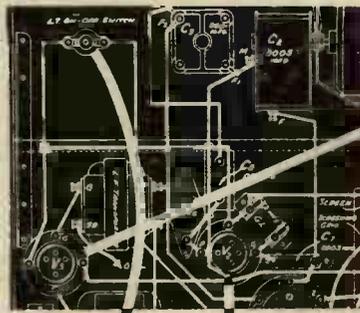
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- REVOLUTIONISING THE S.G.
- A SIMPLE SHORT-WAVER
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- WHEN BROOKMANS BREAKS THROUGH
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- THE "REJECTOR" III.

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FOR THE LISTENER.

(Continued from page 106.)

He has loved soldiering all his life: "I wouldn't have missed Majuba for anything," he said. He praised fighting and hardness, as all strong men do. The modern soldier is a finer fellow because he is better educated.

"We were in tight corners in Gallipoli, such as if we had been in them in the Afghan or the Boer War we should have put up the white flag; but there was no putting up the white flag on Gallipoli!"

"Brigade Exchange."

This German play, specially written for broadcasting, struck me as being a capable piece of work. The voices were poor, bar one; the one which belonged to the ear-phones and kept saying "Brigade Exchange," until it became symbolic of the play. But the other voices, although they did enough shouting, were difficult to follow; and one never quite knew what all the pother was about.

The jumble and confusion of the situation was, however, part of its terror. The frightened little man rather overdid the squealing, I thought.

The listener's emotional imagination is sharper-edged than that of the visible audience; and these aids to terror may easily be exaggerated on the wireless until they lose their effect through over-colouring. I thought that the way in which the play was faded out of the programme was excellent; and, all through, the noise studio was under restraint—to everybody's advantage.

A Spanish Concert.

Towards the week-end, when I was getting a little better, I seemed to be surrounded by old friends. Hubert Eisdell came along with a wonderful little budget of songs; John Coates, with an Elizabethan nosegay, still a superb artiste if not so flexible in voice as he once was; and Harriet Cohen, playing da Falla in the Spanish Concert.

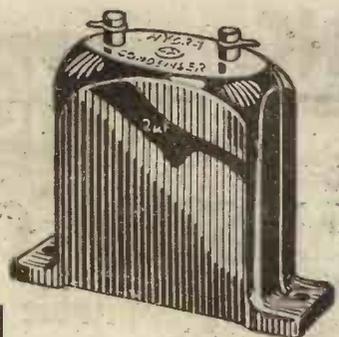
Miss Cohen brought along with her Conchita Supervia, a Spanish prima donna of first rank. I did not care much for her contralto voice in the lower register, although even there it was very impressive for sheer power and volume; but in the middle-singing and the colatura I thought it a glorious voice.

Peggy O'Neill.

But best of all I loved Peggy O'Neill who whispered in my ear and told me that I would certainly get better if I gargled properly like a good boy. A good deal of "Diversions" came after she had gone, but I only remember the snoozly voice in which she said good-night to me, telling me not to forget the "little kiss each morning, the little kiss each night." I remembered the one for that night quite easily!

A Cafe in Vienna.

This, I thought, was rather below what one has grown accustomed to expect from Vienna! The Russian Balalaika Players and Singers were very good; but it was a relief to be able to turn from "Zara," which really was rather tiresome, to the Midland Regional and hear the "Moonlight Sonata" deliciously played by Nigel Dallaway. A happy example of the use of alternative programmes.



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TECHNICAL NOTES.

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

"Damping."

WHAT is meant by the term "damping" and what are the causes and effects of damping in a radio receiving circuit?

This question, in various forms, is often asked by readers, and has also, I think, been discussed by Capt. Eckersley in his "Query Corner."

The simplest way to understand what is meant by damping is to take a mechanical illustration. You know that if a pendulum is set swinging and left alone it will gradually come to rest. Now, the reason it comes to rest is because, during its to-and-fro motion, it has to push the air aside and so do work.

This work can only be derived from the energy possessed by the oscillating pendulum and as the energy is gradually frittered away the oscillation must in consequence die down. The air is then said to have a damping effect.

Clearly, if the pendulum were set swinging in water, its oscillations would die down much more rapidly because water has a greater damping effect, that is, it steals the energy from the pendulum much more rapidly.

"Dead Beat."

Again, if the pendulum were immersed in some very thick liquid such as glycerine it would probably not oscillate at all in the ordinary sense; if pulled to one side from its mean position it would gradually return to that position, but would not overshoot the mark.

In this case the damping is so great that the system is described as being "dead-beat." In passing, I may remark that the moving system of an electrical measuring instrument such as a galvanometer or voltmeter, is often so heavily damped as to be dead-beat; in this way it is much easier to read, as it simply comes to its final position and stays there instead of oscillating about that position.

In Electrical Circuits.

Now, let us turn to the question of damping in an electrical circuit. You know that in a radio receiving circuit the electricity oscillates to and fro; generally it is partly stored in condensers and partly "on the move" in inductances.

If we were dealing purely with the question of capacity and inductance there would be no reason why the oscillations should ever stop, but in practice we cannot have conductors without having some degree of electrical resistance.

Now, as you know, whenever an electric current passes through a conductor it produces heat, and this heat represents a loss of electrical energy. Resistances, therefore, in a circuit must always mean losses and these losses correspond precisely to the loss of the energy of the oscillating pendulum, in our mechanical illustration, due to the resistance of the air.

(Continued on next page.)

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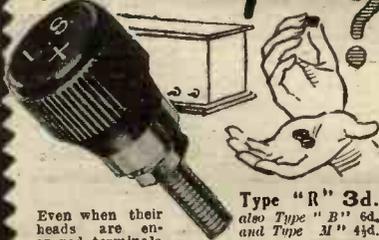
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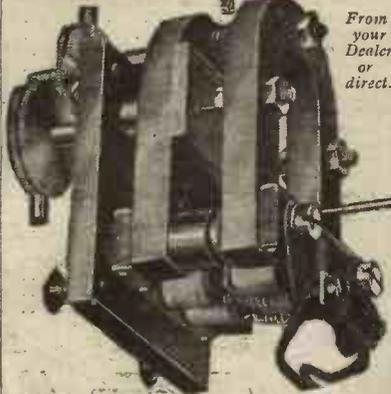
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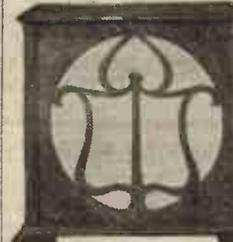
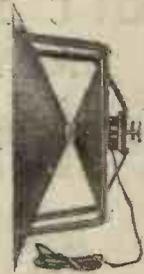
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TECHNICAL NOTES.

(Continued from previous page.)

Ohmic Resistance.

This is the reason why an inductive instrument, such as a transformer or a choke coil, should generally have a low ohmic resistance. In the same way, the impedance of a valve necessarily introduces losses and so has a damping effect upon the system.

Similar, also, is the effect of the aerial which, although it is a receiver of radio energy, nevertheless acts as a damping agent.

Electro-Magnetic Radiation.

I have explained briefly above the simplest form of damping, but, before leaving the subject, there are one or two other aspects of this question which, perhaps, I ought to mention.

In the first place, I have been referring rather to an oscillatory circuit which is set into oscillation and left free; its oscillations will die down and the rate at which they die down will depend, exactly as in the case of the pendulum, upon the amount of damping.

This damping, however, may be of other forms besides resistance of the conductors in the circuit. For example, the radiation of electro-magnetic energy from the system, which may be called electro-magnetic damping, will also have the effect of robbing the oscillatory circuit of its energy; this is, in fact, precisely what takes place in a radio transmitter.

When you tune a receiving circuit to a particular incoming wave-length you put the circuit into such a condition that its natural frequency of oscillation is the same as the frequency of the incoming waves. In these circumstances the induced oscillations set up in the receiving circuit reach a maximum.

Regeneration.

The damping in a circuit may be overcome (or, to be more accurate, it may be counterbalanced), by arranging for a supply of energy to be automatically fed into the circuit in the appropriate way.

You know, of course, that I am referring to the principle of reaction or regeneration, whereby the oscillations in a circuit are maintained notwithstanding the presence of damping agencies in the circuit.

This, however, is quite consistent, as you will see, with the general explanation of damping, since it means that the circuit reaches eventually a steady state in which the input of energy is equal to that which is lost in various ways, one of the causes of this loss being the damping in the circuit.

A Current Question.

What a large number of readers want to know why it is that, inasmuch as the high-tension current supply by the H.T. battery passes into the filament and between the electrodes, so completing the H.T. circuit, it does not cause the filament to burn out!

I do not know whether I correctly understand the difficulty: it is of course, perfectly true that the high-tension current must enter the filament and must pass through some part of it.

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

When the high-tension current is "on," the filament is clearly carrying a greater current than when the H.T. is "off." Of course, this H.T. current does not leave the filament all at one point (as does the L.T. current) but makes its exit, so to speak, over the major part of the length of the filament so that the current carried by the filament is actually greater at one part than at another. The addition of the H.T. current to the L.T. or filament heating current is, however, comparatively small, and makes very little difference to the temperature of the filament.

Anode Load.

In certain circumstances, however, it is true that a valve may be badly damaged by the application of too high an H.T. voltage and the passage of an excessively heavy anode current. This is hardly likely to happen with ordinary receiving valves (unless indeed in certain cases with power valves) and I only mention it as the question is specifically raised by many correspondents.

I think the fact is that most valve users have the impression that, inasmuch as the H.T. current passes through the filament, the whole of the H.T. voltage is thereby applied to the filament and should burn it out. This, of course, is quite a mistaken idea.

Hot Valves.

Whilst on the question of power valves, which I have just mentioned above, you probably know that if you apply too high a value of H.T. to the anode of a power valve you may find your valve getting hot. This is more particularly the case if the grid-bias voltage is not properly adjusted so as to limit the value of the H.T. current.

If the grid-bias battery is not "doing its job" properly you will not only be throwing a heavy load upon your H.T. battery (assuming you use a battery) but will be running the risk of seriously diminishing the emissive power of your valve filaments.

The majority of experimenters are well aware of the advantage of using a high value of H.T., but what they frequently overlook is the fact that this does not necessarily mean a high value of H.T. current. A careful adjustment of the grid bias will not only conserve the H.T. current (at the same time conserving the valve itself) but will positively give better results.

It is, therefore, very desirable from every point of view that you should frequently check up the grid-bias voltage, remembering at the same time that the actual value required depends upon the H.T. voltage which is applied.

Anode Resistances.

This brings me to a further point which is raised in a letter from a reader at Brondesbury. He wants to know whether he should make allowance for the voltage drop in the anode resistance in the case of a resistance-coupled stage.

Of course, the voltage which is actually applied to the anode will necessarily be considerably less than that which is applied

(Continued on next page.)

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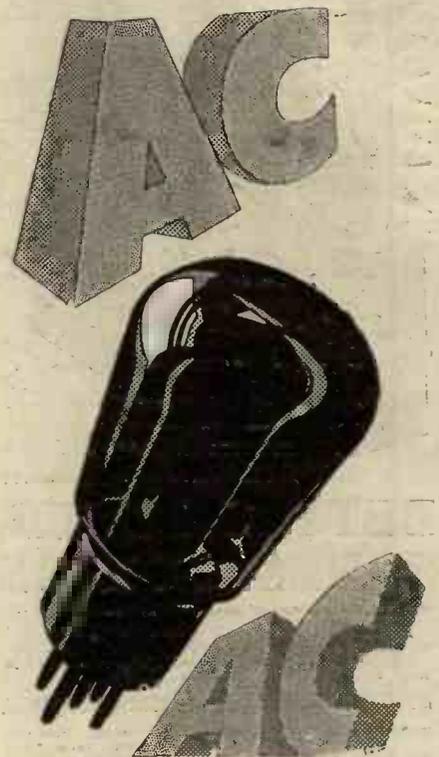
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TECHNICAL NOTES.

(Continued from previous page.)

to the whole system from the source of H.T. and, moreover, it will vary with the anode current passing, in other words with the actual impedance of the valve under the conditions in question.

So far as the valve is concerned, the anode voltage is the voltage which is actually applied to the anode itself, and in order to allow for the voltage loss in the anode resistance it is necessary to use a correspondingly higher voltage in the H.T. source, whatever it may be.

Half-Wave or Full-Wave?

When a mains unit, such as an H.T. eliminator, is provided with half-wave rectification, is there any advantage in substituting a full-wave rectifier? This is a question which has been put to me and the writer wants to know whether he can still use the same circuit and also asks various questions with regard to the components, and so on.

A half-wave rectifier rated to give a certain current actually delivers during the half-periods it is in operation approximately twice that current, so that the rated current is about half that which actually flows during the operative periods. Clearly, if the other half of the wave is utilised the effect is doubled.

For example, a rated ½-amp. half-wave low-tension rectifier actually delivers about one amp. during each half period, whilst a rated ½-amp. full-wave rectifier delivers a ½-amp. each half period.

A half-wave rectifier which actually delivers ½-amp. during the operative periods should be rated at approximately ¼-amp., whilst a full-wave rectifier giving ½-amp. in each operation will be rated as a ¼-amp. rectifier.

A Question of Load.

The question as to whether the circuit will stand the substitution of a full-wave rectifier where it has been designed for a half-wave rectifier is one which I cannot decide without knowing more about it. It may be that the additional load is not adequately provided for in the smoothing appliances.

So far as the condensers in the circuit are concerned, however, you may be interested to know that the peak load on these is, as a rule, less with a full-wave rectifier than with a half-wave.

Of course, I am speaking here about a full-wave rectifier having the same rated output as a half-wave rectifier, whereas in the case raised by my correspondent the full-wave rectifier, if used, will in fact have an output roughly twice as great as that of the half-wave rectifier. Speaking generally, and without knowing more about the facts of the particular case in question, I should say that it would be best to retain the half-wave rectifier for which the rest of the circuit was designed.

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Easter Greeting.

THE year's first holiday venture is almost upon us, boys! It comes just in the nick of time, I always think, though I wish it would not shift about the calendar as it does. Well, rain or shine, it's a great time, the forerunner of those magic weeks when we drop our chains and almost forget them. All the best—oh! and if you are planning to play with wireless components, please don't forget to give the open air also some of your time.

Records for Posterity.

FROM time to time, I acquire a record for the sake of possessing something associated with one of the world's great figures; a speech by a king or a statesman, a song by Melba and so forth. My idea is that in fifty years' time these will be of extraordinary interest to the young people of those days.

One record which seems to me to come within the category is that of Caruso

American humorist, is reported to have made a contract with a broadcasting company whereby for the dollar equivalent of about £14,400 he will deliver fourteen radio "talks," each of which will last from twelve to fifteen minutes.

To us wage-slaves that must seem like a fairy story, but I am afraid that it is true. The world is topsy-turvy, and there is too much money in the U.S.A.

Fog Doesn't Matter Now!

YEARS ago it fell to me to review a bookful of what someone imagined to be poetry. A gloomy task! But it was illumined for me by one ray in the shape of a first line reading, "Fog! Fog! The isles of Greece are lost in fog!"

Something of the wild joy which I felt when I first read that comes back to me over the years when I read that Marconi's are going to link up those historic isles with Athens by means of wireless telegraph and telephone stations. Our poet will now have to write in terms of "atmospherics" of a different kind, unless he is now earning his living.

A Practical Move.

A STEP of great practical value has been taken by the Institute of Patentees in its work of encouraging and helping inventors. In co-operation with the local technical colleges of the country, it will found a series of presentation Courses with the object of encouraging the inventive talent amongst those who are unable to afford training. Applications for these scholarships are to be considered by a committee appointed by the Institute.

Indian Broadcasting.

THIS having been saved for the time being the "Indian Wireless Magazine" has issued a special "joy" number full of thanks to everyone concerned, from H.E. the Viceroy downwards, except the unhappy directors of the firm which gave Indian broadcasting a start.
(Continued on next page.)

"Bring Out Your Dead!"

I MEAN those dead and forgotten hulks which once were accumulators. For the Vice-President of the Spalding Johnson Hospital has suggested that a collection of these, though it lacks the æsthetic appeal of "silver" paper, would be of more value to the hospitals. I agree, but the difficulty and cost of the collection would be quite a different kettle of fish.

However, it's an idea which is constructive, and sound, and I hope that it will be developed. Could not the genius who does Bart's advertising organise an accumulator "drive"?

"Sulphating."

TALKING of accumulators, if I dare, I must say that my note on the cause of "sulphating" in them has started a rumpus in the army. I find that whilst I have many defenders, I have about the same number of opponents—some of them being, apparently, without fixed abodes—but I venture to point out that we are not now dealing with a question of opinion, but one of fact.

Does too low a charging rate cause "sulphating"? I did not introduce the subject as an authority, though I have handled secondary cells by the thousand, and of many sizes and types, but the idea was novel to me, and is still novel, in spite of some makers' instructions sent to me by a heated gentleman, who as he himself admits, writes "in haste."

Anyway, it's been a most diverting topic—and that's something gained!

"IN THE VAN OF PROGRESS."



This picture was taken at the annual Spring manoeuvres of the London University O.T.C., and shows an R.A.F. radio van in action.

singing for the last time for the gramophone; it comprises two songs and is No. DB 1386 in the H.M.V. Red Label series.

Golden Words.

BROADCASTING has done some folk a bit of good, even if many of us have suffered thereby in divers ways. Will Rogers, that wise and whimsical-faced

NOTES AND NEWS.

(Continued from previous page.)

struggled hard to keep it going and finally grew tired of losing money in the business.

References to the "overloaded pockets of the directors and shareholders of a private company of merchants" strikes me as ungrateful. However, some of the jubilation—which we certainly share—is delightfully eloquent.

Hertz and His Worries.

AS certain people had argued that "atmospherics" are really the ruin of Indian radio, the "Indian Wireless Magazine" quite rightly points out that difficulties are meant to be overcome. "Maxwell could not predict the existence of electric waves (in 1867) without establishing alliance with the elementals which were nothing better than unruly." "Hertz had his worries in the Atmosphere and Marconi had not plain sailing." "Difficulties stare us in every march." "P.W." cannot withhold its congratulations to the "I.W.M." on the active part which that periodical took in saving Indian radio.

The Latest Bogey.

WHEN those Canadian doctor people came along with their theory that radio has been killing people, I suggested that it was a pity that they had not first taken expert radio advice. But a certain Mr. W. says that he has applied for patents the theory of which definitely proves their statement. Yes, but what proves the theory to be correct? Mr. W. adds that he has "proof of many other matters relating to the universe showing the exact nature of electricity, magnetism, ether waves as they have been named, and I hope shortly to have same published." Our friend appears to have been favoured with special revelations about Nature.

The "Magic" Three.

THE mail continues to be choked with letters from delighted users of this receiver, and I really do not know how to deal with the letters. I could have them framed—but, the price of glass is—! Or I could stuff pillows with 'em and cure insomnia. There has not been such a sensation since the "Sydney" Two burst upon the startled world. "E. W." says that "Magic" owners do not justify their existence unless they exploit the set's capabilities on S.W. work.

Still More Magic.

AS F. (Hove) extols the set's selectivity and its sensitivity on the broadcast band in daylight. He estimates that he can get about 40 stations any evening! R. W. (Cheshire) says that the reaction is so smooth "as to be almost uncanny." J. O. (Leith) sends a photograph of his "Magic"; the finish does full justice to a fine circuit. R. P. (Folkestone) thinks that it beats the "Titan," and is the "best three-valver you have yet described." C. J. V. (Roorkee, India) added a pentode to his "Magic" Two, and thinks it almost equals the "Three." A. R. T. (Dorset) says that if anyone will add the "Ranger" Unit to the "Three" the result will be "a still greater wonder"!

A Very Up-to-Date Orchestra.

THE manager of a certain famous broadcasting Orchestra tells me that one of their number, is a regular listener on the short waves, and specialises in observing the dance tunes which are played in America. It is a fine tribute to the alertness of these boys to record that on several occasions the melody of new "numbers" has been jotted down, harmonised, "orchestrated," and played to British listeners before the printed music was available here. Er—is that quite legally watertight? I ask as a babe in such matters, but really, one can't be too careful.

Football.

I CONSIDER that the B.B.C. has an unsailable position in its little bicker with the football authorities. I have

SHORT WAVES.

"An automatic radio signalling apparatus has been designed which transmits in Morse Code the latitude and longitude of the sheep in distress."—Australian Paper.
Many shepherds find it simpler to instruct their flocks in the rudiments of the long and short beat.—"Punch."

SAFETY VALVE WORDS.

Somebody figures that broadcasting has added about 500 words to the average radio fan's vocabulary. Only 500?—"Wireless Weekly."

It is reported that a man recently played a cornet for six hours without a halt. He was probably trying to outlast his neighbour's loud speaker.

Taps and hosepipes are being installed for water effects in the new B.B.C. studios, and a large door will be built in a solid brick frame for slamming purposes.

If the B.B.C. are ever hard up they might consider hiring the latter out to irate husbands.

SOUVENIRS FOR SALE.

"We have decided to buy the huge aerial masts on Selridge's store and to take them home in the Baby Austin. We are going to send them in fragments to those souvenir hunters who write and say that, after Sir John Reith's new pronouncement, they will never listen in again."—"Vox."

Recently a Barnsbury listener was summoned at Clerkenwell Police Court for installing and working a wireless set without a licence. He pleaded guilty, saying he had built the set himself, and had only been working it for a fortnight when the officer called.

Mr. Pope, the magistrate, was very interested, and asked: "How much did you pay for it?"

Defendant replied: "I can't estimate it. I bought it bit by bit."

Mr. Pope: "Very well, I am going to add forty shillings to it!"

consistently maintained for years that the promoters or proprietors of what is essentially a *spectacle* and not an appeal to the ear, cannot but gain ultimately as a result of the broadcasting of their show or whatever it is. Take the average member of a football crowd and ask him whether he would give up his seat in order to sit at home and stare at a plan of the ground while a broadcaster stutters and says, "By Jove! Neat!" etc. He would order you off the field!

News for Northerners.

IT is announced by the B.B.C. that they and the Hallé Concert Society have arranged for a season of Northern Promenade Concerts in Manchester, Leeds and Liverpool, beginning on May 26th in the Free Trade Hall, Manchester, where

performances will be given for two weeks. Liverpool will be served from June 9-14; in the Philharmonic Hall, and Leeds in the Town Hall, from June 16-21. These concerts will be used also as contributions to the National and other wave-lengths.

A New Radio Play.

MR. CECIL LEWIS, formerly chief of programmes at Savoy Hill, has returned from the U.S.A., where he has been producing radio plays for the National Broadcasting Company. Listeners who appreciated his work in the presentations of "R.U.R.," "Lord Jim" and "Saint Joan" will be glad to know that he will "open" again in this country with a radio adaptation of A. E. W. Mason's novel, "The Four Feathers."

School Broadcasts.

AFTER perusing the syllabus of the B.B.C.'s programme of broadcasts to schools for the session, April 28th to June 27th, I am happy to say that at last the Corporation have produced what is, to my way of thinking, a much more appropriate bill of fare. Not that I yet believe in the wisdom of using up school time in that fashion. I do not. The present generation need more grammar and arithmetic and less habits of beetles. I note one lesson entitled "The Study of a Lawn." That may do good if it teaches the kids to respect the money and perspiration expended on lawns by their fathers!

The Leyden Jar.

CONTINUING our researches into the history of this type of electrical condenser, we now learn, through the courtesy of W.H.L. (Reigate) that the claim for its discovery which mentions the name of Von Kleist, was really based on a letter written by him to Dr. Lieberkühn and afterwards sent to the Berlin Academy. Hence, I suppose, the Germans seized on the notion that a German was the discoverer. I still pin my faith to Cuneus, though! (Now, children, sit up and tell me who invented Beecham's pills, the Fleming valve, the umbrella and the corkscrew!)

Bags of Money.

THE broadcasting business in this country is still a nice profitable affair—at the transmitting end, and is expected so to continue. According to the official estimates it is reckoned by the Post Office that the B.B.C. will have an income of £1,060,000 during the year ending March 31st, 1931, as compared with the £963,000 of the preceding year. I presume that a profit is still being drawn from the B.B.C.'s periodicals, so that altogether there is enough money coming in to keep the British spoon stirring the ether.

All the Difference.

ONE of those readers—(I like 'em)—who scan my Notes with the eye of a demon examiner has expressed his grief and amazement at my statement that my old college was Magdalen. That little missing "e" certainly makes all the difference, and the least said the soonest mended. (Not that Oxford has any reason to, etc.) However, the name is Magdalene, Magdalen College being at Oxford—just as Pye's are at Cambridge. Sir, the point is taken!

ARIEL.



RADIO as a CAREER

BY
CAPT P. PECKERSLEY
M.I.E.E.

I WONDER how many people who read this article are thinking of taking up, or have taken up "Wireless" as a career. May I, without, I hope, indicating anything but a desire to help, try and summarise some ideas that are the inevitable result of experience?

An example serves the basis for the first point. It took us, in the B.B.C., about three months to find someone to fill a vacancy worth £600 a year, and which involved mostly ordinary electrical engineering knowledge as a basis and some nodding acquaintance with practical high-frequency engineering as a make-weight. Three months! And interviews after interviews.

Fundamental Knowledge Necessary.

Time after time one interviews men who will tell you they have built the super-neuro-dyna-sonic-fifteen, but who are stumped by Ohm's law of alternating current. This is not intended to sneer at the "home maker." (I mean one who makes wireless sets, not homes!)

The home maker of sets has a fascinating hobby, he is to be envied, because his hobby is just that more interesting than others, inasmuch as the thing he makes works on a full scale.

But the making up of sets does not instruct a man in high-frequency alternating-current engineering, at any rate as to its basic principles. Without fundamental knowledge no man can hope to make himself a worth while career in any occupation.

A Slow Business.

I do then most earnestly advise anyone hoping to become a designer of saleable sets, a high-placed engineer in a wireless concern, a research lab. controller, or whatever it may be, to climb from the bottom instead of leaping to precarious hand-holds from where he is more likely to fall than to rise.

It's a neck-aching business looking upwards; it's a discouraging long way from bottom to top, but it's not long when really climbing before one gets, at any rate, a point of view.

* * * * *

Our Radio Consultant-in-Chief has something very practical to say regarding this important subject. He himself has, as "P.W." readers know, held some of the most onerous radio positions in the country, and so is peculiarly capable of giving really helpful and authoritative advice to those who may be interested.

* * * * *

The second point is pertinently illustrated by another example. I know a man very well equipped with engineering knowledge who recently came to me to discuss a receiver design. Technically, in many respects, it was ingenious, but the greatest salesman on earth could never convince the public to buy it. It entirely lacked the "service" aspect.

While it is "unscientific" to design a receiver with "ganged" controls, it is asking rather much of the user to confront him with the job of adjusting seven inter-

dependent controls and watching two instruments before he can get his programmes. And the set would cost about £35 to make.

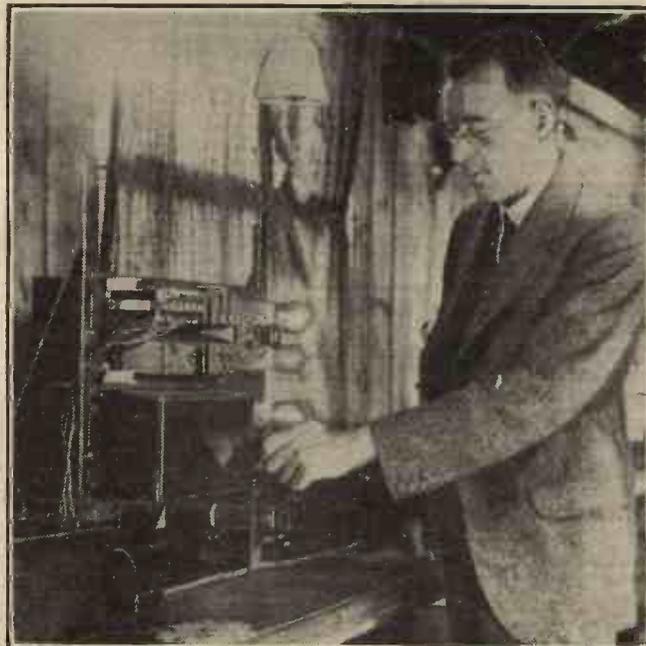
Many men who have gone through the hard work of learning the basic principles feel that they are immediately entitled to assume a special mantle of superiority. Such men can in general be recognised by their carrying a water-cooled slide rule and a harassed expression. They are heard to utter contempt for anything that really works.

Service or Research?

No one who calls himself an engineer should ever lose sight of the reason for his existence. His existence depends upon his products, and his products must be based upon a practical ideal of service. Engineering improvements to apparatus constitute making changes in that apparatus, so that it does more for less cost, capital, and running.

An engineer is defined as one who can do with one horse-power what any sort of fool can do with ten. (The definition comes to me from a friend who has all his life made a study of factor of safety in his products — perhaps after that remark he will forgive me for not mentioning his name.)

GOVERNMENT RADIO RESEARCH.



An engineer testing valves at the Post Office Research Station at Dollis Hill.

There is, further, the man who wants to go in for research. A well-known enemy of mine in the research world once asked me what could be profitably researched about in broadcasting. This is another example of a wrong point of view. One researches to gain knowledge, one experiments to make things work.

Peculiar Type.

The research man has to have a peculiar type of brain, he cannot be ambitious except in matters concerning his work. He will be meagrely paid both in money and in praise. He will be continually harassed by the knowledge that men of inferior quality (as he judges quality) have a greater name and reward than he has.

It is one of the greater scandals that the research man is not rewarded, and that he cannot force rewards from the business man in terms of patents

(Continued on next page.)

GUARDING THE H.T.B.

Some more Grid Bias hints of a practical nature.

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

WHILST the main function of the grid-bias battery is to supply a controllable negative potential to the grid of the valve in order to prevent current flow from grid to filament, the G.B. battery, judiciously employed, helps very greatly to cut down the drain on the H.T. battery.

A grid-bias battery, therefore, if it is carefully looked after in order to ensure that its voltage does not fall very much, acts in many respects as the guardian of the H.T. As it helps to conserve the H.T. current by reason of the negative potential which it applies to the grid of the valve, it is quite obvious that the greater the negative bias on the grid the less will be the current flowing from the H.T. battery.

Comparative Tests.

In the above connection it is often very interesting to make comparative milliammeter tests of the H.T. current flowing through a valve with and without the employment of a grid-bias battery. The use of the grid-bias battery will be seen to cut down the H.T. current by more than one half—very often, indeed, to one-third—of its original amount.

Hence the importance of correct adjustment of grid-bias potential in the case of three, four, or five-valve receivers. In such instances attention to this detail may result in doubling the working life of the H.T. supply.

Generally speaking, it is always best to operate a set with the maximum negative grid bias possible. Or, at least, you will find such to be the case, if you have any leanings towards the economy of your H.T. battery. Often enough, it is easily possible to exceed the grid-bias potential recommended by the manufacturer of the valve without giving rise to distortion.

Naturally enough, if you make a habit of using the G.B. battery "all out," you will need to keep a sharp eye on it in order to see that it does not fall off in voltage too rapidly.

Battery Deterioration.

Perhaps this statement requires some explanation in view of the fact that the grid-bias battery, not being under load itself, does not, to all intents and purposes, give rise to an actual current flow, no matter whether the receiver be in use or not. Therefore, one would expect that a grid-bias battery would remain at its original potential for almost an indefinite time.

Of course, the high-grade G.B. batteries do maintain their original potentials for a considerable period, but, unfortunately, many of these batteries which are on the market at the present day are not of the

highest grade, and, after some use, their potentials drop considerably.

Such results are due to the fact that minute leakages take place in the majority of batteries, for it is hardly possible to produce commercially a battery which is entirely free from all traces of internal leakage paths. Then again, changes take place in the active materials of the cells, and these result in a general deterioration of the battery.

It is, indeed, a recognised fact that every type of dry battery has what is termed a "shelf life." That is to say it can only be expected to remain in good condition in storage for so long, the "so long," in the majority of cases, being about twelve months.

Falling Potential.

After a period of use, the G.B. battery potential on the grid of the valve falls off owing to these leakages. This falling off in negative potential is progressive, and, naturally, the greater the decrease in G.B. potential on the grid of the valve the greater the increase in current taken from the H.T. battery.

It is for this reason, therefore, that the G.B. voltage should be tested from time to time. Very often, for a variety of

A RADIO ROMANCE.



Miss Olive Groves, one of our most popular broadcast singers, and Mr. Marcus Alexander, to whom she was married secretly some two or three months ago. Mr. Alexander is the Recording Manager of a gramophone company for whom Miss Groves frequently records.

reasons, an individual cell in the grid-bias battery will happen to go "dud," and will render the entire battery inefficient. Possibilities of this nature should always be borne in mind.

If, therefore, you would economise on your H.T. battery, don't adopt a cheescraper policy with your G.B. supply. Use as great a G.B. negative potential on the valve as the set will stand, without giving rise to distortion, and when the grid-bias battery shows signs of falling away from its original voltage, keep a careful eye on it, renewing it as soon as the drop in potential becomes serious.

RADIO AS A CAREER.

(Continued from previous page.)

on knowledge. Research does, however, bring its own rewards.

Had I the right type of mind and an independent income, I would gain a lot of quiet happiness in the pursuit of knowledge for its own sake. In this connection a great many fail, as I would, in having some fundamental knowledge, but no mathematics. Faraday lived once; his reincarnation is unlikely, and to-day the use of the mathematical analysis to explain experiment is almost a necessity to all but the very great.

In all this if you are to be a technician, an engineer, or one who goes in for research, one thing stands out, the need for fundamental knowledge.

A Meagre Salary.

And in the end if you do study long and deeply, if you gain theoretical knowledge of a basic kind, and if you then at a meagre salary get practical knowledge and then look round for a real job, your greatest difficulties still lie before you. Because no one will really want you to do much.

In nine cases out of ten the mentality of the people above you will be that any old product will do, the great and important job is to sell it. My opinion is that with moderately intelligent salesmanship the product will itself determine the success or failure.

We are at the moment facing a national crisis of unprecedented gravity. We cannot sell our products abroad. We, on the other hand, have some of the best engineers in the world in this country. No political expedient is going to solve the difficulty; the difficulty will only be solved by allowing keen, knowledgeable, technical men to be allowed to create better products than their competitors.

"Make British Best."

I do not believe that a blind repetition of the slogan that "British Goods are Best," will make them so. "Make British Goods Best" would seem to be a better slogan. Designed by real engineers, based on the research work of well-paid research people, and sold by engineers who will know where their product beats its rivals, British goods might be best.

The responsibility lies mostly in the management applying technical men to their proper functions and cutting out all this hot air about salesmanship. Of course, a non-technical management must find this very difficult.

Life is very difficult for the technical man, too, but the future is his if he will only know his subject, study commercial practicalities, and be no longer put upon by false "business" methods.

BUY
MODERN WIRELESS
BRITAIN'S LEADING RADIO MAGAZINE.



SIMPLIFYING your CIRCUITS By "PENTODE"

You will find your set far more interesting if you can read the story of its working in its circuit. "Circuit reading" is quite easy if you tackle it on the lines described by our popular contributor, and nothing could be more fascinating.

conclusion of my recent series of "P.W." articles, I felt that I had not quite made that point clear.

Indeed, it occurred to me subsequently that in taking you through the processes of radio stage by stage, I had, automatically, given you the idea

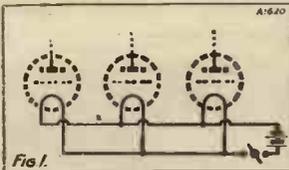
that such processes take quite a lot of time and that there was an interval of even seconds between the time a certain series of radio waves hits an aerial and the arrival of the audio-frequency energy it represents at the loud speaker.

Circuit Reading.

However, having cleared up that point, the ground is, I trust, prepared for the idea I now want to place before you. This is that you should read all the circuits that appear in "P.W." just as you read the

YOU can presume, more or less correctly, that when a certain radio wave slips past your aerial, it has instantaneously an effect on your loud speaker. There are all sorts of amplifying and other processes for the energy created in the aerial to pass through in a modern multi-valve, but it takes no appreciable time.

Anyway, is it correct to say that the energy passes through the set? Perhaps it would be better to drop the "the" and say only "energy"—a word which, by itself, is an almost abstract term, isn't it?

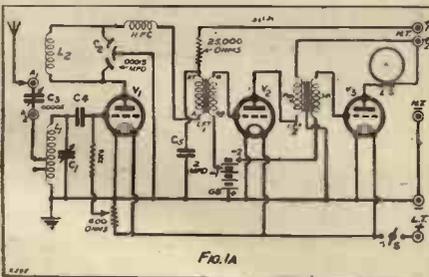


The Filament Circuit is shown in full lines.

No, don't let your series of valve-set operations (received on aerial, passed to H.F. valve, amplified by H.F. valve, passed to detector valve, rectified, passed to first L.F. valve and etc.) take too close a grip of you.

No Time Lost!

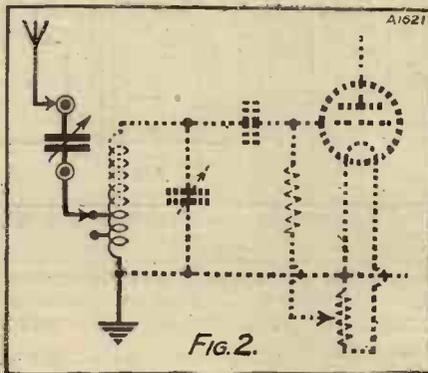
It won't do any harm to jump to the other extreme now and then and imagine the circuits of a set to be a string of suspended weights, hanging in a line and touching each other. Push one at one end, and the



The theoretical circuit of the "Magic" Three.

one at the other end swings simultaneously. The energy is carried through the intervening weights with no appreciable loss of time.

And the foregoing is, in a sense, my *apologia*. No reader has said so, but at the



The aerial circuit includes a part of the coil L1.

articles. It is every bit as easy, providing you know how to go about it.

And you will find it is also just as interesting. In fact, I'll wager that as you grow expert at it, you will get keener and keener until you will find as great a fascination in a new circuit arrangement as in a rattling fine novel.

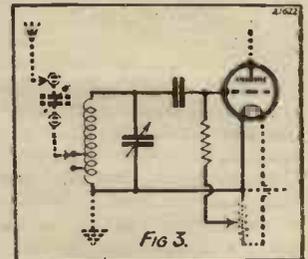
"Bunch of Processes."

I'll show you what I mean. As an example, I will take the original "Magic" Three, which will do admirably. You see it at Fig. 1A; a theoretical circuit that tells you nothing? Not a bit of it—it is a serial story of adventure with all the instalments printed at once! It tells you exactly what happens to a wayward wireless wave from the time it develops "juice" in the aerial until it rattles the diaphragm of a loud speaker.

Fig. 1A is a bunch of processes, a collection of little circuits compressed into one "Magic" entity.

First of all, you "light" the filaments of the valves (Fig. 1). You must do this before anything happens; all the batteries, etc., are, of course, connected up.

With the set (it has now ceased to be merely a circuit) all ready for working, you wangle the dials until the waves due to one particular broadcasting station find a sympathetic arrangement of inductance and capacity to let them develop H.F. currents.



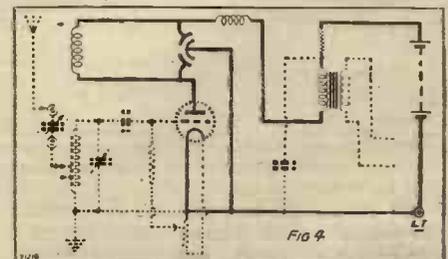
Here you have, in full lines, the grid circuit of the first valve.

These H.F. currents dash about the circuit denoted by thick black lines in Fig. 2. A part of the coil is common to the grid circuit of the first valve, so that the H.F. energy is reproduced in that (Fig. 3).

The varying potentials on the grid of the first valve cause current fluctuations in the anode circuit of this same valve (Fig. 4). In this circuit—for, as you see, it is a complete circuit—you will find the reaction coil whose duty it is to feed some of the energy back to the grid circuit for further amplification.

On the Way. Also, there is the primary winding of an L.F. transformer. This component couples the anode circuit of the detector valve to the grid circuit of the 1st L.F. valve (Fig. 5). The current fluctuations in the detector anode circuit, therefore, give rise to current fluctuations in the Fig. 5 grid circuit. In consequence of this the first L.F. valve has

(Continued on next page.)



The energy is duplicated in amplified form in the anode circuit of the first valve. Some energy is put back to the grid for further amplification by the reaction coil.

SIMPLIFYING YOUR CIRCUITS.

(Continued from previous page.)

a varying voltage impressed on its grid, and this causes its anode current to vary.

The anode circuit of the first L.F. valve is clearly shown at Fig. 6. I will leave it at that, for you can easily find your own way through Fig. 7 and Fig. 8.

The really vital point to note is that every valve in every valve set has a very complete grid circuit and a very complete anode

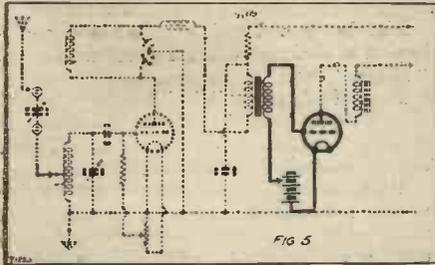


FIG 5
An L.F. transformer passes the rectified and amplified energy to the grid circuit of the second valve for still more amplification.

circuit. Once you can isolate these you will find it mighty easy to dig out the general operation of the whole contraption.

You will notice that each valve is definitely linked with its neighbours through some sort of coupling device such as an H.F. or L.F. transformer. The grid circuit of the one valve is coupled to the anode circuit of the valve which precedes it.

Odd Items.

Every now and then you will come across items that do not appear to have any work to do that directly bears upon the amplification or rectification of the energy that is being handled. An illustration of this is given in Fig. 4, where in the anode circuit of the detector valve you see a resistance of 25,000 ohms.

The purposes of such things are invariably discussed in some detail in the article dealing with the circuit, and you will soon

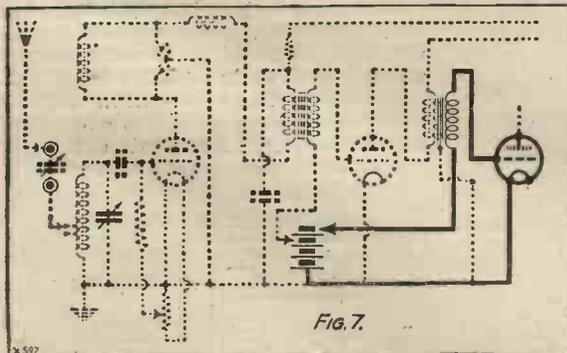


FIG. 7
The grid circuit of the final valve receives the now quite hefty energy, and gives it its last magnification.

learn to recognise their functions the moment you see them. In this case the resistance and the fixed condenser C_5 operate as an "anti-mobo" device.

They minimise any coupling effects that

may occur between this anode circuit and any circuit in the set (other than the rightful first L.F. grid circuit) through the common resistance that may be present in the form of the H.T. supply.

As you will see, the same H.T. battery figures in all the anode circuits (Figs. 4, 6

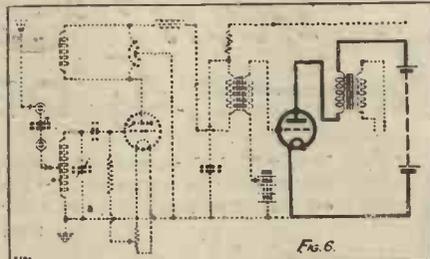


FIG. 6
The anode circuit of an L.F. valve is remarkably simple, as you can see.

and 8). It is obvious that audio-frequencies in any one anode circuit can be passed on to another anode circuit if the battery has any resistance (as it is bound to have in at least some measure) unless steps are taken to prevent it.

Really Quite Simple!

But I cannot, I fear, deal with "anti-mobos" and other such interesting topics in this article, the object of which is merely to indicate the possibilities of circuit reading as an interesting and useful pastime.

A little simplification on the lines I have

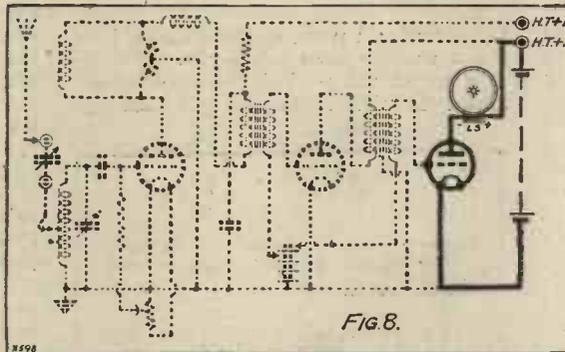


FIG. 8
The loud speaker is included in the anode circuit of the last valve.

described will make the most fearsome-looking collection of symbols masquerading as a circuit look the ingenious fellow he really is to your now sophisticated eyes!

THREE HINTS.

A hydrometer forms such a simple and effective way of keeping a check upon the condition of the L.T. battery that it is safe to say that this instrument is likely to become far more popular in future.

To ascertain wave-length where frequency is known or vice versa, simply divide the metres or the kilocycles by 30,000.

A mixture of equal parts of castor oil and turpentine smeared over accumulator terminals will prevent corrosion and keep them in good condition.

ELIMINATING HUM.

A Simple Cure.

By ROBERT RANKIN.

THE majority of those who use H.T. eliminators have often experienced an annoying persistent hum from the mains, more especially when working on A.C. mains.

At times no hum can be detected, then it appears for no apparent reason. The blame is, of course, put upon the type of H.T. eliminator in use, whereas the trouble is outside the H.T. unit—all reputable makes of eliminators are constructed to give silent working.

The writer speaks from experience; working a well-known three-valve circuit (Det., 2 L.F.'s) on A.C. mains, there was a decided hum; at times very bad; then again almost nil, and again gradually increasing in loudness after the set had been working some time.

The H.T. eliminator was suspected, but on testing was found to be absolutely silent; various smoothing remedies were applied without improvement.

Other causes of hum were tested, e.g.:

- (a) Inefficient "earth" connection.
- (b) Faulty grid leak.
- (c) Incorrect grid bias to L.F. valves.

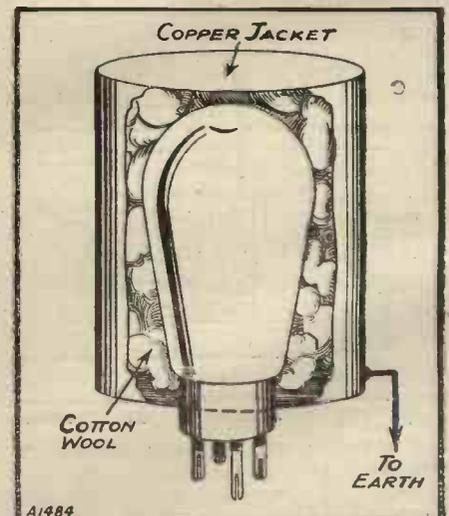
All sorts of things were tried without any improved result.

After experimenting and trying several devices, the writer discovered a cure—a very simple but a really efficient cure.

Screening the Detector.

Now, here is the idea. Procure a piece of thin copper; shape it to fit over the detector valve, forming a jacket to it. Solder one end of a wire to this jacket, and connect other end to the earth lead. Be careful not to allow copper jacket to fall over the valve and touch the terminals on the valve holder.

We made a copper box like a cocoa tin, and putting a layer of cotton wool inside it to protect the valve, slipped it over the detector valve; at once all hum vanished and now the set works silently.



A1484
Mr. Rankin cured his set trouble with this simple screening device.

RADIO by the SEA

Wireless waves can travel over the surface of water much more easily than over land. This fact gives rise to some very curious occurrences, which are described in this interesting article.

By G. H. DALY.



At certain periods of the year, floods are very prevalent over large parts of this country, and it is interesting to speculate upon the effect which large expanses of water such as oceans, lakes, floods and even rivers have upon radio reception.

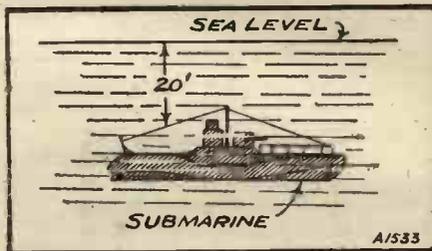
One of the most important of Marconi's later discoveries was that wireless communication over the sea was more than twice as good as communication over the land. For instance, a wireless station on the coast which can only be heard for 50 miles inland is audible with the same receiver about 200 miles out to sea.

Wireless on Submarines.

Incidentally, there is the drawback that Morse interference from ships at sea is always much worse than it would be if dry land intervened between the ship and the receiver. So in one way what the seaside dweller gains in strength he loses in interference.

Although there is still a great deal of research to be carried out in this direction by way of confirming theories, there are, broadly speaking, two reasons why transmission is better over the sea than over dry land.

In the first place, wireless waves which travel over the surface of the earth are accompanied by circulating earth currents



Communication with submarines by wireless cannot be carried out at depths of more than about 20 or 30 feet.

which are part and parcel of the overhead wireless wave. As sea water is a better conductor of electricity than dry earth these earth currents will flow more easily through sea water than through the earth; and wireless waves travelling over the sea will not "feel the drag" of these currents to the same extent as when travelling over the earth.

The second reason is that sea water is a fairly good reflector of wireless waves and prevents them from penetrating far below the surface of the water. In fact, the water

screens the wireless waves from the earth in the same way as a copper box screens a certain sensitive part of the wireless receiver from stray waves and fields.

Thus, wireless waves cannot sink into the sea and get lost, and instead, skim along the surface as a fast skater skims along the



A transmitting station situated on the coast will be heard four or five times further away over the sea than over the land.

ice. In addition to this, as the sea water reflects the waves the latter gain a little of their energy back from the sea as they pass over it.

The fact that wireless waves do not penetrate far below the surface of the sea is a distinct drawback when it comes to submarine wireless, and by experiment it has been found that even with ultra sensitive apparatus very little wireless energy can be detected below 20 ft. of sea water.

"Way Down" in Kentucky.

In the case of underground wireless, however, signals can be heard for at least 100 yards beneath the ground. This was demonstrated recently in some tests carried out in Mount Royal Tunnel and Mammoth Cave, Kentucky, when signals were clearly audible 300 ft. from the surface in the latter case.

Some time ago, Professor Zenneck prepared a table showing the difference between land and sea wireless, with special reference to a station which had a theoretical range of 1,000 miles over a perfect conductor such as copper. Over sea water the range was 920 miles, as against 700 miles over fresh water, such as a lake or flooded area, but over dry land the range was only 150 miles, and under the worst possible conditions only 50 miles;

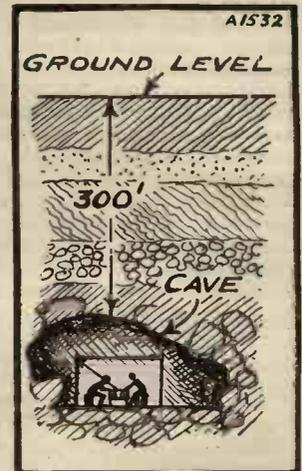
This will give a very good idea of the difference which water makes to wireless communication.

It has been noticed in the case of a receiver situated at the seaside that the quality of speech or music is better from the inland stations than from those stations received across the sea—we have often remarked on the bad quality of Continental stations, for instance.

While this may be due to other factors, such as faulty apparatus, it is also due to the change in medium which the wireless waves experience in passing from sea to land, and may be likened to the effect which occurs when waves pass from a dark to a light atmosphere. In the case of passing from sea to land the wave is slowed down, as it were, and it is thought that the phase may be slightly affected.

Regarding the effect of rivers on radio, these can make very little difference, except in the case of anyone who is directly connected by river with the transmitting station, when a sort of wired wireless effect might obtain. The wireless waves may cling to the river in the same way that they cling and are guided by a power line or telephone cable in the case of wired wireless.

Of course, most rivers curve and twist about too much, but some day towns directly connected by large rivers may use them for guiding the wireless waves and so increase the strength as well as the selectivity of communication. Great rivers like the Nile, Amazon or Mississippi would certainly give useful results if wireless was applied to them in this way.



The fact that wireless waves penetrate several hundreds of feet into the ground has often been proved experimentally.

MARCONI'S CORRECTION.

Some light on the much-discussed subject of distant control by radio.

By THE EDITOR.

AS we anticipated, Marquis Marconi has lost no time in correcting some of the statements which have appeared in the newspapers concerning his recent radio experiment in controlling the lighting arrangements at the Sydney Exhibition. We have received the following statement from Marconi's Wireless Telegraph Company, Ltd.:

"We are authorised by the Marquis Marconi to state that reports attributing to him the statement that his experiment in transmitting a wireless signal to switch on the lights at the Electrical Exhibition in Sydney 'points the way to a future day when there will be no electric wires and all current of electric power will be transmitted directly through the air' was not made by him, and is obviously incorrect."

An Outstanding Example.

We hope the newspapers will give full publicity to this authorised statement by the Marquis Marconi, for in these days, when hundreds of thousands of people know something about radio technique, it is manifestly strange that some newspapers should so misunderstand a wireless story of this nature that they publish it as though it represented some unique discovery connected with the transmission of actual power by radio.

We particularly refer Marquis Marconi's correction to the "Yorkshire Observer," which, on March 27th, published (inter alia) the following:

"The hero of the day is the Marquis Marconi, who has successfully achieved yet another miracle of science, and has once more thrilled the world by his lamp-lighting experiment across a distance of 11,000 miles. The famous wireless wizard is continually searching for new worlds to conquer and never ceases to carry out tests and experiments which will give him results of the essentially practical kind. . . . He sees as a result of his latest triumph the possibility of transmitting power through the air in any desired quantity, and the entire abolition of the electric wire. . . ."

"Nothing Wonderful."

We are glad to note that the London "Observer," in a recent issue, invited Professor E. N. da C. Andrade, the famous physicist, to write an article correcting some wrong impressions concerning electric power at a distance. As Professor Andrade points out:

"A vision of large generating stations at the pithead, or of waterfalls connected to factories and farms solely by space in a state of vibration has been set before us. Be the remote possibility what it may—and a man need now be bold to say that this or that will never be achieved when so many unexpected aspects of nature have been revealed in our generation—there is nothing in the Marchese's performance which brings the consummation any nearer."

"At any time during the last five years, at a very modest estimate, switches in

Sydney could have been operated by wireless in Europe; in fact, with modern technique, as soon as wireless signals can be received with any distinctness there is no limit to the power which can be set in motion by their agency—set in motion, not transmitted."

Is It "Impossible" ?

That, in short, sums up the whole story. But the trouble is really due to the fact that many people have so got it into their heads—and quite rightly, too—that nothing is impossible, that owing to the enormous developments made in science during the last fifty years, they are afraid of saying, "That's impossible!"

We certainly agree that it is a very bad mistake definitely to say, "That's impossible!" But some people take this phrase too seriously.

A good example is television. We have never said that television is impossible;

MARQUIS MARCONI.



This photograph shows the great Italian inventor speaking to Sydney from his yacht the "Elettra."

but we have said that certain known principles of television to-day are definitely limited in their application. But certain people, once hearing that even the crudest of television experiments have been successfully carried out, at once jump to the conclusion that "the day is not far distant, etc., etc., when we shall be able to televise a Boat Race," and so on, ad infinitum.

Consequently, it is not surprising that people with inadequate knowledge of radio assume that because Marconi closed a switch by wireless, the day will not be far distant, etc., etc., etc., when he will transmit any amount of power actually by radio.

We ask our readers to do what they can among their friends to disillusion people of these erroneous ideas about radio, for these

sorts of impressions, when they circulate among the general public, are bound to be repudiated sooner or later—but not before a very bad impression has been given of those who are working in the best interests of radio.

B.B.C. and Beecham.

A piquant situation has arisen in connection with Sir Thomas Beecham and the B.B.C. As we have pointed out more than once, relations between Sir Thomas and the B.B.C. have been strained for some time past, and now the full story has been made public.

It transpires that Sir Thomas Beecham has not conducted recent B.B.C. concerts for the simple reason that, although the B.B.C. has explained his absence from the conductor's rostrum on the grounds that he has been unwell, the facts of the matter are that the B.B.C. has annoyed Sir Thomas by altering the programme without his permission.

For example, recently the B.B.C. announced that Sir Thomas, owing to "the extra strain and concentration involved" was unable to conduct Mahler's Fourth Symphony. Sir Thomas, however, has complained not of the strain, but of the music of that particular programme.

He said that indisposition had nothing to do with the case, but that he wanted to conduct Franck's Symphony, not Mahler's. The latter had also been included in a programme he was recently unable to conduct, and Sir Thomas explained that a few weeks ago when he was ill he was unable to conduct one of these concerts and the Corporation took it upon itself to lift things out of that programme and put them into another one.

Sir Thomas is reported to have stated that he pointed out to the B.B.C. that he had the right to choose the programme, and said in effect, "Either that programme, or I don't conduct."

Sir Thomas Quite Right.

There's no doubt about it—Sir Thomas is quite right in his attitude. He is a great artist, and because the B.B.C. engages him to conduct their Symphony Orchestras they must not regard him as a hired servant who will do just as he is told. We would like to see the B.B.C. handling, say, Toscanini, the great Italian conductor, who will shortly pay a visit to this country.

Toscanini is much more independent than Sir Thomas Beecham, and we should say much more difficult to work with. Toscanini was once summoned for striking one of the violinists in his orchestra because that particular violinist played out of tune or, in some way or another, offended the conductor.

And the Italians, who are, of course, much more appreciative of the idiosyncrasies of artistes than we are, are very much in sympathy with Toscanini. When the latter was summoned by the injured violinist he was acquitted on the grounds that his artistic temperament exempted him from ordinary charges of assault.

Well, Sir Thomas has his own way of showing his individualistic ideas, and we, for one, are heartily with him. Sir Thomas ought to know more about music than all the B.B.C. officials put together, and if he thinks a programme is ill-balanced we don't blame him for refusing to conduct the orchestra at that particular concert.

RADIO-GRAM SWITCHING



IT is so simple a matter to effect the alterations necessary to convert any existing set of conventional design to a radio-gramophone, that everyone who possesses a gramophone as well as a wireless set should certainly avail themselves of the greatly improved reproduction which valve amplification of recorded music offers.

Even a modest Detector and 1 L.F. set lends itself readily to modification in this way, and it is only with more ambitious receivers that there is any need to consider the matter in the light of a problem with more than one possible solution.

How Many Valves?

It may be taken that the output from the average pick-up is of such a value that no less than two stages of low-frequency amplification are required in order to get ample volume from the loud speaker. It by no means follows, however, that more than two L.F. stages are necessary, or even desirable.

Two transformer-coupled stages, for instance, may, unless the final valve is a super-power valve with very high H.T. voltage on its plate and correspondingly high grid bias, be very easily overloaded by the average pick-up with, of course, consequent detriment to quality instead of the improvement desired.

The Leaky-Grid Two-Valver.

The problem, then, resolves itself into a matter of deciding whether the pick-up shall be connected (in the case of a multi-valve set) in the grid circuit of the detector valve, or in the grid circuit of one of the subsequent L.F. valves.

In the case of the Detector and 1 L.F. set, this question does not arise, since we have said that two stages at least are essential and, with such a set, only two valves are available. Obviously, the pick-up must be inserted in the grid circuit of the detector, and we shall now discuss the more usual methods of doing this.

* * * * *

Can any set be converted into a radio-gramophone? Very nearly any set. This article tells you how, and gives the comforting assurance that more than two valves are rarely needed. And that applies to practically any modern set.

By T. B. SANDERS.

* * * * *

Either of two methods of detection are employed in modern receivers; the leaky-grid method and the anode-bend. The application of a pick-up to a grid-leak detector is best achieved by the use of a single-pole two-way switch arranged as in Fig. 1.

Here the grid of the valve is connected to the radio circuit when the switch arm is

phone side a negative bias is impressed through the pick-up itself on to the grid by the grid battery. The value of the bias should be that recommended by the valve maker as suitable for low-frequency amplification when using the H.T. voltage which is normally applied to the detector.

Sometimes slightly better results are obtained by increasing the H.T. voltage, when using the gramophone, to a value higher than that used for grid-leak detectors.

Two Valves with Anode-Bend.

Fig. 2 shows the connections for the alteration necessary to an anode-bend detector. It will be seen that the pick-up is merely inserted in the grid return circuit with a switch to short-circuit it for radio reception.

When a valve is functioning as an anode-bend detector it is biased negatively to a much greater extent than when the same valve is used as an L.F. amplifier, and so, with the anode-bend detector circuit, a reduction of grid bias will be necessary when the pick-up is in use.

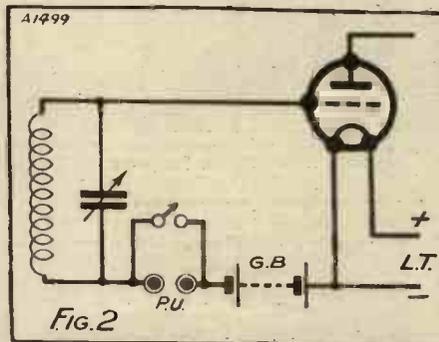
If the set has two or more stages of L.F., the gramophone pick-up should not be connected in the detector grid circuit unless some form of volume control is provided, either in the set itself, or externally in association with the pick-up.

Multi-Valve Sets.

Ample magnification without risk of distortion is provided by two L.F. stages—so, whatever the number of L.F. valves, a pick-up with no volume control should be connected in the grid circuit of the last valve but one.

If this valve is transformer coupled to the preceding valve, the conversion can again be effected by using a single-pole two-way switch in the manner of Fig. 3.

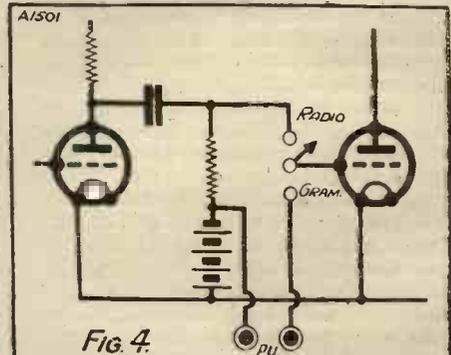
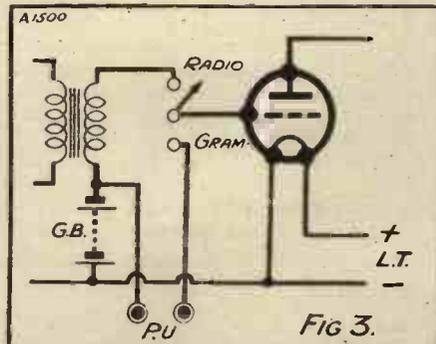
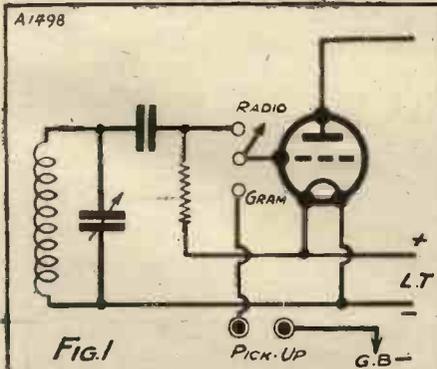
Where resistance-capacity coupling is used the insertion of the pick-up will be carried out as shown in Fig. 4.



Nothing could be more simple than the case of the anode-bend detector.

thrown to the top contact and, by moving the switch arm to the lower contact, the pick-up is connected, in series with the grid battery, between grid and filament.

When the switch is in position for radio reception, the valve receives the necessary positive grid bias for detection through the grid leak from L.T.+. On the gramophone



The leaky-grid detector requires a switch, two terminals and a G.B. lead. When the pick-up follows a transformer or a resistance stage (Figs. 3 and 4), it is a case of "fit and forget," as the same battery adjustments do for radio and gramophone.

LATEST BROADCASTING NEWS.

CUP FINAL PLANS.

A BELFAST FREEDOM—
PERCY PITT'S RETURN—
NORTHERN WIRELESS OR-
CHESTRA—THE CHAIRMAN-
SHIP STAKES, Etc., Etc.

EVERYBODY will be glad that the strained situation between the B.B.C. and the F.A. has now cleared, and we are to have a running commentary on the Cup Final at Wembley. This is as it ought to be, and listeners unable to travel to Wembley on the 26th are congratulating all concerned—and themselves!

After all, the Cup Final is a national event, and there is no doubt news of it should be broadcast to every hamlet as the great game fluctuates on the field. The objection that the "gate" would suffer if broadcasting were permitted is no argument—there would have been some kind of broadcast in any case.

A Belfast Freedom.

Ulster listeners will hear speeches in connection with the ceremony of conferring the Freedom of the City of Belfast on Sir John Lavery, the eminent painter, which is to take place on Tuesday, April 29th.

Percy Pitt's Return.

An English version by Fred E. Weatherly of Mascagni's "Cavalleria Rusticana," and a translation by Percy Pitt of Puccini's "Gianni Schicchi" are to be included in the London programme on Monday, April 28th.

They will be conducted by Percy Pitt with a cast including Miriam Licette, Gladys Ripley, Lila Boddam, Evelyn Arden, Tudor Davies, Dennis Noble and Bernard Ross. Both operas, which are short versions, will be repeated for National listeners on Wednesday, April 30th.

Northern Wireless Orchestra.

An interesting contribution to the afternoon programme for Northern listeners on Friday, May 2nd, will be a concert of old music given by the Northern Wireless Orchestra, Sallie Taylor and Bertha Jackson, the latter artists being down to sing two groups of unaccompanied Elizabethan duets.

The Chairmanship Stakes.

Repeated questions in the House of Commons always drawing a definite negative provide an effective discount to the confident rumours in circulation recently that the Prime Minister had made up his mind about the successor to Lord Clarendon.

Meanwhile, Mrs. Philip Snowden's position has been greatly strengthened by her broadcast on March 31st. This, virtually Mrs. Snowden's microphone debut after being a Governor for three years, was an outstanding success. Mrs. Snowden is now ranked among the greatest broadcasters, The King, Prince of Wales, Mr. Baldwin, and Mr. George Bernard Shaw.

Thousands of enthusiastic letters have reached the B.B.C. and Downing Street. Many of these letters express a strong hope that the Prime Minister may appoint Mrs. Snowden to the Chairmanship. Reso-

lutions are reaching the Postmaster-General from influential bodies up and down the country. One of the most emphatic of these was from the Business Men's Club of Cardiff.

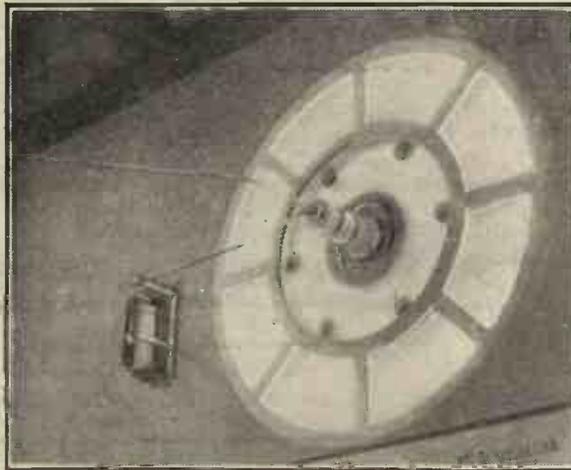
A Midland Sketch.

An amusing sketch entitled "With a View to Matrimony," by F. Morton Howard, will be heard by Midland Regional listeners on Wednesday, April 30th. The sketch will be put in as a ten-minute interlude between an orchestral concert and a musical comedy programme.

"Norton-Lincs."

The first performance of a tone poem for orchestra by W. Gaze Cooper entitled "Norton-Lincs," the name of an old-world village where the composer once spent a delightful holiday, will be given during

SOME LEAD-IN!



This is the lead-in of the Stuttgart station, which broadcasts on a wave of 360 metres, just above London Regional.

the evening programme for Midland Regional listeners on May Day. Another work by the same composer, an original pianoforte concerto, was given its first performance in the Birmingham Studio a few weeks ago.

The Midland May Day.

The May Day programmes for Midland Regional listeners will include another production by Charles Brewer entitled "A Mad Mummer's Bright Dream." It is a fantastic burlesque which will, no doubt, go well with a cast which includes Leonard Henry and Topliss Green.

Following the usual custom, the weekly sports talks for listeners in the Western Region will be given on Monday instead of Saturday evenings during the summer months. The change-over takes place on April 28th, when events associated with the opening of the cricket season will be described by Mr. Norman Riches.

An interesting debate for Scottish listeners has been arranged for Tuesday, April 29th, when Moray McLaren and George Malcolm Thomson, the authors of two striking books entitled respectively, "Return to Scotland," and "Rediscovery of Scotland," will re-state their impressions by means of the microphone.

The next of the series of "My Programmes" for Scottish listeners on Saturday evening, May 3rd, will be devised by Miss Christine Orr, whose talks, plays, stories, and sketches are well-known to listeners north of the Tweed.

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events.
By "PHILEMON."

Who will long be remembered for those wise and witty broadcasts, entitled "From My Window."

London in the 'Nineties.

BUT what a charming voice Mrs. St. Loe Strachey has! And how delightfully she took us down Piccadilly as far as Hyde Park Corner, showing us what that little bit of London looked like, and what the people in the streets looked like, fifty years ago!

It was a model talk, brightly coloured and vivacious. She ended it with the general reflection that the difference between London then and now is largely a question of atmosphere; then it was full of leisure and space, now it is full of speed and vitality.

She thought the most striking difference in detail was the disappearance of the tall hat!

Environment.

These talks on the Problems of Personal Liberty are intended mainly for study classes. The alternative was chamber

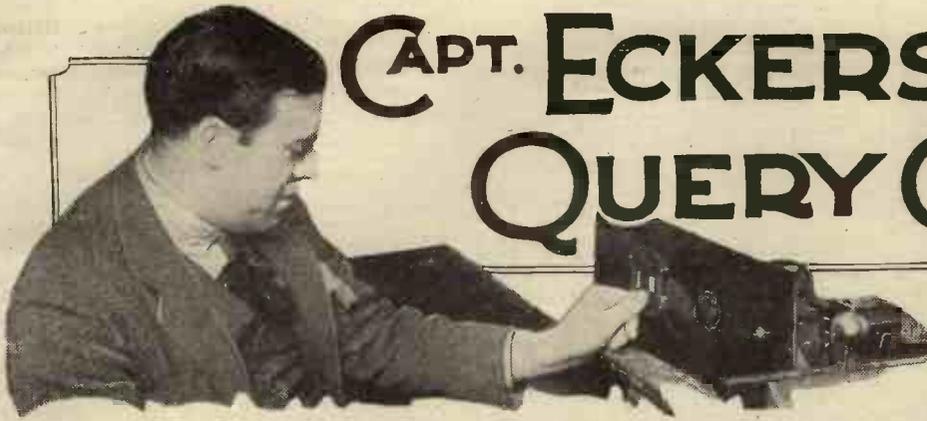
music, so that I was between the devil and the deep sea! I chose Mr. Siepmann, for I think it is very clever the way in which he gets the big-wigs like Professor Jacks and Dr. Cyril Burt into the ring and shows off their points.

Dr. Burt was a bit of a cold douche to believers in personal liberty. Between the Scylla of heredity and the Charybdis of environment, the good ship Freewill has a rough passage.

Every now and again idealism sprouted from Mr. Siepmann, but Dr. Burt firmly nipped it in the bud. In two thousand years, he said, there had been practically no increase in mental capacity, but only in mental content.

The moral seems to be that we should be wiser if we spent more time on enjoying ourselves than on these apparently vain efforts to improve ourselves. So what is the B.B.C. going to do about it?

(Continued on page 150.)



CAPT. ECKERSLEY'S QUERY CORNER

CHARGING YOUR L.T.B. FROM THE CAR BATTERY—"BALANCING" GANGED CONDENSERS—"LOSSERS" FOR IMPROVING QUALITY—NEUTRALISING AN S.G. VALVE.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

Charging Your L.T.B. from the Car Battery.

P. M. (Birmingham).—"Could you please tell me whether it would be a good thing to charge a wireless battery by joining it up in parallel with a car battery, and if so whether any resistance would be required to control the amount of current passing through? Of course, this would be joined up while the car was in use."

Er—yes! But be careful what you're about. The car battery is designed to give and take very high currents. Your wireless battery was designed to be treated gently.

So, as you say, connect a resistance, as shown in my picture below. Charge the batteries and connect an ammeter in series with the wireless battery and see what it takes in the way of current. Don't let it take more than recommended.

* * *

"Balancing" Ganged Condensers.

G. L. (Southport).—"Having tired of turning two drum dials simultaneously in my receiver in order to tune-in stations, I now desire to lock the drums together in order to simplify the control. However, I am given to understand that I will need a small balancing condenser on one of the sections of the double-ganged condenser. Can you please tell me why I must fit this small control, and its most effective position?"

You see, without the most perfect manufacture you cannot rely upon the condensers being exactly the same. And if they're not exactly the same all the way through their adjustments, the circuits they tune will not give the identical response and you'll lose sensitivity. Here you are then.

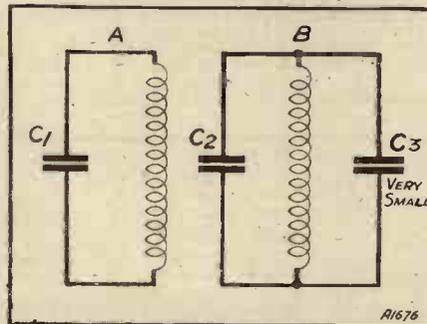
The connections are shown in the sketch with the circuit A and B, and you tune C_1 and C_2 simultaneously locked together. But at one point C_1 may be greater than C_2 ,

so the two circuits won't be in tune.

It's best then to have an extra variable, C_3 (very small), which adjusts for the difference. It will be necessary to lock the two condensers together so that in general and before you connect C_3 , C_2 is smaller slightly than C_1 . Then, with C_3 in middle position you will in general bring C_1 to equal $C_2 + C_3$. Then a plus or minus variation of C_3 will compensate for variation.

When mass production is undertaken the tools for making "ganged" condensers may cost £30,000. But in America, for example, so great is the demand that the supply of very accurate ganged condensers

BALANCED CIRCUITS.



This sketch illustrates the answer to G. L. (Southport).

is adequate and economic. So that in American sets we do not find balancing condensers. But you'll need one, as do most British sets.

* * *

"Lossers" for Improving Quality.

S. S. (Stoke Newington).—"I noticed you recommended a 'losser' (1 400-ohm variable resistance in series with the aerial tuning coil) as a volume control, and an aid to improving quality in a reply to a reader who recently asked you the best means of controlling the volume in a set incorporating an S.G. valve. May I now ask you whether this scheme is satisfactory where the set is installed within twenty miles of Brookmans Park?"

What do you want to do with your volume control—just control the volume of Brookmans Park or make your set a distant listening set for all sorts of programmes at all sorts of intensities?

In any case, this type of volume control will do either requirements, but if you are going fishing for far-away stations, put series resistances in *all* your high-frequency

circuits, aerial and others, because when listening to something feeble the resistances go out and increase the *sensitivity as well as the selectivity* simultaneously. This is what you want. "Gang" all the resistances if you can.

The point about the resistance is that it does broaden out the response curve for near station working and so gives good quality. Whereas it thins up the response curve for distant stations and so gives greater selectivity which is absolutely necessary.

* * *

Neutralising an S.G. Valve.

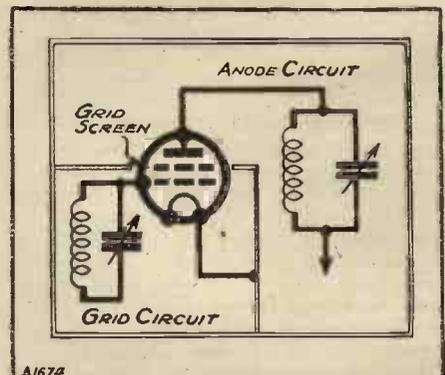
N. H. T. (Edmonton).—"Do you consider there is any advantage in neutralising a screened-grid valve? I intend using home-made or plug-in coils, because I realise it is difficult to carry the scheme into effect with special coil units."

No! There's no need to neutralise a screened-grid valve. That's been done for you by the screen inside the valve. But you want to prevent the grid circuits of a valve coupling with its anode circuits, otherwise you get reaction.

It's no use having a screened-grid valve if the rest of the circuits are not screened. Ideally, then, you have the anode circuits in one metal box and the grid circuits in another metal box, and you stop anything much coupling back through the valve, as is shown in my picture, by continuing the screening even in the valve.

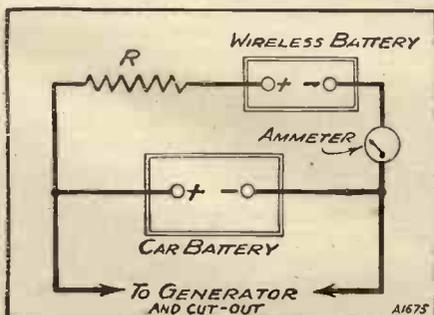
Before the days of the screened-grid you might close up anode and grid circuits in a box, but the valve anode grid capacity still coupled them together and so you had to neutralise.

S.G. CONNECTIONS.



The method of screening the grid circuit from the S.G.'s anode circuit.

CAR CHARGING CONNECTIONS.



How to join the L.T.B. across a car accumulator.

THE "MAGIC" THREE IN SOUTH WALES.

Replying to another "P.W." reader's request for his address, Mr. E. Williams, of Llanelly, says in a letter to the Editor:

"With regard to the 'Magic' Three, I think the world of this set. It brings in so many stations at good loud-speaker strength, compared with the more expensive sets, that I have not given a thought to S.G. sets, of which so much is written. It must not be assumed that I have extra special and expensive components; some of them are of the cheap variety. Two of the valves are cheap ones.

"Since I wrote you last (published in 'P.W.' March 1st) I have tried out the short waves. Without even the neutral and '0005 condensers I have received half a dozen stations (including KDKA and W 2 X A F at excellent volume on the L.S.) with poorly-made S.W. coils.

"In order to be better equipped for exploring the amateur 'ethers' I have, in fact, ordered a set of coils of a good maker, and feel sure of a good time. 'Magic' owners do not justify their existence unless they exploit their set's capabilities on S.W. work.

"The 'Magic' sets, I may add, are very popular in Llanelly. I can assure you there are dozens of other novices who are as delighted as myself. A second set I built gives perfect satisfaction.

"Again wishing you every success.

"I remain,

"Yours sincerely,

"EDGAR WILLIAMS."

"JUDY" 2.

The Editor, POPULAR WIRELESS.

Sir,—Having recently made up your "Judy" 2 wireless set. I feel I must write and tell you what a wonderful little set it is.

I am able to separate the London and Regional Programmes with ease, and when they have closed down she rips in foreign stations galore. And I should very much like to see you add another valve to same in another of your simple circuits, and call it "Judy" 3 for I am sure it cannot be beaten.

Wishing you and our valuable paper all the best in Radio Luck, and I hope soon to see the "Judy" 3.

Yours respectfully,

H. F. DOBSON.

Eltham, S.E.9.

[ED. NOTE.—Mr. Dobson included details of a "Judy" modification he has tried, and the Research Dept. extends its thanks for the information, and will carefully test the arrangement.]

"MAGIC" WAVE-CHANGING.

The Editor, POPULAR WIRELESS.

Sir,—Your "Magic" series are wonderfully efficient and delightfully "slick" to operate.

In my opinion, however, wave-changing by switching from 5 X X to the 5 G B band of wave-

CORRESPONDENCE.

THE "MAGIC" THREE.

THE "MAGIC" THREE IN SOUTH WALES— "JUDY" 2—"MAGIC" WAVE-CHANGING.

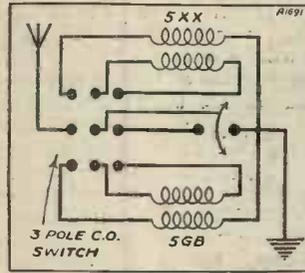
Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

lengths is a desirable refinement in a "home" set for the old folks.

This I have done by using a three-pole C.O. switch (Utility anti-capacity, knob operated), and, of course, two extra coil holders and suitable coils. By chance it so happens that the 5 G B tuning is within two degrees of the 5 X X tuning (these are our "locals"), and also the reaction setting for 5 G B is right for 5 X X.

I have extended the spindle of the differential condenser (Lissen), and fitted a Brownie S.M. dial, which gives an easy way of "logging" both reaction and aerial condenser readings.

The plug-in coils are fitted to the baseboard in pairs, with their axes at right angles to one another, and a test proves that neither tuning nor volume is affected by the presence of the coils not in use at the moment. Diagram herewith. The aerial terminal is fitted to the top left-hand corner of the panel, and the detector valve projects horizontally inside the cabinet, giving a short connection to grid and plate leads. It will be seen that only the aerial end of the tuning coil is switched, but both ends of the reaction coil are



presence of the coils not in use at the moment. Diagram herewith. The aerial terminal is fitted to the top left-hand corner of the panel, and the detector valve projects horizontally inside the cabinet, giving a short connection to grid and plate leads. It will be seen that only the aerial end of the tuning coil is switched, but both ends of the reaction coil are

operated upon. I found that it was not necessary to break the "earth" end of the coil not in use. This was tried with a four-pole switch.

Yours truly,

Llensantfrald, Mont.

W. A. JONES.

SIR OLIVER'S ARTICLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I say how much I appreciate the articles by Sir Oliver Lodge? They are the most easily understood technical articles I have read.

Congratulations, too, on giving us a new line in humorous stuff. I refer to "The Search of A. J. Alan," by S. Howard Jones. This article must be an exaggeration, but it is most amusing. Give us some more, please.

Very truly yours,

J. J. HEMMINGS.

S.W.G.

PICKING PROGRAMMES WITH "MAGIC."

The Editor, POPULAR WIRELESS.

Dear Sir,—My results with the "Magic" Three, built about four months ago, may be of interest. In the first place, I had better state that I have experimented in wireless for the past twenty-five years, and I consider the "Magic" Three quite exceptionally good. The components are as specified in "P.W." and the lay-out only slightly altered to get the tuning dial control and the wiring arranged so that a d.p. switch will put the small neozodyne condenser and the '0005 fixed condenser in circuit for S.W., which saves moving the aerial to the second A terminal, etc.

The jack for gramophone pick-up is fitted to a small "table" alongside the first transformer which saves long leads to panel. I've made a mains H.T. eliminator and use Mullard P.M.4D.X., P.M.3, and P.M.251 valves. On the medium band I got forty to fifty stations L.S. strength; but I haven't bothered to actually count them, as I usually just turn the dial until I pick up some station which is giving a bright musical programme. 2 L O's and 5 G B's programmes are usually so dull and ponderous that I seldom listen to them.

Among the many stations picked up on S.W., 7 L O is sometimes strong enough to work two loud speakers, and so is W 2 X A T. Sydney on 30.5 m. and Melbourne are apparently on experimental work, and came in very loud L.S. strength (time, 4-5 p.m.); Perth (6 W F), announced as Frederick Williams, I picked up about 1.30 p.m. recently—very strong—on about 40 m. (In view of your remarks, page 1230, "P.W." 1/3/30, on Perth, this is interesting). I picked up the "Majestic" one Thursday evening working on about 33 m. with G K A (who is G K A?). It works on 67 m. when nearing Southampton. Of course, Zeesem and Hilversum come in very strong. I use a Broekmans Receptor when working on broadcast band. Aerial 80 ft., 30 ft. high.

Yours truly,

Farnham Common, Bucks.

G. M. T.

CONDITIONS, though steadily improving, continue to be very variable indeed, and we have now reached the stage of the spring when one never knows quite who is going to be heard from day to day. The few mornings before writing these notes the Antipodes have been coming through wonderfully well; last night South America was as good as I have ever heard it; and yet this morning there is not a single Australian or New Zealander to be found anywhere!

I am indebted to a Bournemouth correspondent for some interesting details of his experiences on short waves recently. He says, "Sydney on 28 metres comes to search for you nowadays, goes on for hours and covers a degree or two on the dial, wants re-tuning for 'phone comfort at times." And this with the "P.W." "Short-Wave" Two! Conditions have not been like that in London for a very long time. He finds the best times for Australia from 15.00 to 22.00 G.M.T.

Some Interesting Points.

I am answering one or two of his questions in print as they appear to be of general interest and will probably help out someone else at the same time. For 160-metre work, on a set like the "Short-Wave" Two, a good arrangement of coils is aerial 25, grid coil 30 or 35, reaction 25. With regard to calibrating sets from 5 S W, this is certainly not easy if that gentleman is hardly ever audible, as is the case in many parts of the country. In that case follow the recent remarks in "P.W." on the subject, but use

SHORT-WAVE NOTES.

By W. L. S.

Berlin or 3 R O or some station that is of known wave-length and does come in well.

Regarding U.S.A. broadcasting stations, my Bournemouth reader finds that while U.S.A. amateurs are quite strong, the broadcast is quite the reverse nowadays. I certainly do not find this of the group round about 49 metres, although some of the stations on shorter wave-lengths have been nothing to write home about just lately.

The broadcasting stations below 20 metres certainly seem rather erratic compared with last year, although at times they come over at immense strength for a short period. Probably later in the year there will be a complete change.

Three or four readers have written reporting the re-broadcast from W 2 X A D of the liner "Europa" arriving in New York harbour at about 14.00 G.M.T. Others mention V K 2 M E Sydney relaying 5 S W on frequent occasions. There is a large crop of correspondence about the "Majestic" and the "Olympic" about which very little can be said, for none of the reports agree with each other.

Two readers say definitely that G 2 G N is the "Olympic's" call-sign, although previously several people heard the "Olympic" working with G 2 G N! Yet another correspondent heard a male voice on 25 metres calling the "Leviathan." Does anyone else know anything about this?

Quite a stir was created in my neighbourhood recently by an amateur transmitter using fairly high power and re-broadcasting the National programme on 21 metres!

What the short-wavers round about thought they had found I have no idea, but the broadcast listeners within a hundred yards who were listening to the Regional and boasting about their selective receivers were, I gather, rather shocked to hear the National coming in at almost equal strength all round their dials.

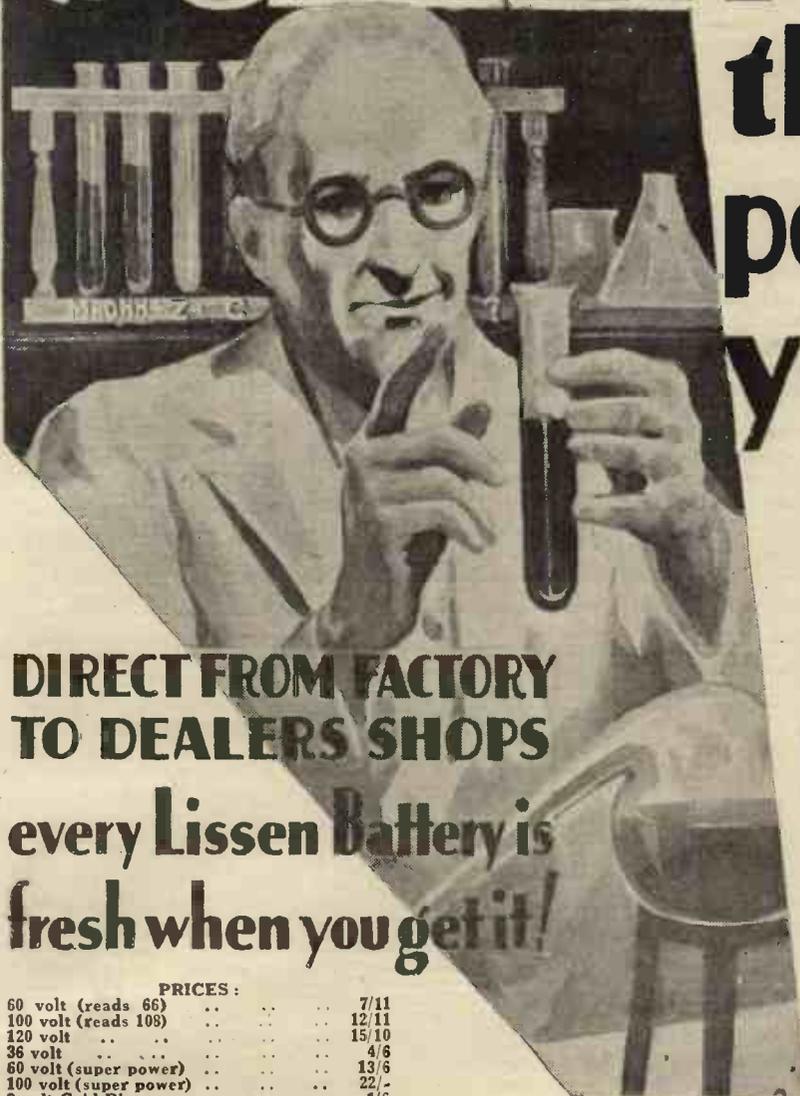
"Nearly a Riot."

Then when he added insult to injury and put his microphone in circuit immediately in front of a large alarm-clock there was nearly a riot. All's well that ends well, though, and I think they are all friends again now! The number of amateurs following the example of the Americans and using telephony on the 20-metre band is now fairly large. Unfortunately, the quality on the whole is not too good.

With our narrow bands it is rather a problem if we are going to be filled up with bad, frequency-modulated telephony stations. Amateurs should make it a rule not to use telephony unless they have a crystal-controlled transmitter.

The SECRET PROCESS

that puts power into your set!



DIRECT FROM FACTORY TO DEALERS SHOPS
every Lissen Battery is fresh when you get it!

There is a secret process and a new chemical combination used only in the Lissen Battery which puts new power into your radio set. It gives to your reproduction of dance music a new liveliness, makes speech distinct, song clear and true.

The current of a Lissen Battery flows smoothly, steadily, sustainedly throughout the longest programme. The large cells have a great oxygen content which gives the battery long life and produces all the time pure power, with never a trace of ripple in it, never a sign of hum.

You want pure power for your radio; any good wireless dealer will supply you with the Lissen Battery that will give it to you.



MADE IN ENGLAND.

PRICES:

60 volt (reads 66)	7/11
100 volt (reads 108)	12/11
120 volt	15/10
36 volt	4/6
60 volt (super power)	13/6
100 volt (super power)	22/-
9 volt Grid Bias	1/6
4 1/2 volt Pocket Battery .. 5d. each; 4/6 doz.	
Single Cell Torch Battery	4 1/2d.

LISSEN LIMITED,
WORPLE RD., ISLEWORTH, MIDDLESEX
Factories also at Richmond (Surrey) and Edmonton
(Managing Director: T. N. COLE)



THIS is not exactly a "modernised" version of the original "Magic" Four design: the set was far too good to be out of date so soon. What it really represents is a response to many requests for something in the nature of a "De Luxe" version, with the addition of certain special refinements.

As a matter of fact, we should have found it very difficult to produce anything more "modern" in the strict sense of the word than the original form of the design.

Possibly the reader may be tempted to inquire about the inclusion of wave-change switching: the trouble here is that one of the special features of the set is that it will work efficiently on short waves, and this would have to be sacrificed if wave-change switching were introduced.

Fortunately our readers have been sufficiently interested in the original design to tell us what they would like in a "de luxe" version to make it their ideal of a truly refined and "last word" outfit, and we have given all their suggestions careful thought.

Of course, we could not embody every one of them in any single set, because it would have become far too elaborate to be practical, but we have made what we think will be found a good selection of them.

Really Outstanding Performance.

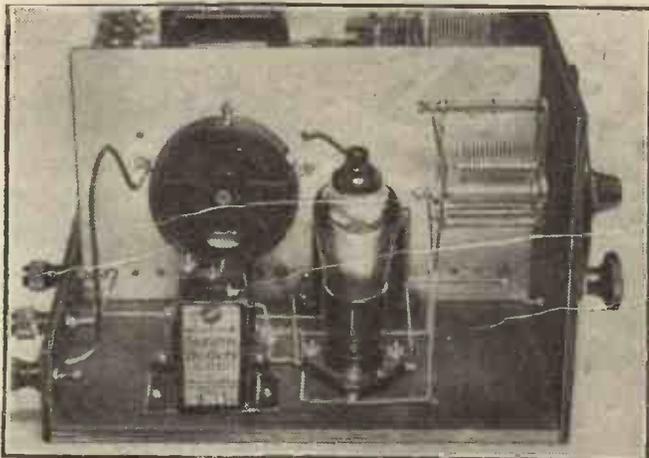
At the same time we have taken the opportunity of working over the design once again in every detail, and effecting certain little modifications of our own to make the new design into a coherent whole.

The result has proved to be an exceptionally fine receiver, with the remarkable performance of the original fully maintained and many special refinements of its own.

Its standard of selectivity is far above the normal standard for only one H.F. stage, and is indeed well up to the level required under "regional" conditions. At all distances from perhaps five miles upwards the set should deal comparatively easily with the Brookmans Park transmissions, and that is saying a great deal, you know.

A set that will cut them out with any ease at that distance would deal with an ordinary main broadcasting station at something like half a mile with equal facility.

SIMPLE STATION SELECTION.



This is the H.F. end of this wonderful "Magic" set, showing the S.G. valve. With the assistance of this the set becomes a wonderful D.X. proposition, and pulls in plenty of programmes with remarkable ease.

Besides giving you this very exceptional selectivity, the set has a tremendous reserve of power which makes it a most impressive outfit for long-distance work. This great sensitivity comes partly from the use of a screened grid valve in the H.F. stage, and partly from the exceptional power of the L.F. amplifying arrangements. This last, of course, is a special feature of the "Magic" Three also, and is undoubtedly one of the secrets of the success of that amazingly popular set.

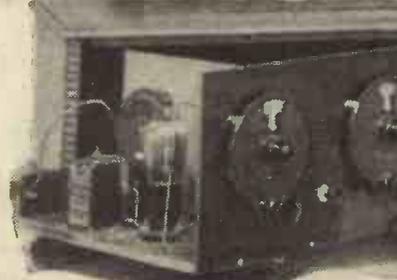
How Selectivity is Obtained.

Before we start upon the features of this year's model let us just run briefly over the main ideas of the "Magic" Four design for the benefit of those new readers who may not have seen the original version.

Well, the underlying idea of the receiver is quite simple: the H.F. stage is arranged to give a very high degree of selectivity, and only a moderate proportion of the total magnification which it would be possible to extract from the S.G. valve if selectivity were disregarded.

The result is that the detector receives and passes on to the L.F. valves a signal of only moderate strength, but one which is exceptionally clean and free from background noises and interference. Arriving

**THIS YEAR
"MAGIC"**



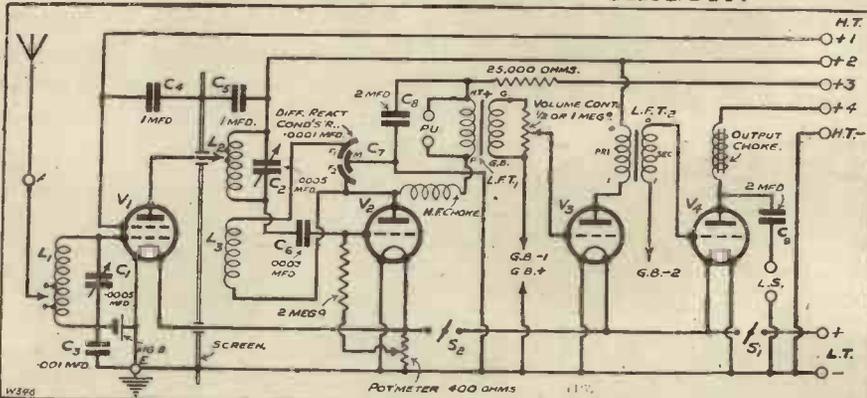
output filter for the last valve, and a carefully planned layout.

To go into details a little, you will

No more than the "P.W." success through any preceding design member of the new range. There is little the range of a se

THE "P.W." RE

SENSITIVE AND SELECTIVE CIRCUIT.



Special reaction and H.F. circuit arrangements provide This Year's "Magic" Four with astonishing virility.

in the L.F. circuits this signal undergoes a process of extra powerful amplification, and is built up to the tremendous volume characteristic of "Magic" sets.

Where the power of the L.F. side comes from you see in a moment when you look at the circuit diagram. Transformer coupling is used in both the L.F. stages in the modern fashion, with careful provision to prevent howling or any other form of instability.

This is chiefly a matter of the use of a properly arranged anti-battery coupling filter in the detector H.T. lead, an

THE PARTS

- 1 Panel 21 in. x 7 in. (Goltone, or Paxolin, Keystone, Trollite, etc.)
- 1 Cabinet to fit, with baseboard 10 in. deep (Camco, or Pickett, etc.)
- 2 .0005-mfd. variable condensers (Ready Radio, or Lissen, Lotus, Polar, J.B., Burton, Dubilier, Igranic, Ormond, Utility, etc.)
- 2 Vernier dials, if condensers not of slow-motion type (Igranic, or Lissen, Burton, Lotus, Utility, etc.)
- 1 .0001-, .00013-, .00015-, or .0002-mfd. differential reaction condenser (Ormond, or Lotus, Lissen, Polar, Burton, Formo, Dubilier, Keystone, Utility, Ready Radio, Magnum, etc.)
- 2 On-off switches (Lissen, or Benjamin, Lotus, Wearite, Bulgin, Keystone, Igranic, etc.)
- 1 1/2- or 1-meg. volume control, 3-terminal type (Varley, or Igranic, R.I., Wearite, Gambrell, etc.)
- 2 Small Clix
- 4 Springs
- or
- For
- 3 Coils
- We
- 2 1-m
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- 2 2-m
- T.C.
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A REAL LONG-DISTAN



Popular series of sets has ever been produced. "Magic Four" And they have achieved their combining higher proportions of ease of construction, simplicity, power and selectivity than any other. This Year's "Magic" Four is the senior design and it really is a most effective instrument. It is the World's ether that is out of this. Designed and Described by SEARCH AND CONSTRUCTION DEPT.

observe that the H.F. stage is arranged to use plug-in coils, so that by substituting the appropriate small sizes you can receive short-wave stations.

The aerial and grid circuit is made up with an X coil, the aerial tapings

on this giving you two alternative adjustments of selectivity.

The H.F. inter-valve coupling uses another X coil (L_2) to give a form of tapped tuned anode. This part of the circuit is arranged so that only the "X" portion of the coil is included in the anode circuit of the S.G. valve, thus giving the comparatively weak coupling desirable for good selectivity. In this detail the set differs slightly from the original version, in which a form of parallel feed was used. Electrically, however, there is no essential difference. The tapings on the coil again give a control of selectivity, and also affect the volume, so be sure to try the flex lead from the anode of the S.G. valve on each in turn.

The Special Features.

Reaction of the latest differential type is provided upon this anode circuit by means of the coil L_3 . This gives you the high sensitivity and delightful ease of control characteristic of the system, with its special feature of absence of any effect upon the tuning.

The rest of the main features of the circuit the reader will no doubt be able to follow quite easily for himself, so now we can go on to consider some of the special details.

One of these, namely, the different arrangement of the H.F. coupling circuits,

this part of the design we have spent a good deal of time.

The final scheme possesses several valuable advantages, notably these:—only two valves are required for gramophone work, yet ample volume is given, the unused valves are switched off, so saving current, and it is possible to superimpose radio reception on the gramophone reproduction, and so find out whether some particular part of the programme which it is desired to hear has commenced. Finally, the volume control governs the strength of both radio and gramophone reproduction.

This is all arranged very simply by providing first a couple of small sockets on the panel in which plugs on the ends of the twin pick-up leads are inserted when it is desired to use the gramophone.

These are wired across the primary of the first L.F. transformer, and so feed the output of the pick-up into the L.F. circuits. A separate L.T. switch for the detector and H.F. valve is provided to turn these off while the pick-up is in use.

To hear what is going on at the broadcasting station all you have to do is to turn on this switch, whereupon the radio programme will come through at reduced volume. To hear it properly, of course, all you have to do is just to pull the pick-up plugs out of their sockets.

Working The Set.

Space is running short, so let us now give you some condensed working data. Valves: one S.G., one H.F. type for the detector, one L.F. for V_3 , and a power or super-power for V_4 . Coil sizes: No. 60 x for L_1 , ditto for L_2 , No. 50 or 60 plain for L_3 .

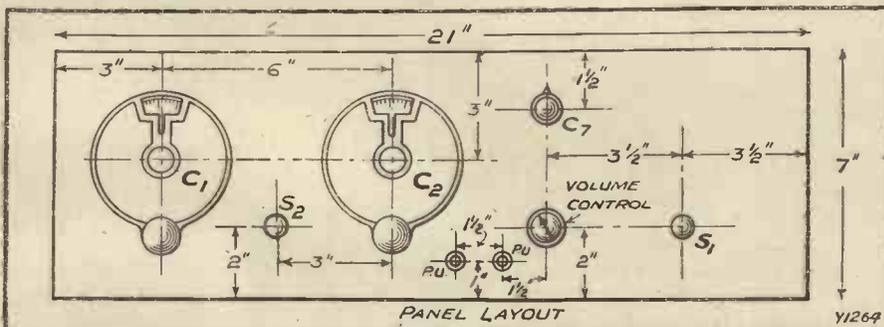
For the long waves, No. 250x for L_1 and L_2 , 75 or 100 for L_3 . For 20 to 45 metres, No. 4 in L_1 and L_2 , No. 6 for L_3 . Working voltages: H.T. +1, 60 to 80 volts; H.T. +2, 120 volts (not less); H.T. +3, about 60 volts; H.T. +4, 120 volts or more if you have it.

Now adjust the potentiometer for the smoothest control of reaction, and you are ready to start searching for the foreigners.

Now let us use the small space remaining for some miscellaneous notes on short-wave matters and other practical points. First, about the grid bias on the H.F. valve; you will see that we fitted a single 1½-volt cell into the original set, and this is suitable for

(Continued on next page.)

HOW YOU PREPARE THE PANEL.



Here the position of the holes you have to drill in the ebonite panel are clearly shown.

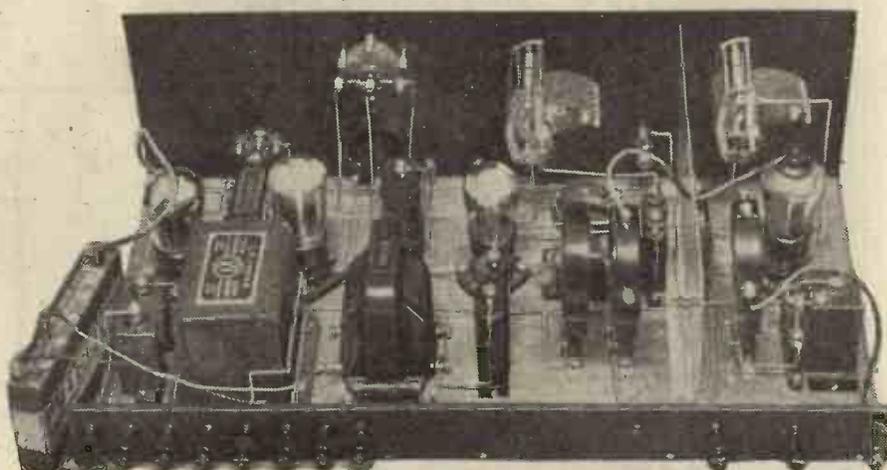
You will find it well worth while studying the theoretical circuit and other illustrations of this set, even if you do not intend immediately to build it. Its design is full of interest, and as it will probably hold its own for a very long time against all comers, you should at least carefully preserve this copy of "P.W."—you might find it invaluable at some future date.

WHAT YOU WILL NEED.

- 1 200-ohm potentiometer (Wearite, Ready Radio, etc.).
- 1 Reg. grid lead and holder (Dubilier, or Ediswan, Lissen, Igranic, Mullard, Graham-Farish.)
- 1 3-mfd. fixed condenser (T.C.C., Goltone, Dubilier, Lissen, Mullard, Igranic, Darke, etc.).
- 1 10-mfd. fixed condenser (T.C.C., Lissen, etc.).
- 1 200-ohm potentiometer (Wearite, Ready Radio, etc.).
- 1 11 Terminals (Belling and Lee, or Burton, Eelex, Clix, Igranic, etc.).
- 1 Wire, screws, flex, G.B. plugs, etc., or Keystone "Konecterkit."
- 1 Standard "P.W." screen, 10 in. x 6 in. (Ready Radio, Paroussil, Keystone, Wearite, etc.).
- 1 25,000 or 20,000-ohm resistance and holder (Ready Radio, or Lissen, Varley, Ferranti, R.I., Igranic, Mullard, Dubilier, etc.).
- 1 Output filter; L.F. choke (R.I., or Wearite, Varley, Ferranti, Bulgin, etc.).
- 1 H.F. choke (Leweos, or Lissen, Dubilier, R.I., Lotus, Varley, Ready Radio, Bulgin, Keystone, Wearite, etc.).
- 1 Low-ratio L.F. transformers (Lissen 2½:1 and Igranic Type J 3:1, or Ferranti, Varley, Telsen, R.I., Mullard, Lotus, etc.).
- 1 200-ohm potentiometer (Wearite, Ready Radio, etc.).
- 1 3-mfd. fixed condenser (T.C.C., Goltone, Dubilier, Lissen, Mullard, Igranic, Darke, etc.).
- 1 10-mfd. fixed condenser (T.C.C., Lissen, etc.).
- 1 200-ohm potentiometer (Wearite, Ready Radio, etc.).
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- 1 200-ohm potentiometer (Wearite, Ready Radio, etc.).
- 1 11 Terminals (Belling and Lee, or Burton, Eelex, Clix, Igranic, etc.).
- 1 Wire, screws, flex, G.B. plugs, etc., or Keystone "Konecterkit."

we have already mentioned. The main points raised by our readers have concerned the use of a gramophone pick-up, and on

MUSIC FROM MANY LANDS.



The layout of components arrived at makes the set delightfully easy to assemble, although an extraordinarily high degree of efficiency has been achieved. Note the very simple but most effective screening.

CELESTIAL LOUDSPEAKER SET

**THIS YEAR'S
"MAGIC" FOUR.**

(Continued from previous page.)

very many of the types of S.G. valves current to-day.

Adjusting H.F. Grid Bias.

Some S.G.'s, however, will take a little more, say 3 volts, and it is advisable to experiment a trifle. Try to find out how much bias you can give your particular valve without impairing quality or volume on either weak or strong signals. The more you give it the less H.T. current will it consume.

Finally, just a few short-wave tips. Tuning on the lower waves you will find very much easier than you might expect, because only the right-hand dial is critical. The other is quite broad, and you can leave it alone for a good deal of the time, just

using it to bring up strength when a station has been found on the right-hand dial with the aid of reaction.

The flex leads to the tapings on the coils, by the way, should carry clips for short-wave work, and each should go to a turn near the middle of the respective coils.

By shifting these clips you can control the aerial coupling (on L_1) and the interval coupling (on L_2), and it is worth trying both adjustments when you are endeavouring to receive a rather weak station, in order to make sure you have secured the best couplings.

Before we forget, let us just pass on the usual tip regarding the use of tapping clips on these bare wire short-wave coils. It is most important that the clip should not touch more than one turn, because if it touches two or more it short circuits part of the coil, with disastrous effects on the signals.

To prevent this from happening it is a good plan to bend the selected turn outwards a little so as to space it out from its

neighbours. This will not impair the efficiency of your coils in any way.

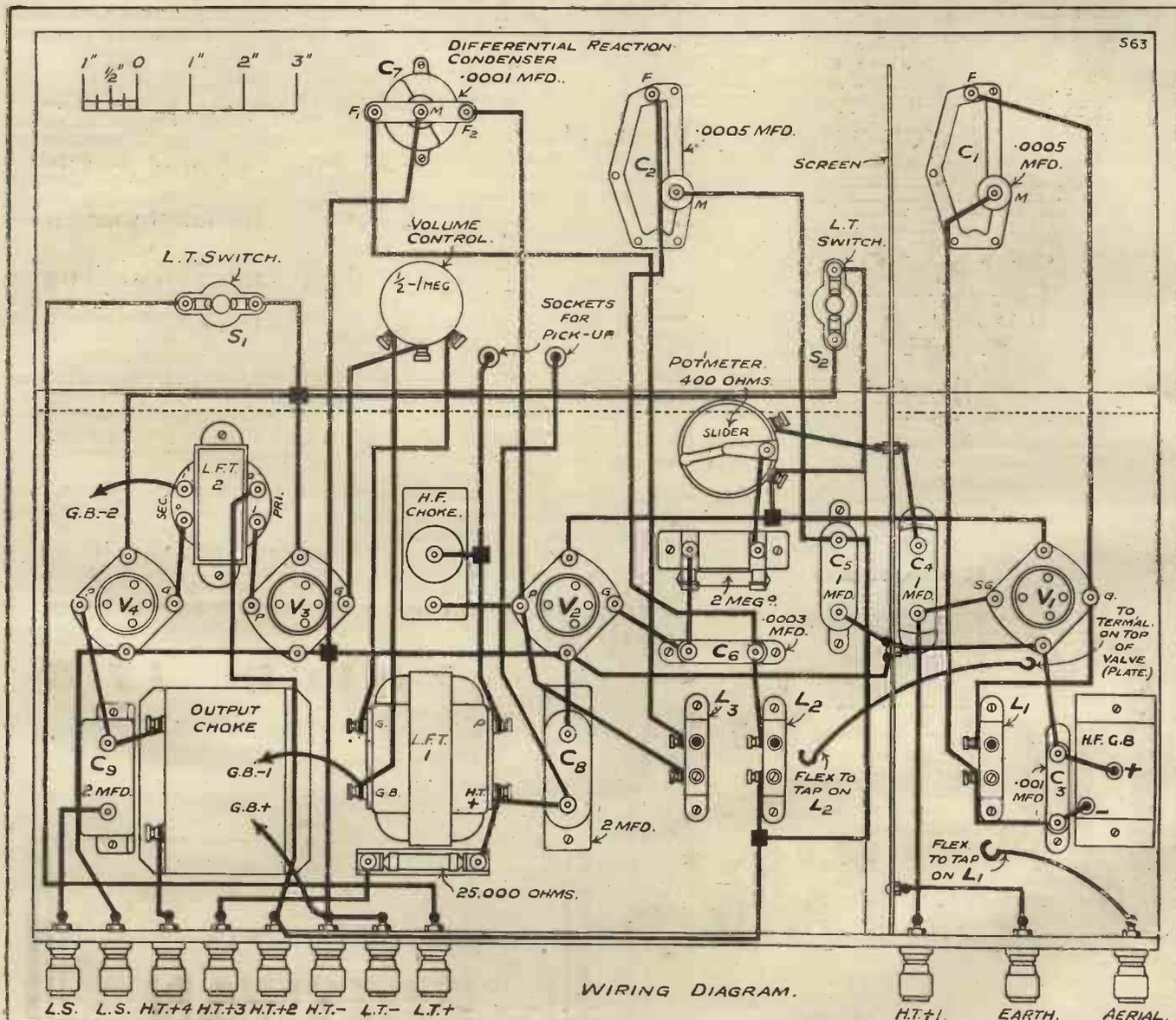
Of course, the clips can be left on the tapping leads for general work, because they serve perfectly well for making connection to the tapping points on the ordinary broadcast coils.

The coil sizes for the other short-wave ranges are just the usual ones, i.e., for 30 to 60 metres, No. 6's for L_1 and L_2 , and a No. 4 or No. 9 for L_3 . For waves from 60 metres or thereabouts upwards, use No. 9's for L_1 and L_2 , and a No. 6 or 9 for L_3 .

Easier Short-Wave Tuning.

Here is a hint for those who want the very last word in ease of operation on the short waves. The condenser C_2 is pretty critical on low waves, and a smaller effective capacity, obtained by means of a .0003 mfd. fixed condenser in series in the lead to the fixed vanes, is a possible refinement, with a device for shorting it out for broadcast work. This is probably only worth while for those who are particularly keen on short-wave reception.

A GOOD SET DESERVES CAREFUL WIRING.



Take as much care with the back-of-panel work as you do with the front panel, for it is more important electrically, and in any case a receiver like this deserves a little time spent on it in doing the wiring neatly.

COMPLETE FREEDOM FROM HUM WITH THE A.C./P.1.



COMPARE
THESE FIGURES
WITH THOSE
OF OTHER
POWER VALVES.

	A.C./P.1. Super Power.
Filament Volts	4.0
Filament Amps	1.0
Anode Volts	200
Mutual Conductance	2.5
Amplification Factor	5
Impedance	2,000

The latest Mazda indirectly heated Power Valve is the A.C./P.1. It combines a very high power handling capacity with great sensitivity, and in addition the use of the famous Mazda indirectly heated cathode ensures complete freedom from hum when this valve is used.

The Amazing

MAZDA

ALL MAINS
VALVES

PRICE 17/6



THE EDISON SWAN ELECTRIC CO., LTD.
Radio Division,
1a, Newman Street, Oxford Street, W.1.
Showrooms in all the Principal Towns.

EDISWAN

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

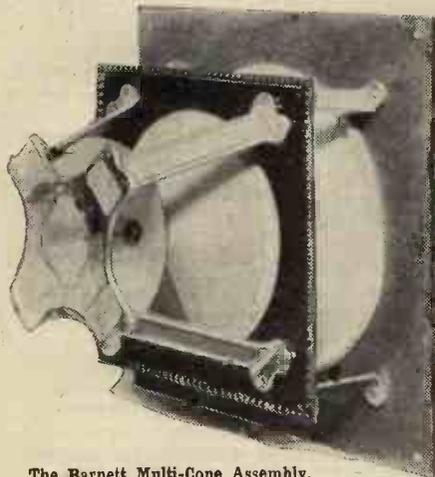
Tested and Found-?



A TRIPLE CONE AND CHASSIS.

M. BARNETT, of North Street, Barking, recently sent us one of his multiple-cone speaker outfits which retails at 27s. 6d. The device comprises three cones of different sizes fixed to the one spindle, the whole being artistically mounted in a chassis.

The fitting of a loud-speaker unit is a simple business, and such gives you a



The Barnett Multi-Cone Assembly.

complete loud speaker of unusual design. The smallest cone, which is there presumably to handle the high notes, is arranged so that it is directional towards the back of the assembly. However, the arrangement does give good results, despite the abnormal mass locked to the driving spindle. With a unit of average price, the complete cost of the outfit is round about the £2 10s. mark, and bearing this in mind one has to admit that it is an unusually interesting proposition.

TONEX H.F. CHOKE.

Nowadays H.F. chokes are called upon to do more important jobs than they were in earlier radio days. For instance, a common method of coupling a screened-grid valve is to use an H.F. choke. An H.F. choke does not have to be very bad as judged by the standards which existed a year or two ago, to fail miserably in such a position.

One of the main requirements of a good H.F. choke is that it shall not have a natural wave-length within the working wave-band of the set in which it is to be used.

I find that the Tonex H.F. choke sent me for test by the Tonex Co., of Blackpool, Lancs., has a natural wave-length of approximately 1,900 metres. From that point downwards to the low waves the choke is quite efficient.

Now 1,900 metres is not high as a point for an H.F. choke to "peak" at, and you can sweep past such a point and go a good bit above it with a 250 coil in a closed circuit position, using a .0005-mfd. condenser, and at such a point with this choke the set might howl loudly.

Nevertheless, it must not be forgotten that this Tonex H.F. choke costs only 4s. 6d., and also that it is well made and is a clean-looking component. You will find it quite satisfactory as a universal choke for the reception of stations up to 1,800 metres. That takes in 5 X X, Radio-Paris, and other such broadcasters.

THE OSRAM G.E.C. BULLETIN.

The recent issue of this journal, which is published by the General Electric Co., Ltd., contains details of the new Osram 4-volt power valve, and a number of articles on domestic electricity of a general character.

"BLUE SPOT" PICK-UP.

The "Blue Spot 88" Pick-up originates from the same quarter as the famous "Blue Spot" loud-speaker unit. This in itself is a goodly measure of guarantee that the device is sound. But, in my opinion, it is all that and a bit more.

The designers of this Blue Spot pick-up have not left off at getting good results, but have gone on to make the operation of the pick-up as easy as possible.

I must explain that the pick-up is supplied fitted to a carrier, and the template and full details that are provided make the mounting of the device on the gramophone platform a simple, straightforward job.

Now, this is the point I particularly like.

To change the needle the pick-up itself can be rotated 180 degrees, and simultaneously the carrier-arm is raised so that the pick-up swings clear of the turntable. This not only facilitates the changing of the record, but prevents this from being damaged through the pick-up inadvertently being dropped on it when needle changing. It is a most excellent scheme and, as far

as I know, is unique to the Blue Spot. The Blue Spot is offset and gives nearly perfect tracking. The carrier-arm is mounted on ball bearings and swings with complete freedom and without the slightest play to induce chatter on heavy passages. An efficient volume control is built in, and all the connections through the system, which terminate in the actual flexible lead for connection to the set, are concealed and efficiently arranged.

The Blue Spot pick-up is very sensitive and two valves are adequate for providing the volume needed in ordinary circumstances.

WHEN YOU ARE BUYING—

10. AN L.F. CHOKE.

Make sure that it is the right choke for the job you have in mind. L.F. chokes vary a very great deal in their specifications.

There are L.F. chokes designed for intervalve coupling which are not suitable as output chokes owing to their comparatively high resistances and low current carrying capabilities.

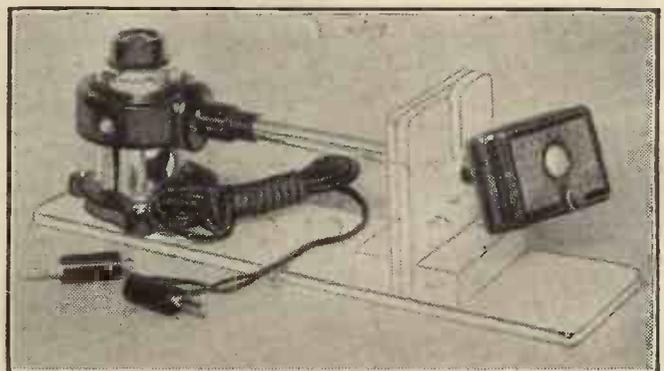
An L.F. choke used in an output arrangement needs to have a high inductance (when carrying fairly heavy currents) and a low ohmic resistance.

L.F. chokes used in mains units must be specially designed to carry the heavy currents used in these devices. "Small" chokes so used might get hot and would give quite inadequate smoothing.

With three valves, the volume control has seriously to be brought into operation and this reminds me of another good point, and that is that the volume control gives a fine gradation. There are no flat spots throughout the adjustment.

As one would expect from a Blue Spot product the reproduction is bright and clean and there is much better bass than in the average. I tested the Blue Spot against some of those earlier pick-ups, pick-ups which were considered to be in the first rank only a year or so ago.

The comparison was almost startling. It was almost as bad as switching from a horn loud speaker to a moving coil. Yet I know, with regret, that some of those earlier pick-ups are still sold. It is things like those that give the radio-gram a bad name.



The "Blue Spot" Pick-up is provided with a wooden "cradle" mounting to ensure safe travelling.



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 care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent 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 specialities described may be the subject 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.

RE-WINDING A SIX-PIN COIL.

G. E. E. (Marlow, Bucks).—"The circuit requires a coil of the type called Reinartz transformer, and, as I have not one of these, I wondered if a split secondary coil would do.

"P.W." TECHNICAL QUERY DEPARTMENT

How's the Set Going Now?

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

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

Full details, including 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 free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

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

The connections appear to be very much the same, but it looks to me as though the reaction winding was too big if used in this way.

"Would it be possible to make a Reinartz transformer of this, and, if so, what are the alterations necessary for the ordinary and the long 5 X X wave?"

The arrangement of the windings, connections, etc., is the same as the split secondary, but in the case of the S.S. coil there is usually a primary of 20 turns and a secondary consisting of two sections of 65 turns each, making a total of 130 turns. In the Reinartz transformer type of coil, instead of the two sections being 65 and 65 respectively, the lower section consists of only 25 turns, and is used for the reaction winding.

The same wire and the same spacing can be used, so that to change over all that is necessary is to take 40 turns off the present coil. On the long waves, the S.S. coil's primary usually consists of 75 turns, with a 450-turn secondary tapped in the middle, making two sections of 225 turns each.

For the Reinartz transformer one-half of the secondary will give too many reaction turns, and so about half of the lower section can be taken off, leaving a reaction winding for the 5 X X coil of about 100 turns.

IMPROVING THE SELECTIVITY.

G. M. W. (Crawley, Sussex).—"The only information I could get about improving selectivity was that 'the aerial should be inductively coupled to the grid circuit by means of a separate coil.' What does this mean? What have I got to do to the set to make the tuning sharper? (I have plenty of plug-in coils.)"

You will need to mount another coil holder on the baseboard beside the existing aerial coil holder. Place it right up close, so that the coils are practically touching when in position.

Then from one of the terminals on the new coil holder, take a wire to a new terminal on your panel or on the terminal strip and label this "aerial terminal." The other side of the new coil holder must now be connected to earth—that is to say, either to the earth terminal itself or to the nearest point connected to earth, probably the earthed side of the existing coil holder.

Now all that you have to do is to transfer the aerial lead from the old terminal to the new one and plug another coil in the new coil holder.

The selectivity of the set will partly depend upon the size (number of turns) of the coil placed in the new holder, and in general the smaller this is the sharper the tuning, whilst the larger, the louder the signals. What you must do is to arrive at a satisfactory compromise which gives good strength combined with the necessary sharpness and selectivity.

Your old aerial coil holder now becomes the secondary coil holder, and for the secondary coil you will need a No. 60 or 75-turn coil for the ordinary broadcast band and a No. 200 or 250 for Daventry 5 X X.

In the new coil holder a No. 25, 35 or 50 coil will be needed for the medium band, the 25 giving the greatest selectivity and the 50 the greatest strength. For the long waves (Daventry, 5 X X, etc.) the new coil holder will require a No. 75 or 100-turn coil.

"GENERAL DEBILITY."

L. H. D. (Westerham, Kent).—"My set seems to be getting weaker and weaker. What is the cause of that?"

You do not give us much assistance, do you, L. H. D.? Nobody hates red tape and unnecessary formality more than "P.W.," but, on the other hand, wireless faults can be very puzzling even when the set is carefully examined, so that it is almost impossible to diagnose the trouble unless we are furnished with a few particulars.

You would not expect a doctor to cure you of an illness if you simply called him on the phone and said, "I am not feeling so well to-day—what do you recommend?" Would you?

He would want to know the symptoms—how you differed from normal, whether you had been suffering from any undue strain lately, and all sorts of similar data that might be affecting the trouble. In the same way we want to know whether you are using valves or a crystal, batteries or the mains, an indoor or outdoor aerial, and any other information bearing on the trouble.

To help readers as far as possible we have prepared a proper form on which queries should be asked, and

if this is filled in correctly we have something to go on. If no such details are given we can only indicate the probable cause of the trouble; but, as many faults show the same symptoms, it may take you some time to decide which particular fault is causing your trouble.

In your own case, for instance, as reported above, the cause of the fault may be a loose or corroded contact in the earth or aerial wires, or imperfect connection inside the set. This applies equally to a valve or to a crystal set.

Dirt or soot on the outdoor insulators or the lead-in tube will also give rise to these symptoms; and, if it is a valve set, a similar effect will result if the H.T. battery is running down. Yet another cause is imperfect insulation across the sockets of a valve holder or valve legs, sometimes caused by dust or grease; and, even if the insulation is O.K., the valve filaments may be overrun and losing emission.

If telephones are used it is possible that rust has formed inside the telephone diaphragm, which would result in insensitivity; but if, on the other hand, you employ a loud speaker, its magnetic or mechanical efficiency may have been impaired, and thus be leading you to blame the set.

These are by no means the only possible causes of the trouble, but they are the most likely ones, and in the absence of particulars of your set, we suggest that you carry out a careful inspection bearing all these possibilities in mind.

If this fails to reveal the trouble we will gladly try to help you further, but you must do your share and send us a few particulars bearing on the results if we are to be enabled to localise the trouble for you.

HOT STUFF!

H. F. (Chesterford).—"As soon as I switched on the loud speaker there started a concert at good strength—and, highly delighted, I tried to tune it a bit further. My ear drums have not yet recovered from the shock!"

"The punch was simply enormous, and yet every instrument could be heard as clear as a bell. Honestly, I do not believe there ever was such a set. The only thing that is troubling me is that the P.625 A seems to get pretty hot."

"None of the other valves are more than slightly warm after several hours' running, but I can always feel the heat of the last valve, and I am wondering whether this is anything to worry about?"

With a large valve of the type that you are now using, capable of handling plenty of power, it is only to be expected that a certain amount of heat will be developed, so that this and similar types of valves

WHAT DO YOU THINK ABOUT THIS?

A reader of "P.W.," who lived in Harley Street, London, W., was greatly troubled by "an intense roar," which completely blotted out his reception during morning and afternoon programmes.

It was so loud and unpleasant that the set had to be shut down immediately it started, but it never lasted longer than ten minutes or so, and it never appeared after about seven p.m.!

If you had been in his shoes, would you have known

WHAT WAS WRONG?

N.B.—There is no prize for answering this but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

The Burnley reader's trouble with the loud speaker, described last week, was found to be due to a small nut on the cone drive having become loose owing to vibration.

will generally be found to be quite warm after a long run. Usually, however, it is only a question of getting warm, and not hot.

If a valve gets really hot, or its quality seems to be below par, it may be that the high power developed is being obtained at too costly a price, and that the valve is being "softened." This never happens in the ordinary way if you are careful to give the correct H.T. and grid bias; and, in any case, you can test a valve if you have a milliammeter, by joining this in its plate circuit.

(Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

This will give you the milliamps flowing; and then, if you compare this figure with that given by the makers in their valve curve (which shows the grid bias and H.T. voltages, and normal anode current corresponding to these), you can ascertain if the valve performance is normal or otherwise.

If the amount of plate current is in accordance with the maker's figures, you can be pretty sure that the valve is O.K., even although it perceptibly warms up quite a lot in action.

THAT TWIN REJECTOR.

H. T. W. (Handsworth).—"I must have details of the 'P.W.' 'Twin Rejector'!"

This was described in "P.W." No. 407, March 22nd issue. If you have any difficulty in obtaining a copy from your newsagent you can apply direct to the publishers: The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. The price is 4d. per copy, post free.

WHAT IS THE USE OF SHIELDING?

"CAPT. COOK" (Devonshire).—"After being abroad for two and a half years, I come back to find that wireless has gone ahead in an amazing fashion, and what little knowledge I had of it is all out of date.

"One thing which puzzles me very much is the fact that nearly all the sets use shields, which have become so commonplace that no explanation is offered as to why they are there. It may be silly to ask, but what is the good of shielding?"

The purpose of shielding is two-fold. In the first place, it protects a set from direct pick-up of a station to which it is not tuned, and so assists selectivity.

You may have noticed that, under certain conditions, it is possible to disconnect the aerial and earth wires from a set and yet to receive programmes from a powerful local station. The reason for this is that the coils, wiring, etc., are acting as an aerial, and you are getting direct pick-up on these, instead of reception via the aerial in the normal way.

Naturally, if a station is able to "break through" in this way, the set's selectivity or powers of excluding the local station will suffer, and one use of shielding is to prevent this.

When the coils are enclosed in metal screens they will be quite unaffected by stray interference of this kind and will respond only to impulses which are passed on to them through the correct coupling.

The other use of shielding is to "protect" one circuit from another in the same receiver.

Just as impulses from a broadcasting station can cross the intervening distance and disturb reception, so will the electro-magnetic effects of one valve circuit reach out and affect a neighbouring circuit, and thus upset the normal cumulative effect of the receiver's action, unless the circuits are so far separated that this

is impossible, or are screened by metal which effectively separates circuits in close proximity to one another.

The modern radio receiver is so much more sensitive than its predecessor, and in particular the amplification of valves has advanced so far that this trouble of interaction between different stages is now much more prevalent than formerly. This, no doubt, explains the reason why you noticed how commonly screens are now used.

H.F. STOPPER AND SECONDARY CONNECTIONS.

W. P. F. (Hillingdon).—"In order to cure a slight hum, I have been recommended to reverse the secondary terminals of my low-frequency transformer.

"One of these is connected to a grid-bias negative, and the other one not to grid but to a ½-megohm leak. The other side of this leak goes to grid, and I am wondering whether it is better to undo this when changing over the secondary terminals, or to transfer the present grid connection to I.S. and the present grid-bias negative lead to the resistance or to the O.S. terminal?"

The purpose of the extra resistance is to prevent unwanted feed back to the grid of the valve, so the resistance must be left connected to the grid of the valve at one end, and only the actual secondary winding connection reversed.

Thus the final connections will be grid of the valve to the resistance, other side of the resistance to I.S., and O.S. to grid-bias negative.

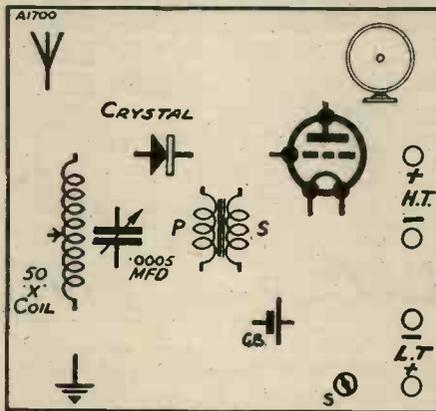
CALIBRATING THE H.F. OR THE AERIAL CIRCUIT?

F. E. L. (Nr. Newcastle).—"I never heard so many foreign stations in my life, and I am going to get out a chart so that I can identify them by the dial readings instead of having to wait for announcements. The only thing that is troubling me is whether it is better to make the dial readings on the aerial condenser, or on the anode?"

"I can easily tell when the circuits are in tune with each other, so it seems unnecessary

(Continued on page 150.)

POPULAR "WIRELETS" No. 8



Here are the "components" for a crystal-and-one-valve set, as used for loud-speaker work near to a B.B.C. main (or very near to a relay) station.

Can you "wire-up" this circuit? Look out for the answering diagram in next week's "P.W."

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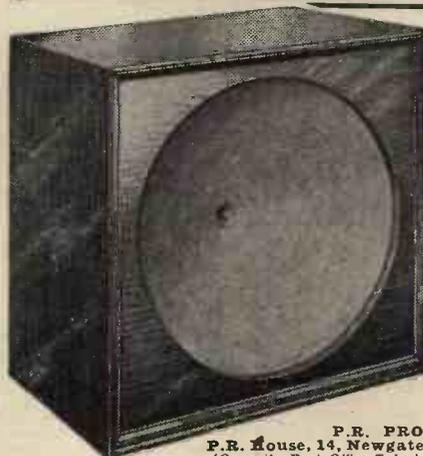
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The KIT consists of our Balanced Armature P.R. Speaker Unit, the Special P.R. Fabric Cone, 3-ply oak-front Baffle, 4 heavy, natural oak, cabinet-finished sides cut ready for assembly, 4 pieces oak front moulding, 4 rubber feet, 3-ply unit cradle, screws, etc.

The whole sent safely packed by return of post ready for you to assemble, with full instructions.

Please note that the above consists only of a complete KIT READY TO ASSEMBLE, and is UNPOLISHED.

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P.R. House, 14, Newgate Street, London, E.C.4.
(Opposite Post Office Tube.) Telephone: City 3788.

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PRICE 2/-

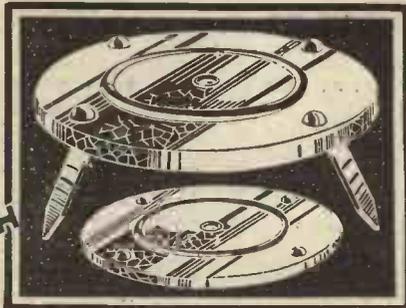
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A NEW ball-bearing turntable combining several new features, folding legs which can be opened out for outdoor use, considerably reducing capacity of set to earth, and folded up for indoor use. Fitted with rubber buffers—preventing damage to the polished receiver or article on which set is placed. The smooth running ball bearings make "direction finding" easy. Price complete, 7/6.

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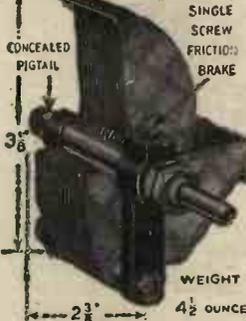
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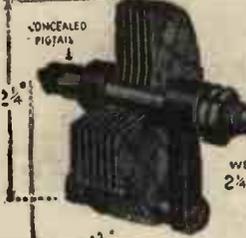
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4/6 each.

WEIGHT 4 1/2 OUNCES

*Double spacing of vanes for Ultra Short-wave work.

"MIDGET" Reaction CONDENSER
CAPACITIES .0002 and .0001 MFD.



CONCEALED PIGTAIL

2/9

WEIGHT 2 1/2 OUNCES

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Formo Internal "PIGTAIL," undoubtedly the finest collector or "Pigtail" yet devised, and thereby is absolutely noiseless in operation.

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HAMPSTEAD 1787.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 148.)

to get both readings, and, normally, I should have followed the ordinary run of events and calibrated the aerial condenser readings.

"But it strikes me that I shall find difficulty, because when I vary the aerial tapping for selectivity it seems to affect the readings on the condenser scale, and this does not happen in the case of the anode.

"Would it be just as satisfactory to draw the chart for the anode as for the aerial in the usual way?"

In such cases it is better to calibrate the anode condenser, as this remains unaffected by other adjustments; and consequently, when once the station-reading has been found, it is easily duplicated, with the certainty that the same wave-length will be covered.

"MAGIC" THREE BLUE PRINT.

"DABBLER" (Chelsea).—"I have become interested in the 1930 'Magic' Three, but have recently missed a few copies of the 'P.W.' so can you inform me how to obtain the Blue Print of same, and where?"

This blue print was given away, with others, in the March 1st issue of "P.W." (Back numbers of "P.W." can be obtained from your newsagent, or direct from

TECHNICAL TWISTERS

No. 6—BATTERY CONNECTIONS

CAN YOU FILL IN THE MISSING LETTERS?

When undoing battery leads, they must ALWAYS be disconnected from the battery

The set will work with the L.T. battery connections but not with the H.T.

Battery leads should be carefully from each other and from the set.

There is danger of fire if the L.T. battery leads are allowed to

Last week's missing words (in order) were:—Constant; Dielectric; Paper, Mica; Small, large.

The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4., price 4d. per copy, post free.)

DYNAMIC LOUD SPEAKERS.

S. A. (Bishop Auckland).—"Looking over an American radio paper, the other day, I was interested to notice a reference to the dynamic loud speaker. What is the principle on which this type works?"

In America the "moving-coil" loud speaker is referred to as the "dynamic" loud speaker, in reference to the fact that this class of instrument requires a comparatively large and powerful field magnet.

BROKEN GRID CONDENSER.

C. M. F. (Bury).—"The set gives no sign of life at all, and I am wondering if my repair to the grid condenser has anything to do with this, as I cannot find anything else wrong. When screwing this condenser down to the baseboard, I rather carelessly used a biggish screw for it, and split the case; so, instead of using the proper hole to fix the component, I drilled another one close beside it. Would this be likely to cause trouble?"

Certainly. By drilling a hole through the condenser you have shorted one set of plates across to the other, and thus destroyed its value as a condenser. You will have to get another one of the same capacity, and try your luck again.

"The Knob-Twister's Paradise."

So Cecil Lewis described American radio, as run on advertisement lines. He held no brief for the B.B.C., but was clearly of opinion that our wireless is better than the American both in variety and quality.

The standard of the American programmes is practically determined by the advertisers who "buy air" in order to sell cigarettes, peanuts, or soap. The programme is a means to an end, not an end in itself. But Mr. Lewis paid a glowing tribute to American drive and efficiency.

Phillip the King.

This provided a good example of what I feel is the present danger in Radio drama—over-production. "Philip the King" is a fine play, but it seemed to me to be overburdened with music, noises, and "effects" generally.

I liked the music, but there was too much of it; sometimes I could hardly hear the spoken words through it. It looks for the moment as if the B.B.C. producers have created in the "control panel" a machine which is getting the whiphand over them.

It's no good getting together a company of excellent actors and then blotting them out with superimposed noise!

Spare the Rod.

The sub-title of this "entertainment" (!) was "A Lesson to Parents." Was that a joke, or has the B.B.C. undertaken also the education of parents? And, my ghost! what a lesson it was!

Parents of the Victorian age passed before us, the pompousest, stupidest, most flatulently futile creatures imaginable, sparing the rod and spoiling their prim, sly, whining, cajoling little kids.

But we are so inured to hortatory sermons these days, and have so well learned the trick of applying them to others that I'll bet not one single parent took the awful lesson to heart!

War-Time Music-Hall.

So the vaudeville hour that evening described, itself. It was an interesting reminiscence. With what a swing, what full-blooded vigour, and what halos of associations those old songs came back. They were really rather poor songs—"For Me and My Girl," "Where the Black-eyed Susans Grow," "The Broken Doll," and the rest.

But whenever they are sung, while the memory lasts of the generation that first sang them, they will come charged with the poignant emotions of those mad hours of release, and hearts will beat high, and well-nigh burst, to hear them!

Harold Nicolson.

When Mr. Harold Nicolson came to the microphone as usual the other night, he must have received the silent congratulation of many listeners on his recently published biography of his father, Lord Carnock.

Good Friday.

This will be celebrated this year in the B.B.C. programmes by a relay from Leipzig of Bach's St. Matthew's Passion, and a Parsifal concert from the Queen's Hall. No lover of great music will wish to miss the former at least.

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Causton

TECHNICAL NOTES.

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

Separate Amplifiers.

THE usual way in which the impulses from the electrical pick-up are amplified is through the medium of the L.F. part of the radio receiver, but in some cases a separate L.F. amplifier is used for the purpose, and in some commercial instruments the L.F. amplifier is built into the cabinet with the gramophone.

Personally, I prefer to use a separate L.F. amplifier for the electrical gramophone pick-up, as I think that using the radio receiver for the dual purpose is apt to lead to complications and is often unsatisfactory.

As regards using the radio set for both purposes, many radio sets now on the market are specially so designed, and it is a very simple matter for the user to switch over from radio to the gramophone or vice versa.

A Simple Adaptor.

For those, however, whose radio set is not so designed, it is possible to use an adaptor which plugs into the detector valve holder (the detector valve being, of course, previously removed and then replaced with the adaptor in position).

This adaptor is connected to the pick-up and, once the adaptor is in its place, it is not necessary to remove it, as a switching arrangement is provided which either connects the pick-up leads into the grid circuit or disconnects the pick-up leads and leaves the grid circuit connected as it was before the adaptor was introduced.

The particular adaptor I have in mind is made by the Igranic Company, and should prove very useful to those who want to make a ready connection to their radio set for electrical gramophone reproduction.

Perhaps I should also mention that the same manufacturers make a really convenient volume control; a volume control is practically essential when playing records with an electrical pick-up.

Aerial Problems.

Everyone knows the difficulty of obtaining satisfactory wireless reception in a building which contains a large number of steel girders.

The metal framework of the building acts as a more or less closed conducting "cage," and shields the receiver from electro-magnetic radiation from without. If an ordinary indoor aerial is used, this screening effect may be so serious as to render reception virtually impossible.

In view of the increasing use of radio in hotels and large blocks of flats, and so on, it became necessary to find some simple way of overcoming this difficulty. In America the need for some solution was even greater than here, since hotels and "apartment houses" tend to be larger and more patronised than in this country.

The Communal Aerial.

A simple way out has now been found in the shape of what may be called a "communal" aerial, which is erected high

(Continued on page 154.)

BROWNIE

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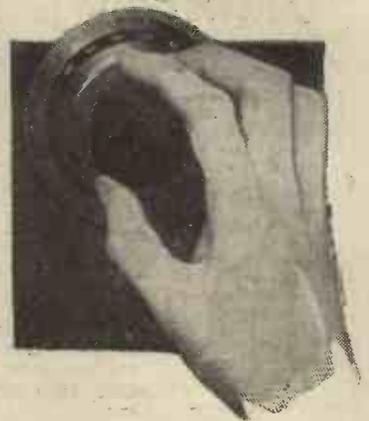
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WHAT MAKES A SET SELECTIVE?



Selectivity is no longer a refinement. The Regional scheme has made it necessary for all sets to possess the quality in some considerable degree, and this article tells you about the factors in an outfit that tend to render it unselective as well as those that have the reverse effect.

By A. JOHNSON-RANDALL.

AT the present time the question of selectivity is a vital one. A set which is unselective is, to all intents and purposes, useless in the light of modern-day conditions.

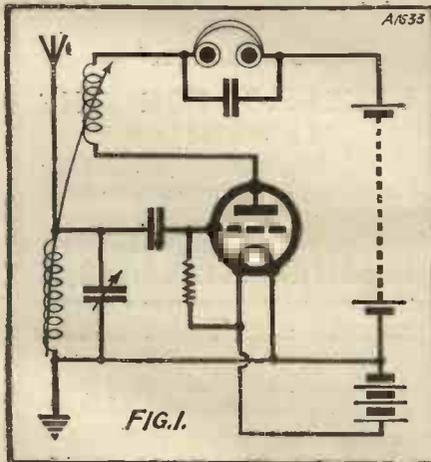
What is selectivity? Well, it is something which enables stations to be separated from each other so that the particular transmission to which it is desired to listen can be brought in free from interference. This is a most desirable feature, because without selectivity it is impossible to enjoy the broadcast programme.

Effect of the Aerial.

What are the factors that make a set selective? This is best answered by dealing with simple tuning circuits, because it is actually this part of the receiver which makes or mars its selective properties.

In Fig. 1 you will see a circuit of rather old type; in fact, the type of circuit arrangement which was popular three or four years ago. You have a tuning coil and a tuning condenser with the aerial and earth attached to the respective ends, the whole being connected across the grid and filament of the detector valve.

"PLAIN AERIAL."



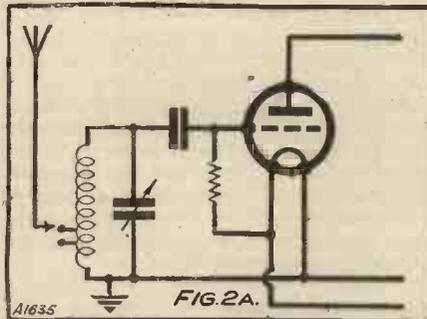
The type of circuit popular three or four years ago. It is quite useless for modern-conditions.

Now, this type of circuit is absolutely hopeless when used on the existing broadcast wave-bands. On the medium broadcast band, in nearly every case, there would be some interference from a second

station which would be superimposed upon the transmission the unhappy listener was endeavouring to isolate.

The reason for this can be given in one word—damping. The average aerial and earth system exercises an effect upon the tuned circuits, which flattens the tuning and, in consequence, makes the receiver responsive over a wider wave-band for any given dial setting.

USING AN "X"



A tapped coil of the "X" variety increases the selectivity of a simple circuit.

This effect may be likened to a resistance connected in parallel, that is, across the two ends of the tuning coil. If a circuit is to tune sharply, its high-frequency resistance must be low, and if the aerial and earth are connected directly across the coil this is impossible.

So we see that to improve the sharpness of tuning it is necessary to "remove" the aerial and earth, and this can almost be achieved by adopting one of the methods shown in Figs. 2 and 2a. In the case of Fig. 2, you have the aerial connected through a small coil to earth.

Employing Tapped Coils.

This coil is coupled to the second coil, which becomes the main tuning circuit. If the aerial coil is properly chosen it is responsive over a fairly wide band of wave-lengths. The effect of the aerial and earth is now removed, to a very great extent, from the tuning circuit and, in consequence, selectivity is greatly improved.

A circuit of this type is called an "aperiodic" aerial circuit, and the aerial coil has a very marked effect upon the selective properties of the set. By making the aerial coil smaller it becomes easier to separate stations; thus, if the coil is of the tapped

variety, varying degrees of selectivity can be obtained.

The second scheme is to employ a tapped aerial circuit in which the aerial and earth are connected across a small portion of the main tuning coil. This is a very good and convenient method. It is particularly suitable for sets which utilise plug-in coils and enables the listener to modernise his old set by purchasing a new coil and plugging it into his old coil holder.

Resistance, as I implied before, is the enemy of selectivity.

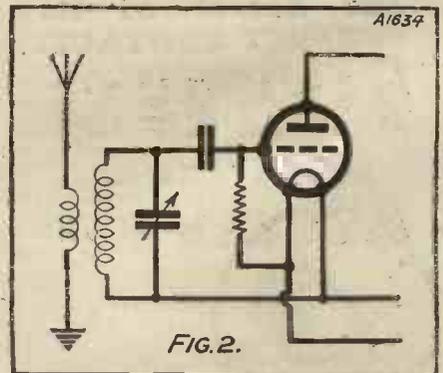
Two Tuned Circuits.

A coil wound with No. 42-gauge wire would not be very efficient on the medium broadcast band because of its H.F. resistance. The gauge of wire and the spacing between the turns are important.

There are limits to selectivity. For instance, a single-tuned circuit of either of the types shown in the figures would only give a certain amount of freedom from interference. Two tuned circuits would give much greater selectivity, and three would be better still.

When you adjust the tuning control of the aerial circuit of, say, Figs. 2 or 2a, to any particular station, the set is highly responsive to the transmission tuned in and only weakly responsive to other transmissions on neighbouring wave-lengths.

SEPARATE AERIAL COIL.



How the "aperiodic aerial" scheme is applied.

If we add another tuning coil and control it is not difficult to understand that the receiver now becomes more responsive to a given station and much less to the other unwanted transmissions.

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TECHNICAL NOTES.

(Continued from page 152.)

above the top of the building, and which serves for all the flats or suites which may be connected to it.

In this way the broadcast is received with little or no interference, and it is then a comparatively simple matter to distribute it through the building as may be required.

Of course, inasmuch as only a given amount of broadcast energy is received, and this has to be divided, each receiver in the building only gets a comparatively small proportion; but this, again, may be compensated for by means of the necessary amplification.

Another important point is that, quite apart from the question of receiving a sufficient amount of broadcast energy, interference also is very prevalent in a large building, due to electrical appliances, particularly to electric lifts.

With the arrangement described above these interferences are not entirely eliminated, but, owing to the main aerial being high over the building, their effect is very much minimised.

Question of Selectivity.

Whilst on this question of aerials, I may take the opportunity of mentioning a query received from a reader a few days ago who wants to know whether there is any advantage in using two aerials instead of one.

Of course, if the two aerials are both connected to the one receiver, they are not to be regarded as two separate aerials, but simply as one aerial of more elaborate form.

The question whether this will be more efficient than each part separately depends on circumstances. Generally speaking, it should receive a greater amount of broadcast energy, but questions of selectivity are bound to arise, with the result that it may be better to use a single aerial than the more elaborate one.

Receiving Two Stations.

If it is intended to connect the two aerials to the same mast, but to two different receivers, then, of course, they definitely act as two separate aerials, and it should be possible to receive one station on one aerial whilst receiving another station on the other aerial.

If the two receivers are, however, tuned to receive the same station, the amount of broadcast energy received on either of them will not be so great as it would be if the other were not present.

This is, of course, obvious, and is simply due to the fact that, inasmuch as the two aerials are in close proximity, they can only draw their electro-magnetic energy from more or less the same region, and consequently each tends to some extent to rob the other.

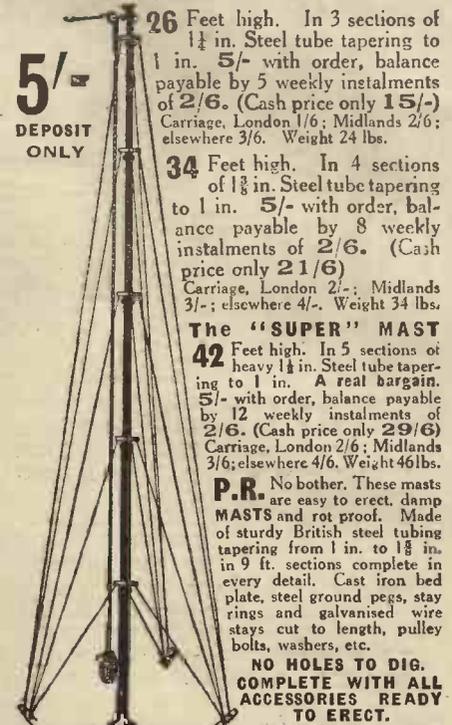
Loftin-White Amplifier.

The new method of amplification developed some year or two back by Loftin and White, the well-known United States, radio engineers, has now been considerably developed and improved. You may remember that in the system as it was first announced, although it seemed to have great possibilities, there were certain important practical difficulties which were never properly overcome.

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

Loftin and White, however, have been working on the scheme in the interval, and have now just published particulars of developments which would seem to have overcome these drawbacks, and also to open up a considerable future for this amplification system.

In the latest form, the Loftin-White system involves direct coupling between the plate of one valve and the grid of the next; that is, without the usual coupling devices such as transformers or condensers.

With proper arrangements, it is possible, with a minimum number of valves—two or three—to make up a set of remarkable power. But, of course, it still remains to be seen whether all practical difficulties have now been overcome.

Growth of Radio.

I have before me some very interesting figures which show the remarkable growth of radio broadcasting in the States during the seven years it has been in vogue.

The number of licensed broadcasting stations is just over 600, and the equipment of the same is valued at about five million pounds. The staffs of these broadcasting stations number about 8,000 persons.

About £50,000,000 is invested in the manufacture and distribution of radio sets, whilst in the radio factories about 100,000 people are engaged, receiving about £50,000,000 a year in salaries.

The radio sales last year amounted to about £150,000,000, or about £3,000,000 a week throughout the year, whilst during the whole of the past six years the sales of radio apparatus have totalled about £500,000,000. The radio sales in 1929 were just about ten times those in 1922.

During 1929 about £3,000,000 was spent in the United States on the broadcasting of music alone.

Heaviside Experiments.

The recent announcement of the discoveries of Professor E. V. Appleton in connection with a second Heaviside Layer is of extreme interest and the discoveries themselves of considerable importance.

It is now well known that when Dr. Heaviside, the famous physicist (who died only recently) first formulated his theory of a conducting layer at a height of some miles above the earth's surface, the announcement was greeted with considerable scepticism, not only in this country but also abroad. That was before radio had developed to anything like its state to-day.

The advances in radio science, however, have more and more confirmed Heaviside's theory and, indeed, it is believed that the Heaviside Layer plays a very important practical part in certain forms of long-distance radio communication, in particular, of course, I refer to transmission on the "beam" system.

The "Second" Layer.

The Heaviside Layer theory, I think it is correct to say, is now accepted by the majority of scientists, many of whom at first had doubts about it, and now comes Professor Appleton with the discovery of a

(Continued on next page.)

Stations galore!

1930 "MAGIC" 4

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2 Igranic vernier dials		12	0
1 Ready Radio 00015-mfd. differential condenser		5	0
2 Ready Radio on-off switches		1	8
1 Igranic 1-meg. volume control		6	0
2 Small sockets		5	0
4 Sprung valve holders		2	6
3 Ready Radio coil sockets		5	0
2 Dubilier 1-mfd. condensers		7	0
2 Dubilier 2-mfd. condensers		1	6
1 T.C.C. 0003-mfd. condenser		1	10
1 T.C.C. 002-mfd. condenser		2	9
1 Ready Radio 400-ohm potentiometer		2	6
1 Dubilier 2-meg. grid leak		1	9
1 Grid leak holder		19	0
1 Lissen super transformer, 2½ to 1		17	6
1 Igranic type J. transformer		7	9
1 Lewcos H.F. choke	1	0	0
1 Varley output filter L.F. choke		2	5
1 Ready Radio 25,000 resistance & holder		2	0
1 Ready Radio screen, 10 in. X 6 in.		2	0
1 Terminal strip, 21 in. X 2 in.		5	6
11 Belling-Lee insulated terminals		4	9
1 1.5 grid cell		4	0
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TECHNICAL NOTES.

(Continued from previous page.)

second Heaviside Layer at a distance of more than a hundred miles above the earth's surface.

It is believed that this second layer may largely prevent radio energy produced on the earth from passing outwards to other planets.

Although the announcements have only recently been made in connection with this important discovery, Professor Appleton described them to me a year or two ago, but naturally I was not at that time at liberty to mention them publicly.

He is to be congratulated on an important achievement in the face of very serious experimental difficulties.

Radio Absorption.

In the same connection I may mention some other work which has just recently been published by the Radio Research Board and which deals with an investigation into the absorption of radio broadcast energy by receiving aerials and other objects.

The investigations have disclosed the fact—as indeed might have been expected—that in the London area the vast majority of aerials are tuned to receive the London station, with the result that the broadcast is seriously weakened by the time it reaches the Home Counties and other parts still more distant from London.

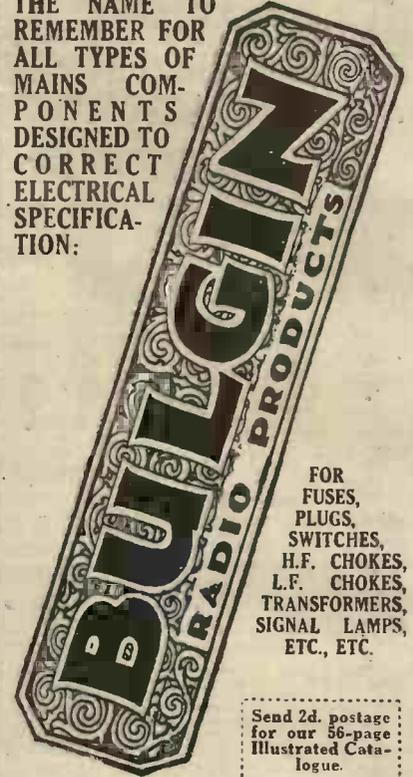
Field of E.M. Energy.

We have to think of a "field" of electromagnetic energy, this field being set up by the broadcast transmitter and the energy seeking any and every means of dissipating itself. Clearly, inasmuch as the electromagnetic energy is being dissipated by setting up oscillating currents in the various aerials and other conductors in the field, the intensity of the field becomes less and less as we go from the origin.

Every aerial and every conductor, particularly if earthed, is to be regarded as a "sink" for the energy and helps in setting up an energy "gradient."

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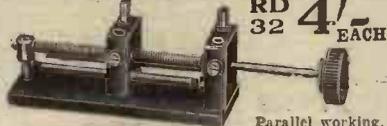
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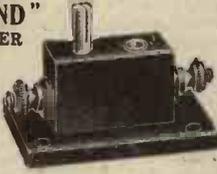


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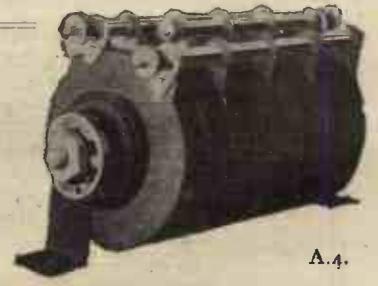


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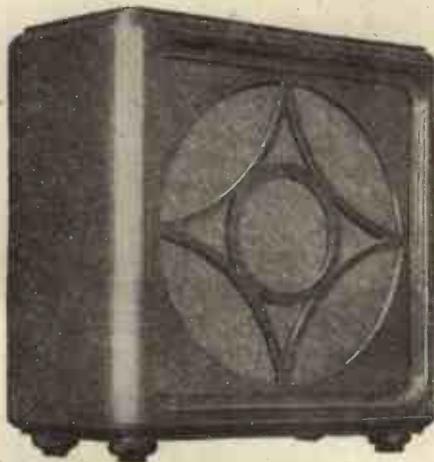


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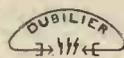


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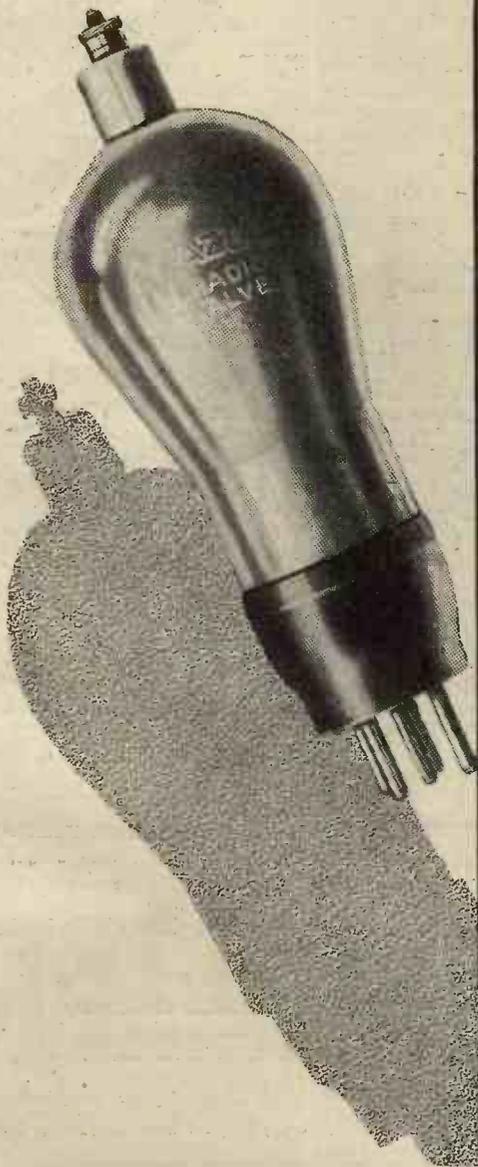
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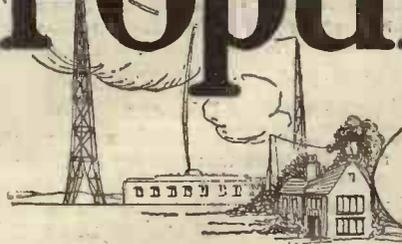
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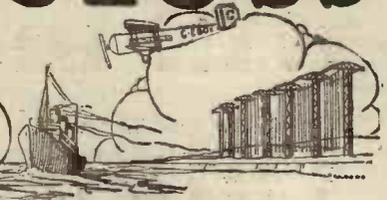
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RADIO AND CRIME.
STOLEN FROM PUNCH.
RADIO v. WORMS.
A FORETASTE.

TERRIBLE TWINS.
THE TURIN BIRD.
LONG-FELT WANTS.
THE POOR INVENTOR.

RADIO NOTES & NEWS

Holiday Observations.

ENORMOUS increase in the number of nomadic ice-cream tricycles at large. If there were as many motor-cars per 1,000 population on the roads here as there are in America they would just have to stand still. Where do all the portable radio sets go to? Rarely have I seen one in the process of portage. Saw a skinny-legged girl child of about thirteen years shin up a wireless pole with the skill of a monkey. I believe they learn that sort of thing at "gym." It's a good thing that my pole fell down in 1926, for my girl also fancies herself as a contortionist.

A Common Plight.

A FRIEND of mine is in an unhappy position through having supported the radio trade early. His set is a three-valver and cost about £60. It is a tremendous thing, has some seven controls and uses obsolete valves. When he wants a new valve he has to employ a detective to track one down! All bright emitters; 0.7 ampere, I believe. Quite naturally he is at a disadvantage and would like to have a new set, but the old one is unsaleable, either as a lump or broken up. It's hard on a poor man to have to write off £60. And all because he bought a ready made set in 1923!

So, so!

BEFORE we continue the week's proceedings, I beg to draw your attention to this portion of a boy's essay, shown to me by an unfortunate schoolmaster. "So Jimmy's father said what would you like so he said a wireless. So they went to the shop and bought it. When they got home Jimmy said now we must put up the aerial so he went to find his father but he was not there. So he got his mother to help and when it was done his father came

back and said that's all wrong. So they had to do it again." There is much more—but I ask you to consider the unconscious humour of this extract.

Wireless and Crime.

SAUCE for the goose is sauce for the gander! The adoption by the police of radio in connection with the operations of the "Flying Squad," has made the underworld think and the result is that the nimble-fingered fraternity are "getting into the game," too. Portables, which are

the discovery by radio experts of an outer 'Heavside Layer' which prevents our broadcasts from reaching Mars is that the Martians don't know what they are missing."

Radio versus Worms.

REPORTS from the U.S.A. allege that in Washington County radio has been enrolled in the fight against insects which have attacked the fruit. An aerial is slung over each row of trees and a transmission from a five kilowatts set is turned on early in the morning so as to avoid interference with broadcasting. It is stated that the radiation sterilises the larvæ and scares off the grown insects, resulting in a reduction of the fruit attacked from 25 per cent to 4 per cent.

Commonsense at Maidstone.

WITH so many Town Councils taking fright at the thought of aerial wires crossing their streets it is refreshing to learn of the attitude taken up by the Works Committee of the Maidstone Town Council. When "Radio-by-Wire, Ltd.," applied for permission to run the necessary wires about the borough, the Committee did

not wag their heads solemnly and refer the vital question to a sub-committee consisting of the engineer, the surveyor and the sexton. No! They merely said, in effect, "Righto! Carry on! But pay us a bob per wire per annum as rent." Good!

A Foretaste of the Future.

IT has often been prophesied that by the aid of radio facsimile transmission, newspapers will be published in various parts of the world simultaneously, and this is nearer realisation than most people are aware. Early this month the whole of the front page of a Californian newspaper was

(Continued on next page.)

THE LURE OF OPEN-AIR RADIO.



With the coming of the holiday season, the keen listener will turn out his portable set and start planning wireless picnics. This picture shows members of a well-known London Radio Society enjoying a day in the country.

disappearing from shops with great frequency, are being used, it is suggested, for eavesdropping by a gang of motor-thieves, and a complete transmitting and receiving set has recently been found in a car which was far from respectable. ("How charmingly American," said the Duchess!)

Stolen from "Punch."

BY means of wireless on his yacht at Genoa, Marchese Marconi lit two thousand five hundred electric lamps in Sydney Town Hall. Later on the famous wireless pioneer will endeavour to ignite an automatic cigarette-lighter." And the other: "The only thing to be said about

NOTES AND NEWS.

(Continued from previous page.)

transmitted from Oakland to New York, 2,500 miles, where it was automatically reprinted and read on that side of America in less than three hours after its leaving the printing press in San Francisco. The development of means of communication is going to be terrific during the coming decade.

Italy's New Short Waver.

I LEARN that the new short-wave broadcasting station built for Italy by Marconi, has passed its trials with flying colours, having been received in India, Australia, S. Africa, U.S.A., the Italian colonies, etc., at excellent strength. These tests were carried out on a wave-length of 25.4 metres, but transmissions will be given on 80 metres also, for the benefit of listeners in Italy and neighbouring countries. The transmitter is rated to deliver 9-12 k.w. of unmodulated "carrier" power to the aerial feeder system, so that the station ought to be a "star" amongst our own "fans."

The Terrible Twins.

MR. HENNEQUIN, of Seven Kings, Essex, has been at it again about the 261 metres wave, but his letter develops naturally into a delightful diatribe against the B.B.C. which I regret is too long to print. He says that on a set which formerly was capable of tuning out 2 L O and receiving 56 stations on L.S. he can now get either the 261 metres or the 356 metres, without an aerial, and loudly enough to be heard outside the house. He adds that the reader who can show him how to eliminate both transmissions so that he can receive other stations can have "P. W." free for a year at his (Mr. H.'s) expense.

The Right to Escape.

MR. H. argues that he ought to have the right to escape from the B.B.C. programmes and listen to foreign transmissions. That sounds reasonable, but perhaps we ought to recollect that in a highly-organised society an individual cannot possibly get all the rights to which he may feel entitled. He cannot even always get minority rights. I shall be accused by some of writing complacently about an evil from which I am free; nevertheless, much as I sympathise, much as I deprecate the B.B.C.'s average programme, I believe that the B.B.C. tries generally to realise "the greatest good for the greatest number."

Last Words on Turin's Bird.

W. B. (Stroud Green, N.) in stating positively that the Turin bird is a clockwork affair made in Switzerland, expresses the hope that he has said the last word on the subject. Perhaps he has, unless a Croat writes to say that it is an electrical device made in Iceland. W. B. says, "The Italians (unlike us) are both practical and lovers of beautiful things. Thus they get a bird's song on tap. Only a foreigner would think of such a thing." Yes, I believe that some foreigners have their good points! I give them their clockwork birds, friend, since you insist! And I must comfort myself with the thought of the level, broad, views which characterise the best type of Briton.

Austrian Troubles.

MOST of us, being fairly free from interference, will extend our sympathy to Austrian listeners, who are driven to distraction and desperate deeds by the noises caused by trams. "Strikes" have occurred at Graz and Innsbruck, licence fees being held in arrears by the licensees pending an improvement in conditions. It is announced that an Electricity Act which has been drafted contains clauses intended to protect listeners in Austria. Cause and effect?

The P.M.G.'s Secret.

MR. H. B. LEES-SMITH, the Postmaster-General, who has recently been measuring the broadswords of his permanent officials against the rapiers of Marconi, Fleming, and Sir H. Young—

SHORT WAVES.

The discovery that blocks of flats which are largely constructed of steel have the effect of paralysing receiving sets brings the complete wireless-proof residence within the bounds of possibility.—"Punch."

Wireless Pirates. Still sail the B.B. Sea.—"Daily Mirror."

"The broadcaster has to remember that outsiders are listening. If everyone were as POLITE over the garden wall or on the highway as we are on the ether, the world would be a better place."

Sir John Reith,
Director-General of the B.B.C.

It is reported that special headphones have been invented to enable the deaf to enjoy listening-in. All we want now is an invention so that we can all ENJOY listening-in.

"I'm certain there's something wrong with this loud speaker. I've had bad reception all the week."

"Have you, dear? That reminds me, I saw baby toddling round filling that trumpeting with pieces of coal, the darling."

"West Australian Wireless News."

THEY MUST BE HAPPY.

The House of Commons is to have a room where members who are tired of sleeping on the benches can retire and listen to broadcast programmes.

That'll larn them.—"Vox."

"Twenty yards from me there is a motor-saw bench which comes through my loud speaker and spoils all reception," writes a correspondent.

This must be the unknown quantity "X" so often referred to.

The Constable (a wireless enthusiast, to burglar turning a knob of safe-combination): "What are you trying to get—Fremantle?"—Australian Paper.

and very ably, too—has received a considerable amount of attention from papers which support Socialism—and one of these—the 'tallest' of them all," as Tennyson said of one of King Arthur's three queens—reveals the fact that the P.M.G. used to scrub the floors at Ruskin College. If such a sanitary occupation is a pass-key to eminence, then I shall one day shed my fairy clothes, for when I joined a certain engineering firm, filled to the brim with maths. and wisdom (so I imagined), I was given a bucket, a mop, and a tin of soft soap, and told to "redd oop floor, laad."

Sublime to Ridiculous.

LIKE most Americans, liable to go to extremes, Henry Ford moved also the top soil of nearly an acre when he shifted the laboratory of his idol, Thomas Edison, from its original site in New Jersey

to his own kingdom of Dearborn, Michigan. Our dream over this senseless bit of hero-worship is roughly dispelled by the knowledge that the cold-blooded Federal Court fined the railway £280 because it failed to kill the larvae of the beetles with which the hallowed earth was infested. No liberty there! Henry must not move Thomas's beetles!

Progress of Telephony.

RADIO-TELEPHONE services are now available from this country to North America, Mexico and South America. As to possibilities, we have seen that in 1919 Marconi telephoned to Australia, and again last month with a much smaller plant. Yet only fifty years ago the technical press reported that the telephone was successfully used over a distance of about half a mile at an Easter Monday Volunteer Review. By the way, also fifty years ago, a patent for transmitting scenes to a distance was applied for by patent agents in Pittsburg, Pa.

"Longfelt Wants"?

FROM time to time I look over "The Inventor," which is the Journal of the Institute of Patentees and a stimulating little production withal. Acknowledging the useful information and advice to be found in its pages it must forgive me if I refer particularly to its humour. I was delighted to read that an invention from the U.S.A. relates to eye-protectors (goggles) "more particularly designed for fowls, so that they may be protected from other fowls that might attempt to peck them, and providing a construction which may be adjusted to fit different sized fowls." I should dearly love to see a whole chicken-farm fitted with horn-rimmed!

The Poor Inventor.

THE recent little demonstration by Marconi has brought all the cranks out like gnats at eventide, and were the inventor not gifted with a sense of humour he would probably be scared to see what he starts when he indulges in a little electrical frolic. Thanks to a tolerant press, they all appeared—the water-diviner, the man who foretold the transmission of power by radio, the victim of short waves which follow him around, and the man who says it was done in 1863 by Abijah K. Bohunk, of Florida. The sanest letter on the subject was probably that written by a man who asked whether Marconi could be retained to relight the electric lamps that so frequently go out in a certain town.

An Amusing Story.

HAVE you ever heard of an instance like that related by Miss Cissie Woodward, who tells that on one occasion she was billed to play at Rugby? I mean, she was to play the piano. You probably heard her "bang the bones" over the wireless on April 23rd! Very well, then! The hall filled up nicely, and everybody sat back, ready to be charmed. But no piano! Something had gone amiss with the Rugbeian transport system, or else they thought she used a portable. As the piano continued to remain absent, the audience had to be bowed out. Hard lines, but worse has happened. I have known other cases wherein the audience and the piano stayed—and the artiste left hurriedly.

ARIEL.

YOUR LOUDSPEAKER

VICTOR KING

THEY say that beauty is in "the eye of the beholder," and, indeed, it certainly is. Further, there is not the slightest doubt that beauty is just as much in the ear of the listener.

A sound means nothing to you if you do not hear it with your own ears. And, if you are an ordinary, mind-of-your-own sort of fellow, a thousand experts could tell you a certain morsel of music was "beautiful" without altering your opinion of it, if you had already decided that you considered it sounded rotten.

Probably, you would be prepared to listen to it again in order to give it further consideration. And you might even be influenced to some extent by the battery of pundits. But, nevertheless, I very much doubt whether you would find your fundamental conception very greatly altered. Many might say: "It's worse than I first thought it." Such is human nature!

Now all this has a very direct bearing on radio reception. Our old friend, Captain Eckersley has asked several times in his articles whether we want realism in radio. He seems to consider that true art (and radio reception is an art) demands, at times, a deliberate sacrifice of realism.

Justifiable Distortion?

In other words, his idea is that distortion may be justifiable. I am not using the word distortion in the popular sense of *battered* musical notes, cracked up tones due to valve overloading, and what not, but in its broad sense—i.e. the departure from a realistic replica or from conventional musical standards.

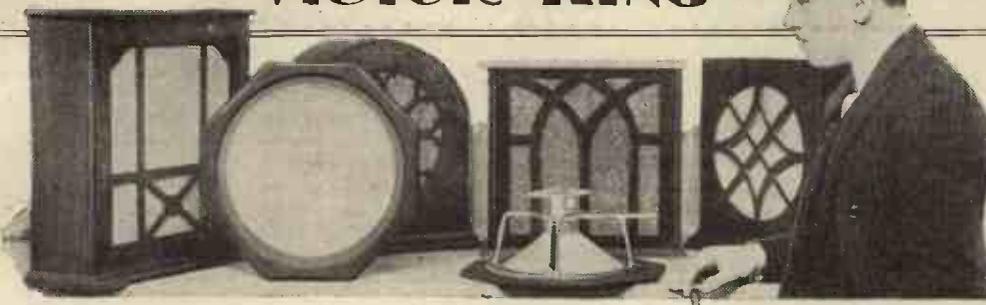
Let me get down to brass tacks and give an example. Supposing a listener has a loud speaker that "sugarises" or mellows everything. And supposing, still further, that that listener thinks his loud speaker is the best in the world.

An expert listens to it and says the reproduction is "vile," that not a note skims away from the diaphragm without being distorted. That there is no true bass but only a little box resonance, and that there are no higher frequencies than, say, 2,500, present.

Tuneful Stuff.

The listener will politely say: "Is that so? But I think it sounds fine." "But it's not a bit like the original," says the expert.

But what does that listener care? He hasn't heard the original music, but he does know that his version of it moans its way, right into his Philistine heart.



the back of their heads that the said noises should be such that the average radio receiver can deal with them fairly faithfully.

But the mere

fact that they expend their greatest energies and the most money on symphony concerts enacted in huge halls proves that they are miles away from realising that broadcasting demands a special treatment.

The crux of the matter is this. You want to fill your parlour with good music, etc. The B.B.C. give you full-size brass bands and symphony orchestras arranged in the normal manner. Your loud speaker doesn't give you true representations of full-size brass bands or symphony orchestras because of its technical limitations.

The "distortion" is often most pleasing—more pleasing, in cases, than reality.

Anyway, the average parlour won't accommodate a full-size band or orchestra!

Now are you satisfied to regard your loud speaker as a keyhole to big concert halls and so on, an eavesdropping keyhole through which the sounds lose many of their original qualities, or would you rather that the loud speaker were a sort of instrument that the B.B.C. played upon in various ways and with various materials specially chosen and arranged for filling your parlour with sweet music?

The Real Thing!

Well, personally, I want a bit of each. I like to "listen-in" to big cinema organs, theatres, and what not, though I realise I must inevitably be "listening-in." But I also want the B.B.C. to do me the honour of remembering that I, among millions of others, have only a small parlour and only a modest sort of set.

They are wasting thousands a year developing sound waves that never can get duplicated by any known loud speaker.

Microphone drama is being timidly developed as an individualistic art. Microphone music is not advancing at all. Set and loud speaker improvements that are enjoyed by but a few rich amateurs clearly prove that.

But remember, my idea is not that quintets should displace big bands, but that the big bands should be built up in line with the new technique of radio.

You wouldn't notice a drastic alteration. You would merely say: "My speaker gets better and better. That sounds just like the real thing." It wouldn't be because it couldn't, but would that matter?

A well-known set designer discusses the problem of loud-speaker realism in this very interesting article.

The violin wailing the "Liebesleid" always gets more applause than the trumpet solo, because it is mellow, tuneful, and sweet, and the ordinary fellow likes his music that way.

And it is possible that the ringing brass band can stand a pruning of its harmonies when it has to fill a parlour and not shake the summer air at the seaside.

Now Then, B.B.C.!

Should the set designer deliberately go out of his way to ensure "mellow" results? Should loud-speaker makers do ditto? Many of the latter seem to, but that is actually due more to haphazard design and lack of research.

My view is that we set designers at least must aim at realism. And aim as straight as we can.

The duty of the receiving equipment is plain and straightforward. It must endeavour to reproduce what is handed to it on the wings of the ether just as truthfully as it can.

And it is the job of the B.B.C. people to serve up programme material that starts at the microphone of the broadcasting studio in a form suitable for this new art of radio.

Are they trying to do this? I don't think they've yet thought of it. I believe they devise their noises with some idea at

A KNOTTY PROBLEM?



Members of the Research Departments of "P.W." and the "Wireless Constructor" discussing a point of common interest. Mr. Kelsey (second from right) directs the "Constructor" research, and "P.W." readers will easily recognise their Mr. Kendall

THE ROW IN BIRMINGHAM

WILL THE B.B.C. GIVE WAY?

By THE EDITOR.

THE B.B.C.'s policy of centralisation includes, as our readers probably know, the disbanding of the Birmingham Studio Orchestra, Choir, and Military Band. But Birmingham is up in arms against this, and there is a real tussle going on as to whether the B.B.C. shall have its way or not.

Organised Protest.

The "Birmingham Gazette and Express," for instance, has organised a listeners' protest, and we understand that thousands of forms are being filled in, which will be sent eventually to the Postmaster-General, petitioning against the B.B.C.'s decision.

Birmingham claims that in the near future there ought to be a development of a nature which will allow Birmingham citizens in particular to voice an emphatic protest, and Mr. Arthur Hayday, M.P. for West Nottingham, has given it as his opinion that the B.B.C. is fast becoming a bureaucracy of the worst possible description.

"They have placed themselves above reasonable criticism," declared Mr. Hayday recently. "The tendency to sit in an office and map out a plan without considering the desires of the general body of clients—for they must look upon the Provinces as clients—is a bad one. It ceases to be a national service when you get a few persons in London setting up as arbiters of what is good for the Provinces. The possibility is that they have no practical insight into what is generally wanted. If a machine could be 'laid on' to give comments on the programmes, I think their ears would scorch off. I am tired of constant repetition and centralisation, and I am disgusted sometimes with the programmes."

This is pretty fierce criticism, but there is no doubt the B.B.C. has stirred up a hornet's nest in the Birmingham district, and it will be interesting to see the outcome. The idea that the Provinces are not keen on having their own orchestras and their own local talent is wrong. For they certainly are, and we ourselves are rather inclined to the view that a policy which reduces to a bare minimum the chances of encouraging local talent is essentially a bad one.

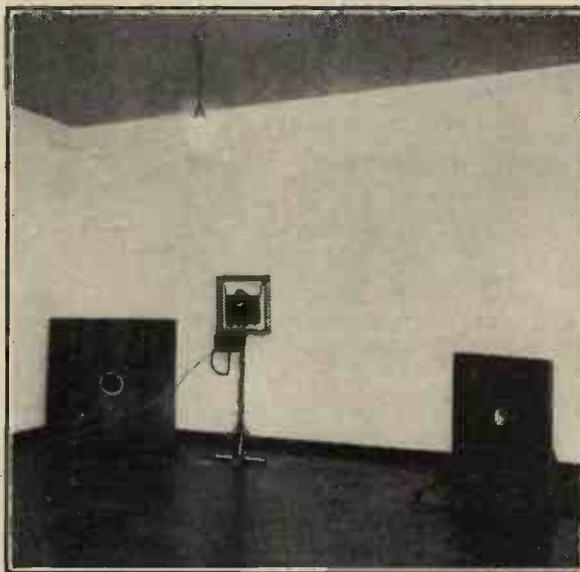
Policy Should Be Dropped.

Of course, there are many things about the B.B.C.'s centralisation policy which are admirable. The question of economy is certainly a big point, because listeners as a whole will benefit if the B.B.C. can save more money in order to improve the programmes. But, on the other hand, that money will not continue to be given to the B.B.C. if this centralisation policy really "gets the backs up" of a large number of listeners.

It is true the B.B.C. can still go on pointing out that the licences are being taken out in greater numbers than ever. But there is bound to come a day when saturation point is reached, and then certain districts—like the Birmingham district—if properly organised and led, might institute a boycott against the B.B.C. And if you get several hundred thousand listeners in the country properly organised and absolutely refusing to put up with what is dictated for them at Savoy Hill, there is going to be a severe hitch in carrying out the plans made by the B.B.C.

Our advice to the B.B.C. is: Let Birmingham keep its orchestra, choir and military band. And don't persist in a policy which is obviously arousing very widespread resentment.

LOUD-SPEAKER ACOUSTICS.



The smooth floor, bare walls and ceilings shown are specially arranged for loud-speaker tests, echo effects, etc., in this room of the Heinrich Hertz Institute, Berlin.

Writing of policy and expenditure reminds us that the financial statement accompanying the Third Annual Report of the B.B.C., which is shortly to be submitted to the Postmaster-General, contains some interesting and rather illuminating financial facts. One point is pretty clear, and that is that the B.B.C. is spending more than its income, and that one of the reasons for the delay in the progress of the Regional Scheme is simply that the B.B.C. hasn't got the money, and that it is waiting for another instalment from the Post Office before it can proceed.

For example, up to December 31st last year, all the Corporation had put into the Regional Reserve Fund, i.e. the fund started for paying for the Regional Scheme, was £300,000. This sum may look big, but it is certainly not enough to pay for the Regional Scheme.

Furthermore, as the licence figures increase, the B.B.C.'s share of the revenue is not what it ought to be. The Post Office and the Treasury are getting a very good "rake-off" these days because, under the Charter, the Post Office is entitled to retain a higher percentage of the licence revenue with each additional million issued.

Why this Charter was ever allowed to go through on these terms heaven only knows, for there is no possible reason why the Post Office expenses should increase to such an extent that their rake-off from the licence fees need be so high.

What P.O. Gets.

In the year 1929 the Post Office appropriated an additional £20,000 from a gross revenue of £1,470,000, as against £1,307,000 in 1928, while the share of income for the Treasury was £70,000 greater than for the previous year—£342,000 compared with £272,000 in 1928.

Last year showed a gross increase in the licence revenue of £164,500, and the B.B.C.'s actual share worked out at only £72,000. Already the B.B.C. has received £2,617,000 since the Charter was granted, but it must also be remembered that the Treasury has received £856,000, and the Post Office has received £496,000, and as the wireless licence figures increase, so the Post Office and Treasury will get bigger and bigger "rake-offs."

It all seems wrong, somehow, that listeners should pay licence fees and that appropriation should be made by the Treasury and Post Office of this nature. That the Post Office should make an appropriation to cover working expenses for the issuing of licences, etc., etc., is understandable, but why the Treasury should step in, and why the Post Office appropriation should increase out of all proportion to the extra work involved, is beyond understanding.

FOR YOUR NOTEBOOK.

Copper is usually considered the best metal for aerial wire, but phosphor bronze and silicon bronze run it close.

Generally speaking, there is no advantage in using a "cage" or "sausage" aerial for broadcast reception, unless only a limited space is available.

From the Postmaster-General's point of view the length of an aerial is the distance from the farthest point of the aerial to the earth. It is independent of the number of wires used.

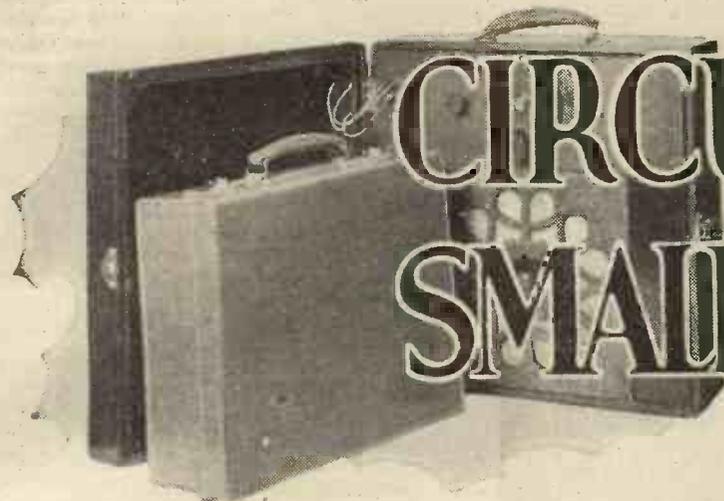
MUTUAL INTERFERENCE.

If aerials attached to different sets are separated by only a few feet it will be impossible to avoid a certain amount of mutual interference when the sets are working.

A long lead-in should always be avoided if possible, so the best place for the set is close to the lead-in's point of entry.

If an aerial is placed close to telephone wires it will be screened by these, especially if half-a-dozen or more wires pass near it.

CIRCUITS FOR SMALL PORTABLES



If you have not yet had experience of constructing and operating a small portable, I would advise you to lose no time in building one for use this season. Reception on the headphones may seem rather dull indoors, but with a portable it acquires a renewed interest, since you are able to get away from the restrictions of a permanent aerial and listen wherever you choose.

Whether your portable will be an unqualified success or not depends to a large extent upon the circuit chosen as a basis for construction.

The simplest type is naturally the one-valve detector which is essentially a set for local station reception on a small external aerial and 'phones. Selectivity is not of a

for use with a small open aerial, on which it will put up a remarkably good performance for its size.

You will see from Fig. 1 that it is actually the detector section of the famous "Magic" receivers, so that a full description will not be necessary here. (Incidentally this circuit, although developed primarily for a fixed receiver, is eminently suitable for portable construction, especially in view of its adaptability for both long- and short-wave reception.)

Reference to the original articles on the "Magic" receivers will give you full details of coil sizes and operation. No attempt should be made to alter the reaction arrangements or omit the potentiometer, as both of these result in remarkably smooth reaction control which is a very desirable feature in a small portable.

This circuit also can be used for the construction of a compact frame-aerial receiver, replacing the tuning coils by a frame aerial winding for L_1 , and for L_2 another winding of about one-third the number of turns. One or two tapings on the frame winding are brought out to terminals for connecting the temporary aerial, the "earth" lead being taken to L.T. negative.

Adding L.F. Stages...

The frame aerial is best wound round a skeleton wooden frame-work, of four sides only, supported an inch or so from the sides of the carrying case. Division pieces inside the skeleton former serve as supports for mounting components and for dividing off compartments for the batteries, 'phones, and accessories.

It is also quite easy to add an L.F. valve, which further increases the usefulness of the set. In fact, the addition of an L.F. stage to any one-valve frame aerial portable is well worth while, because the resultant reserve of signal strength comes in very useful when the receiver is used in rather noisy surroundings, such as in a train.

Another one-valve of outstanding efficiency is the Filadyne detector which can be relied upon to put up a good performance on a quite small aerial system. A suitable arrangement of this circuit for portable construction is shown in Fig. 2, which also indicates details of components.

The advantages of the Filadyne are the small H.T. battery required (30 to 45 volts) and the delightfully smooth control of

If you are thinking of building a light-weight radio outfit for holiday purposes you should read this interesting and helpful article, in which details are given of some particularly sensitive circuits that are suitable for such purposes.
By J. ENGLISH.

reaction which, like the reaction control of the "Magic" receivers, does not alter tuning. The reaction coil coupling is adjusted to give just sufficient reaction for gentle oscillation at all dial settings and thereafter all adjustments are carried out by means of the potentiometer P. The two tuning coils L_1 and L_2 are mounted close together with the direction of their windings in opposition.

Valves for Filadynes.

With care you can make room for a rejector unit, as shown in Fig. 2, which you will find very useful when working the portable within six or seven miles of the Brookmans Twins.

A "MAGIC" CIRCUIT.

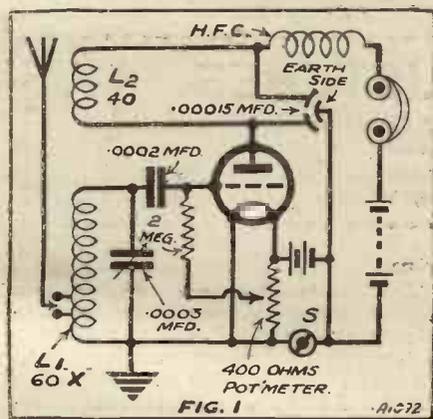


FIG. 1
A highly-efficient one-valve circuit suitable for a small portable.

high order, but nevertheless adequate for Regional conditions outside the "swamping" area. Compact and light construction are the attractions of this type, and its simplicity makes it very suitable for the beginner.

A "Magic" Circuit.

A more versatile local-station type is the one-valve frame aerial portable, as this gives you reception where an elevated aerial cannot be used. Selectivity is excellent, and although range is restricted, 'phone reception of the local station is very satisfactory up to ten miles or so.

The first circuit given for your consideration is a highly efficient one-valve intended

THE "FILADYNE."

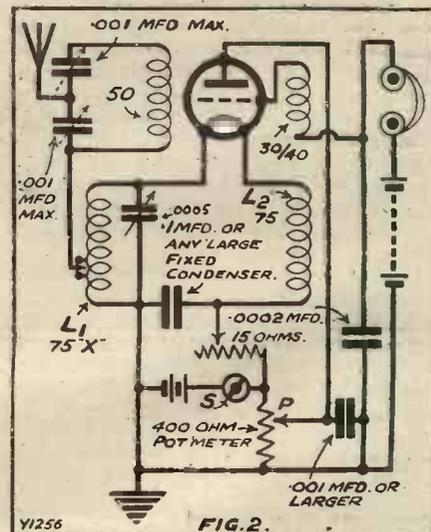


FIG. 2
A modernised version of a famous detector arrangement.

Not every valve will do for the Filadyne circuit, which is rather particular in this respect. Valves to use are the Dario Super H.T. and Frelat (detector) two-volters, and certain obsolete types such as D.E.R., D.E.3, and D.E.2 L.F., which make excellent Filadyne detectors. For the best results careful adjustment of filament current is necessary.

LATEST BROADCASTING NEWS.

KNELLER HALL
CONCERTS.

TRouble WITH PILGRIMS?—
B.B.C. EX-EMPLOYEES—A
DERBY BOY MARVEL—"THE
WHOOPEE BOYS," Etc., Etc.

THE B.B.C. has wisely decided to take this year's season of Kneller Hall Band Concerts. They are given in the afternoon from 3.30 to 5, beginning on Wednesday, May 14th, and continuing on the first Wednesday of each month until September. During term time the broadcasts will be limited to from 4 to 5 p.m.

Trouble with Pilgrims?

It is stated that the B.B.C. received an invitation to broadcast the speeches at the Pilgrims' Dinner to Dr. Nicholas Murray Butler, on May 15th. But apparently Savoy Hill didn't want this occasion, and pleaded "previous arrangements." This answer has hardly satisfied some of the more eminent Pilgrims, who are promising a spot of trouble in the House of Lords.

B.B.C. Ex-employees.

The recent sad death of Auntie Ruby, of Nottingham (Mrs. Barlow) called attention to the difficulties which many B.B.C. ex-employees are facing. The concentration of stations makes reduction of staff inevitable. Most-employees have been with the B.B.C. six years or more, and are not particularly well qualified for jobs outside.

Officials who had quite important jobs, such as band leaders, and station directors, are enduring long periods of unemployment. It is greatly to the credit of the B.B.C. that they keep on the pay-roll difficult cases sometimes for months after the official connection has been severed through concentration.

A Derby Boy Marvel.

Niall Lyall, who is giving his first broadcast in a ballad concert from the Birmingham studio at 1 p.m. on Thursday, May 1st, is still a Sixth Form boy in his school at Derby.

Last year he won the third prize at the Buxton Musical Festival in competition with fifteen adults in the baritone class, and recently sang the part of the Archangel Raphael, in Haydn's "Creation." On May 1st he will sing songs by Schubert, Sullivan and Vaughan Williams.

"The Whoopee Boys."

A band of young American students, most of whom are in the Medical Faculty at Edinburgh, and who are known as "The Makin' Whoopee Boys," with their leader, Richard B. Phillips, are visiting the Edinburgh studio next Monday afternoon, April 28th, to give an entertainment of dance music, songs and other items in the approved American style.

The Whoopee Boys provided an enjoyable interlude in the Students' Revue last year, and since most of them have played for big recording orchestras in America, and have had broadcast experience in their

own country, an enjoyable and somewhat unusual entertainment can be expected.

Broadcast Education in the North.

The activities of broadcast adult education in the North-Western and Yorkshire

NEW RADIO CHIEF.



Lieut.-Col. Crawley, who has been appointed Inspector of Wireless Telegraphy at the G.P.O.

areas will be the subject of a talk for Northern listeners on Tuesday, April 29th. It will be given by Dr. W. H. Moberly who, before he became Vice-Chancellor of Manchester University in 1926, was principal of the University College of the South-West of England.

Dr. Moberly has taken a keen interest in the development of adult education in the North, and his talk will no doubt be eagerly awaited by numbers of discussion groups of which there are more than eighty in about forty-five centres in the Region. Yorkshire alone has forty-five groups, and there are another thirty-five in the North-Western area.

The Oban Gaelic Choir.

All Scottish stations are to hear a recital by the Oban Gaelic Choir, which is to be relayed from the City Hall, Glasgow, on Tuesday, April 29th. Gaelic songs will also be sung by Neil McLean, the station representative at Aberdeen and the B.B.C.'s own Gaelic expert, and items will be contributed by Nan McKinnis (soprano) and Alan Hunter, the latter having a reputation of being the finest exponent of mouth music, an art peculiar to Gaelic singers.

Mozart's Requiem.

Mozart's "Requiem," performed by the Battle Abbey Musical Society, under the direction of Mr. R. Sheehan-Dare, relayed from Battle Church, Battle Abbey, will be heard by listeners to the National transmitters on Tuesday evening, April 29th.

It will be given by the Hastings Municipal Orchestra, conducted by Basil Cameron, the soloists being Winifred Dixon (soprano), Linda Seymour (contralto), Albert Crouch (bass), and Archibald Winter (tenor).

FOR THE LISTENER.

A Specially Contributed Criticism of Current Broadcasting Events
By "PHILEMON."

Who will long be remembered for those wise and witty broadcasts entitled "From My Window."

Picking Flowers.

"THE Flowers are Not for You to Pick" was the title of an item in the programmes the other day. I wish I had taken it at its word, and left it alone. It was a deadly blossom, a dreary bloom, culled from the sunless banks of the Styx!

Happily there were primroses in the garden, and gorse on the common, to take the taste out of the mouth next morning!

It was clever, as these depressing items so often are; but, good Lord! with the Budget, and quarterly bills unpaid, life at the moment was depressing enough without this orgy of gloom! Shall we form a society for a brighter B.B.C.?

The Boat Race.

I had no luck. I was on a train when the race was being rowed. In the evening, the announcer said that a gramophone record of the running commentary would be broadcast at 10.25 p.m.—a smart bit of work; but at ten precisely a friend of mine, to whom wireless is an offence, dropped in for a drink. So I missed everything. Hospitality stood firm, but words failed me!

Crime.

The Topical Talks are now the only surprise items left in the programmes. The other evening we had a very interesting glimpse into a criminological laboratory. All this kind of thing has a queer fascination for me. Perhaps in some previous incarnation the police hunted me!

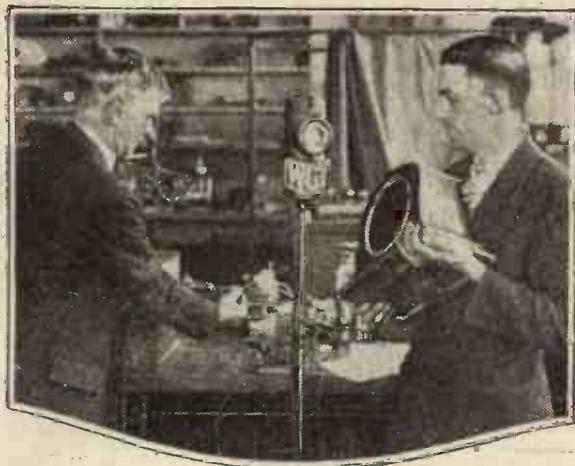
There was no modern chemistry then, thank goodness, and I must have got away. One feels that if a criminal can elude the searchings of modern chemistry, he almost deserves to escape!

The mud on a pair of boots, the writing on a charred piece of paper, the invisible finger print. Henceforth I determine to be good! The way of transgressors is hard!

Vox Humana.

I do not pretend that I understood Schonberg; but I am bound to say that I felt a queer kind of fascination in listening to Erika Wagner reciting the vocal part of his "Pierrot Lunaire." The idea, so far as I could make out, was that the voice was not simply accompanied by the

(Continued on page 186.)



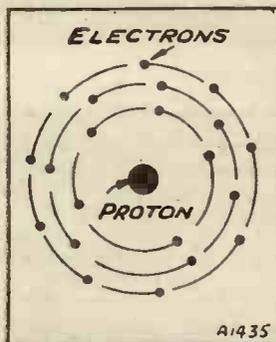
SMASHING THE ATOM

THE fact that two German scientists have been making serious attempts to discover atomic energy is of especial interest to wireless investigators, because the science of wireless is based fundamentally on the behaviour of the atom and its electrons. And any attempts which are made to increase our knowledge of these units are likely to affect also the theory and practice of wireless.

It will not be out of place, therefore, to relate exactly what atomic energy is and how scientists hope to obtain it.

Most people are aware that all matter is composed of tiny units called atoms; a common brick, a star or a human being, all

A MINUTE "SOLAR SYSTEM."



How electrons are arranged round the proton of an atom.

are built up of these tiny and invisible units.

are built up of these tiny and invisible units.

Towards the end of last century it was discovered that the atom itself contained still smaller units, namely the now familiar electron, which appeared to revolve round a more or less stationary unit in the centre of the atom. This has been given the name proton.

Using the Hidden Energy.

The speed of a rifle bullet depends largely upon the charge behind the bullet, and so it must be with the electrons—its speed must be the result of some tremendous force inside the atom—the force is certainly not supplied from outside. The discovery of the rapidly moving electron was the first hint that science received of this so-called atomic energy.

When we use radium we are making use in a mild way of atomic energy, but radium is rare and expensive, so that the only hope of obtaining atomic energy on a large scale is to devise some method of exploding the ordinary atom of matter, when it will discharge its electrons and give us abundant energy in the form of heat.

Uranium is the most likely substance for our purpose, for it is brimful of latent radio-active energy, more so than radium,

Will the secret of atomic energy ever be discovered? This article gives some interesting data bearing on this most fascinating subject.

By G. H. DALY.

and there is plenty of it in the world, and if we can explode its atoms in some way or even accelerate their rate of explosion (for uranium atoms do explode, only they take some thousands of years to do so), then atomic energy will be plentiful.

The Magnetic Method.

The point is how are we to explode these ordinary atoms? The two German scientists, Lange and Bransch, hope to accomplish the feat by submitting the atom by a potential of 9 million volts from thunderstorms and atmospheric electricity generally.

The electron and proton are both electrical in nature, they are more electrical than material, the electron being a negative charge and the proton a positive charge of electricity, and it is the positive charge of the proton which holds the electron to its orbit, and prevents it from flying off into space like its radio-active brother.

If then, in some way, the electric strain which holds these two together can be broken even for an instant, then the atom will split open, the electron will fly off at thousands of miles per second, and terrific heat will be generated.

And what is more likely to break this electric strain than the terrific potential tapped from a thunderstorm?—so, at least, believe the German scientists. When we consider that there are billions of atoms in the size of a pin head, all containing electrons capable of generating terrific energy, then the extent of atomic energy will be appreciated.

A Magnetic Method.

There is also the possibility that the electron in the atom may be torn from the proton by magnetic means, but this has already been tried unsuccessfully in the United States, while the thunderstorm method, with a potential of 9 million volts, is a new one on the atom. However, the magnetic method may again be attempted.

The importance of the experiment to wireless, apart from the world in general, is that whatever happens, some new data

concerning the atom and the electron are likely to be forthcoming. Of course, the investigators may even find out that there is no such thing as atomic energy and that the apparent high velocity of electrons inside the atom is not a demonstration of energy but something else.

As a matter of fact, Professor Millikan, of cosmic-ray fame, has stated his disbelief in this energy, although the majority of scientists, such as Lodge, Rutherford, and Soddy, have made positive suggestions regarding it.

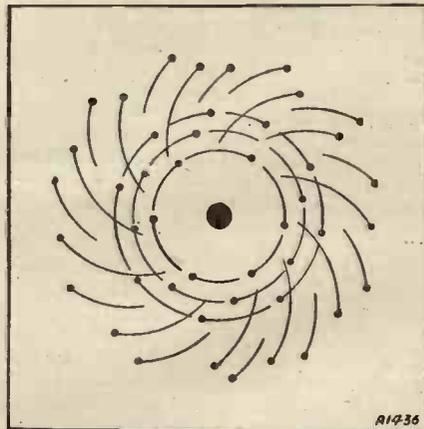
Should atomic energy be harnessed, however, it will cause a complete revolution to life on this planet. From the wireless point of view alone, we should be able to dispense with the most costly part of the transmitter or receiver, namely the power supply; the atomic energy in a few pounds of uranium salts being sufficient to run all the motors and generators of a station like Rugby for twenty or thirty years.

Difficult and Dangerous.

All valve filaments would be coated with radio-active deposit, and neither the low tension or the high-tension batteries would be necessary on the wireless set.

At the same time, atomic energy is not

WHEN THE ATOM SPLITS.



This illustration gives you an idea of how uranium salts split up, free electrons being shot off at high speed.

going to be of very-much use to us if we have to brave the dangers of tapping a thunderstorm every time we require any atomic energy. Some very much less difficult and dangerous method will have to be discovered, and the most we can hope for in the meantime is that the various attempts to break into the atom will throw some light on the behaviour of the electron—surely the most elusive and mysterious entity of our time.

THE "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I take this opportunity of thanking the "P.W." Research Department for that fine set the "Magic" Three? Conditions down here are none too good and I was doubtful as to the results of a straight Det.-L.F. circuit; however, as it turned out, the set gives good loud-speaker results from 5 X X, both Brookmans Park transmitters and 5 P.Y. About a dozen foreigners also come in well and if conditions are fairly good, another three or four may be added to these. 5 G B, for some reason, has been rather erratic this winter in these parts; that is, with myself and one or two acquaintances, so I presume others must have had the same trouble.

The coils in use in my "Magic" Three are Lewcos 250X, and 200 for reaction, and Lissen 60X and 60 for reaction. The H.F. choke is an old Watmel (which has been in use for 23 years), and the second L.F. transformer, a Telsen Radlogrand 3-1. My aerial is 40 ft. high and 50 ft. long, and the earth lead is a long one to an earthing tube. I recently took the set with me on holiday to a Dorset resort and on a fairly good indoor aerial and a poor earth it gave excellent results. In passing, I might mention that my detector is of an unknown make (which my brother "swapped" at school for a broken hockey-stick!) and has been repaired once. I tried a P.M. 1 L.F. in its place, and the difference was only very slight. It has been in use for 4 years!

Although I am still at school I find time for experimenting with various gadgets described in "P.W.", and four years ago when I was 13, I made up various crystal sets. In the Argentine (Buenos Aires), where I was at the time, I could get 12 stations on one of these sets, clear of interference. Since then I have had a one-valver and a two-valver, but the "M.3" was just as easy to build as either of these. I hope soon to add your "Ranger" H.F. circuit, which I have just read about, as I want to keep H.T. consumption down to a reasonable amount for a double-capacity H.T. battery, or I would make your "Magic" H.F. unit.

I remain, your faithfully,
NORMAN WILLIAMS.

Cornwall.

The Editor, POPULAR WIRELESS.

Dear Sir,—A few weeks ago I wrote you commenting on what an excellent set the "Magic" Three is on the ultra short wave-band, and I enclosed a few stations I had heard. Since then I have logged C J R X (Winnipeg), 25.6; W 2 X A C (Schenectady), 34.5, and the new station at Rome, 25.4, at good strength. On the 10th inst. at 11.45 a.m. (G.M.T.) W 2 X A F (Schenectady) 31.48 were relaying Australian dance music, and afterwards speaking to 2 Y A (New Zealand). On the 11th inst. 2.15 p.m. (G.M.T.) P L E (Bandoeng) 15.93 came through on the speaker, and were playing gramophone records. At 5.45 p.m. (G.M.T.) 7 L O (Nairobi) 31.0 was very good, and were also playing records. I find conditions are improving, especially below 30 metres.

Yours truly,
H. HUXLEY.

Leamington Spa.

H. HUXLEY.

REFERRING back once more to the "Majestic"-cum-"Olympic" controversy that has been the cause of so much correspondence, I find in the latest call-book that G 2 G N is the call-sign of an Experimental Station. White Star SS. "Olympic," and G 2 I V is allotted to the "Majestic." G 2 A A is one of the G.P.O. stations at Rugby. I have not heard quite so much of these two stations for the last week or two, but conditions have not been very good for transatlantic work.

The bright spot in the world of amateur telegraphy has undoubtedly been South America. Night after night stations have been roaring through from Uruguay, Argentine, Brazil, Chile, and Peru, and there is one station in Ecuador (H C I F G), who forcibly removes the headphones from my ears whenever I am bold enough to tune him in.

Like Last Year.

In this direction, again, it appears that conditions correspond fairly well with those of last year, for it was just at this time that South Americans were best. The year before, they did not reach their peak until late in the month of April and early May.

In reply to those who have been asking me whether differential reaction control is worth while for short-wave work, I can definitely say "no." A study of the circumstances that led up to its wide adoption

CORRESPONDENCE.

THE "MAGIC" THREE.

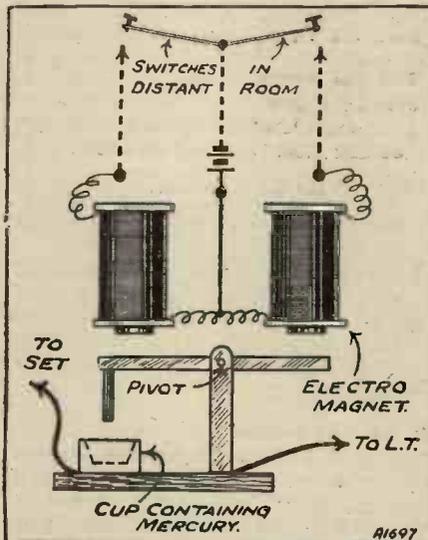
DISTANT CONTROL — REVERSING THE L.T.—"IN SEARCH OF A.J."

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

DISTANT CONTROL.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having read many articles in "P.W." on remote control, I am sending a diagram of an arrangement which I have had in use for about a year. I find it more satisfactory than other controls



This is the remote control devised by our Wolverhampton correspondent.

owing to the mercury contact. Trusting this will be of interest to your readers. I have been a reader of "P.W." since the first issue.

Yours faithfully,
COLIN MACKAY (age 16):
Wolverhampton.

REVERSING THE L.T.

The Editor, POPULAR WIRELESS.

Dear Sir,—The article on "Reversing the L.T." in "P.W." of March 29th, takes a rather narrow view. Only two points are dealt with, namely, the grid leak and the grid bias. When I change the L.T. I always do it in such a way that the grid leak is connected to L.T.+ (at least, until the potentiometer arrived). Similarly, G.B. was not necessarily changed. To look at it very generally there are the following things: Earth, H.T.—, L.T.—, L.T.+ , grid leak, G.B. (when I first tackled it there were also filament resistances). I arrived at the conclusion that it was better to connect H.T.— to earth, and the grid leak to L.T.—. But should L.T.— or L.T.+ be connected to H.T.—? Now that the potentiometer method has been put in a really good form, I say grid leak to potentiometer; H.T.— still to earth; but you still have the question about the L.T. It amounts to little or nothing now, but still I prefer L.T.+ to earth and H.T.—. As for G.B., connect as seems best. Apart from the slight difference in potential, two ideas strike me. First, it would seem better to earth it; but, secondly, the return from the anode goes up the earthed filament lead, and a very slight coupling would seem to take place. As for filament resistances, I would put them in the lead that is not earthed and, incidentally, connect the potentiometer actually across the valve filament and not across the L.T. It does not come to very much, but every little counts.

In the "Magic" series the "magic" was not any revolutionary design, but merely a combination of several somewhat big "littles."

In connection with this every-little-helps business, I rather like the method of applying G.B. to the S.G. valve in this year's "Titan" Three.

Finally, "P.W." are trying to "clean up" mains units, and seem to be succeeding (though when the A.C. sets will arrive, I don't know); but why not try a little more on ordinary sets? The "Magic" series were produced by something of this kind, but I am sure more could be done. I think that a "super-Magic" series could be brought out next winter.

Yours sincerely,
WILLIAM FORSYTH.

Glasgow, W.4.

"IN SEARCH OF A.J."

Dear Sir,—Congratulations on being the first wireless weekly to have a really funny story.

I picked up "P.W." No. 407 and, although I was rather depressed, I laughed heartily over your contributor's adventures "In Search of A. J. Alan."

I shall be looking forward to any more articles you may publish by Mr. S. Howard Jones.

They come as a delightful opposite to the more serious side of wireless.

Yours faithfully,
G. E. FOWLER.

London, W.2.

SHORT-WAVE NOTES.

By W. L. S.

for "P.W." circuits (for normal broadcast reception), will show that the reason that does exist on those wave-lengths for its use does not exist on the higher frequencies.

With normal reaction control on, say, twenty metres, we still have quite a large enough capacity in circuit when the receiver is just below oscillation point to serve as quite an efficient by-pass for the high-frequency component. Don't lose sight of the good old capacity-frequency law!

I have always said that threshold howl is most severe when one uses a reaction coil of unnecessarily large dimensions, and I find a most interesting corroboration of this in an extremely useful article on the subject in "Experimental Wireless." The writer makes his reasoning very clear indeed, and, very broadly speaking, proves that the severity of "threshold howl" is more or less proportional to the total inductance included in the anode circuit of the detector valve. Moral, shun H.F. chokes, use resistance coupling, and use as small a reaction coil as is humanly possible.

The Editor told me recently that he was receiving scores of letters that prove conclusively that the writers haven't the foggiest idea what threshold howl really is. They are apt to confuse the true threshold howl with the howl that occurs when an oscillating receiver is made to oscillate still more strongly; this, is, of course, something totally different, and is due to the grid discharging intermittently through the grid condenser—the values of this and of the grid leak govern the frequency of the howl.

Threshold howl occurs on the threshold of oscillation, an obvious statement but apparently a necessary one. If your short-waver slides smoothly into oscillation with the usual gentle hiss, then, no matter what happens afterwards, you have not got a case of threshold howl.

How Many Countries?

I wonder who can claim to have heard signals from the greatest number of different countries (including amateur telegraphy and telephony)? I should be interested to hear from readers who think they can put up a claim.

I might mention that nothing much under 70 will stand a chance, as I know of two or three readers who are transmitters and have been in two-way communication with that number of countries! What offers, please?



NOTES FROM THE NORTH.

The Chief Engineer of the B.B.C. talks about Moorside Edge, to our Northern Correspondent, in a very special interview.

THE wave-lengths allotted for the North Regional station at Moorside Edge are 479.2 metres and 301.5 metres. These are at present in use by Daventry (5 GB) and Aberdeen respectively.

On the 479.2 metres wave-length Moorside Edge is expected to have a very extensive service area, for its aerial will be 500 feet high (compared with 200 feet at Brookmans Park), there will be 50 kw. of power to play with if necessary, and the wave-length is the best of the bunch used by the B.B.C. on the "broadcast band." The other transmission will not cover such a large area, although a maximum power of 50 kw. will be available here also.

The actual service areas of the two transmissions are still unknown, but it is certain that the radiation will be stronger to east and west than to north and south. As the population is chiefly concentrated to east and west, in Yorkshire and Lancashire, that is as it should be.

When I asked the B.B.C. chief engineer, Mr. Noel Ashbridge, the other day whether the Newcastle transmitter will be dismantled along with the other northern transmitters he answered that we must wait and see what reception Moorside Edge provides in the Tyneside area.

One thing is certain, however—that thousands of people in Huddersfield, Leeds, Halifax, Oldham, Rochdale, Bradford, and Manchester will have to shorten their aerials, alter their sets, or buy wave-traps.

Two Aerials from Three Masts.

Mr. Ashbridge told me that the machinery will be installed towards the end of the summer. In spite of the difficulty of conveying materials to this high site (several miles of roadway have had to be specially improved), the cost of the North Regional station is not expected to be much different from that of Brookmans Park—£100,000 to £150,000.

The economy produced by supporting two aerials from three masts will not, it is stated, be offset by any technical drawbacks. The masts will be similar to those at 5 X X, with the exception (partly owing to experience at Daventry) that they will be insulated at the base. The transmitters will be brought into service by gradual stages, and both should be in full swing by 1931.

land Regional and Moorside Edge—at any rate, the 479.2 metres Moorside Edge—although the shorter wave may fade at this distance, just as the London Regional transmissions fade in Yorkshire and Lancashire but are heard well in parts of Scotland.

Manx Relays.

Moorside Edge will obtain its studio programmes by direct land-line from the Manchester and Leeds studios and from London via Leeds. The existing "S.B." centre at Leeds is to be maintained for a time, but the chief engineer told me that changes may ultimately be made in the S.B. system.

To-day all relays for the North of England stations, Scotland, and Belfast, go via Leeds. The new route to Belfast, via Leeds, Manchester, Blackpool, and the Isle of Man, is functioning well, and has incidentally put

With a new mouth to feed at Brookmans Park, Savoy Hill is calling on the Northern Wireless Orchestra to supply music over the land-line for the London Regional programmes.

An Important Agreement.

The North Regional administration of the B.B.C. deserves warm congratulation on having negotiated a most interesting and important agreement with the famous Hallé Orchestra.

The B.B.C. and the Hallé Society have arranged for a series of concerts to be held in the North of England rather on the lines of the London "Promenade" Concerts, the idea being to give Northern audiences an opportunity during the summer months of hearing music of a high standard at very popular prices.

The season will start on May 26th at the Free Trade Hall, Manchester, where performances will be given during two weeks.

Liverpool & Leeds.

The Hallé Orchestra will then move to Liverpool, where concerts will be given in the Philharmonic Hall from June 9th to 14th, and finally there will be a similar Hallé week at Leeds, with concerts in the Town Hall from June 16th to 21st.

Sir Hamilton Harty will conduct and the concerts will be used as contributions to the North Regional, National, and other B.B.C. programmes.

Local Aid.

Mr. E. G. D. Liveing, the North Regional Director, rightly claims that the scheme is the most important of its kind ever attempted in the provinces. It has certainly aroused the warmest interest throughout the North of England. Sir Hamilton Harty states that the programmes will include

symphonic music and lighter items, and in Leeds and Liverpool the co-operation of the local choral societies will be invited.

In Manchester the Hallé Chorus will be heard, perhaps once in each week.

LISTENING WITH A CRITICAL EAR.



Mr. George Clarke, the leading comedian in "Darling, I Love You," recently broadcast. And here we see Vera Lennox and some of the other girls from the show listening to him by means of a portable set.

Manxland on the map for the Programmes Department.

The first week in July will be a Manx week, and the broadcasting of the motor-cycle T.T. races in June is under consideration.

WIRELESS IN MALAYA.

From A READER.

Continual listening to home and continental stations is inclined to make us forget that radio exists in all parts of the globe, and this contribution by our correspondent, who is a member of the Posts and Telegraphs Dept. of the Federated Malay States, serves to remind us that there are listeners in the remotest parts of the world.

I MIGHT introduce myself as being a one-time contributor to "P.W." My articles, "A Triple Dual Magnification Receiver," dated September 20th, 1924, "A Three-valve Double Dual Receiver," dated January 30th, 1926, etc., may help to bring my name to mind.

I came out here in December, 1926, and have kept in touch with wireless developments ever since. I must say I have appreciated your journal very much indeed. The object of my writing this is to let you know the absolute truth about G 5 S W, Huizen, P C J, and the other stations on the short waves.

Stations Received.

I might first deal with the stations I have received here in Kuala Lumpur, Federated Malay States. I have received Morse from stations in all continents, including Europe (England, France, Holland, Spain, Norway, Germany, Italy, etc.), Africa (Egypt, South Africa, Belgian Congo, British East Africa, etc.), America North (from east to west), Australia (Melbourne, Sydney, Perth, W.A., etc.), Asia (India, Indo-China, China, Burma, Java, Sumatra, Borneo, Philippines, Japan, Siam, Straits Settlements, Andaman Isles, Russia, etc.), South America (Brazil).

As regards telephony broadcasting stations I have logged all continents with the exception of South America. These stations include—Rugby (short wave), Chelmsford, Eindhoven, Huizen, Kootwijk, Nauen; Calcutta and Bombay on the 300 to 400 metre band; Radio Sindex, several Japanese stations on the 300 to 400 band; Shanghai, Manila on long and short waves (the long wave, 300 odd metres, is barely audible), Bandoeng (Java), Brastagi (Sumatra), Bangkok (Siam), etc., Melbourne, Sydney, G A G, Perth (West Australia), Nairobi, K E S (California).

Reception of 5 S W.

Now with regards to the reception of 5 S W here. This station during his lunch-time music (7.30 to 8.30 p.m. local F.M.S. time) is not worth listening to. It takes an expert operator to tune in at this time of day, and most people say "carrier only."

I myself, on a highly efficient Det.-L.F. set, have very rarely failed to resolve his carrier, but he is very weak. I have had him at times on the loud speaker with Det.-2 L.F., but not of good strength.

Now during his later transmission he is decidedly better, but not as good as Huizen sometimes is during the latter's transmission at 8 p.m. onwards, local F.M.S. time. In fact, 5 S W has been such a failure as regards Malaya that I understand our department have decided no longer to check his transmission, as we were requested to do by the Colonial Office.

As regards Huizen, things are very much better. During the past three or four

months this station has fallen off as badly as 5 S W normally is, but I notice a gradual increase in strength of late. He will probably now improve as climatic conditions change at home from winter to spring, and so on.

Wonderful Strength.

The other evening—on 19.130—I had Huizen at wonderful strength. I use 'phones mostly, as I object to trying to reproduce at loud-speaker strength a station which is just "beyond the pale." On the evening in question, however, Huizen was coming over so loudly on two

WHERE THERE'S AVIATION THERE'S WIRELESS.



We are continually hearing of successful long-distance flights nowadays, and radio often plays an important part in such ventures. Here we see a wireless receiver being shipped aboard a plane at Cape Town to be taken up the West Coast of Africa for the purpose of keeping in touch with Mr. Chichester in his recent epic flight.

valves that I switched in the L.S., and could follow him quite plainly on the two valves.

Then I brought in the last valve, a P.M.6, and things began to hum. His strength was so great that I left the bungalow, which is situated above the road, and even at 100 yards speech could be followed. The L.S. is a Brown "Mascot" Cone. Using a super-power valve in the last stage gave clearer results, although not quite so much volume. Music was of very good quality and speech quite good, but liable to a little muffling.

Chelmsford Disappointing.

Fading was practically non-existent that evening. The sky was clear and the moon was full. Altogether, conditions such as existed on that evening are very rarely met with here. One, however, is grateful for small mercies.

Now, in connection with reception conditions in India, I am not in a position to speak, so we must take W.L.S.'s correspondent to know what he is talking about. I can endorse the remarks of correspondents on this part of the globe that our Empire station (G 5 S W) is at most times not worth listening to.

I have heard that 5 S W is good occasionally at three or four in the morning here. But who wants to stay up in this climate until those hours? If an Empire station cannot give us in Malaya a transmission during reasonable hours, then as far as we are concerned the station might as well not exist.

Dutch Development.

I am not grumbling, as we cannot expect the home listener to pay for us, but I might point out the Dutch are far ahead of us in this respect. Of course, the Dutch colonies in Java are really "Holland," whereas Malaya to Britain is only a dot on the map with little importance.

The Dutch development of wireless in their colonies is due more or less to economic conditions. Java is an immensely rich country and well ahead of Malaya in many ways.

The other night I had an opportunity of testing out a commercial set consisting of H.F. screened valve, Det., one L.F. and one pentode. The set is a wonderful one to handle, and Messrs. "X" are to be congratulated. I, however, was not so much interested in the size, ease of handling, etc., as in the signal strength.

I tested the "X" against my own short-waver, and was more than surprised to find that, valve for valve, my own set had it easily. I first tested out the commercial, using three valves only, and the signal strength on this combination was fully equalled on my set using Det. and one L.F.

H.F. Useless?

I have always been a firm adherent of H.F. amplification on the medium bands but have still to be convinced that below thirty or forty metres it is of any use. The H.F. valve, in my opinion, merely acts as a buffer and provides ease of reaction at the expense of another tuning control.

The trade set, however, has a ganged control apparently, and the chief point with that particular set is its ease of handling and its reaction—smooth and regular without "bumps." The set is sealed up, so it is not possible to see how coupling is effected between the H.F. and the detector valves.

I had an idea it was by an H.F. choke, in which case ganged controls would not be necessary. I have also tried out a screened-grid valve in front of my short-waver, but with no increase in strength whatsoever.

J. J. MacINTOSH, A.C.C.S.



CAPT. ECKERSLEY'S QUERY CORNER

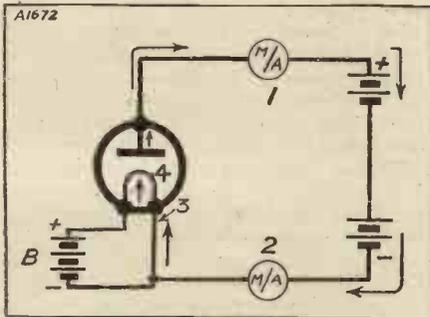
HOW THE CURRENTS FLOW—H.T. ON THE PLATE—TOO MUCH BASS—USING AN R.C. VALVE.

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

How the Currents Flow.

A. J. (Shetland).—"When operating a wireless receiver I understand that the current from the L.T. battery heats the filament and causes a stream of electrons to flow to the plate of the valve, thence through the positive leads to the H.T. battery. Endeavouring to repair the waste going on inside the valve, another stream of electrons

H.T. AND L.T.



This sketch illustrates Capt. Eckersley's comments on the question submitted by A. J. (Shetland).

flows through the H.T. negative lead to filament.

"As the stream of electrons completes the circuit between filament and plate, why does the H.T. current not pass too, and burn out the filament as it would do if the connection were a solid metallic conductor? Is it not just possible that the H.T. current might surge to and burn out the filament?"

My little diagram shows a two-electrode valve. We heat the filament by the battery B. Electrons get discharged from the filament. The plate is positive and attracts these electrons.

The electrons go on through the plate to the positive of the battery, which shoves them over its shoulder back to negative and from negative back into the filament again to start their little journey over again. If we put an ammeter (a measurer of flow of electrons) at positions 1 or 2 we measure the high tension current.

If we put an ammeter at 3, we measure high-tension current plus filament lighting current. If we could put an ammeter at 4 we should measure filament lighting current plus some high-tension current. But the filament current is always much greater than the high-tension current, and although a part of the filament carries all heating and nearly all H.T. current, the addition of

the latter is so small that the filament doesn't worry.

H.T. on the Plate!

R. H. W. (Nottingham).—"I know that I have to choose my grid-bias with reference to the H.T. voltage on the plate of the valve. I am uncertain, however, what to do in the case of a resistance-coupled stage.

"The voltage actually on the plate of this valve will be less than that applied to its H.T. terminal, owing to the voltage drop across the anode resistance. Do I have to allow for this when adjusting the grid-bias on this valve?"

Oh yes, of course. I really think the best way is to get a milliammeter, put it in the plate circuit of your valve and mess about with grid negative until you get the milliammeter steady, neither flicking up or flicking down when you're getting a strong signal amplified.

I was going to give you another way, but it's all a bit wordy and mathematical—much better borrow a milliammeter, if you haven't got one, and do as I say, because characteristics have been known to vary as between valves. So have grid-bias batteries been known to vary from their labelling!

Too Much Bass.

N. D. (London).—"I have constructed a moving-coil loudspeaker which gives a very 'deep' response and appears to have no high-note output. Can you please tell me how I might improve it? You may presume that my set is above suspicion."

This is very difficult. So many things may be wrong. I take your word that the set is absolutely right and is giving equal currents to the loud speaker for every frequency (if the loud speaker had a uniform impedance).

Now, if there is a severe "resonance" of the loud speaker movement at low frequencies, you will get a booming tone which masks high frequencies. This resonance comes from having too tight a support.

Everything should be as "slack" as may be, and if you pull the movement and let it go it should not go back and restore itself in a series of quick-dying vibrations. If your movement is too heavy (I should say has too much mass), things usually conspire to make bass resonance. Then, again, if the cone is too rigid and cannot "break up" in some sort of high frequencies, you will get a lack of "top."

I suspect above all things a strong bass resonance. If you have a screened-grid valve and a small aerial, try oscillating on, say, London before the programme starts. Run slowly through the bass notes of heterodyne and see if at one the movement doesn't go off into violent vibration.

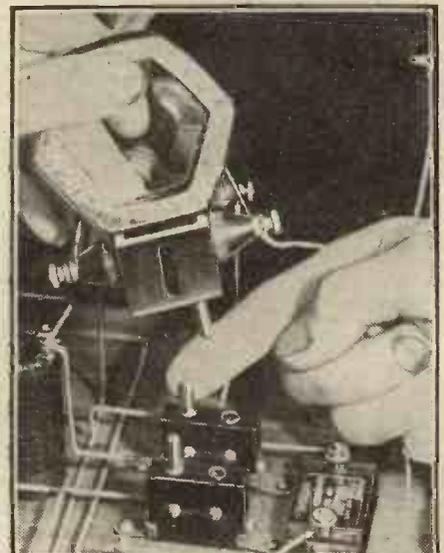
If it does, you've got bass resonance. The common-sense thing to stop it is to try and make any resonance lower than audibility by reducing restoring force, *not* by increasing the mass.

Using an R.C. Valve.

F.R. (Strood).—"I understand that it is possible to obtain large amplification by using special R.C. valves in conjunction with anode resistances of high values. I notice that there are very few sets having L.F. sides designed on these lines. Has this scheme certain drawbacks?"

It should be eminently suitable for resistance-capacity magnification with, say,

X COIL CONNECTIONS.



The standard X coil-holder connections are the pin of the holder to earth.

200 anode volts, 100,000 ohms series anode resistance, and connected in the stage immediately following the detector valve. I can see no drawbacks to such a scheme so long as the designer of the set is after good quality with a proper factor of safety and so long as he does not overload.



WANDERINGS OF A TROUBLE TRACKER

The Earth Again—A "Film" Mystery—Those Fixed Condensers, etc.

By H. REES.

I WAS asked in all seriousness the other day if the clay pipe of the waste-water gully could be utilised as an earth. The earth connection had not actually been transferred to this point, but to something not very far from it—a piece of rusty iron pipe about nine inches long stuck in the soil.

The set was suffering, among other things, from chronic oscillation, and crackling noises reminiscent of a local fish and chip shop, and my friend was astonished that the simple expedient of coupling the earth wire to the tap cured all the troubles at one stroke.

Don't Forget the Earth!

I have found that, to most people, the earth fades to insignificance compared with the aerial. It is believed that the aerial is everything, and the earth nothing but a theoretical whim of some learned pedant. One reason for this appears to be that some have discovered the remarkable fact that their sets "work" with the earth disconnected.

This is, of course, quite true in a large number of instances. Most modern sets will "work," somehow, without an earth if they have fairly strong incoming signals to deal with, and stability is one of their strong points.

But I have never in my humble experience come across a single case where a good earth did not mean an all-round improvement, especially on the distance-getting capabilities of a set. Even with a highly efficient and stable H.F. amplifier, one could ill-afford to dispense with the earth, although quite a batch of stations may come in at good strength without it.

But no earth at all is better than a poor one, if results can be obtained without it. Something more than a mere connection with earth is essential—it must be a good and a permanent connection. Yet scraps of pipe, and even collections of empty tins are used as earths, and it is wondered why some sets are so noisy.

A "Film" Mystery.

I had to investigate a peculiar case of weak reception recently, on a set which had hitherto given very fine results. It was a detector, 2 L.F., with all modern refinements in the way of wave-switching,

selectivity, decoupling, etc. Signals and selectivity had fallen flat, and there were all the symptoms of heavy damping in the aerial-earth system or the tuning circuit.

What was peculiar, however, was the gradual return to normal conditions at times, and the gradual fading almost to nothing. It appeared at first like a faulty grid leak, but changing this component had no effect whatsoever, nor did tests on the other components reveal anything wrong. It was the fading that was perplexing, for an intermittent break or short would reveal itself by sudden interruptions and scratchiness.

Now I had observed that the tuning condenser was one of that variety which had a rubbing contact between the terminal and the spindle of the moving vanes.

This is always a pregnant source of trouble, but in this instance contact seemed to be quite sound. I was about to make a continuity test of this component when I



Earth leads soldered to pipes, earth tubes, etc., should be covered with oiled or greased tape to prevent corrosion due to damp.

noticed that the finger with which I had just touched the bearing was greasy.

Closer examination showed that some time or other a lubricant had been used, and a wipe-up soon put matters right. At intervals, the oil must have formed a high-resistance film between the spindle and its bearing, thus introducing damping into the tuning circuit.

Fixed Condenser Faults.

The fixed condenser seems to be a sadly-neglected component, judging by the frequent troubles I have traced to this source. Indeed, I am certain that if care were taken to choose condensers of reputable make, at least fifty per cent of wireless agonies would disappear, and there would be all-round improved reception.

This applies particularly to grid condensers. More often than not these have to perform a dual function. They have to act as condensers proper, and at the same

time insulate the grid from the H.T. voltage of the preceding valve.

There is no necessity for this distinction, of course, for no leaky condenser can "condense" efficiently, but it must be realised that a very high insulation resistance, comparatively speaking, may be sufficiently low to transfer a considerable voltage on to the grid.

For this reason nothing short of the best mica condensers should be used in this position if you are out for the last ounce of efficiency, and have little inclination for trouble hunting.

But wherever a fixed condenser is used in a set, it is there for a purpose, and there is no point in shunting it with a resistance of a megohm or two—for this is exactly what low insulation amounts to. In choosing your fixed condensers, distinguish between those which have to withstand a fairly high voltage and the ones which are not bound to fulfil this requirement.

Let the insulation of the latter be good, but let that of the former be beyond question, especially if you are dealing with mains voltages.

Those Nameless Batteries.

"But it is a brand-new battery," was the incredulous remark of one to whose H.T. I had traced the source of a deafening howl. The battery was one of those nameless specimens which dupe people into believing that they are getting bargains, when in reality they get only bags of trouble.

It was only by offering to pay for a well-known make of battery should my diagnosis prove wrong, that I succeeded in showing my friend that it pays to buy reputable goods.

The majority of listeners are very slow in grasping this back-coupling business, despite the writing there has been on the subject. A voltmeter across the battery is a concrete indication, and this is all that matters.

When one tries to explain the evils of "resistance," one is met with an incredulous expression and perhaps a dark suspicion that someone is being gently led up the garden. But then, "resistance" is one of those hazy abstractions which seems far removed from an H.T. battery and wander-plugs.

A Certain Cure.

The fact is I am tired of lecturing on the subject. I now invariably put in a decoupling unit. This satisfies the demand of "having something done to the set," besides serving as a permanent cure for battery coupling. Moreover, it generally results in purer production.

PEOPLE WHO WANT PURE POWER TURN TO THE LISSEN

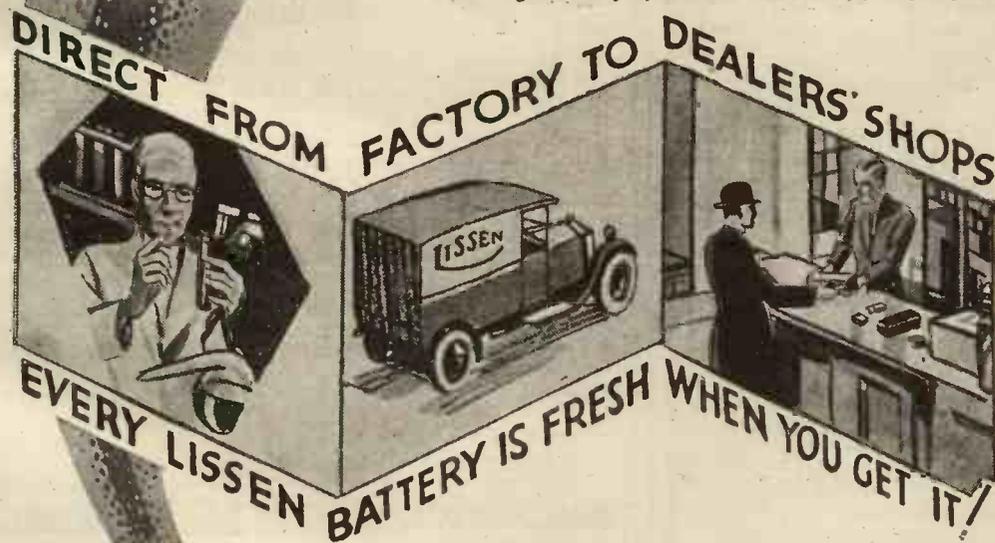


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Player's Please

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- Screened Grid . . . **17/6** each
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It seems to be one of the little failings of human nature that when something new comes along we are apt to be so dazzled by its advantages that we forget about the special merits of its predecessor.

The screened-grid valve is quite a good example. When we first discovered its admittedly very great merits we were, most of us, so delighted that we quite forgot about some good points of the older neutralised H.F. stage which are not shared by the S.G.

Running Costs.

It is a fact, all the same, that the ordinary neutralised H.F. valve does score in certain matters of initial and running costs. It is the old story: the S.G. offers us good things, but we have to pay for them.

The cost question is not the only one, for the "neuted" valve has certain other almost forgotten advantages, but let us go into this matter first. The most obvious difference is in the cost of the valve itself: the standard price for the S.G. is 22s. 6d., whereas the ordinary three-electrode H.F. costs only 10s. 6d., or less than half. This must be quite a point to most of us, remembering that renewals must be taken into account also.

Running costs differ considerably, too, a fact which is not quite so widely known. It is not such a very serious matter, perhaps, and we do not want to frighten anyone off the S.G. valve, but the fact remains that it makes considerably heavier demands on the H.T. battery.

Where it Scores.

The point is that the S.G. really *must* have its full 120 volts for proper results. The actual anode current, moreover, is decidedly heavier than that of the neutralised three-electrode valve. As a matter of fact, the anode current of this season's S.G.'s is, in many cases, something like that of a small power valve, which is why you see grid bias on the H.F. valve in all recent "P.W." screened-grid sets.

When grid bias is used judiciously you can keep the anode current of the S.G. down to some three or four milliamps, but, even so, it is quite a noteworthy addition to the drain on the H.T. battery. Many people, of course, consider the price well worth paying for the tremendous magnification they get, but it is just worth stopping to consider whether it is always necessary.

The S.G. set makes a very fine outfit for many purposes, but we do not always need all this amplification, and where a reason-

ably good aerial is available, a set with the neutralised type of H.F. stage can still give a very useful performance indeed. The economy which results is a serious consideration to many of us; remember that such an H.F. valve will work well with 90 to 100 volts H.T., and only takes one milliamp, or a little over.

We have gathered from correspondence that quite a large proportion of our readers realise these advantages of the "neut" set; and, indeed, we have received quite a lot of requests for a set on these lines. It is in response to these that we have built the "Neutype" Three, and it has been quite a pleasure to renew acquaintance with a type of circuit which we feel is by no means out of date, old friend as it is.

Excellent Results.

We have been pleasurably surprised to find how good it can be when assembled on the modern plan with a spot of judicious screening, its high selectivity being particularly valuable under Brookmans Park conditions. The "neuted" H.F. stage does

indeed score here, for it is decidedly easier to obtain really good selectivity with it than

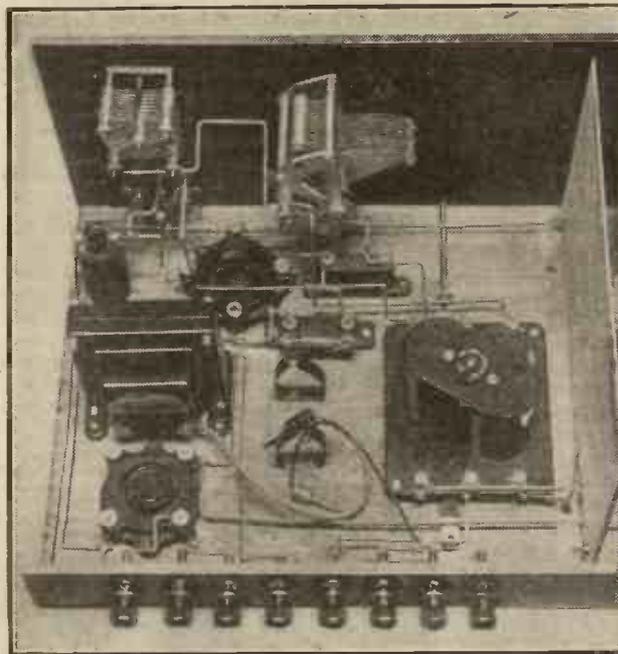


Here is a set specially designed in response to requests from readers. It is an inexpensive set to maintain, as well as being

Designed and

THE "P.W." RESEARCH

REAL LOUD-SPEAKER POWER.

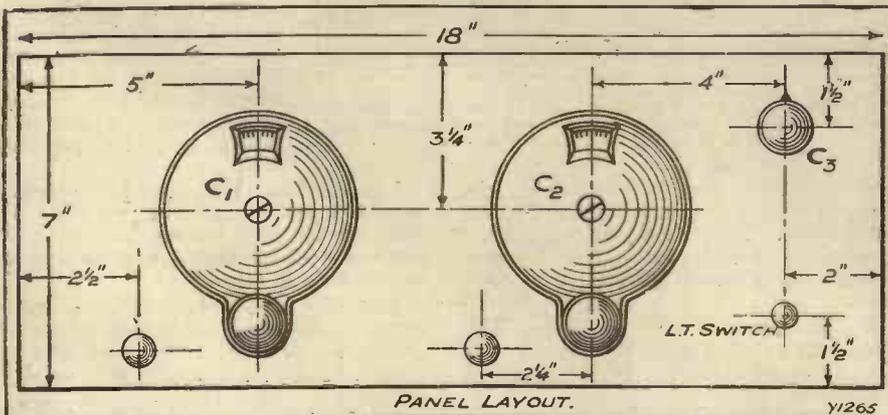


The set has ample power for the operation of a loud speaker on a very respectable number of distant stations.

COMPONENTS YOU

- 1 Panel, 18 in. x 7 in. (Resiston, or Goltone, Keystone, Paxolin, Trolite, etc.).
- 1 Cabinet, with baseboard 10 in. deep (Cameco, or Pickett, Osborn, etc.).
- 2 0005-mfd. variable condensers (Lotus or J.B., Dubilier, Lissen, Ormond, Ready Radio, Polar, Burton, Utility, Formo, etc.).
- 2 Vernier dials if condensers not of slow-motion type (Lissen, or Formo, Ormond, Igranic, Brownie, J.B., Lotus, etc.).
- 1 0001- to 0002-mfd. differential reaction condenser (Lissen, or Ormond, Ready Radio, Bulgin, Dubilier, Lotus, Formo, Polar, Keystone, etc.).
- 1 L.T. switch (Pioneer, or Igranic, Lissen, Lotus, Benjamin, Wearite, Keystone, Jewel, Ready Radio, Burton, etc.).
- 3 Sprung valve holders (Igranic, or Benjamin, W.B., Burton, Lissen, Lotus, Wearite, etc.).

AN EASY-TO-DRILL PANEL.



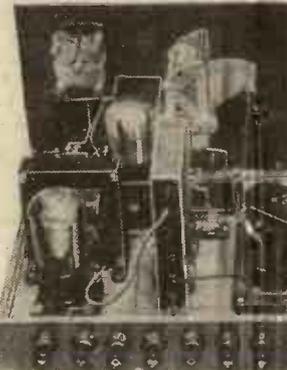
PANEL LAYOUT.

The panel preparation is well within the powers of the inexperienced constructor, and, when he has done this, a big part of the work of assembly is completed.

with the S.G. type. The latter really requires quite special schemes, as in the "Magic" Four, to make it sufficiently selective for modern conditions.

The "Neutype" Three, then, is a set with a neutralised H.F. stage employing an ordinary three-electrode valve with the advantages we have enumerated, wave-change switching, easy construction and operation, and a surprisingly excellent degree of sensitivity for

EXAMINE THIS



You will see that the "Neutype" is a real radio. The more you know about radio, the more

SELECTIVITY, SENSITIVITY

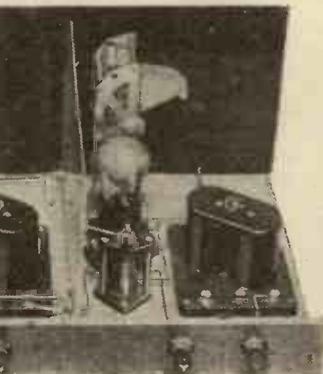


response to a large number of re-
 expensive three-valver to build and
 both selective and powerful.
 Described by
 & CONSTRUCTION DEPT.

YOU WILL NEED.

- 1 Neutralising condenser (J.B., or Bulgin, Lissen, Wearite, Igranic, etc.).
 - 1 D.B.A. and 1 D.P.B. coil unit (Lewcos).
 - 1 Standard "P.W." screen, 10 in. x 6 in. (Paroussi, Ready Radio, Keystone, Wearite, Magnum, etc.).
 - 1 Low ratio L.F. transformer (Ferranti A.F.3, or R.I., Lissen, Varley, Igranic, Telsen, Mullard, Lotus, Lewcos, etc.).
 - 1 H.F. choke (Keystone, or Varley, Lissen, R.I., Dubilier, Lotus, Lewcos, Ready Radio, Wearite, Graham-Farish, Igranic, Bulgin, etc.).
 - 1 0003-mfd. fixed condenser (T.C.C., or Dubilier, Lissen, Atlas, Graham-Farish, Igranic, Goltone, Mullard, etc.).
 - 1 2-meg. grid leak and holder (Dubilier, or Lissen, Mullard, Atlas, Igranic, Graham-Farish, etc.).
 - 10 Terminals (Igranic, etc.).
- Wire, screws, G.B. plugs and pair of clips, flex, etc.

VIEW CLOSELY.



ally sound, straightforward design, and
 ore you will appreciate its finer points.

SIMPLICITY AND QUALITY

its type. Selectivity, too, is really good. Now, we do not want to give the impression that we are running down the S.G. type of set. Far from it; we are merely pointing out that one does not always need the great amplification which it provides, and that

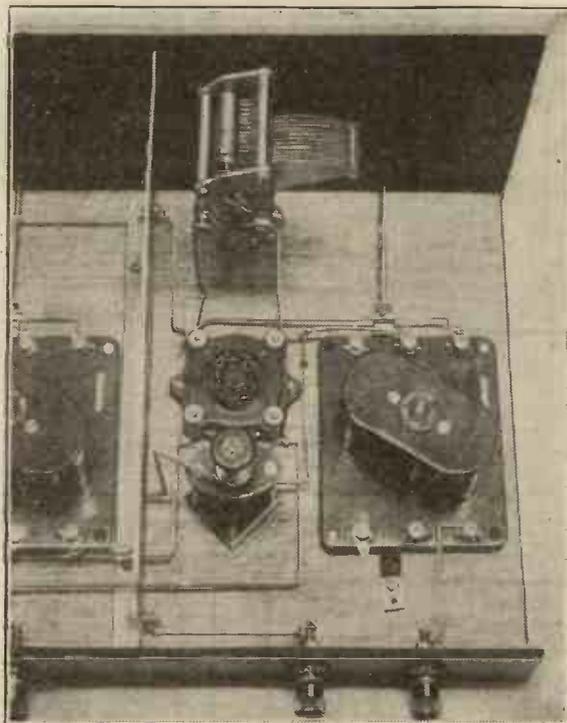
where the neutralised type will serve, there results quite a noteworthy all-round economy. One point is that so long as the reader has a fairly good aerial he would do well to give such a set as the "Neutype" Three a little consideration, if economy is what he wants.

Under these conditions it will give a really excellent performance. Its selectivity is well up to the modern standard, and its sensitivity is high enough to bring in quite a lot of foreign stations on the loud speaker after dark. It is very simple to operate, with its two dials which keep quite nicely in step over the tuning range, wave-change switching and, of course, differential re-acton.

Circuit Simplicity.

Since this type of set has probably become a little unfamiliar by now, let us just explain briefly how the circuit is arranged. First of all, note that the apparent complication

THE "DISTANCE" END.



This inexpensive set owes much of its "DX" power to a very efficiently arranged H.F. stage.

of the tuning arrangements is really only just a matter of the wave-change switching. They are actually quite simple, and, since

all this is arranged inside the special coil units, it need not concern the constructor.

The grid circuit of the H.F. valve is made up in just the normal way, with a coupling arrangement for the aerial which gives good selectivity both on the normal wave-band and on long waves. The coupling unit between the H.F. valve and the detector is a form of H.F. transformer known as a "split primary," which enables the necessary neutralising circuit to be arranged.

Securing Stability.

In this way, the set can be stabilised and any tendency to self-oscillation removed by a suitable adjustment of the neutralising condenser. Just how this part of the circuit works it is impossible to explain fully here, but the essence of the idea is that part of the primary winding is used to feed back energy into the grid circuit via the neutralising condenser.

This energy is of opposite phase to that which makes its way back through the plate-grid capacity of the valve, and so if it is made equal thereto in quantity the two will cancel out and the circuit will be stable.

The detector valve is of the usual grid leak type, with differential reaction of the modern form, which is so beneficial in promoting sensitivity and preventing the tuning from being upset by adjustments of the reaction condenser.

You will find the set is a very easy one to build and there is little which we need tell you about the work itself. The two coil units are entirely self-contained with the wave-change switches built into them, so they do not make any real difference to the amount of work to be done. All that you have to do is to screw them down and drill two holes in the panel for the extension spindles for the switches.

Some Wiring Tips.

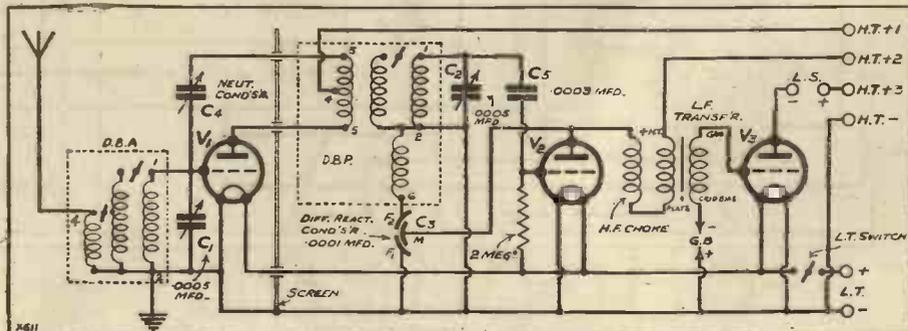
When it comes to wiring up, there are one or two points we should mention in relation to the screen. This is of the standard "P.W." type, with a row of perforations along the lower edge, through which leads can be passed. Of course, the wires which do actually pass through (there are only three of them) must be insulated.

Observe, too, that connection is actually made to the metal of the screen itself at three points, one near the back and one at either side of a point near the panel.

Just one other constructional tip: You will find the wiring-up easier if you do not fit the condenser C₂ until all the rest of the job is finished, since it is easier to get at some of the connections around the

(Continued on next page.)

A QUITE STRAIGHT-FORWARD CIRCUIT.



Although the circuit incorporates many special features that contribute a great deal to the general efficiency of the set, it is of an essentially non-complicated character.



The DIFFICULTIES of a BROADCAST SKETCH

by
MICHAEL HOGAN

An article exclusive to P.W. by the well-known actor and radio entertainer, who, with Miss Mabel Constanduros, writes and presents the ever-popular "Buggins" sketches.

TO me, the broadcast sketch is a great problem. It bristles with difficulties from every aspect. True, it is an entertainment which lasts at the most a quarter of an hour, and consists only of short, crisp dialogue—but that is just the trouble. A few minutes, you know, is not a long time in which to portray a complete episode from the lighter side of life.

Just think it out for yourself. Suppose you had to write an account of your own family outing at a picnic, at the Zoo, or with friends. In actual fact, your outing may last five or six hours, and during that time your conversation will probably not contain a single word or sentence which would cause a wireless listener to laugh.

Really Hard Work !

Yet Miss Constanduros and myself have to conduct our outing within the short space of ten or fifteen minutes. We have to crowd our dialogue with laughs, to create endless ridiculous situations to tickle the humour of the wireless public.

It will surprise many people to know that the writing of a ten or fifteen-minute sketch for the wireless often means three weeks real hard work. First, there is the general idea or theme of the sketch to be thought out, frequently the most difficult part of the job.

Thus, a lot of hard thinking has to be done even before we put our pens to paper. As time goes on, and listeners have heard the Buggins in this, that, or the other farcical situation, our field becomes narrower and our difficulties increase proportionately. I tremble to think how difficult our task will be in a few years time if the Buggins are still broadcasting !

Fantastic Jokes Useless.

It is sometimes days and weeks before the right inspiration comes. By dint of much brain racking, however, it usually turns up, and, with our general idea before us, we sit down to think out how convincingly funny the Buggins might make it appear.

I say "convincingly" because our jokes, no matter how far-fetched they may be, must have some real life foundation. In other words, they are exaggerations of incidents which might easily occur in real life with such a person as Mrs. Buggins.

There must be thousands of screamingly funny jokes which, in the ordinary way, will raise laughter, but which, from our point of view, are so fantastic as to be useless. It is only because there is some foundation in fact for the stupid things the Buggins do and say, that the sketches have become so well liked.

Our best lines are those which are inspired by our own everyday experiences, and these, of course, come to us most easily. One of the greatest difficulties of radio sketch writing is the manufacturing of incidents which have never come within the scope of one's own experience.

For instance, it would be much easier for me to write of the Buggins moving their lodgings than, say, of their trip to the North Pole. You see, I know of the difficulties and trials of removals, but have never experienced the terrors of the ice wastes !

I am sometimes asked how I manage to think out laughs. To be quite frank, I sometimes wonder myself. In the case of Grandma and Bert, however, the main



Mr. Michael Hogan.

basis for raising laughter is the entirely different natures of their characters.

As near as we can make them, they are exact opposites, and, as a direct consequence, they have the most ridiculous misunderstandings.

Unlike most sketch writers, I never keep my ears open for useful "gags." I make this statement in no boastful spirit, for, as I have pointed out, the best jokes

are those inspired by personal experience.

As far as I can remember, we have only once used a manufactured "gag," and that was a typical schoolboy "howler." The idea of "King Charles disguising himself as a pheasant to escape from the Roundheads" was too good to be missed !

I do not believe in introducing "impromptu" "patter" into a radio sketch. Comedians who can think out a really good line on the spur of the moment are so rare as to be almost non-existent, and even those who have this gift really well developed seldom make use of it.

Taken With "Nerves" !

Whilst it may be true that the best joke is the spontaneous one, I prefer to stick to my lines and be sure of at least an occasional laugh, rather than blurt out some inanity which flashes to my mind, and get none !

On more than one occasion, I have found that the sketch I thought so good when writing seems sheer nonsense when I stand before the microphone. This, I suppose—and hope—is my own nervousness. I have sometimes thought that when in the studio, Grandma and Bert are the most stupid creatures who ever applied for an audition.

Curiously enough, it is only occasionally that I am thus taken with "nerves." At other times, I feel quite at home. In this I am not alone, thank goodness, for Miss Constanduros herself sometimes becomes nervous in the awe-inspiring presence of the "mike."

A Ghastly Moment.

I can recall one occasion when she became terribly flustered, and, in her haste, dropped her script on the floor. The leaves scattered in all directions, and for one ghastly moment, we feared the end had come.

By frantically peering over my shoulder, however—there is only a small space in which to work before the microphone—Miss Constanduros managed to read my own script, and we got through the sketch without further mishap.

The studio audience was greatly amused by the incident, but to us it was anything but funny. I might say here that the few onlookers who are admitted to the B.B.C. studios every evening are of inestimable value, especially in vaudeville work.

Not only do they create that almost indefinable thing, "atmosphere," but lend an air of cheerfulness to the proceedings which would otherwise be lacking.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

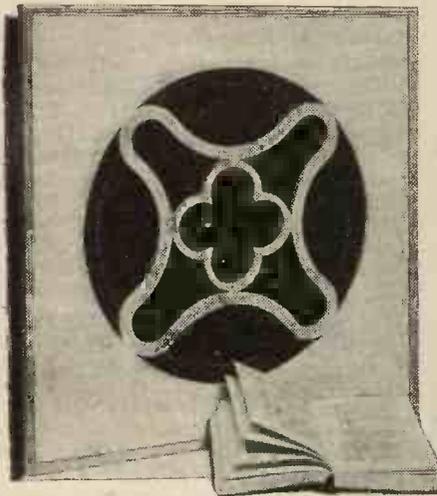
Tested and Found—?



THE STORNOVOX CONE-SPEAKER CHASSIS.

THE average loud speaker unit works very well with a large cone. The "Stornovox" cone speaker chassis manufactured by Goodmans, embodies a large cone, and its results are distinctly pleasing.

The cone is of the free-edged variety and is made of a special doped paper. The framework consists of a light aluminium casting



This is the "Stornovox" Loudspeaker cone and baffle.

which can be fitted with practically any make of unit. Finally, there is a cleanly finished baffle, and this is provided with a fretted front to protect the diaphragm. The assembly is available in plain wood or ready stained, and polished in mahogany finish.

"PRINCIPLES OF RADIO"

Messrs. Chapman & Hall have published the above book by Keith Henny, M.A., at 17s. 6d. It is a very excellent work, and very comprehensively covers the theory and practice of modern radio, more particularly in regard to reception.

READY RADIO VARIABLES.

The Ready Radio people are now manufacturing a variable condenser which retails at 4s. 6d. in either .0003 or .0005 mfd. maximum capacity. This will be good news for all constructors, and not only those whose pockets are lean, for this Ready Radio variable is cheap only as regards price.

Forgetting the price, which is no indication of this component's qualities; the construction and finish of the condenser are of good standard. The buying tablet which appeared on this page a week or two ago was devoted to variable condensers, and I shall not fail to do justice to this Ready Radio variable if

I save space and say that it answers the specified requirements.

Additionally, its design is such that there is hardly any solid dielectric at all in its structure, the insulation of the fixed vanes being accomplished in a particularly ingenious manner. The metal work is almost entirely aluminium and the cut-away end plates are of a very solid nature. Finally, the movement is consistently smooth. Altogether it is a distinctly commendable proposition.

A CALIBRATION CHART.

Mr. Percy C. Skinner of 98, Cherry Orchard Road, East Croydon, has sent me a copy of a large calibration chart he is selling for 6d. It has all the well-known stations printed on it, the long-wave ones down one side and the medium-wave ones down the other. And it is figured along the bottom both for 180 and 100 degree dials.

On the back of the chart are given full instructions for drawing up station-finding curves. While, of course, most amateurs can quite well do such jobs themselves, many must find it convenient to have charts prepared for them in this way.

"RIDING THE AIRWAVES."

Short-wave enthusiasts should find "Riding the Airwaves With Eric Palmer, jr.", a book full of interest. Eric Palmer, jr., is a very young American short-wave fan who seems to have crowded more radio thrills into the space of a few years than most of us have managed to do in a decade or two.

I have not finished reading the book yet, but am browsing slowly through it. I think it deserves it. I was very amused at the account of how his father, getting perturbed at his late hours, wrote to the Radio Commission and asked them to suspend his transmitting licence! This blossomed forth as a front-page newspaper story. Eric Palmer, jr., has some good yarns to tell, but his chronicle is, of course, very "American." The book is published by Horace Liveright of New York, but at what price I do not know, it doesn't say in the book itself.

THE PETO-SCOTT "VOX-KIT."

Details of the "Voxkit" Console Cabinet were included in the Peto-Scott advertisement that appeared in page 127 of our April 12th issue.

Unfortunately, the words "accommodates Ultra Air Chrome Speaker" led many to believe that the speaker is an extra above the cash price of £6 17s. 6d. This is not so; that price covers the Air Chrome.

WHEN YOU ARE BUYING—

11. AN H.F. CHOKE.

Make sure that it is designed to cope with the wave-length band you wish your set to cover.

There are special short-wave H.F. chokes and H.F. chokes that cannot efficiently be used on short waves.

Others will not go up to the long waves.

Then again we have the "Universal" variety that can deal with short, medium, and long waves. But a "Universal" needs very special design, and manufacture, and only the good makes manage to prove really efficient on all waves.

If an H.F. choke is needed in an S.G. circuit, it requires to be more than usually good.

Size is no indication of an H.F. choke's efficiency. Some that appear to be unusually small are quite up to the high standard demanded by modern radio conditions.

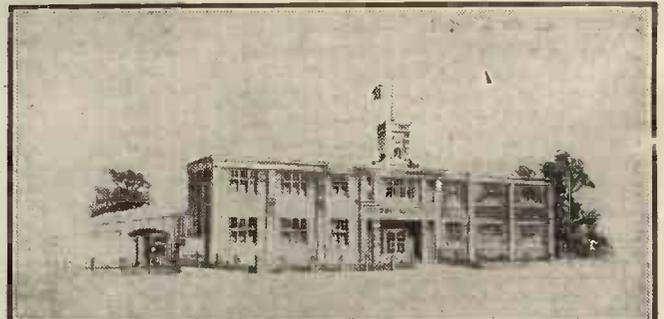
An H.F. choke is, or should be, more than a mere bobbin of wire! The wire must be wound properly and in correct proportions for the device to have the comparatively high inductance and low self-capacity that are necessary.

NOT QUITE RADIO!

A. Arnold & Company, of 17, Elmercroft Avenue, Golders Green, London, sent me a stop-watch for test and report a week or two ago. At first I was inclined to regard this as being rather out of the province of "P.W." However, thinking it over, I came to the conclusion that I would be wrong to do this.

Time is all important to the radio enthusiast, while there are occasions when a stop-watch can be especially useful. Particularly may this be so in connection with outside broadcasts of sporting events, and, more scientifically, a stop-watch can be used usefully in observations on atmospheres and such like.

The Arnold New Stop-Watch sells at 7s. 6d. with guarantee. It records to a fifth of a second and, over some short tests, it acquitted itself quite well.



This is how the new R.I. factory will look when it is built at Croydon.

NO ADJUSTMENT NEEDED!

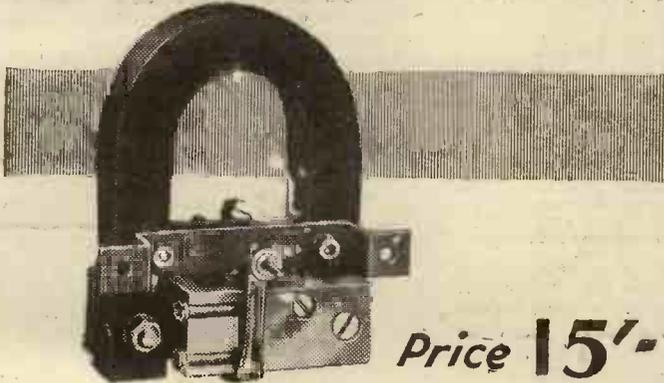


Price 12'6

The Ediswan Cone Assembly is specially designed for use with the Ediswan Cone Unit and the complete speaker can be assembled in a moment. Only two screws are necessary.

To obtain the finest possible results a baffle at least 18" square should be used.

EDISWAN CONE ASSEMBLY



Price 15'-

Ediswan Cone Units are designed and adjusted by engineers of great ability and long experience. This means that when the unit reaches you the armature setting is fixed in the best position for efficient operation. This setting also eliminates any possibility of chattering.

EDISWAN CONE UNIT



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W.77.

AGE 16 TO 45.



J. H. Bennett

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Practical Mechanical Engineering
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Foundry Work
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Heating, Ventilating and Lighting
Internal Combustion Engines
Marine Eng., B.O.T.
Mathematics
Matriculation
Metallurgy
Motor Engineering

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Pattern Making
Post Office
Examination
Costing and Estimating
Builders' Quantities
Road Making and Maintenance
Sanitation
Shipbuilding
Structural Engineering
Surveying and Levelling
Surveyor of Works.
R.E.
Telegraphy and Telephony
Town Planning
Transport A.M.Inst. T.
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Fireman's Exam.
2nd Class Mine Mangr.
1st Class Mine Mangr.
H.M. Inspector
Mining Elect. Engineer
A.M.E.E.
Mining Mech. Engineer
Mine Surveyor

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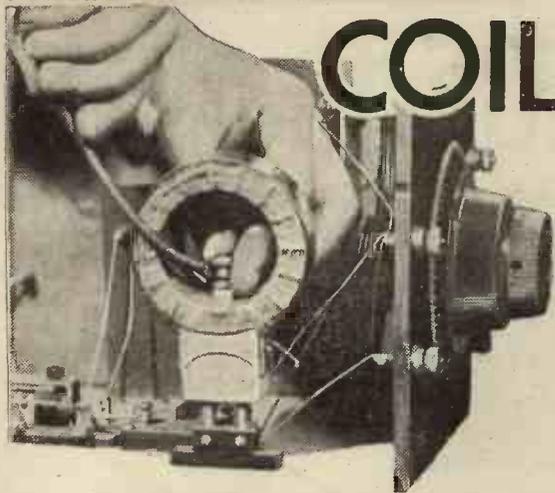
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COIL CONNECTIONS



If you have a good supply of plug-in coils, there is hardly any special coil arrangement which you cannot hook up in a few moments. Read how to set about it in this clear and instructive article.

By A. S. CLARK.

PLUG-IN coils of the two-pin variety seem to have had a revival in popularity lately, and are now much more in favour than they were a year or two ago. Whether this is due to a greater appreciation of their usefulness it is difficult to say, but it is certainly a fact that the scope of their utility is much wider than many realise.

Probably all wireless enthusiasts have come across circuits they would like to have tried but have been unable to do so because special coils were employed. Naturally, they would not want to buy expensive coil units merely for experimental purposes. In such cases a little ingenuity and some plug-in coils will often work wonders.

Some Simple Examples.

With a little thought it is possible to arrange almost any circuit with plug-in coils, particularly with the help of those of the centre tap and "X" types. If we take two or three simple examples, they will serve to show the idea, so that the experimenter can work out schemes for himself.

We will start with that very common coil the split-primary H.F. transformer. Look at Fig. 1. Here a theoretical conception of the coil is shown, and also the equivalent numbers on three plug-in coil mounts.

It would be as well to mention here that the positions of the pins and sockets do not matter, but that the method of connecting the reaction and tuned coils together is important if correct reaction effects are to be obtained.

For the tuned winding we use a No. 60 coil (assuming we are going to work on the lower broadcast band), and a 35 or somewhat similar sized coil for reaction. The

only point in this case which is likely to be puzzling is the question of the centre-tapped primary.

Unless we actually know the ratio of turns on the primary to those on the secondary in the six-pin coil (and it is not likely these details will be available) we shall have to find a suitably sized coil by trial. However, a No. 50, 60, or 75 centre-tapped coil will prove quite satisfactory in most cases.

A split-secondary coil can be arranged with plug-in coils in a very similar manner (see Fig. 2), but the centre-tapped coil will now take the place of the tuned coil and consequently should be a No. 60. Different size primary coils may be tried, and in this connection we are able to vary our selectivity in a manner not usually possible with a complete unit, such as one of the six-pin variety. A reaction coil of size similar to that for the split-primary case will most likely be suitable.

In Fig. 3 is shown a six-pin coil known as a split-primary type aerial coil. This is replaceable by an ordinary "X" coil without any special adaptation, but remember to keep the pin of the coil holder connected to earth, otherwise the taps will be at the wrong end of the coil, with the result that selectivity will suffer.

Coil Sizes to Use.

The following will help in choosing the right sizes of coils for various purposes. For the lower broadcast band a No. 60 coil should be used for the tuned circuit; this applies whenever the circuit is a closed one, and whether it has a centre tap or aperiodic aerial taps. The reaction can be between a No. 25 and 50, according to the ease with which the circuit oscillates.

Primaries for aerial coupling can range from a No. 25 to No. 50 coil, and these sizes will also do for the anode coil in the case of H.F. transformers. (Centre-tapped coils of double the size are necessary in split-primary arrangements because of the neutralising winding.)

For long waves a No. 250 coil is required for the tuned circuit and a No. 50 to 150 for reaction, and No. 50 to 150 for the anode coil also. The remarks with reference to coils for the lower band apply to those for long waves as well.

In circuits where binocular coils are necessary in order to obtain stability the matter is not so easy. But there is a lot of scope for experiment in this line by using two plug-in coils side by side and connected so that their fields oppose one another. The coils will, of course, be in series, and the total number of turns must be larger than with just one coil.

The three illustrations we have given indicate the methods to employ in all cases, and you will find that most arrangements can be divided into three sections, namely tuned coils, coupling coils and reaction coils.

Watch Your Windings.

A point which you should appreciate when working with plug-in coils is that a part from "X" type coils, it does not make the slightest difference in what orientation the plugs and sockets of the coil holders are arranged. What is important is that all coils should be wound in the same direction, or connected up in a similar manner.

If you wish to ascertain whether all your coils are wound in the same direction, lay them in a row on the table with the pins all to your left. If now you trace out the wires which start at the pins you will find that

SPLIT SECONDARY.

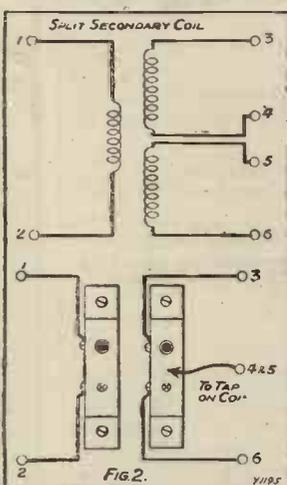


FIG. 2. Two plug-in coils, one with a centre tap, can be used instead of a split-secondary H.F. transformer.

SPLIT PRIMARY.

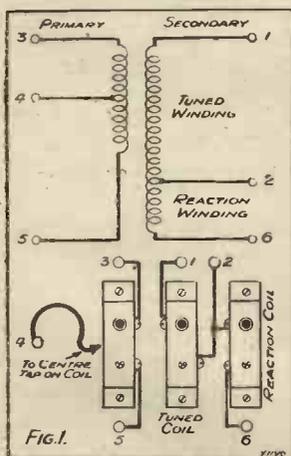


FIG. 1. Three plug-in coils, suitably arranged, will form quite a good split primary H.F. transformer with reaction.

FOR THE TAPPED AERIAL.

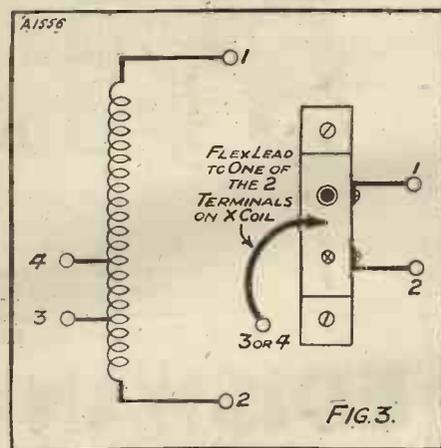


FIG. 3.

A two-pin plug-in "X" coil may be employed instead of a 6-pin aerial coil.

they all run in either a clockwise or anti-clockwise direction (assuming all the coils are wound the same way). If you find they are mixed you can overcome the trouble by changing over the connections on the coils that do not correspond with the majority.

This reversing of connections does not apply to X coils, so when such coils come into consideration the others must be changed to conform with them.



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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 specialities described may be the subject 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

THOSE TWO PROGRAMMES!

E. T. (Rickmansworth).—"I always got the old London programme well, and when the new station at Brookmans Park opened it seemed even better. The crystal still works two pairs of 'phones on the 356 metres, but on the 261 transmission it is much weaker.

"I turn the condenser right round to zero and can just begin to pick up the 261-metre

CAN WE HELP YOU WITH YOUR SET?

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

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transmission when it won't go down any further. Is there any way of making the condenser go down a bit further, as I feel sure this is all that is necessary to bring in the 261 as loud as the 356?"

You want a few turns off your aerial coil. If this is of the home-made variety you can easily undo the winding and reduce the number of turns by 9 or 10, but if you use a plug-in coil you may not find it so easy to alter, though all you need is a one-size-smaller coil or a few turns taken off the present one.

TRANSFORMER TERMINALS.

D. G. (Aldgate).—"On the blue print they are marked '+' and 'P.', 'grid' and 'grid bias'; but on my transformer there is

I.P., O.P., I.S., and O.S. What do you know about that?"

The "+" and "P." correspondent with I.P. and O.P. The I.S. and O.S. correspondent with "Grid" and "Grid Bias." These two sides must not be interchanged, but you can try I.P. or O.P. on + (or on "P."). And you can try I.S. and O.S. on either "Grid" or "Grid Bias." Test to see which connection gives best results, and leave it at that.

A SHOCK FOR THE TRANSFORMER.

J. L. C. (Nr. York).—"I think it is trouble with my L.F. transformer. In the old set it worked perfectly, but results with the new portable in which it was embodied were so bad that I tested every component and found the transformer was the cause of the trouble.

"Strangely enough, on putting it back into the old set, it failed to live up to its previous standard, although I was careful to connect it exactly as before, and the set itself had not been altered except to take out the transformer! (It's an American make.)

"It does not appear to be out of condition in any way, but the only thing I think might account for it is that before putting it into the portable set I dropped it from a rather high shelf, and I am wondering if this could possibly affect the characteristics of the instrument?"

It would appear to be quite possible that the fall is the cause of your trouble, and if the transformer has one of the high-permeability cores that were used in America some time ago it may be suffering from the mechanical shock of the fall, which is very harmful to the magnetic properties of some alloys.

With certain types of transformer made from these alloys, considerable care has to be exercised in manufacture to prevent shock, if the high permeability which is characteristic of the alloy, is to be retained permanently.

WHEN THE TEST WAS MISLEADING.

R. P. (West Ealing).—"I bought a new variable condenser but noticed that, in two different sets in which I used it, reception was poor.

"It appears to be perfectly O.K., and continuity tests between terminals and moving plates, etc., were O.K., but eventually I proved definitely that the condenser was the cause of the trouble by substituting that, and nothing else, in the set and noticing how poor results were with this one when compared with another. Not wishing to throw it away, I finally took off the braided pigtail which was affixed to the moving plates, and put on a new piece of flex, after which I found, to my surprise, that the condenser behaved perfectly.

"What could have been wrong?"

That is very difficult to say without inspecting the material, but there is a possibility that, although the joint appeared to be O.K., between the pigtail and the metal it was really a form of dry joint. These

sometimes respond to a continuity test with a battery, but nevertheless have a high resistance at high frequencies, and so cause a fall-off in signal strength every time the condenser is used.

THE CALL OF KATOWICE.

C. P. (Doyercourt, Essex).—"I am very interested in a station which I receive two or three degrees above Frankfurt, Germany. From the dial position, as compared with other stations, I think it must be Katowice, Poland, and on one occasion I heard him announce, 'Hallo, Polsky Radjo.' But I have also heard him speaking in French, and then the ringing of a sort of one-note gong. Do you know if Katowice does ever announce in French, and, if so, about how far would it be from my aerial to his?"

We have no doubt that this was Katowice you heard, as the dial position is right for 408 metres and the announcement of the call, "Hallo Polskie Radjo Katowice," might be given as you say. Usually, Katowice closes down in the Polish and French languages, and the one-note gong that you heard is really a series of hammer strokes upon an anvil. (This characteristic sound indicates the industrial character of the district around this station.) The distance would be almost exactly 800 miles.

CAN NEUTRALISING CONDENSERS BE CONNECTED IN PARALLEL?

L. B. (Eastchurch).—"I should like to use an old H.F. valve that I have on hand, but I find that I cannot neutralise this because my neut. condenser capacity is insufficient. Is there any way of increasing the capacity or shall I have to buy a new neutralising condenser? I already have two of these, both of which give the same results; that is to say, insufficient capacity for this valve, though O.K. for others."

The easiest and best way out of your difficulty would be to connect the two neutralising condensers in parallel, which would promptly double the capacity available. The objection to this is that all H.F. wiring should be kept very short, so the provision of two neutralising condensers instead of one is not usually advisable; but, in your case, we think it should prove a very easy and satisfactory way out of the difficulty.

In connecting, all you have to do is to place the two condensers as close together as possible, and mount them so that the leads can be direct and very short. Then join them by two wires, fixed plates to fixed plates and moving plates to moving plates.

Set one near its maximum and then neutralise with the other as usual.

(Continued on page 184.)

WHAT DO YOU THINK ABOUT THIS?

A few weeks ago one of these accounts of other readers' troubles reminded a Falmouth listener of a very bad evening he spent with a new set.

He made it for his fiancée, tested it at home and found it worked splendidly, fitted it up with nice leads, spade tags, etc., proudly installed it at his fiancée's house, and switched on. It wouldn't work!

Everything looked all right—the valves lit, aerial and earth were O.K.—but yet there was not a sound in the speaker! Can you tell

WHAT WAS WRONG?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

The problem presented last week by the case of the Harley Street reader of "P.W." was the old one of interference from electrical machinery. (The best thing to do in such cases is to write to the B.B.C., who will do all in their power to assist such unlucky listeners.)

This "Ekco" All-Power Unit eliminates three sources of trouble



- No Batteries**
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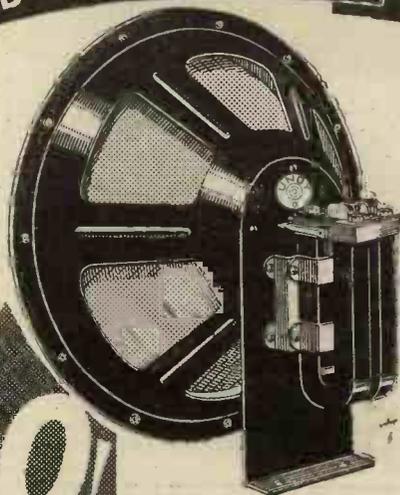
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 182.)

NERVOUS OF LIGHTNING.

E. A. M. (Camberwell).—"As my wife is very nervous of lightning, I think of fitting some sort of safety-device to reassure her. The aerial is not very high, being 25 ft. at the house end and about 20 ft. at the far end, which is the most I can make it.

Upon inquiry, I find that a gadget called an earth arrester can be used, which is supposed to make the aerial safe. How does this work? (I already have the ordinary earthing switch, but she is afraid that, as this is out of action when the set is in use, we may get sparks on the aerial while we are listening-in.)"

There is really not the slightest need to be nervous if you always keep the aerial joined to earth when it is not in use, and never attempt to listen-in during thunderstorms. As a matter of fact, an earthed aerial outside the house is often a protection instead of a danger, giving very much the same advantages as a lightning conductor on a tall building.

Your aerial is hardly high enough to matter either way, and if the earthing switch is fitted with a fairly long extension handle or a length of cord by which it may be put into operation without actually touching it, this alone is adequate protection. An earth arrester can be used as well as a switch, the advantage of it being that it is always in circuit whether the set is in use or not, and it acts automatically.

Practically all earth arresters consist essentially of a very small air gap, interposed between two fairly large surfaces. Each of these is connected to a terminal, and of the two terminals one is connected to the aerial and the other to the earth lead.

The ordinary H.F. currents received from broadcasting stations suffer little loss across this air gap and so they are passed through the leads on to the set to the ordinary way. Should the aerial become suddenly charged from electrified rain, etc., as soon as a charge had accumulated on the aerial, the little air gap would be bridged across by a spark, thus discharging the aerial.

With all such instruments, care should be taken to instal them as directed by the manufacturers, the best place usually being directly underneath the aerial lead at the point where it enters the house by the lead-in tube.

CHECKING H.T. BATTERY CONSUMPTION.

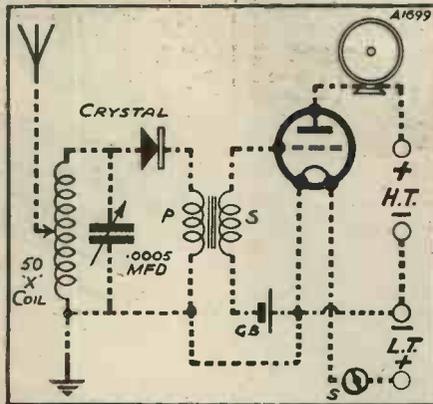
H.D. (Hamilton, N.B.).—"A friend of mine in the electrical trade has made me a present of a milliammeter with the idea of checking distortion. It seems invaluable for this, and I am finding further uses as it is provided with

in the lead from the tuned anode to the plate, I get a plate current reading, and there is also a similar but slightly smaller reading if I place it in the lead to the screen of the valve.

"This comes direct from the H.T. battery, not through a tuned circuit. Does this indicate that the valve is taking two separate H.T. currents, and should the total current consumption be these two added together?"

Yes. Both the screen and the actual anode of the valve are taking current from the H.T. battery, and the total H.T. consumption of the valve is the sum of these two.

POPULAR "WIRELETS" No. 8



The dotted lines show the connections of the crystal and onevalve amplifier given in last week's "Wirelet." (This class of receiver is very useful for obtaining loud-speaker results from a station situated only a few miles from the receiving aerial.)

shunts which enable me to read 0 to 5 milliamps, as well as 0 to 25.

"It is very interesting to notice how anode current increases if grid bias is reduced, and another thing that interests me is the S.G. valve. I find that if the milliammeter is placed

MEASURING THE INPUT.

D. D. W. (Dumbarton).—"I understand that it is possible to measure an H.F. input by means of a valve voltmeter, and should like to know the principle upon which such an instrument works?"

In the simple form usually employed, the instrument consists of a valve with characteristics suitable to be employed as an anode-bend rectifier, a sensitive milliammeter, a reliable unvarying H.T. supply, and a large by-pass condenser. The whole has to be made up very carefully with constants that really are constant, if it is to be of service for comparative checking.

Usually separate and reliable batteries are employed for it, the connections being H.T. - to one filament socket on the valve holder to grid-bias positive, to one side of the large by-pass condenser and to L.T. -

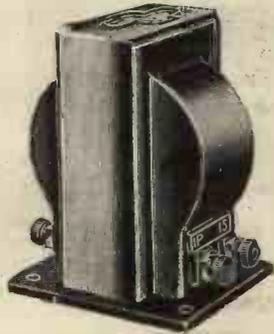
H.T. + goes to the positive side of the milliammeter. The negative side of the milliammeter goes to the remaining side of the by-pass condenser and to the plate socket on valve holder. The grid socket of the valve holder goes to one of the input terminals and the other terminal goes to negative G.B. The final connection is from the remaining side of the filament to L.T. +, via a switch if necessary.

The instrument works on the principle that the amount of H.T. current in the plate circuit will vary according to the input voltage on the grid and thus, when checking different forms of coupling, etc., the arrangement which gives increased voltage at the grid terminal will show a marked increase in the plate current.

It is important to remember that the measurements are only comparative; that is to say, the whole arrangement of the valve voltmeter amplifies them

(Continued on page 186.)

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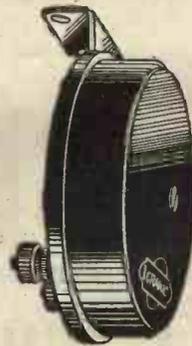


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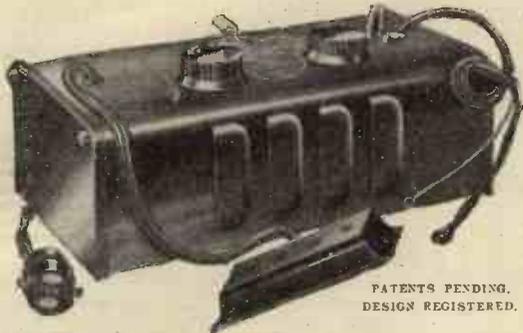
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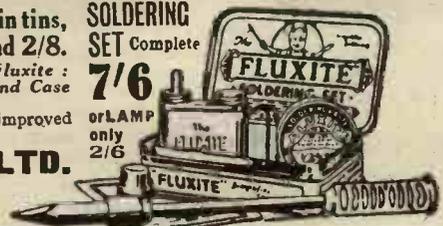
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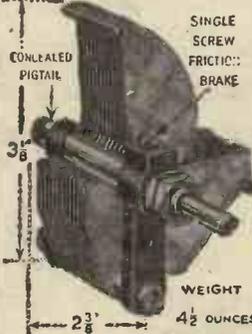


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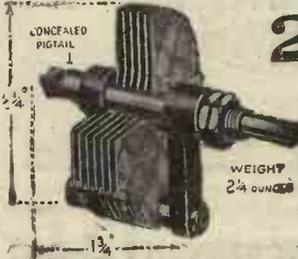


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HAMPSTEAD 1787.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 184.)

to an arbitrary degree, though within reasonable limits this amplification enables a comparison to be made between different inputs.

But unless the instrument is calibrated for the purpose and kept perfectly constant, the readings of the plate circuit will not give the actual figures or voltage of the input, but will only indicate comparisons and changes in those voltages that may be taking place.

WHAT'S THE TIME?

C. W. (Grantham).—"What with this Summer Time and different wave-lengths. Sunday signals, Greenwich, Big Ben, etc., I am never quite clear as to when the Time Signals are supposed to be sent out by the B.B.C. What are the regular hours?"

The following are the REGULAR broadcast time signals from the National Programme, on 261 and 1,554 metres.

Week days: 10.15 a.m., Big Ben: 10.30 a.m., Six Dots: Noon (except Saturdays), Big Ben: 1 p.m., Six Dots: 4.45 p.m. (5 X X only), Six Dots: 6.30 p.m., Six Dots: 9 p.m., Six Dots: 11.30 p.m. (5 X X only), Six Dots.

Sundays:—10.30 a.m. (5 X X only) Six Dots: 3 p.m., Six Dots: 9 p.m., Six Dots. (Usually Big Ben is broadcast at the beginning and end of programmes emanating from London.)

USING A CALIBRATION CHART.

E. G. M. (Ashby-de-la-Zouch).—"In the lid of the set is a calibration chart, very much

TECHNICAL TWISTERS

No. 7.—GRID BIAS.

CAN YOU FILL IN THE MISSING LETTERS?

Generally a grid-bias battery should supply no

Insufficient grid bias means that the H.T. current taken by the set is

Modern H.F. and low-frequency stages need grid bias.

The anode-bend detector requires grid bias, but bias is necessary for a leaky grid detector.

Often no separate G.B. battery is used for the leaky grid detector's bias, but this is obtained by connecting its grid return to L.T.

Last week's missing words (in order) were: First; Reversed; Insulated; Short.

like the one which appeared in 'P.W.' a week or two ago in the article, 'Finding Those Foreigners.' Quite a number of stations are now marked on the line, but I am told that other unknown stations can be listened for on it, and I do not see how this is done. Is there a method?"

Once you have the calibration chart, its curve shows the relationship between the dial readings and wave-lengths, so that if you know one of those you can always find the other. If, for instance, you pick up a station at 71 degrees on the dial, and you do not know what station it is likely to be, you follow the 71-degree line up to the curve and then turn at right angles along the line which shows you exactly what wave-length this reading corresponds to. In this way you are able to identify the station.

Similarly, if you wish to pick up a particular station such as, say, Oslo, Norway, and you do not know whereabouts it comes on the dial, you first of all ascertain from a list of wave-lengths, etc., what is the wave-length of Oslo. You will discover that it is 493 metres, and, with this information, you can discover the dial reading by reversing the procedure outlined above.

That is to say, you first of all look up the line corresponding with 493 metres, follow it along to the point where it intercepts your calibration curve, and then turn at right angles to the corresponding degree reading on the dial. Easy, isn't it?

FOR THE LISTENER.

(Continued from page 164.)

orchestra but was part of it, as a 'cello or trumpet might be; an instrument blending with the rest.

Erika Wagner's voice is a wonderful instrument, musical in the extreme, flexible, and capable of rendering the whole gamut of the emotions. Her manner and artistry were superb. It was a curiously intriguing experience. I felt I got something, and I envied those who seemed able to enjoy this fascinating performance to the full.

The Cup Final.

Parsons are some use after all! The Bishop of Buckingham deserves our gratitude for the part he has played in solving the difficulties between the B.B.C. and the Football Association, so that we shall now have a running commentary on the Final.

Nobody would be satisfied to watch a football match if he could play in it; and nobody would be satisfied to listen to one if he could see it; but there are so many of us who, for one reason or another, cannot see these historic battles, but who love the scene and the thrill. Thank you, my lord Bishop!

Journalism.

The relation between the B.B.C. and Journalism is very close. In a sense the daily programmes are a kind of journalism. It was fitting, therefore, that there should be a broadcast of the ceremony of presenting the freedom of Manchester to Mr. C. P. Scott of the Manchester Guardian.

Fifty-eight years is a long service; and it was good to hear the splendid things that were said, and so deservingly, of this doyen of the newspaper world.

In Fleet Street.

By a happy coincidence we heard on the same day from Mr. R. D. Blumenfeld what newspaper work was like fifty years ago. In his view, while there has been an amazing revolution on the mechanical side, there has been little change in the spirit and temper of newspaper men and the quality of their work.

"The Press of to-day is not much better, and not much worse, than the Press of fifty years ago. The typographical appearance of the papers has greatly changed. There were no headlines, no illustrations then."

The change from the old to the new style was inaugurated by Alfred Harmsworth, as he was then known. It was interesting to hear that the sum of £10,000 only was spent in launching the first number of the "Daily Mail."

In those days a circulation of a quarter of a million was reckoned phenomenal. Newspapers were produced more leisurely, and read more leisurely. Integrity, then as now, was the "shibboleth." But nobody had dreamed of Cross-words!

Variety.

Lately I have very much enjoyed Walter Lanham's imitations of animals; very carefully observed and very cleverly reproduced. I have also lost my susceptible heart to Janet Joyé, whose impersonations of women she has known, particularly the

(Continued on page 188.)

SCRAP YOUR OLD AERIAL and fit the 'GOLTONE' NO-MAST AERIAL

"GOLTONE" NO-MAST PATENT AERIAL

A WONDERFUL INVENTION.

No pole or mast required. Gives greater selectivity and wipes out interference. No "assembling" necessary; can be fitted in half an hour.

THE STRONGEST GALE CANNOT BLOW IT DOWN. Your signal strength can be nearly doubled, selectivity vastly improved, and stations hitherto unobtainable come in at loud-speaker strength with the "Goltone" No-Mast Patent Aerial.

Price: No. NM/22. "Goltone" No-Mast Patent Aerial complete with insulated down lead wire and full instructions for fitting. **24/-** No other Aerial Wire required. From all first-class Radio Stores

A postcard brings illustrated Pamphlet giving extracts from testimonials and technical Press reports.



WHAT USERS SAY.

Major F. W. C. D.S.O. M.C. Belgrave Crescent, Eccles, writes:—

"I have fitted the No-Mast Plate and 'Negrolac' Aerial, and am delighted with the results.

"I obtained increased selectivity and volume, received several foreign stations at enjoyable strength on Loud Speaker which were unobtainable on my old pole aerial."

Mr. E. L. Maryhill Rd., Glasgow, writes:—

"I live in a block of flats where poles are impossible. I must say my reception is now better and clearer than when I used a Pole Aerial elsewhere."

Mrs. G. I. Leigh-on-Sea, Essex, writes:—

"Aerial arrived safely and is giving splendid results on a Two-Valve Set. It is better than the ugly poles, and we shall recommend them to our friends with pleasure."



Just What You Want!

For receiving those foreign stations.

The 1930 "Straight-line" FOUR.

A special high-power receiver designed by PERCY W. HARRIS, M.I.R.E.

Fully described in the APRIL

WIRELESS CONSTRUCTOR.

Also in the same issue

The "Feather-weight" Portable

a novel and remarkably light portable loudspeaker set, and

The "King" Cut-out.

VICTOR KING solves your interference problems.

Don't miss the APRIL

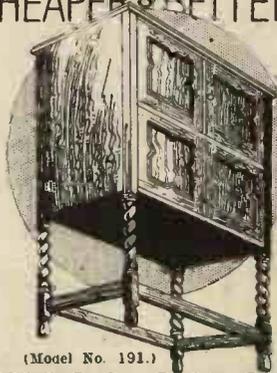
WIRELESS CONSTRUCTOR.

Now on Sale.

Price 6d.

CHEAPER & BETTER

This "OSBORN" READY-TO-ASSEMBLE FIGURED OAK RADIO CABINET for £1/15/0



(Model No. 191.)

Machined Parts ready for assembling - £1 15 0
Cabinets assembled ready for polishing £2 7 6
Cabinets Finished ready for use £3 0 0
Carriage paid.

3 ft. high, 2 ft. wide, 1 ft. 4 ins. deep. Panel size 21 ins. x 8 ins. (or smaller). Four doors opening top and front.

Send 3d. in stamps for 56-page Illustrated Catalogue.

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(Dept. P.W.), THE REGENT WORKS, ARLINGTON STREET LONDON, N.1. Telephone: Clerkenwell 5095. Open to 7.30 p.m. Sat., 4.30 p.m. And at 21, Essex Rd., Islington, N.1. Phone: Clerkenwell 5634 Open until 8 p.m. Sat., 9 p.m.



Dependable!

For Mains Work

All Heayberd Power Transformers are built—as Power Transformers should be built—to work efficiently under any load. Each instrument is tested with 3,000 volts between windings and frame before leaving the works! That's one reason why you should use them in your eliminator when you make it. Ask us to send you lists.



Type W. 14. Output 135 v. at 70 m.a.; 4 v. at 4 amps.

Price 21/-

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Telephone: CLERKENWELL 7216.

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4/6	Type	Fil. volts.	Amp.	Imp. ohms.	Amp. fac.	
EAOB Post 4d.	GPR 22	-095	24,000	13-5	H.F. Det.	
	GPR 32	-095	12,000	9	L.F.	
	GPR 42	-095	40,000	32	R.C.	
	GPR 93-5-4	-09	22,000	14-5	H.F. Det.	
POWER 7/6 EAOB Post 4d.	GPR 103-5-4	-09	10,000	9	L.F.	
	GPR 113-5-4	-09	44,000	41	R.C.	
	GPR 17	5-6	20,000	17-5	H.F. Det.	
	GPR 18	5-6	11,000	9-5	L.F.	
SUPER-POWER 12/6 EACH Post 4d.	GPR 202	-15	6,000	7	Power	
	GPR 404	-15	6,000	7	"	
	GPR 606	-15	6,000	7	"	
	GPR 1202	-3	3,000	4-5	Super Power	
SCREENED GRID 15/- Each Post 4d.	GPR 1404	-2	3,500	4-5	"	
	SG 25 2	-2	220,000	150	S.G.	

2 Values or more sent POST FREE. Matched Valves 1/- extra per set.

A STILL BETTER P.R. VALVE

By a special process employing an extremely rare element in minute and precise quantities, in the coating of our "Golden" Series, we have been able to turn out a valve of extraordinary efficiency and robustness, the emission also being increased BY OVER 50 PER CENT.

INSIST ON THE GOLDEN P.R.

For selectivity and volume a better valve cannot be obtained anywhere with such a low consumption of H.T. and L.T. The glass bulbs are of a distinctive golden colour, and each valve has a golden guarantee band.

GUARANTEE. All valves despatched under guarantee of Money Back in Full if not satisfied and returned within 7 days. All valves are carefully packed and breakages replaced.



Sent C.O.D. if desired.

Ask your dealer for them. Accept no other.

THE ONLY BRITISH VALVE WITH A WRITTEN GUARANTEE AS TO PERFORMANCE & LIFE.

Tel.: City 3788.

P.R. PRODUCTS, 45, P.R. HOUSE, NEWGATE STREET, LONDON, E.C.4 (Opposite G.P.O. Tube Station)

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Solve all H.T. Troubles. SELF-CHARGING, SILENT, ECONOMICAL JARS (waxed), 2 1/2" x 1 1/2" sq. 1/3 doz. ZINCS, new type 10d. doz. Sacs 1/2 doz. Sample doz. (18 volts), complete with bands and electrolyte, 4/1, post 9d. Sample unit. 6d. illus. booklet free. Bargain list free. AMPLIFIERS, 30/- 3-VALVE SET, £6. P. TAYLOR, 57, Studley Road, STOCKWELL LONDON.

ALL APPLICATIONS for ADVERTISING SPACE in "POPULAR WIRELESS" must be made to the Sole Advertising Agents, JOHN H. LILE, LTD., 4, LUDGATE CIRCUS, LONDON, E.C.4.

FOR THE LISTENER.

(Continued from page 186.)

little slavey in the lodging-house, seemed to me first-rate. She is original, and has a very alluring voice.

Also Thanks.

To the Glasgow Orpheus Choir for a wonderful hour of part-songs, glees, and madrigals. This form of entertainment gives me the greatest pleasure. And to Douglas Jerrold again for a very racy account of the hoax which goes by the name of "Antoinette's Necklace." Jeanne de la Motte, Cagliostro, Vilette—what romantic names they are!

A Negro Chrysostom.

"Were you there when they crucified my Lord?" What a glorious voice Paul Robeson has! It was a good beginning to Good Friday week to have him in the programme on the Sunday. What is the secret of these Negro Spirituals?

Is it the quaintness and simplicity of the words? Or some rhythm of the tune that stirs very deep? He sang two songs that were new to me, and very lovely; but the familiarity of the old ones, like "Steal away," does not breed contempt—they are too great.

* * * * *

DID YOU KNOW THAT—

* * * * *

A water pipe makes an excellent earth connection, especially if it is the "rising main."

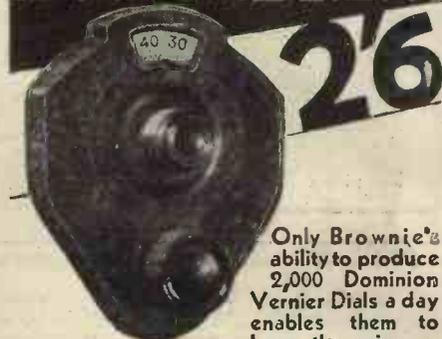
The earth wire need not be insulated.

There should be no joint in the aerial or earth wires, but if one is unavoidable it should be soldered.

Large earthed objects such as trees, have the effect of partially screening wireless waves, and one of the advantages of a high aerial is that it is lifted above such obstructions.

One of the disadvantages of a screened aerial is that it often tends to make the first condenser's tuning flat.

DOMINION VERNIER DIALS



Only Brownie's ability to produce 2,000 Dominion Vernier Dials a day enables them to keep the price as low as 2/6. The special non-backlash design (for fine tuning) and the splendid finish (smooth black or beautifully grained mahogany bakelite) coupled with the low price, makes the Dominion Vernier Dial a real radio bargain.

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BROWNIE WIRELESS

HEADPHONES REPAIRED 4/-
Transformers 5/- Loudspeakers 4/- All repairs re-magnetised free. Tested, guaranteed and ready for delivery in 24 hours.
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E. MASON, 44, East Rd., City Rd., N.1.

USE YOUR ELECTRIC SUPPLY!
Build a Fel-Ectric Eliminator, giving 120 volts at 15 m.A.'s, for 36/- complete, including valve. NOTHING ELSE TO BUY.
Send for booklet which explains, from—
FEL-ECTRIC RADIO,
56, GARDEN STREET, SHEFFIELD.

"Strange mysteries of time"

If There were not Movement there would be no time and no Universe.

A splendid article in this week's THIS AND THAT deals in a popular way with the so-called fourth dimension. It shows that to measure time without the aid of the sun or without clocks and watches set by the sun would be hopeless. "Let a few experimenters," says the author, "segregate themselves for a few days with artificial lighting and no means whatever of knowing the time. They would come to vastly different conclusions regarding the length of their sojourn."

There is much more of intense interest in this grand number of

This and That

Every Thursday

2d.

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NOW STOCKED EVERYWHERE

You can buy TUNGSRAM A.C. Valves from your own dealer. He stocks the whole range—including Indirectly Heated A.C. Valves. They'll cost you nearly 50 per cent less than Association valves, too. But they're of better quality—they have the famous Barium filament.

Why pay a higher price when you cannot get a better valve?

Indirectly Heated Valves, 9/6
4 v. A.C. Power Valves .. 8/-

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Types
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Factories in Austria, Czechoslovakia, Hungary,
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Branches: Belfast, Birmingham, Bristol,
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Nottingham.

TECHNICAL NOTES.

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

Picture Records.

IN view of the great interest shown by many readers in the question of talking pictures, you may like to have some particulars of the sound-recording and reproducing arrangements used with the "talkies," as these—though you may not think so at first—differ in some important respects from the arrangements used with ordinary gramophone records.

Of course, you know that the electrical pick-up is used with a powerful amplifier, and a system of loud speakers is placed behind the cinematograph screen.

As regards the records themselves, these rotate at about 30 revolutions per minute instead of the usual 75 to 80. Furthermore, the needle usually travels from the centre of the records towards the edge, which is opposite to the arrangement of an ordinary home record.

Whereas ordinary standard records are 10 or 12 inches in diameter, the records used with the talking pictures are 16 inches, 18 inches, and in some cases, 24 inches in diameter.

In fact, records have actually been made of a considerably greater diameter even than this. The records are single-sided and have a total "playing time" of 10 to 25 minutes.

Efficient Sound Reproducers.

These records have the wavy or "sinuous" cut, sometimes called the "lateral cut," and a V-shaped groove. The top of the groove is roughly the same width as the "wall" between one groove and the next, that is, about half the "pitch," or spacing of adjacent grooves. The depth of the groove is about 2½ mils. (a mil. is 1/1,000th of an inch).

When the record is being "cut," the recording disc passes under the needle at a linear rate of about 60 to 160 feet per minute, or very roughly about 1 mile per hour average.

The loud speakers used are often of the exponential horn type and the units are capable of handling up to 5 watts of energy, the conversion of electrical energy into sound energy being claimed to be (although I very much doubt it) between 30 and 40 per cent efficient.

Constant Inductance Chokes.

The question whether a constant inductance choke is preferable to the ordinary variable inductance type is raised in a letter from a reader in Portsmouth; he says that he wanted an L.F. choke in connection with a choke filter output for his receiver and that he was asked, by the dealer whom he approached, whether the choke was to be of the so-called "constant inductance" type or not.

It was explained that with the ordinary choke the inductance decreased as the current through the choke was increased, whereas with the other type the inductance remained more or less constant, at any rate up to a certain specified maximum current.

(Continued on page 190.)

Stations galore!

1930 "MAGIC" 4

"POPULAR WIRELESS" says:

"There is everything in favour of buying a complete kit of parts and nothing against it. You get all the little items, such as screws, etc., and your panel is neatly drilled for you. Moreover, you are certain that every component is suitable for the set—that is if you purchase an approved kit such as is sold by Ready Radio."

PRICE LIST OF PARTS READY FOR IMMEDIATE DESPATCH:

	£	s.	d.
1 Panel drilled, 21 in. x 7 in.		7	0
1 Oak cabinet, with baseboard.	1	12	6
2 Ready Radio '0005-mfd. variable condensers		9	0
2 Igranic vernier dials		12	0
1 Ready Radio '00015-mfd. differential condenser		5	0
2 Ready Radio on-off switches		1	8
1 Igranic 1-meg. volume control		6	0
2 Small sockets		5	4
4 Sprung valve holders		5	0
3 Ready Radio coil sockets		2	6
2 Dubilier 1-mfd. condensers		5	0
2 Dubilier 2-mfd. condensers		7	0
1 T.C.C. '0003-mfd. condenser		1	6
1 T.C.C. '002-mfd. condenser		1	10
1 Ready Radio 400-ohm potentiometer		2	9
1 Dubilier 2-meg. grid leak		2	6
1 Grid leak holder			9
1 Lissen super transformer, 2½ to 1		19	0
1 Igranic type J transformer		17	6
1 Lewcos H.F. choke		7	9
1 Varley output filter L.F. choke	1	0	0
1 Ready Radio 25,000 resistance & holder		2	5
1 Ready Radio screen, 10 in. x 6 in.		2	0
1 Terminal strip, 21 in. x 2 in.		2	0
11 Belling-Lee insulated terminals		5	6
1 1.5 grid cell			9
1 Set non-soldering connecting links		4	0
Screws, flex, and plugs		1	6
6 Lewcos coils, 2/60 X, 2/250 X, 1/50, 1/100	1	10	6
4 Valves (S.G., Det., L.F., and Power)	2	16	0

TOTAL (including valves) .. £13 11 3

Any of the above components can be supplied separately if desired.

KIT A LESS VALVES AND CABINET £9: 2: 9
OR 12 EQUAL MONTHLY PAYMENTS OF 16/9

KIT B WITH VALVES LESS CABINET £11: 18: 9
OR 12 EQUAL MONTHLY PAYMENTS OF 22/-

KIT C WITH VALVES AND CABINET £13: 11: 3
OR 12 EQUAL MONTHLY PAYMENTS OF 25/-

EXTRA TO ALL KITS IF REQUIRED:—
1 SET "MAGIC" FOUR SHORT-WAVE COILS
(20/100, METRES)
2/No. 4, 1/No. 6 3/No. 9 - Price 16/-

READY RADIO IMMEDIATE DESPATCH SERVICE.

TO INLAND CUSTOMERS. Your goods are despatched post free or carriage paid, cash with order. If desired you can avail yourself of the C.O.D. system on orders over 5/-.
TO OVERSEAS CUSTOMERS. All your goods are very carefully packed for export and insured, all charges forward.

Write, Wire or 'Phone.

1930 Illustrated Catalogue Post Free, 1/-.

Ready Radio

159, BOROUGH HIGH STREET,
LONDON BRIDGE, LONDON, S.E.1.
Telephone HOP 5555 (Private Exchange).

TECHNICAL NOTES.

(Continued from previous page.)

The constant inductance choke has a slightly higher D.C. resistance than the other. He wants to know whether there is any advantage to be gained by the latter.

The choke (or, for the matter of that, any inductive device which has an insufficient iron core) will approach magnetic saturation under operating conditions, with the result that the inductance will decrease as the current increases.

Iron and Copper.

In order to ensure that over the operating range of current values the inductance of the instrument shall remain reasonably constant, it is essential to provide a sufficient amount of iron in the circuit, and also, of course, a sufficient amount of copper—that is, a sufficient number of turns and wire of proper current-carrying capacity.

In view of the limitations of space, the increase in the number of turns usually means some increase in the D.C. resistance which agrees with the information supplied to my correspondent as mentioned above.

But it is generally worth while to have the constant inductance choke, and in the case in question I would advise my correspondent to make this his choice.

Charging from Car Battery.

A letter from Nyasaland, Central Africa, deals with a more or less simple problem which, however, is often referred to in different forms in letters from readers of these Notes.

He wants to charge up his L.T. battery by joining it in parallel with a car battery, and wants to know whether a resistance is required in order to control the current passing through the L.T.

My correspondent in this case omits to state the respective voltages of the L.T. battery and the car battery. If these are both 6-volt batteries, then there is no need to introduce any resistance, and the L.T. battery may simply be shunted across the terminals of the car battery.

The amount of current which will be drawn will regulate itself, since it will depend partly on the extent to which the battery is run down and partly upon the size of the plates, that is, upon the internal resistance of the battery.

In any case, if the two batteries have the same rated voltage they can quite safely be joined together in parallel and charged from the generator of the car.

If, however, the car battery is a 12-volt one and the L.T. a 6-volt battery it will be necessary to introduce a resistance in series with the 6-volt battery.

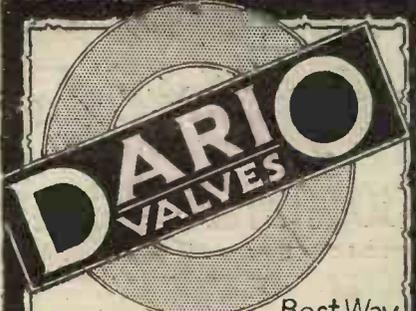
The value of this resistance cannot be stated off-hand, except that it must be such that when the dynamo is charging, the desired current flows through it.

A Meter Test.

As a matter of fact, it will be necessary to insert an ammeter in series with the L.T. battery and the resistance in order to make sure that the proper current passes. The resistance, being adjusted until this state of affairs is secured.

It is important to remember that the self-starter should not be used when the wireless battery is connected, as it would

(Continued on page 191.)



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Best Way to All Stations!

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Enormous Range
BIVOLT ·15 amps.
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SUPERBLY SELECTIVE
The best Screen Grid in the world.

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DARIO L.F. TRANSFORMER

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THE MOST FAVOURABLE OBTAINABLE

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Connect the new Belling-Lee Condenser Spade to your aerial lead. In every case it will greatly increase the selectivity, and in most cases it will entirely eliminate the unwanted station. This new idea combines a .0002 series Aerial condenser with a Belling-Lee clip-on Spade Terminal, which ensures perfect contact.

Ask your dealer, or write to us, for Belling-Lee Handbook "Radio Connections."

only 2/6 Patent applied for.

BELLING-LEE FOR EVERY RADIO CONNECTION

Advt. of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.

**HIGHLY SENSITIVE
SUPER - MICROPHONES**



New, made on the latest principle, a vast improvement over all other types; will pick up whispered words from a distance of several yards, also strongly amplify and transmit speech and music over a distance through Loud-speaker or Headphones, splendid instruments for making Detectaphone DEAF-AID, LOUD-SPEAKING TELEPHONE, Announcements through Loud-speaker, Amplifier for Crystal or Valve Sets, Electric Sound Detector, BABY ALARM or INVALID CALL, from bedroom through distant Loud-speaker, Experiments, etc. NO OTHER MICROPHONE OF EQUAL SENSITIVENESS KNOWN; each instrument finely black enamelled and fitted with a 3-ft. silk connecting cord. By return of post **8/6**
SPECIAL MICROPHONE TRANSFORMER for connecting Super-Microphone to Radio Headphones, Loud-speaker, Valve Set or Valve Amplifier **6/-**

SMALL 10 OHMS EARPIECE for use with Super-Microphone as a HIGHLY EFFICIENT DEAF AID, or Detectaphone, etc.; thin 3-ft. silk connecting cord fitted, Earpiece Fine Black Enamelled **6/-**

Full Directions for use of Super-Microphone for many purposes and Diagrams of connections free.
FREDK. ADOLPH, Actual Maker, 'Phone: 27, Fitzroy Street, London, W.1. Museum 8329

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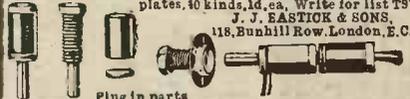
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MAKE YOUR OWN**

with our guaranteed R.T.A. Furniture Sets
Send P.C. for Free Catalogue and Price List.
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Standard Socket 1d. each, Plugs 3d. each (6 colours) Name plates, 10 kinds, 1d. ea. Write for list T97.
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YOUR Picture Paper

KAY'S CABINETS
This Cabinet soundly constructed of Oak and equipped with Ebonized Runners. Full Front, Blinged Top. Polished rich Jacobean. 36" high. For panels up to 18" wide **45/-**
Also made to accommodate any Popular Set. Greatest Range of Wireless Cabinets. Illustrated Lists Free.
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DX THE STANDARD PLUG-IN COIL
Sold everywhere from 1/-
DX COILS LTD., LONDON, E.8

TECHNICAL NOTES.

(Continued from previous page.)

take a fair proportion of its current from the smaller accumulator.

Fading.

Another battery point is raised in an enquiry from a Battersea reader who finds that his set gives excellent results on various stations for a short time, but that the volume then gradually fades away.

He says, "If I remove the plug to the H.T. battery (there is only one), and then after a time replace it, the set commences to function again, but soon begins to fade once more. The receiver consists of a leaky grid detector followed by transformer-coupled L.F. stages."

Recuperating.

The effect described may be due to the high-tension battery being more or less worn out. It often happens that when a dry battery is becoming exhausted it will give quite a fair voltage when idle, but when a load is thrown upon it the voltage quickly drops, owing to the rapid rise in the internal resistance of the battery.

If then the load is removed and the battery allowed a few minutes in which to recuperate its voltage will rise again and if the load is again connected the same sort of thing is repeated.

In a fresh battery in good condition the internal resistance is prevented from rising by the activity of the chemical ingredients, which is immediately excited when current is drawn from the battery, and it is upon this recuperative power that the current-delivering efficiency of the battery depends.

The simplest way to find out if this is the cause of the trouble is to try another battery temporarily. If this disposes of the trouble, then clearly a fresh battery is indicated.

Choked Grid.

Another possible cause of the effect, however, is an unsuitable value of grid leak. If the grid leak value is too high the detector valve may be getting choked, owing to the fact that the grid charge cannot escape rapidly enough.

The result is that the grid becomes charged up and the action of the valve impeded. If the high-tension is disconnected, the charging effect on the grid is delayed and the grid charge has time to leak away.

It is a good plan, therefore, in a case of this sort to try the effect of a lower value of grid leak. But the substitute H.T. battery is easier to try and should be tried first.

'Unit' Construction.

A contemporary writer has recently pointed out some of the advantages of the "unit" system of set construction, and suggests that a return, or, at any rate, a partial return, to this vogue would be advantageous at the present time.

Of course, none of us can tell with any certainty what the trend of set construction is going to be, but personally I have always thought that it was rather a pity that the unit system so quickly became unpopular.

You may remember that in the early days of broadcasting, some four or five years ago, quite a number of manufacturers

(Continued on next page.)

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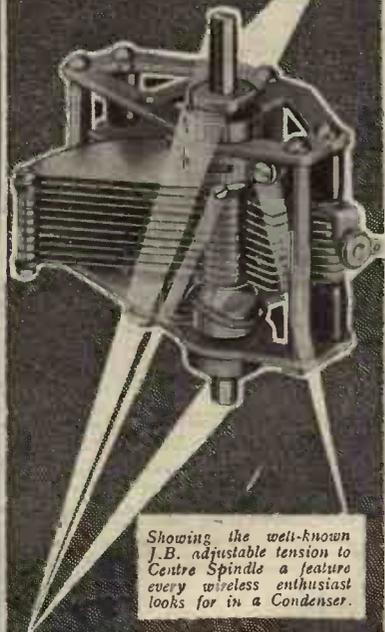
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TECHNICAL NOTES.

(Continued from previous page.)

made sets in separate parts or units which were adapted for connecting together so as to build up a complete receiver; for instance, there was the high-frequency amplifying unit, the detector unit, the low frequency amplifying unit and so on; to-day this would be added to by the mains-supply unit or some equivalent.

One of the great advantages of the unit system is that the design is comparatively easy and it is a very simple matter for an experimenter to juggle about with the units and to make up, for temporary purposes, different types of receivers.

A Single Housing.

One of the objections to the unit system was that the set was apt to become rather untidy and unwieldy, owing to the spacing out of the units, and the necessary connectors between adjacent units. But if proper cabinets were designed in which the units could be housed this particular difficulty would be completely overcome.

Another objection to the unit system was that it called for a certain amount of technical knowledge on the part of the user, whereas there is a great tendency nowadays—and I think quite rightly—to provide sets of the utmost simplicity both in appearance and in operation.

Nevertheless, there is still a good deal to be said for the unit type of set and I think it would have a definite if limited field.

A further advantage, which is pointed out in the contemporary article to which I referred above, is that a set could be built up on the instalment plan, extra units being obtained from time to time, as funds allowed, so as to modify or elaborate the whole receiver.

I have heard several people say lately that they would not be surprised to see some kind of return of the "unit"-built set in the near future.

Atmospherics.

The investigations of the Radio Research Board into the causes and characteristics of atmospheric and similar types of interference are described in the first of a series of Annual Reports which has just recently been issued.

The report states "Perhaps the most important feature is the fact that clear systematic variations have been observed and recorded in phenomena which have long been regarded as completely random and chaotic."

The co-ordination of the many observations which have been made has only been rendered possible by a remarkable system of co-operative or team work, and it is a matter upon which the Research Board is to be congratulated that out of the apparent chaos of atmospheric disturbances they have been able to evolve a definite order.

It is interesting to note that by means of directional recorders one particular source of atmospheric disturbances was actually traced and kept under observation during its movement from the West of Scotland to the Black Sea.

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