POPULAR WIRELESS, April 23rd, 1927. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

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Popular Wireless

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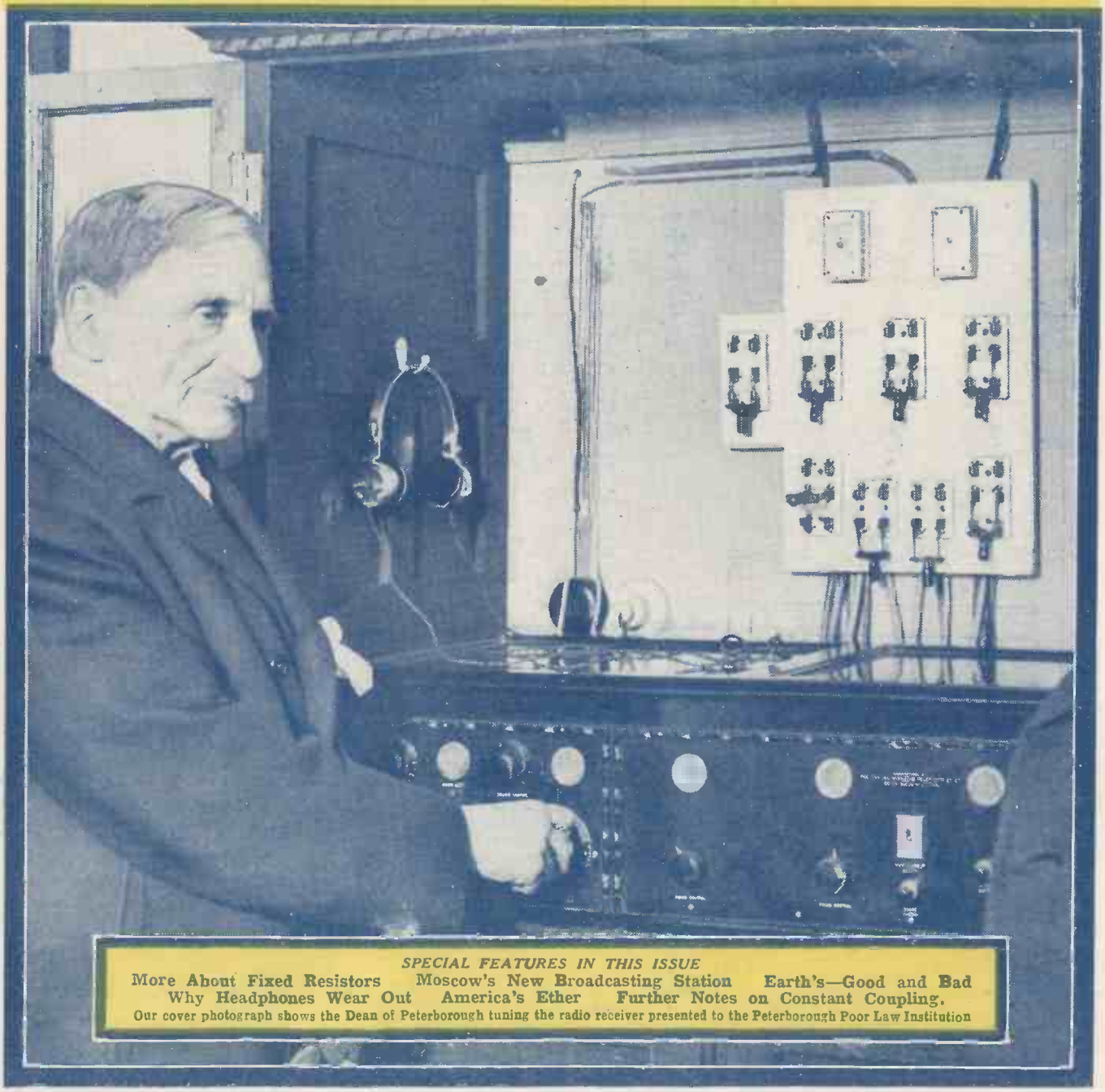
No. 255. Vol. XI.

INCORPORATING "WIRELESS"

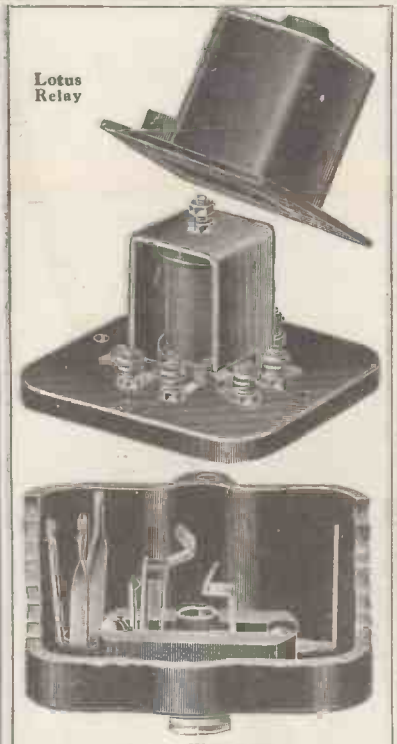
April 23rd, 1927.



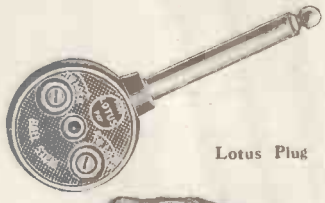
SPECIAL FEATURES IN THIS ISSUE

More About Fixed Resistors **Moscow's New Broadcasting Station** **Earth's—Good and Bad**
Why Headphones Wear Out **America's Ether** **Further Notes on Constant Coupling.**

Our cover photograph shows the Dean of Peterborough tuning the radio receiver presented to the Peterborough Poor Law Institution



Lotus Wall Jack



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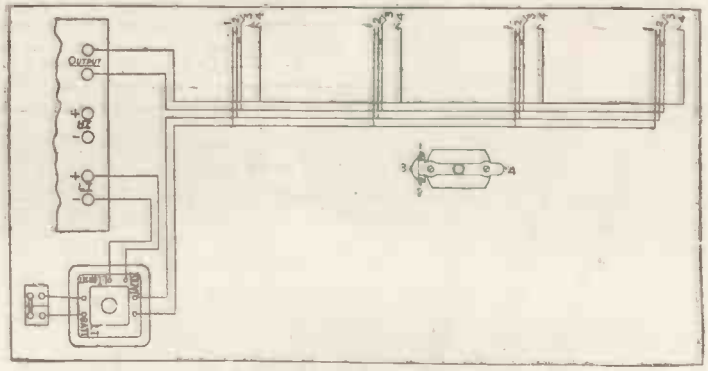

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RADIO NOTES AND NEWS.

A Well-earned Bouquet—The "Dug Out"—Now in the Museum—"Bang Goes Saxpence" A Correction—"S.O.S."—The Australian Beam—Wireless Exhibition.

A Well-Earned Bouquet.

ALTHOUGH these Notes will not appear till some time after the event, they are being written a few days after the Boat Race, which, in my opinion, was the occasion of the B.B.C.'s most successful "outside" broadcast. An excellently transmitted, clever and interesting description, the job was a credit to all concerned, and must become a yearly event.

The "Dug-Out."

RUMMAGING about the other day I hit upon the last valve I used during the war. I kept it because it was given to me and because it was in circuit when Foch's Armistice message came through. It arrived, I may add, with the American Expeditionary Force.

Now in the Museum.

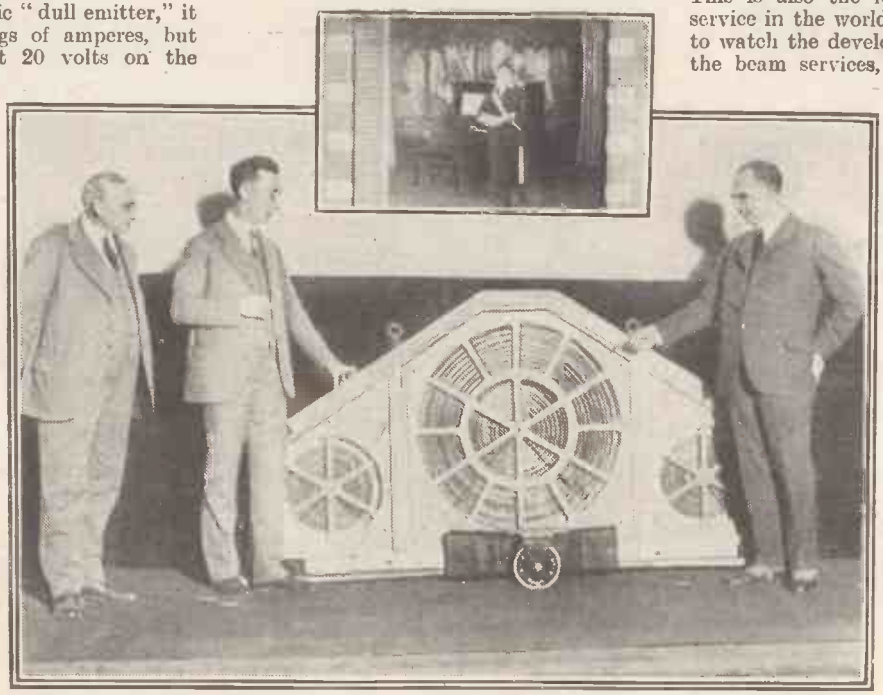
A SORT of prehistoric "dull emitter," it consumed lashings of amperes, but took only about 20 volts on the anode. As some of our valves needed 200 volts it was a curio, but worked beautifully. I have put it with a few brass buttons and a slightly tarnished medal. You ought to hear my nephew—born during the first "Somme"—criticise it.

"Bang Goes Saxpence."

BIRMINGHAM No. 1 Branch of the British Legion is organising a ballot in aid of a fund to give 500 children a day in the country. You send sixpence to the Hon. Sec., Mr. J. E. Jones, British Legion (Birmingham No. 1 Branch), 4, Bartholomew Street, Birmingham, and receive details of the draw which takes place on July 15th. The prize is a three-valve set ("R.C. Threesome"), complete with valves and various accessories and loud speaker, value £15. The result will be out on July 30th, and will be communicated direct to the Editor and the winner. Why not have sixpennyworth and help to give a kid a good day?

A Correction.

SEVERAL readers, whose critical perusal of these Notes rejoices the writer's heart—what is left of it—have been kind enough to point out that my recent hallelujah over the supposed conversion of Mr. E. Newman, the musical critic, to a kindlier feeling for radio music, was an error. The paragraph on which I based my remarks was written by someone else. Alas, and alack! Too true! I have still to mourn over Mr. Newman, and to confess a slip which demonstrates that I am not a machine.



This is the huge loud speaker which operates in conjunction with the "Talking Film," a section of which is shown inset. Is this the precursor of television "broadcasting"?

"S.O.S."

WILL Jack M. (Morayshire), whose address has been lost, kindly communicate with a brother Scot, Mr. C. M. S., 23, White Street, Govan, Glasgow, who desires to exchange DX results, and crack on generally about radio?

The Australian Beam.

THE "Beam" service to Australia (Melbourne) which opened recently is the first direct line of communication established between London and Australia. The signals cover the distance in about one-eighteenth of a second, and the service is worked in both directions simultaneously. This is also the longest direct telegraph service in the world. It will be interesting to watch the development of telephony on the beam services, and it does not seem fantastic to anticipate the transmission of pictures and music to Australia and thence to New Zealand in the near future.

Wireless Exhibition.

FOR the fourth time the Manchester "Evening Chronicle" is holding an exhibition in the City Hall, Manchester. It will take place from October 24th to November 5th, and as additional space is being provided one judges that a great success is anticipated. Inquiries for space should be addressed to "Head Exhibition Offices, City Hall, Manchester."

(*Continued on next page*)

NOTES AND NEWS.

(*Continued from previous page.*)

Japan in Earnest.

MARCONI'S have just received an order for three broadcasting stations, one destined for Tokio, another for Osaka, and the third for a site not yet decided. The aerial power of these transmitters will be ten kilowatts. Tokio is the twelfth capital city to install a Marconi broadcasting station. Japan has placed orders for three more stations with the Standard Telephones and Cables, Ltd.

B.B.C. Defended.

APROPOS the letter from Dr. Donelly which we published in March, headed "Poor B.B.C. Stations," B.D. (Stock, Essex) comes forward with a stout defence of B.B.C. stations, with which most of us will agree. "Second to none," he says. Further, he pays a tribute to the promptitude and courtesy of the B.B.C.'s replies to letters. I believe the Corporation has always justly prided itself on those qualities.

These Simple Questions.

N. B. (Grimsby) has asked me the distance between Grimsby and Miami, Florida. Pleased to oblige, but I wonder whether he has any idea how long it takes to work out. However, it's all in the day's work, and as Miami is a favourite "pick-up" the answer will probably interest many readers.

Distance to Miami.

MY querist did not say what part of Grimsby we were to measure from, so we started from the Mayor's parlour, and scaled the globe as far as the Central Soda Fountain, Miami. This gives us 3,900 nautical miles, We then calculated the brute, the result being 3,828 nautical miles, so that taking this as the more accurate figure you can consider the required distance to be 4,400 land miles.

American Note.

AN obliging DX fellow tells me that 2 X A F (Schenectady), 32.77 metres, recently announced that in addition to the regular programmes on Tuesdays and Saturdays there will be a programme on Thursdays at 6 p.m. (E.T.), and on Friday at 8 p.m. (E.T.) The power has been increased to 10 kw. output.

Wireless Control.

THE Croydon Wireless and Physical Society, a really go-ahead crowd, has had the luck to secure a lecture by Major Raymond Phillips, who specialises in wireless control of mechanism. Major Phillips can work wonders by pressing a transmitting key, and I hope he will write a practical book on his fascinating subject, the pursuit of which might be a welcome relief to DX transmitters with no more worlds to conquer.

A Drastic Event.

THE L.C.C. has decided to allow listening in at their elementary schools for one year. Judging by the noise one hears when passing one of those schools the loud speaker won't be able to hear itself speak. But perhaps they are installing the "public address" system.

Gullibility Incredible.

A CASE occurred recently of a person who sent £3 14s. to the Continent in reply to an advertisement and expected to receive in return a 4-valve set. It might be done, I suppose—with cardboard and stolen condensers and so on—but considering the advanced state of the British public in wireless matters, such gullibility is sad to see.

DX Results.

W. B. (Sheffield) reports the reception of Cape Town, Calcutta, Denver City, Buffalo, Schenectady and Y D C R (an Indian amateur). These seem to be extraordinarily fine results for telephonic broadcast reception, considering that the wave-lengths of the first five were between 200-500 metres. Has any other reader had Calcutta and Cape Town ?

Words of Wisdom.

FROM a Sunday paper's wireless notes: "A crystal gives a pure reception, but there is no need to select the weakest." Hum ! Never thought of that. Where's the hammer ? Yes, carborundum *is* the strongest. Moreover, as this Sunday sage continues, "It is twice as loud as a good ordinary galena crystal." I wonder whether a really noisy bit of carborundum can drown Daventry's signals ?

Broadcasting versus Music.

RADIO, the curse which has settled upon the world like some deadly gas, has amongst other things been the ruin of music. We hear this kind of thing every week, so it is a relief to learn that 3 L O (Melbourne) has founded three musical scholarships at the University Conservatorium of Music, one of which has this year been awarded to a blind pianist.

SHORT WAVES.

"Beam"-ing news—our prospective chats with Australia.—"Everybody's Weekly."

* * *

Task for the B.B.C. Broadcasting the film version of a play adapted from a novel by a modern composer.—"Sunday Pictorial."

* * *

The wireless correspondent of a daily paper recently wrote an article entitled: "How to adjust a loud speaker." Husbands, please note.

* * *

Famous Quotation:

"A man may dial and dial and dial—and be a villain still."—"Radio Digest."

* * *

THE INSTINCTS OF A SURGEON.

"Dad," said the tactful youth, "I want to be a radio expert when I grow up."

"Why a radio expert, son ?" asked the busy father.

"So I can put back together your new radio again."—"American Legion Monthly."

* * *

A Yorkshire miner claims to be able to play ten musical instruments at once. Strenuous efforts are being made to keep the B.B.C. in the dark about this.—"Humorist."

* * *

Mr. W. J. Talco, of Helena, Georgia, reports that the chimes from the cathedral at Strassburg came in so strong over his one valve set that three-fourths of the population rushed out to help extinguish the fire.—"Radio News of Canada."

* * *

Cricket will be broadcast through the summer.—"Derby Daily Telegraph."

And cricket balls through the windows ?

* * *

THE WIRELESS VOCABULARY.

It is said that broadcasting has added about five hundred words to the average man's vocabulary, not including those he uses when the thing won't work.—"Evening Standard."

* * *

A cowman has written to an American station that he has set up a portable wireless set out on the ranch, and "treated the cows to metropolitan dance music." "It sure is a big saving on the voice," he declared. "The herds don't seem to tell the difference. Don't put on any speeches, though. That'll stampede 'em as sure as shootin".—"News of The World."

Our New War.

LATEST bulletin from the front and the wings. Mr. Charles Gulliver writes to the B.B.C. dissociating himself from the alleged hostilities against broadcasting of which he has been represented as the sponsor. Pass, friend, and all's well. Yet I seem to recollect at least two instances of artistes breaking their promises to broadcast for the B.B.C. because their friend Mr. Gulliver did not like broadcasting. Perhaps Mr. G. is only the enemy's unconscious propagandist.

"Hands Across the Sea."

MR. H. WILSON, "Ocean View," Atcheson Street, Wollongong, South Coast, New South Wales, Australia, prettily expresses his appreciation of "P.W." for which we prettily thank him, and says he would be pleased to correspond with a reader in England about radio matters. His letter breathes the fraternal spirit and I hope somebody will give him the pleasure of receiving a radio letter from the "Old Country."

Back Numbers.

MR. A. OLDFIELD, 245, Manchester Road, Heaton Chapel, Stockport, and Mr. S. Dobson, 9-10, Swan Lane, Guildford, Surrey, kindly offer parcels of old "P.W." copies to any reader sending sufficient postage. Let the good work go on and prosper. When I think what *new* readers have missed, I wish we could begin again at No. 1. But let them cheer up, for we are "still showing."

The "Spanspace Three."

THIS was a winner, and no mistake. Approving letters arrive every day. J. H. W. (East Ham) has logged on less than 40 short-wave and nine long-wave stations, all received on the loud speaker. He has added extension handles to overcome "hand capacity" effects, and considers the set to be excellent and reasonable in price. Thank *you*, sir. Glad to have suited you. Other fans, please copy.

The Millenium.

IF and when this arrives I shall claim a large share of the credit for radio. When people really get to know one another there is another nail driven into the coffin of General Mars. There is nothing so redolent of amity as the sound of two amateurs swapping criticisms of each other's modulation. I am all for the encouragement of international amateur transmissions. Where are "P.W.'s" transmitters ? Readers desirous of sending as well as receiving will find help and inspiration readily given by the Radio Society of Great Britain, once the Wireless Society of London, which has kept the flame of amateur effort alive from the earliest days of popular radio.

ARIEL.

Earths Good & Bad

By H. J. BARTON-CHAPPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I. D.I.C., A.M.I.E.E.

THIS article completes a series of three, undertaken with a view to covering many of the salient features involved in the successful erection of an aerial system, one which will reflect to the credit of the constructor and give particularly good reception of stations near and far. The dissertation on the earth lead alone was given in POPULAR WIRELESS, No. 231, Vol. X, dated November 6th, 1926; while in an issue of the journal, No. 243, Vol. X, dated January 29th, 1927, all the points likely to arise in connection with the aerial and down lead were delineated.

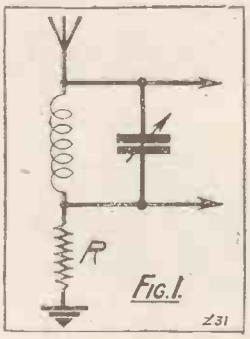


FIG. 1.

There now remains the earth itself, the portion of the complete system which, perhaps, in the majority of cases I have had cause from time to time to examine, is most neglected. This is a regrettable state of affairs and, as will be shown later, merits the earnest attention of all readers seeking reasons for, what to them, is an inexplicable combination of instability, lack of sensitivity and selectivity as far as their own receivers are concerned. When the anticipated results from a recently constructed receiver fail to materialise on test, although the published constructional details have been carried out with absolute thoroughness, the designer is nearly always held to blame, whereas careful and impartial investigation shows the defect to be nearer home, namely, the aerial system, with long odds on the earth.

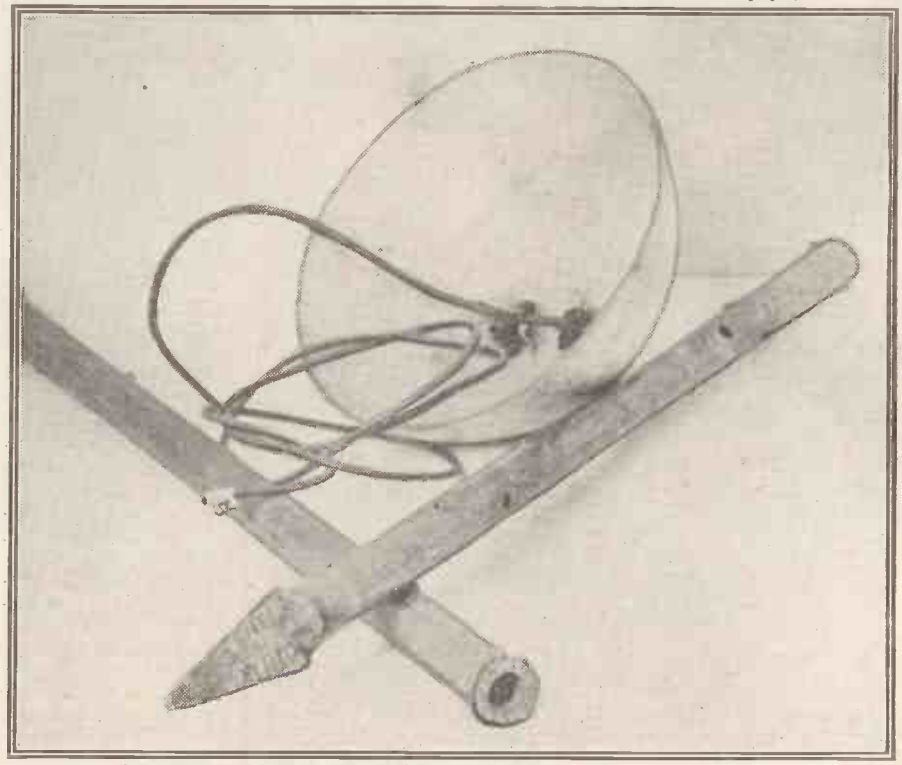
Usual Symptoms.

Before going into details as to what constitutes a good or bad earth, let us see how a poor earth manifests itself as far as signal results and operation are concerned. The most general symptoms, assuming that other things are above suspicion, are instability, lack of selectivity, and poor signal strength, with the cognate result of failure to pick up those distant stations which are so dear to many amateurs. A little thought will produce a correct diagnosis of the complaint, for a poor earth connection is tantamount to introducing a resistance into the lead connecting the earth terminal of the receiver to the earth itself, as indicated by R in Fig. 1, thus bringing about an appreciable loss of sensitiveness. The problem, however, does not end here. It is well known to most readers of this journal that the addition of resistance to any tuned H.F. circuit results in a flattened resonance curve, or, in other words, the circuit in question does not respond sharply to a narrow band of frequencies, but is practically equally sensitive over a broad band of frequencies. This is illustrated in Fig. 2, the curve with a sharp peak being for a tuned circuit with low resistance, while the flat curve is the result of an addition to the initial resistance, and it will be obvious from this that selectivity is at a discount. Instability is introduced through the earth point of the receiver not being at earth potential in the true sense of the word. By earth potential we mean zero potential, and due to parts of the receiving apparatus being above this true zero, the adjustments are adversely affected, become more difficult to handle, and stability is thus at a premium.

Various Types.

Everyone is aware that deeds, not words, are the real criterion, and are more likely to convince the sceptics, so if anyone takes, say, a two-valve set, with an efficient stage of H.F. amplification, for trial on different aerial systems, they cannot fail to be led to this conclusion. A good aerial and a poor earth give poor results, but if, from a variety of unfortunate circumstances, out of the control of the amateur, a bad aerial is the only return for the labour expended, then if this is used in conjunction with a really good earth, the results will be far

(*Continued on next page.*)



Two types of earthing devices: The Climax tubular earth and the Eelex bowl.

EARTHS— GOOD AND BAD

(Continued from previous page.)

more satisfactory than in the previous case. Thus a good earth will allow you frequently to retrieve some of the loss in efficiency brought about by screening from trees or buildings, reduced height owing to the presence of overhead wires, etc., hence any efforts directed towards the earth portion of the complete aerial system brings in its train a good return for the time and labour invested.

Having outlined the points associated

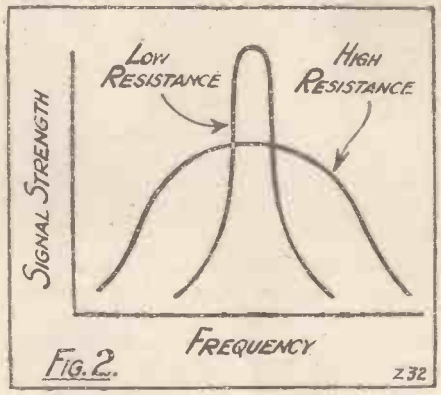
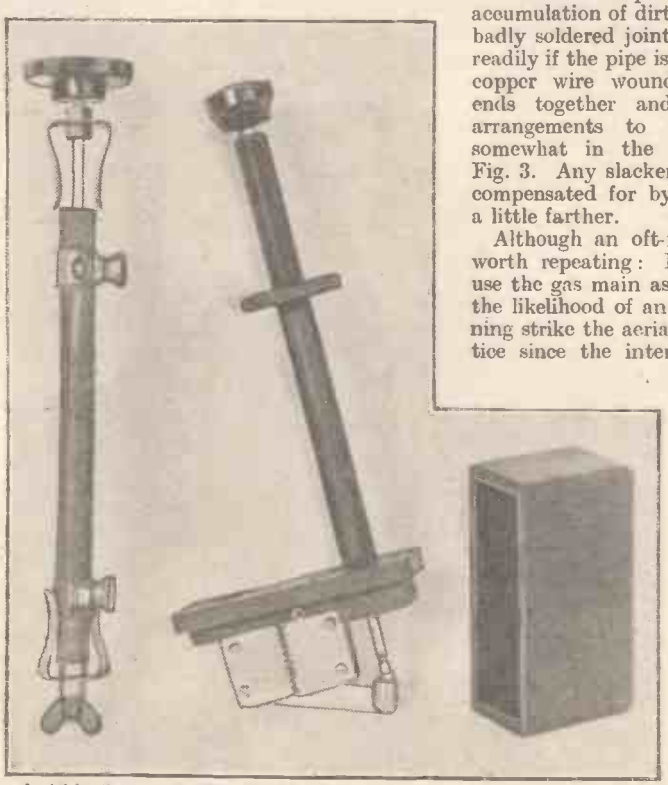


FIG. 2. Z32

with cause and effect, let us examine a few types of earth, and weigh up their good and bad features. The query is often raised as to whether it is the better policy to have an external earth or make use of the popular water-main earth. Now, this will depend on circumstances. Where such a course is



Aerial-earthing switches or lead-in tubes incorporating these, or lightning arresters, must be efficient both mechanically and electrically.

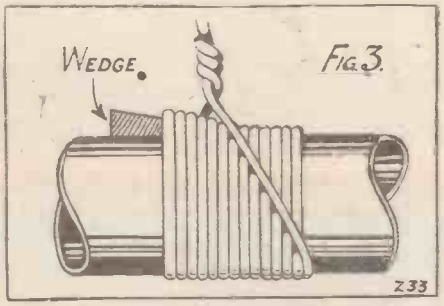


FIG. 3. Z33

permissible, a direct earth outside the house is usually rather better than the water-pipe earth, but the main factor governing the final decision is the resulting length of the earth lead, and a personal test is the surest way of getting the best answer. If recourse is made to the water pipe, pay attention to the following points.

Do not join the earth lead to any of the water pipes in an indiscriminate manner. First of all trace out the system and find what is known as the rising or ascending main—i.e. the pipe connected direct to the underground main passing up to the taps and cistern. Naturally this pipe will be always filled up with a column of water, and a good earth connection is thus provided. The other pipes will usually traverse a long length and have many joints before entering the earth, and consequently we automatically inherit what is, in effect, a long earth lead, which, as we have seen previously, is to be avoided.

Making the Joint.

Be very careful in making the joint to the lead pipe, and if at all doubtful of the efficacy of your handiwork after a soldered join is made, call in a plumber to undertake the work. Failing this, a dry joint, well looked after to prevent corrosion and the accumulation of dirt, is to be preferred to a badly soldered joint. This can be effected readily if the pipe is scraped clean and bare copper wire wound round, twisting the ends together and wedging the whole arrangements to ensure good contact, somewhat in the manner illustrated in Fig. 3. Any slackening of the wire can be compensated for by driving in the wedge a little farther.

Although an oft-repeated warning, it is worth repeating: Do not be tempted to use the gas main as an earth. Apart from the likelihood of an explosion should lightning strike the aerial, this is very bad practice since the intervening gas joints, between the point of connection to the set and the buried gas main, introduce a very large resistance. The sealing compound employed in these joints is for the purpose of preventing gas leakage and consequently metallic continuity is at a discount. If difficulties of situation preclude the making of a good connection to a water main or outside earth, instead of using the gas pipe, resort to a counterpoise. In cases of emergency this can take the form of a length of wire laid on the floor in the vicinity of the set, one end being connected to the earth terminal; but for permanency, the counterpoise is really a duplicate of the outside overhead aerial. The wire or wires should be run underneath the aerial at least six feet above the ground and be well insulated. The connection to the counterpoise should be brought into the house through a lead-in tube, in a similar manner to the aerial, and joined to the earth terminal on the set.

The Best Position.

The buried earth should be as nearly as possible below the aerial, otherwise the presence of impurities in some types of soil may make the arrangement inefficient, due to the distance between the actual earth

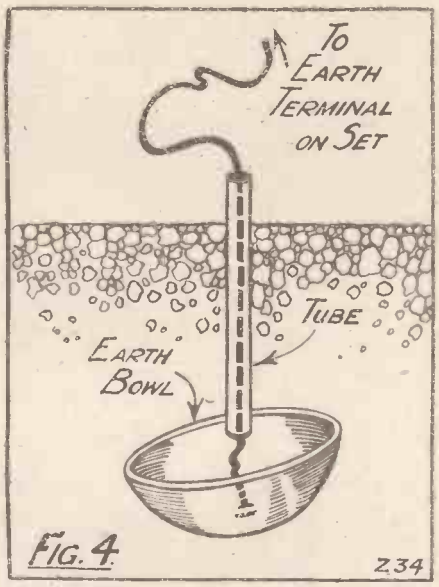
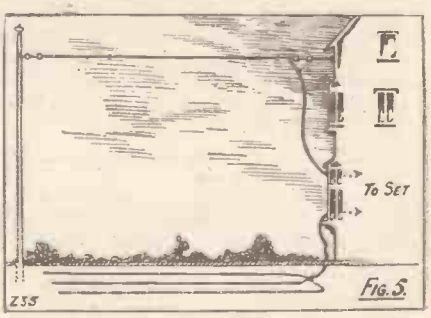


FIG. 4. Z34

connections and that portion immediately below the run of the aerial wire. It is for this reason that the water-pipe earth sometimes gives poor results, the actual underground mains often being very remote from the position beneath the aerial.

To assist in keeping the earth damp, very

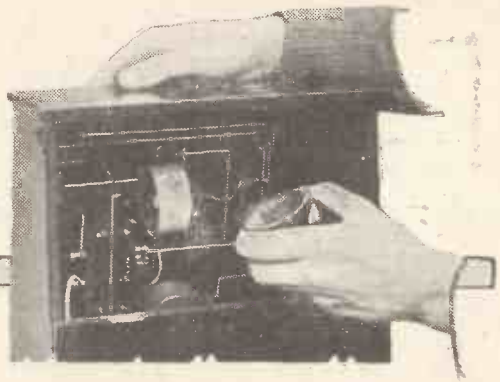


Z35 FIG. 5.

small pieces of coke and ashes should be mixed with the earth surrounding the metal plate, and a pipe lowered into the ground through which water may be poured. (See Fig. 4.)

Four or five wires, spaced about six to nine inches apart, as indicated in Fig. 5, will provide an efficient arrangement, and in dry weather function as a sort of counterpoise so that the previous watering precautions do not hold.

Constant Coupling



Some further practical notes concerning the new Loftin-White circuits.

By
PERCY W. HARRIS, M.I.R.E.
(Editor of "The Wireless Constructor.")

IN the last two issues I have described in detail the Loftin-White method of constant coupling and oscillation control. This, as readers now know, is applicable to aerial coupling, inter-valve coupling, and—as I shall show this week—to reaction coupling, giving a uniform feedback of energy for reaction purpose over the whole range of the tuning condenser and coil used. Before going into details of this remarkable development it will be well to consider a few points regarding the ordinary methods of reaction and their disadvantages.

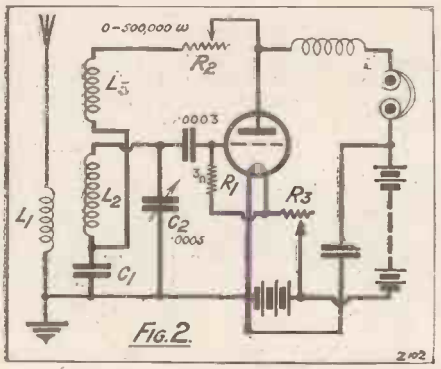


FIG. 2.

If we consider the circuit in Fig. 1, we shall see that the reaction coil L_2 is coupled to the grid circuit tuning coil L_1 variably, this being the commonly used "swinging coil" reaction method. We will imagine that the coil L_2 is a No. 60 and that it is coupled to the aerial in which the coil L_1 is situated. With a small setting of T_1 we shall tune to the short waves used in general broadcasting, while at the maximum value we shall be able to tune to the wavelengths at the top of the shorter wave-band scale.

Operation of the Circuit.

When currents are induced in the circuit L_2–C_1 by the arrival of signals from the broadcast station, the variations of voltage set up across the grid and filament connections of the valve cause variations of current to flow across the space in the valve between the plate and the filament. The path of this plate current is obviously through the coil L_3, which being inductively coupled to L_2, induces correspondingly currents in L_2–C_1 circuit. This, of course, is common knowledge, but I am repeating the facts as we have to consider in this article certain critical values which need a clear understanding.

Now the actual current flowing in L_3 is provided not by the incoming signals but by the high-tension battery. The sole purpose of the incoming signals is to *control* this energy by voltage changes on the grid of a valve corresponding to varying pressures on the accelerator pedal of a motor-car. It is therefore possible to have a much more powerful current flowing in L_3 than in L_2, and this being so, we can feed back more than enough energy from the plate circuit into the grid circuit to maintain the receiver in a state of continuous oscillation.

In most cases, however, this is a very undesirable state. What we want to do is to utilise this feed back of energy so that the grid circuit is just below the state of oscillation, whereupon the receiver is most sensitive to the reception of weak signals.

"Critical Reaction."

This state is generally called "critical reaction," and it is as well to state right away that not one receiver in fifty is so designed that this highly sensitive state is achievable. Most receivers "plop" into oscillation long before the critical state is reached, so that most experimenters are quite unaware of how sensitive a single valve set can really be made.

A question often asked by the beginner is why a critical reaction setting cannot be found for coils L_3 and L_2 and fixed, so that the receiver will be in just the right state of sensitivity over the whole scale. The reason is, firstly, that when the condenser is set at a very low value the circuit can be made to oscillate very easily, whereas when C_1 is increased to, say, ·0003 mfd. for its full scale setting, the circuit is much "stiffer." Progressively, more reaction is needed as we increase the condenser readings and no one setting would suit the whole scale.

But there is another more important reason why the reaction cannot be set constant for this particular circuit. As we increase the value of C_1 so we decrease the frequency of the circuit and, as we have already seen, the efficiency of inductive coupling decreases as we lower the frequency. In the previous Loftin-White articles we have found that whereas the energy transfer in inductive coupling decreases as we lower the frequency so the transfer by capacitative coupling increases as we take the same step. Obviously, then, we can adopt the Loftin-White principle to reaction coupling in a single valve set, and if all values are correctly proportioned, we should be able to compensate for both effects and retain this desirable critical reaction state over the whole tuning range.

The Controlling Resistance.

For those who wish immediately to try out the arrangement in practice, a circuit diagram and a practical wiring diagram are both given in this article. Those readers who

(Continued on next page.)

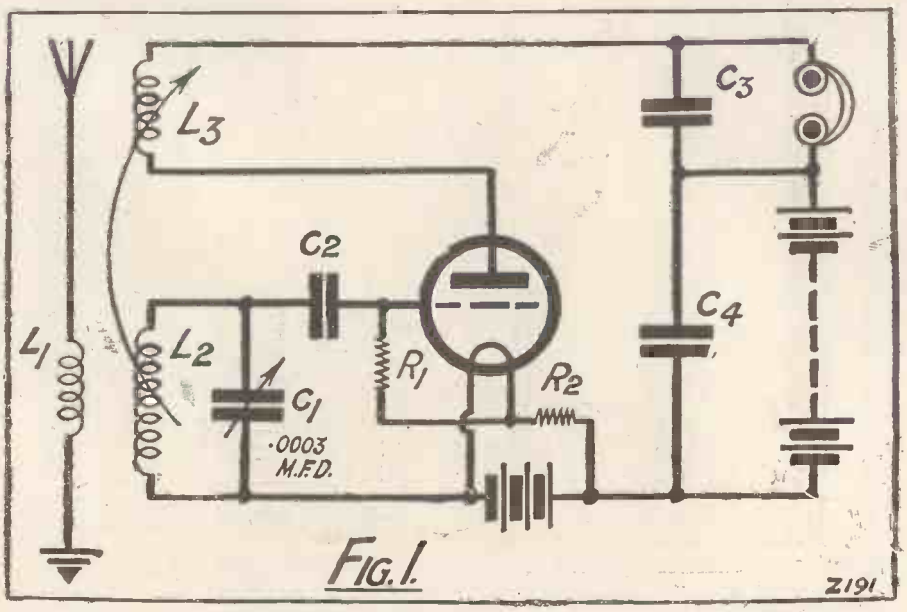


FIG. 1.

CONSTANT COUPLING.

(*Continued from previous page.*)

have already made up the experimental board will have no difficulty in adapting this and those who have so far confined themselves to theoretical study will find it easy to assemble a few pieces of apparatus on a board in the manner shown. The additional component required is a variable high resistance, such as a Dubilier Duvolcon or a Centralab 0–500,000 ohm variable resistance. Although a three coil is not strictly necessary, it has the advantage in adjusting aerial coupling and, of course, the swinging reaction coil is only moved in the preliminary adjustments, for once the correct coupling has been found it will "stay put" over the whole tuning range of the condenser.

Values of Condensers.

It is important to note that the grid leak R_1 must *not* be placed across the grid condenser C_3, for if it were so placed the plate potential would be applied to the grid through L_3 and L_2, while, of course, the coil L_3 must be coupled to coil L_2 the correct way round. The radio-frequency choke is necessary to prevent the radio-frequency current passing to earth through the 'phone capacity and the high-tension battery rather than through the coil L_3 and the coupling condenser C_1. This choke can be a plug-in coil of, say, 200 or 250 turns, or one of the many excellent radio-frequency chokes now sold. It may even be possible to dispense with this in a few cases where the choking effect of the telephones is sufficient, but I would advise its use in all cases to obtain reliability.

The value of the condenser C_3 can, of course, be any suitable capacity for tuning over the broadcast range with a given coil. L_2 can be a No. 60 and C_2 a ·0003 or a ·0005 mfd. max. Using an H.F. type of valve the coil L_3 can be a No. 35 for first trials and the coil L_1 must be chosen to suit your particular aerial. C_1 should be variable in steps and R_1 two or three megohms. You will find it interesting to experiment with different grid leak values here. R_2 *must* be continuously adjustable up to, roughly, 500,000 ohms.

The value of the condenser C_1 must be very carefully chosen and in the previous Loftin-White article I have shown the McMichael clip-in condenser base into which various values can be clipped as required. A still further improvement on this arrangement, and one which gives the reader a wide range of condenser values at low cost, is to use the C.A.V. Multiple Fixed Condenser, of which two patterns are made, one with values from ·0001 to ·0015 and the other from ·001 to ·015. The latter is the value to choose. In this the reader can get many values from ·001 upwards in small steps and if he requires greater refinement one of the other values, i.e.—·0001 to ·0015 can be placed in parallel, thus giving an almost infinite number of variations.

Preliminary Experiments.

The first experiments with this set should be carried out as follows.

Place a No. 60 coil in the middle socket of the three-coil holder. Do not trouble to connect aerial and earth nor place any coil in the left-hand, or aerial socket. Short circuit the right-hand (reaction) socket and choose a fairly large value such as ·005 for C_1. Now with a suitable valve, such as an H.F. type, in the socket listen on the telephones and vary the tuning condenser from the bottom of the scale to the top, keeping R_2 at a minimum resistance value. You will find that the receiver will oscillate with all of the plates interleaved—i.e. at maximum capacity and will not oscillate at the lower end of the scale, this being quite the reverse of the usual phenomenon.

Do not be tempted to short circuit the condenser C_1 to try the inductive effect alone, for if you do this the high-tension battery will be connected direct to earth through the telephones, the radio-frequency choke and the coil L_3.

Now insert a coil of, say, 35 turns in the reaction socket and bring up the coil to be fairly tightly coupled to the centre coil. If the reaction coil is the correct way round for this experiment, the coupling of this coil to the grid coil will tend to set up oscillation when the condenser C_2 is set at a minimum capacity.

Even Reaction.

When the coil is correctly connected you can then proceed with your experiments and by adjusting the capacity of C_1, and the value of the coil L_3, you will be able to find an adjustment which will give you, if not perfectly critical reaction over the whole scale, a sufficiently constant reaction to give a very appreciable and useful amplification effect. In arriving at your result, aim first to get even oscillation over the whole scale, and then by increasing the value of R_2, bring the set just below oscillation point.

When the aerial is connected, of course, there will be an effect of aerial damping to consider. The Loftin-White system of constant coupling can also be applied to the aerial here, but I do not advise the experimenter to try this until he is well acquainted with the working of the receiver with the normal form of coupling.

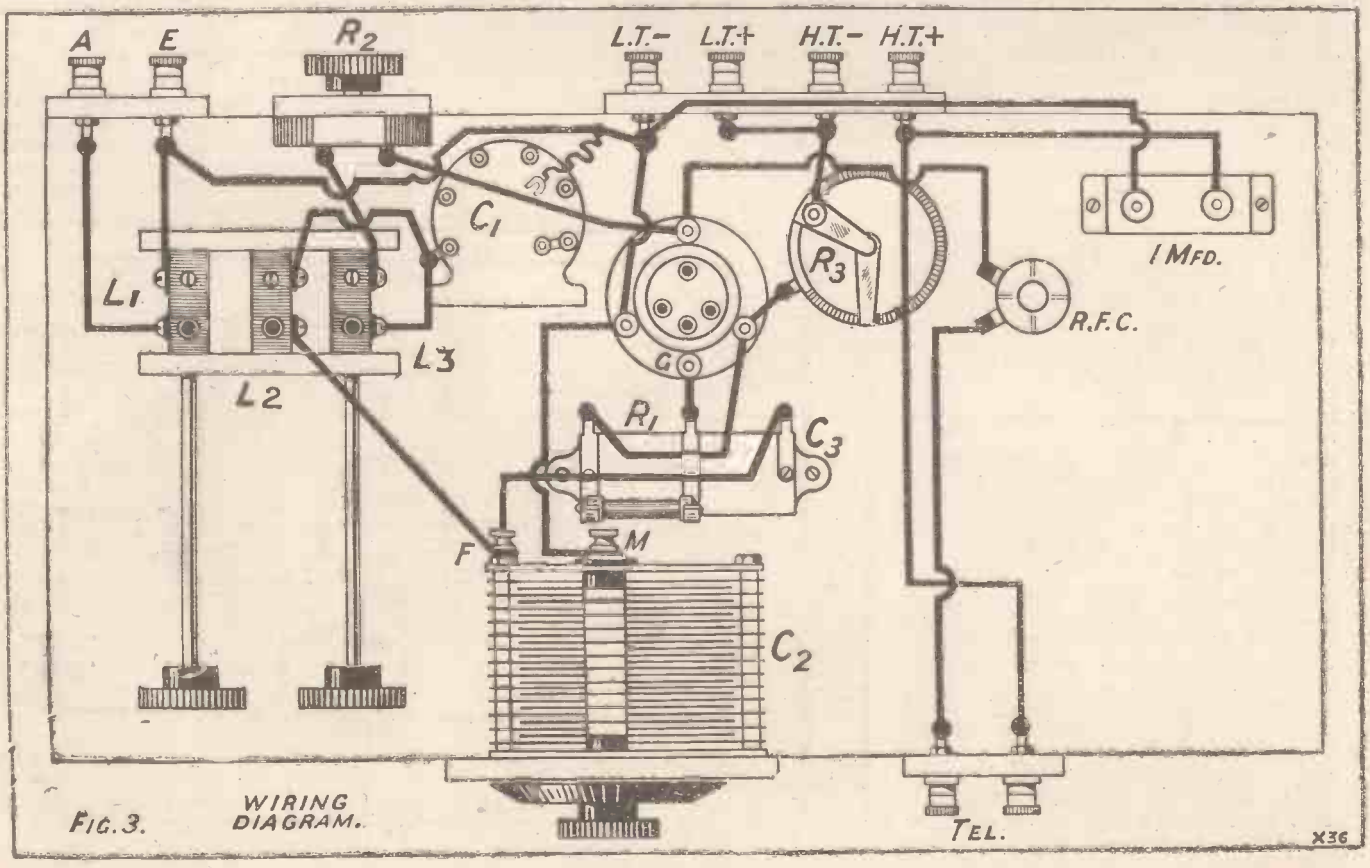
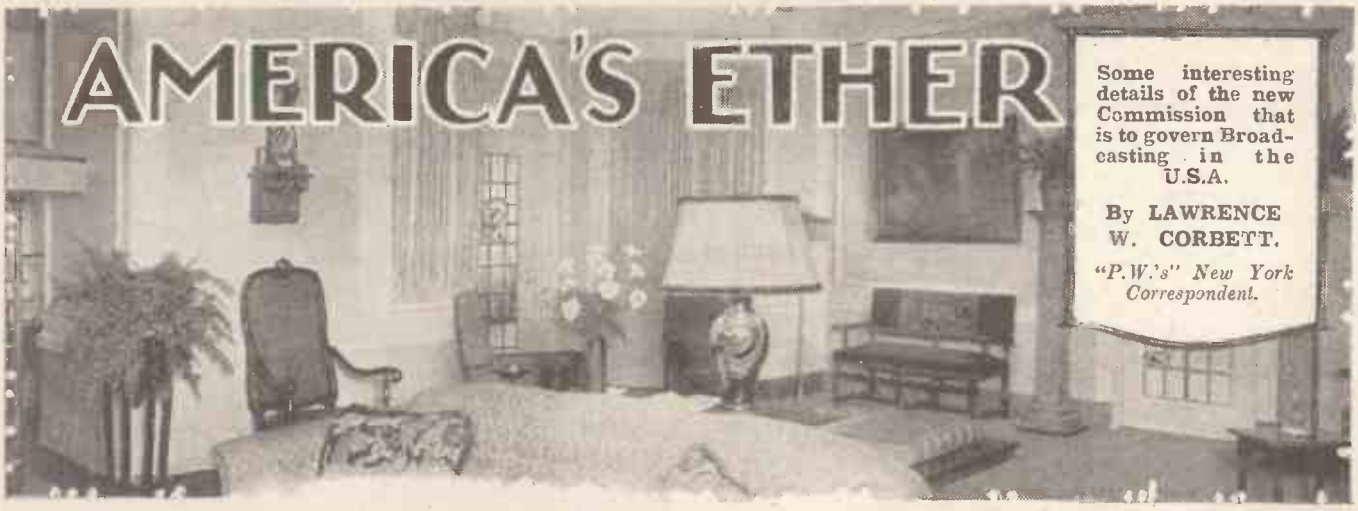


FIG. 3. WIRING DIAGRAM.

AMERICA'S ETHER



Some interesting details of the new Commission that is to govern Broadcasting in the U.S.A.

By LAWRENCE W. CORBETT.

"P.W.'s" New York Correspondent.

THE Congress of America has finally passed a bill for the regulation of wireless in that country. And a stormy passage it has had. With broadcasting conditions becoming worse daily, and hardly a single station broadcasting without an accompanying heterodyne whistle, many had despaired of legislation ever being passed. The situation was becoming intolerable. So many loopholes had been found in the old wireless laws that it became impossible for the authorities to refuse the issuance of a licence to whomsoever wished to broadcast, providing a few minor qualifications were not lacking.

Twenty Local Stations.

That the ether was hopelessly overcrowded was no excuse for the Secretary of Commerce (who administers radio broadcasting in the United States) for denying an applicant permission to add his voice to the chaos. Were that the case, there is little doubt that conditions would not be so severe as they are in America to-day. This morning's "New York Herald Tribune" (to-day is a Sunday) prints programmes for to-day of over twenty local broadcasting stations. By *local* is inferred any station within a dozen or so miles of the centre of the City. If we double this radius, the number of broadcasters would be increased by at least fifty per cent. Incidentally, there are now over seven hundred licensed broadcasting stations in America.

The Radio Act of 1927, as it is termed, having passed the House (the House compares with the British House of Commons) two days after its presentation, was delayed in the Senate (House of Lords) through filibustering, and finally passed on Friday, February 18th, and was sent to President Coolidge for his signature.

An "Air Magna Charta."

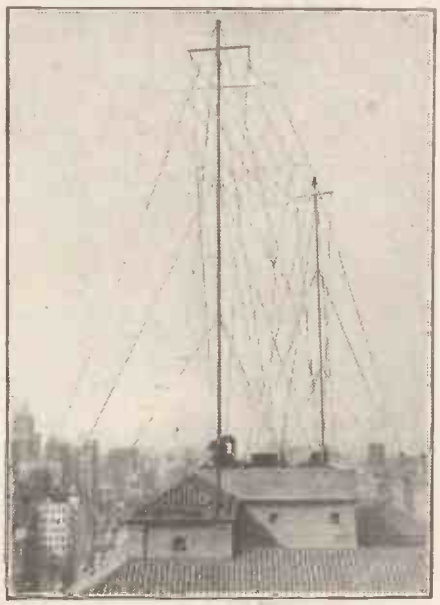
The main point in the new American law is that a commission, known as the Federal Radio Commission, shall be created, the President of the United States being responsible for the appointment of the five men comprising this Commission. The United States is divided up into five zones by the law, and one commissioner is chosen from each zone. Qualifications which the commissioners must meet are as follows: They are required to be citizens of the United States; no member of the commission shall be financially interested in any branch of wireless; not more than three of the Commissioners may be of the same political party.

The five commissioners will be remunerated to the extent of $10,000 each for the first year of their services, and $30 per day, with all expenses, for each day on which they have to attend a session after the first year. The five commissioners are to be appointed for two, three, four, five, and six years respectively. New commissioners will serve for a six-year term.

In the hands of this new Commission rests the future of radio broadcasting in America. They have the power to make or break broadcasting in that country. Senator Dill, interviewed after the passage of the Act, described it as the "Air Magna Charta," for it makes public service the basis of granting, refusing, or revoking a broadcasting licence.

New Licences Necessary.

Within sixty days after the first meeting of the Commission, every broadcasting station (and every commercial or amateur telegraph station for that matter) must apply to the Commission for a new licence,



The aerial of W R N Y, "Radio News" station on the Hotel Roosevelt, New York.

the latter, if granted, lasting for a period not to exceed three years in the case of a broadcasting station. This is where the Commission is going to meet with difficulties. It will have to adopt a system of weeding out to improve present-day conditions. It may have to refuse several hundred renewals to stations which at present are on the air. What then? There will be cries of despair from those present licensees who have spent thousands of pounds, despite warning, in erecting a broadcasting station during recent months, and whose claims for renewal will be denied by the Commission in sixty days' time.

The law is very flexible as regards the granting of licences, and it will be a simple matter for the Commission to refuse a licence on the grounds that a certain district is already sufficiently supplied with stations, and an over supply would cause interference. Reading the law in such light, it would be legal for the Commission to cut down the present forty odd stations around New York to half a dozen or so. An applicant whose request for a licence is refused, has the right to appeal for an opposite decision to the Court of Appeals of the District of Columbia. Such appeals are likely to be numerous when the Commission first becomes active, and it will be interesting to watch their outcome.

Final Decisions.

At the end of a year, all the duties vested in the Commission, with the exception of those concerning the revocation of a station's licence, are automatically transferred to the Secretary of Commerce, who may, however, entrust to the Commission for decision any matter he may so desire. The Commission, when the Secretary of Commerce assumes its duties, then becomes an appellate body, to which all disputes regarding the issuance or renewal of a licence are referred for adjudication. The decision of the Commission in such disputes is final unless the plaintiff wishes to take the matter to a higher court.

The Commission has a pretty free hand in the matter, and they will receive very little sympathy from the American public if they cannot greatly improve broadcasting conditions as they now are.

Although puplic opinion is not in favour of a control resulting in a restricted broadcasting similar to that existing in England it is certainly tired of an etheric chaos.

TECHNICAL NOTES.

A Weekly Feature Conducted by

Dr. J. H. T. ROBERTS, F.Inst.P.
(Staff Consultant.)

Collapsible "Cage."

A VERY convenient cage aerial which I see described in one of the foreign papers consists of two aluminium discs which form the ends of the cage, these discs each being pierced with eight holes symmetrically spaced around the rim, through which eight stranded wires are passed. Each wire has a lug at each end to prevent it from coming out of the hole, so that the device forms really a collapsible tubular cage. It can be erected by passing a small rod through a hole provided in the centre of each of the aluminium discs, this rod then supporting the discs at the correct distances apart, so that the eight wires are in a taut condition. The cage aerial thus formed may be suspended in any manner, or may, of course, be mounted vertically upon the end of a mast. Apart from the convenient form of this aerial it is claimed to have considerable sensitivity for reception.

Universal Condenser.

A remarkable variable condenser has lately appeared on the American market which seems to be intended to combine in a single instrument all the useful properties which have hitherto belonged to all different types of variable condensers. It is stated to combine features of the straight-line capacity, the straight-line wave-length, and the straight-line frequency types, and to give the greatest possible separation between stations throughout the entire broadcast band. It has heavy brass plates held in position by tie-bars, an exterior brake for holding the rotor in position, one-hole mounting with anchoring screw, and pig-tail rotor connection and ball-bearing shaft. Another interesting feature is that the axle may be entirely removed and a longer axle substituted in order to connect several condensers together. The condenser may also be adjusted for coupling to other condensers, for applying a gear-type vernier to a single condenser, or for mounting a variable primary coil. Also, a shaft of insulating material may be substituted, if desired instead of the metal shaft.

Altogether, this condenser seems to be about as adaptable as such an instrument possibly can be, and the product of careful thought and considerable experience.

Short-Wave Communication.

The recent discovery that, by the use of short waves, considerable distances may be covered with an extremely small power, is now being made use of in various parts of the world by business concerns for intercommunication between their different branches. One of the leading American organisations to utilise this means of communication is the General Motors Export Company. Short-wave stations have been installed in Valparaiso, Buenos Aires, regional headquarters at Montevideo and at San Paulo. Similar stations are now in process of erection at two points in Northern Brazil.

These stations are all operating on a wave-length of 40 metres, and signals are exchanged between them quite easily when ships off the coast of Rio, using long wave-lengths, cannot reach coastal stations owing to static interference.

Every night, at a definite time, messages are broadcast from regional headquarters to each of the branches scattered throughout South America, and the day's reports from the branches are given at Montevideo. The station at San Paulo has daily conversations with Chile and Buenos Aires, and with amateurs in various parts of South America.

Licence Difficulty.

The only serious difficulty which has been experienced in the installation of this system was that of obtaining licences, particularly in Argentina and Brazil.

Across the United States the 17-metre wave is daily carrying communication between the main works of the General Electric Company in Schenectady, N.Y., and its factory in California. A similar service is now operated by the Westinghouse Electric and Manufacturing Company between its plant at Pittsburg and those at Springfield, Mass., and Cleveland, Ohio.

Many other concerns are also making use of this cheap and efficient system.

A new completely self-contained portable receiver exhibited at a recent London exhibition.

Dr. de Forest's Forecasts.

In the current number of "Popular Radio" is an important article entitled "Radio in 1950," by Dr. Lee de Forest, in which some remarkable speculations as to the future of wireless are made by one of the greatest living authorities on the subject.

You know that light waves and wireless waves travel with a speed of approximately 186,000 miles per second, or sufficient to go round the world about seven times per second. Dr. R. A. Millikan, the famous American physicist, now comes forward with the suggestion that there are rays which have a frequency of vibration of 10 million times that of the fastest or violet light rays. According to Dr. Millikan, these new rays have a speed sufficient to take them round the earth 75 million times in a second. They are described as "cosmic" rays, and they will discharge an electroscope even though it may be sheathed in lead, which would have the effect of keeping out any other high-frequency rays hitherto known. The cosmic rays have a frequency about a thousand times greater than the X-rays.

Wireless Clocks.

Dr. Lee de Forest believes that before very long the automatic regulation of clocks and watches by radio will be an established fact. He says:

"It is possible, even at this date, to use a simple receiving set for this purpose, with a relay which corrects itself once or twice a day, or to adjust the escapement in a watch or clock so that it will register an impulse from a master station every second or so. This is actually little more than the Western Union Telegraph Company is now doing with a myriad clocks which are electrically operated and regulated. An impulse is sent by wire every ten seconds."

There is no reason why the desk clock in one's office should not be thus kept accurately on the second with Greenwich time.

After discussing many other interesting matters with characteristic liveliness and imagination, Dr. de Forest concludes his article with a reference to the possibility of communication with Mars.

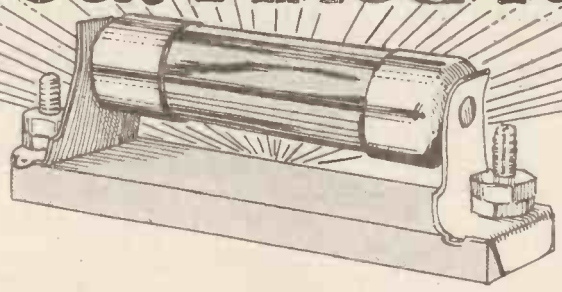
"When Mars was nearest the earth a few months ago, an English doctor sent in a telegram to be transmitted by wireless to that planet. His faith in radio was too great. But who shall say that some higher frequency (such as that of the cosmic rays) may not make it possible to communicate with Martians—if there are any—when next that planet swings our way?"

A New Current Measurer.

A new instrument that indicates a change of electric current as small as one ten-millionth of an ampere has been developed

(*Continued on page* 364.)

More About Fixed Resistors



Details of some easily made filament resistances.

By O. J. RANKIN.

IN a recent article entitled "How to Make Fixed Resistors," we dealt principally with a simple and practical method of finding the correct gauge and length of resistance wire to use in order to "drop" the accumulator voltage down to the voltage at which the valve should operate; that is, the correct working voltage, as specified by the makers of the valve. It was also mentioned that the length of wire could be wound on a former of almost any desired shape or form, providing it was neat, well made, and suitably mounted. This may have tempted many constructors to try to improve on the examples which were given in the sketches, and so it may be well to deal with a few further examples.

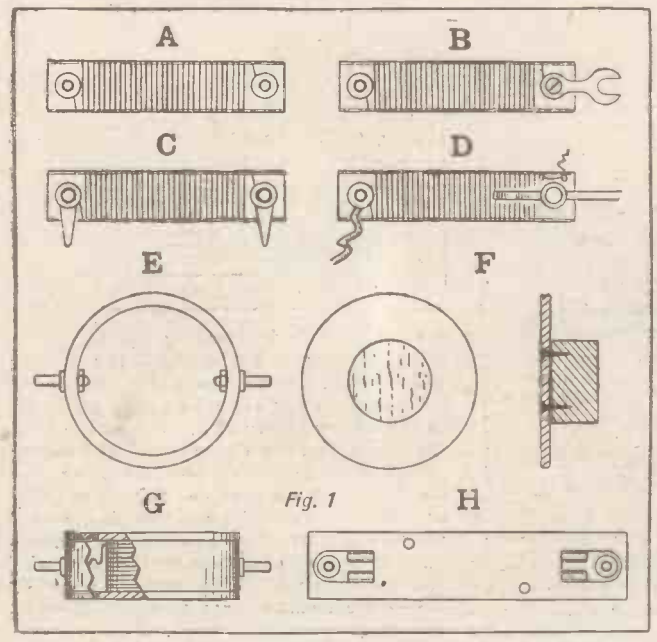


Fig. 1

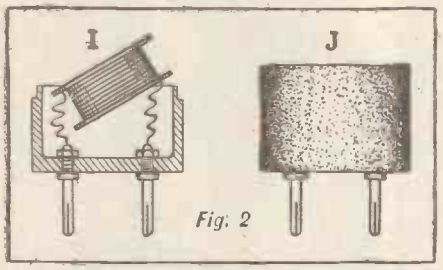


Fig. 2

Undoubtedly the most simple and cheapest method of making up these useful little components is to wind the wire over a flat strip of fibre and connect the ends to the shoulders of two small terminals which are fitted to the strip in the manner shown at A, in Fig. 1. The length of the strip will, of course, depend upon the amount of wire used; it should be about ½ in. wide and ⅛ in. thick, and to find the exact length it is only necessary to cut out a few fairly long strips of cardboard, each ½ in. wide, place them one over the other until they equal the thickness of the fibre, wind the wire on same, measure the length of the winding, and then cut the fibre strip to a corresponding length, plus the space to be occupied by the terminals.

In place of one of the terminals a sheet brass spade may be fitted, as at B, this being joined direct to the filament terminal on the valve holder. Flush-type valve sockets may also be used, as at C, small soldering tags being clamped under their shoulders; thus the resistor may be mounted on pins, or the connections may be soldered. A very simple form of "semi-variable" resistor is shown at D. Here one end of the winding is joined to an ordinary terminal.

Enclosed Resistors.

At this end of the strip is fitted a small telephone terminal, this being connected to the valve holder via a short length of ordinary busbar wire which is previously bent at one end to form a "slider" to engage the bared winding. Connection is made to the ordinary terminal (on left) by means of a flexible lead, so that adjustments may be effected by sliding the resistor over the permanent "slider," the telephone terminal acting as a guide and locking device for the latter. In its present form this arrangement is not entirely successful, owing no doubt to the absence of a spring effect between the copper wire and the winding; nevertheless, it is simple, and a more efficient modification of same would be well worth trying.

Fig. 5 shows two simple modifications of the ideas A to C. On the left the strip is fitted with an angle spade and a small terminal so that it can be attached to the valve holder in an upright position, as shown in Fig. 4, and on the right the strip is bent to approximate with the periphery of an existing valve-holder base, fitted with an angle spade and a small terminal, and attached to the holder in the manner shown in Fig. 8.

Amateurs who prefer to enclose the resistance elements in small casings will find a small idea germ in the arrangement

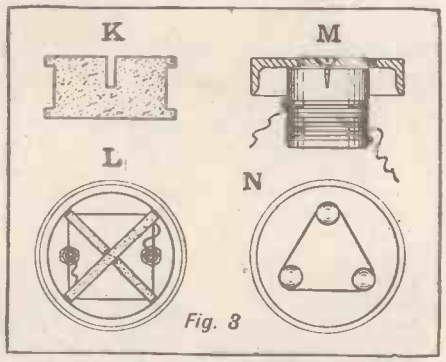


Fig. 3

outlined in the diagrams E to H (Fig. 1). Take an ebonite or fibre tube about 1¼ in. in diameter, and cut off a ring about ½ in. wide. Fit two brass stops (as used for multiple switches), as shown at E, prepare two cardboard discs as end-caps for the ring, and to the centre of one disc secure a ½-in. length of round wooden rod, about ⅝ in. in diameter. (See F.) Wind the resistance wire over the wooden rod, secure the ends with small screws, and connect them to the nuts on the stops. At the same time glue this disc to one side of the ring and

(*Continued on next page.*)

Fig. 4.—The resistor in place on the filament terminal of the valve holder.

MORE ABOUT FIXED RESISTORS.

(Continued from previous page.)

similarly attach the other disc. The complete resistor, as at G, may then be mounted in any suitable spring clip holder, such as the one shown at H, the flat sides (or otherwise ends of the casing) lying parallel with the base of same.

Fig. 5. Two forms of home-made resistors.

A more simple form of casing is shown at I and J, in Fig. 2, where a small pill-box, well dried and shellacked, is fitted with two valve pins which are connected to the ends of the resistance coil. The latter is wound on a small bobbin consisting of a piece of fibre rod and two flanges, the flanges fitting tightly into the box so that when the connections are made as at I the coil may be pressed into the box and secured, if necessary, with a little glue.

Further Designs.

The flanges are provided with holes or slots so that the connecting wires may be kept clear when fitting the coil. The lid of the box should be glued in position, and for sake of appearance the box may then be covered with imitation leather, as shown at J.

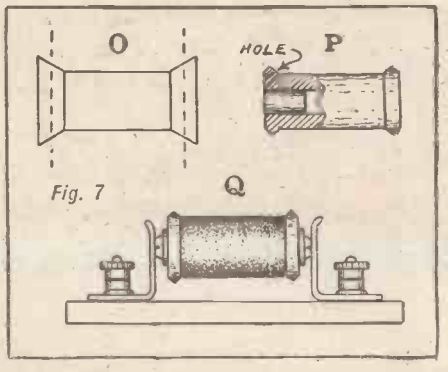


Fig. 7

Fig. 3 shows three alternative methods of arranging the coil; at L the wire is wound over a simple former made up from two interlocked fibre strips arranged as at K, at M the wire is wound over a wooden rod which is attached to the lid of the box, and at N three or four small ebonite rods or tubes are used in place of the solid wooden rod.

Empty cotton reels make excellent formers for fixed resistors. Take a small wooden reel and saw off the flanges at the points indicated by the dotted lines at O, in Fig. 7. Trim them up as at P, plug a piece of soft round wood into each end of the reel, and carefully drill a small hole through the edge of each flange. Fit each plug with a small woodscrew and washer, and then proceed as follows: Take one end of the resistance wire, pass it through the hole in one of the flanges, and clamp it firmly under one of the washers. Wind on the wire, pass the other end through the hole in the other flange, and secure it under the other washer, taking care not to strain the wire to breaking-point when tightening the screw. The complete resistor may then be provided with any suitable protective covering.

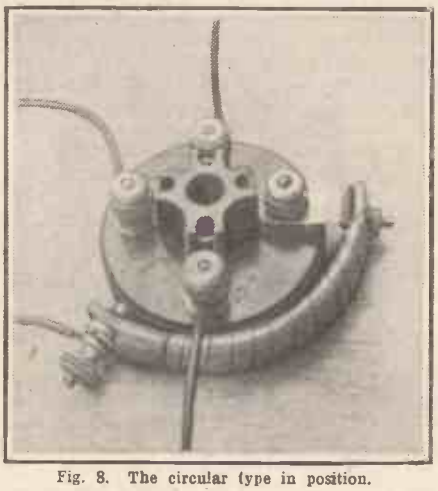


Fig. 8. The circular type in position.

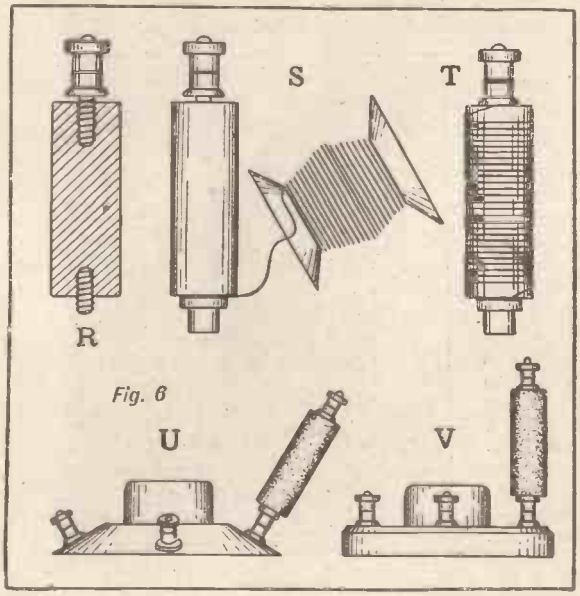


Fig. 6

A Neater Arrangement.

Without going to any extra trouble and expense we can acquire a much neater and more "scientific-looking" resistor by following the suggestion in Fig. 6. Here the former consists of an ebonite rod, drilled and tapped at both ends, and fitted with a small terminal and a brass stud, as shown at R. The stud is part of a screw which fits the thread in the milled nut of one of the filament terminals on the valve holder; it is screwed firmly into the ebonite and then cut off so that four or five threads are left projecting. Over this is screwed the milled nut taken from the valve holder terminal which, if sufficiently deep, will contain enough threads for making the necessary attachment to the terminal shank on the valve holder. The beginning of the resistance winding is firmly clamped under its head, in the manner shown at S. The wire is then wound on the former (the length of which is previously ascertained) and the other end secured under the shoulder of the terminal, as at T, the complete coil then being provided with the usual protective covering. Such a device is suitable for use with the types of valve holders shown at U or V, where the terminals are placed well away from the valve. Fig. 10 shows the resistor connected to an experimental valve holder.

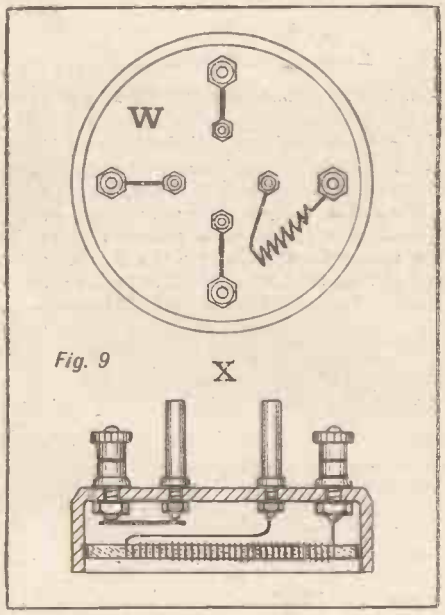


Fig. 9

(Continued on page 363.)

Fig. 10. A further type of resistance that is easily constructed.

CURRENT TOPICS.

By THE EDITOR.

Short Wave Successes—Simultaneous Seeing and Hearing by Radio—A French Mystery Station.

WIRELESS has figured prominently in the newspapers this week, and amateurs have been interested in the re-broadcasting of wireless programmes received from a station 12,000 miles away. This was accomplished on April 9th, in Australia. The Philips Experimental Station (Transmissions), Eindhoven, Holland, were received by 2 B L and re-broadcast; 2 B L is the broadcasting station at Sydney, Australia.

Also, it is stated that three wireless amateurs at Christchurch and Palmerston North, Australia, report picking up the transmission on short waves from Eindhoven.

A record like this is enough to stimulate any amateur, and to make him all the more interested in his hobby. Those who say that all the fun has gone out of wireless since Marcuse and Simmonds, and others, set up long-distance records, will perhaps now realise that there is no end to the fund of interest and amusement to be found in amateur wireless work. Just as in motoring when, year by year, new records are set up (although this year's record by Major Segrave will want a lot of breaking !), so in wireless are constant opportunities cropping up which give the amateur chances for smashing previous records and setting up new ones which, besides being interesting and amusing, are of real help to the progress and technique of amateur radio work.

A Television Triumph.

Another item of interest is the report from New York by experts of the American Telephone and Telegraph Co. that television will, within a few years' time, have been brought to such a state of perfection that it will be in general use. As our readers know, completely satisfactory television results can only be obtained when at least 300,000 optical "dots" are electrically transmitted and received per second. Up to date the maximum number transmitted is 45,000.

The demonstration held in New York recently was conducted both by telephone and by radio, and, according to reports, with equal success. Mr. Hoover, the American Secretary of Commerce, participated in the experiment, and his image was clearly recognised at a distance of over 200 miles. Mr. Hoover, in speaking radio-telephonically between Washington and New York, could not only be heard in New York, but was seen; and, later on, the engineer in charge of the experiment, after a technical description of what was taking place, allowed his fascinated audience to watch a comedian and to hear that comedian, although the latter was speaking and acting 200 miles away.

The engineer pointed out that speed and exactitude are the first requirements of television: and, briefly, the process used the other day was the dividing of an object to be photographed into 2,500 light squares of varying illumination, they being recorded in the form of telegraphic dots at the rate of 45,000 per second. They were transmitted and then re-assembled on the receiving screen as a sort of mosaic picture.

The English Experiments.

In this country we have all been watching the experiments of Mr. Baird with considerable interest, but in America they seem to have gone a step further and, based on the experiments of Mr. C. Francis Jenkins, have now evolved a system of television which, if not perfect, is at least comparable to the early successful flights of the Wright Brothers in aviation.

This successful experiment in America has, at any rate, demonstrated to those pessimists who believed television was only an ideal possibility that there is now every chance of television being made a practical possibility within a very few years. Progress is more or less inevitable, and it is no exaggeration to say that the day is not far distant when the British Broadcasting Corporation of this country will not only broadcast sound, but vision.

Radio Melodrama.

Considerable excitement in France has been occasioned by the discovery of a secret wireless station. The story of this station reads very much like an old Drury Lane melodrama.

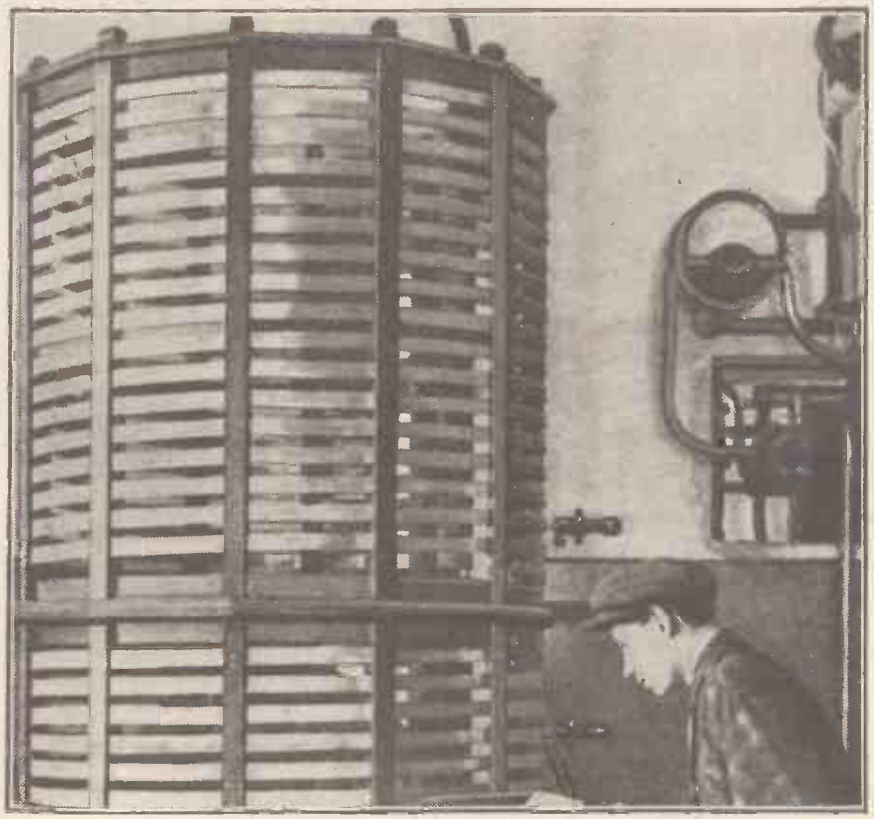
It is stated that this station has been used for the service of "international finance," and its discovery by the police has put an end to what, it is alleged, was a very successful and highly ingenious method of quick market dealing. It appears that for some time past Government officials attached to the telegraphic department of the Post Office have been rather puzzled by advertisements asking for wireless operators. The police looked into the matter, and discovered that a powerful transmitting station in a private house in the suburbs of Paris was operating without authorisation, and between nine and six o'clock each day messages were sent out with sufficient power to reach Amsterdam, Berlin, and Russia, giving exchange rates and Paris Stock Exchange quotations.

In order to prevent these messages being read by listeners-in, the numbers in the messages were, it is stated, altered in accordance with an agreed formula, so that they conveyed nothing to a person who did not possess the key to the code. Six bankers and the two operators in charge of the station are to be charged with infringing the Government telegraphic monopoly.

This Paris story reminds us of an attempt which was once made to set up a private transmitting station near a race-course in order to broadcast the result of the race to London, where bets were made, after the horse had won, but before the result of the race reached London.

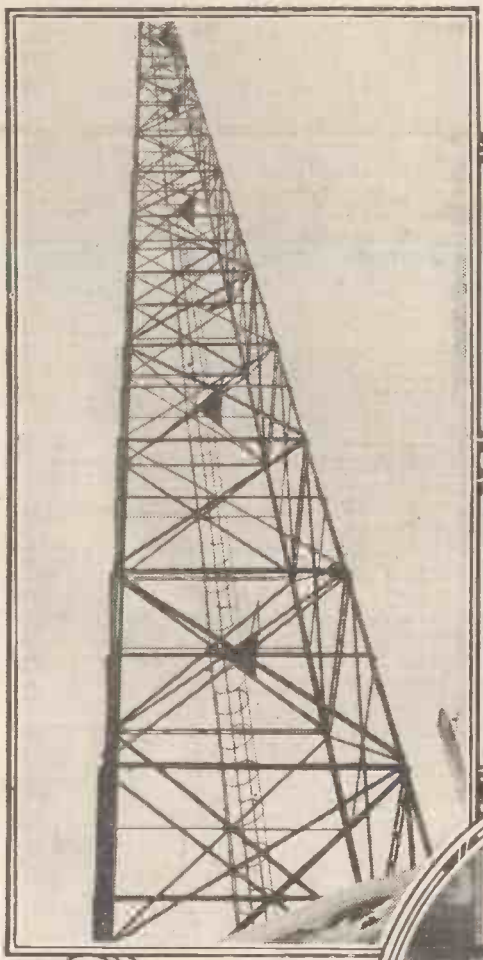
News also comes from Paris that a new transmitting station, called Radio Vitus, is now transmitting on Sundays, Wednesdays, and Fridays between 9 p.m. and 10.30 on a wave-length of 308 metres, and reports from British listeners will be welcomed by the owners of the station.

Letters should be sent to The Director, 90, Rue Damreont, Paris, and listeners are asked to give their opinions as to the quality of modulation, power, and purity from this station.



One of the huge inductance "coils" at the Komintern broadcasting station, Moscow.

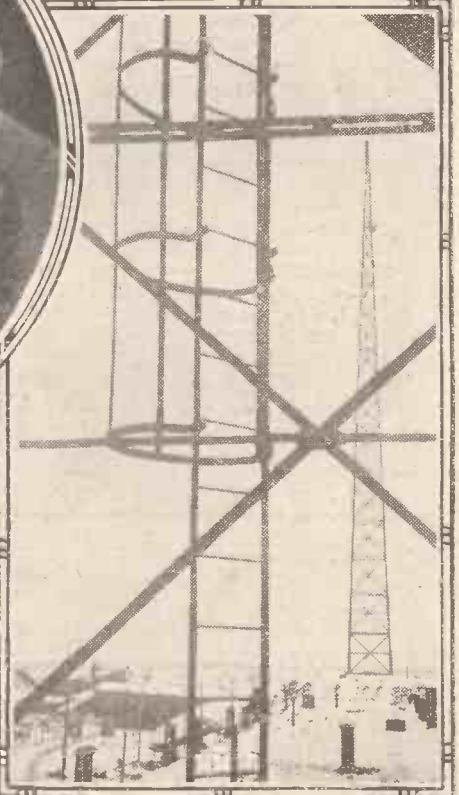
MOSCOW'S NEW BROADCASTING STATION



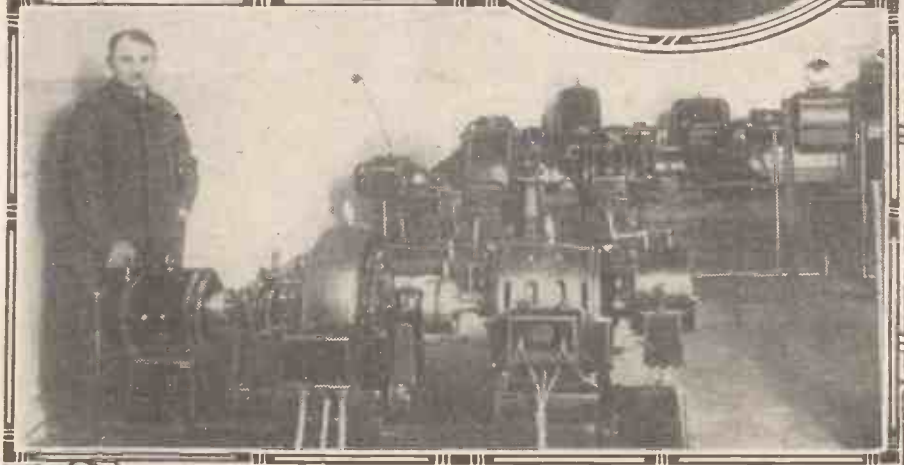
The photograph above shows the oscillator portion of the transmitter, which was constructed by Marconi's Wireless Telegraph Co.

Above: A view of one of the towers, showing the ladder. (This can be seen more clearly in the lower right-hand photograph.)

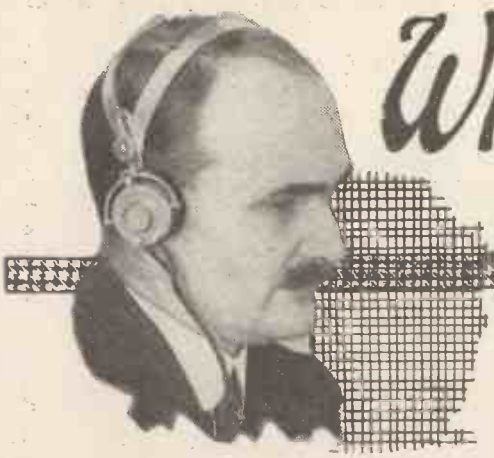
Right: The modulation control board at the Moscow station. This station is frequently heard in this country on two- and three-valve sets. The three stations at Moscow transmit on 450, 1,010, and 1,450 metres.



A close-up of the ladder and guard which run from the ground to the tops of the masts.



A portion of the generating hall, from which comes the power for the transmitter.



Why Headphones Wear Out

An article of essentially a practical interest.
By J. F. CORRIGAN, M.Sc., A.I.C.
(*Staff Consultant.*)

ONE of the most unfortunate things about material devices and mechanisms is that by far the majority of them wear out after they have been used for a certain length of time. It is impossible to eliminate wear and deterioration of one description or another in any humanly devised instrument or article. Hence it is that any article will only give a certain amount of service before it succumbs to the universal tendency to deterioration.

Fig. 1. A typical headphone magnet.

Wireless headphones are very common and universally known articles. And if you examine a typical pair it will become obvious that the instrument is really a very efficiently made article. You will find it to be, in fact, a good mechanical production. Also, from a consideration of the theoretical nature of a pair of headphones, it is not always easy to realise exactly why such instruments decrease in working efficiency and ultimately wear out. Yet headphones

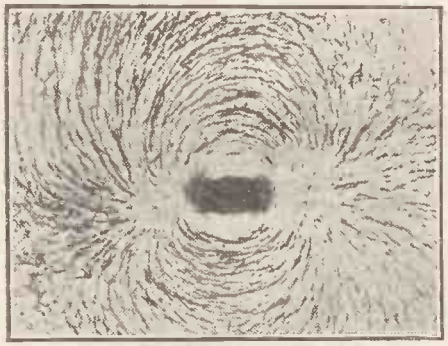


Fig. 2. Showing the field of magnetic force existing around the poles of an efficient headphone magnet.

do wear out, as many enthusiastic radio amateurs will know only too well. In what manner, however, does this gradual process of deterioration proceed? Let us consider the question a little more closely.

Mechanical and Magnetic.

The construction of radio headphones is well known to even the veriest tyro in radio science, and therefore no purpose would be served in entering into a description of the various headphone parts. However, in looking for avenues along which the actual working efficiency of an average pair of radio headphones may gradually decrease, we are confronted with two main modes in which this unwanted deterioration may take place.

Fig. 3. A test for the efficiency of 'phone magnets.

'Phones lose their pristine efficiency:

1. In consequence of mechanical disorders;

2. As a result of the deterioration of the magnets.

Most 'phones go wrong in consequence of some defect which can be included in the first of the above categories. However, let us deal with the causes of 'phone disorder which can be included in the second category—viz., those due to a deterioration of the magnetic properties of the 'phones.

Various types of headphones contain different patterns of permanent magnets, but despite this fact the various types of magnets fulfil the same purpose, to wit, that of exercising a constant pull upon the headphone diaphragms, and of varying the strength of this pull under the influence of the pulsating currents which pass into their windings from the receiving set.

A Simple Experiment.

Fig. 1 depicts a fairly typical type of headphone magnet. From that photograph, it will be seen that the magnet consists of a circular piece of iron, upon which are mounted two "poles," the purpose of which is to actuate the telephone diaphragm. Now, in a normal condition, these poles, and, in fact, the whole of the magnet assembly, are imbued with a permanent magnetic force. Magnetic force pours out of one of the magnet poles, and passes across the intervening space to the other pole.

Any amateur can be completely clear of this point by conducting a very simple experiment. Unscrew one of the earcaps of a pair of headphones, and gently slide off the diaphragm in order to expose the magnet poles. Next, take a sheet of white paper and lay it on top of the magnet poles. Now sprinkle a small quantity of iron filings on the paper, and finally gently tap the latter with the finger of one hand. The iron filings will assume a pattern which will depict the actual presence of the magnetic force flowing around the magnet poles. Such a pattern is illustrated in the photograph, Fig. 2.

If, now, this magnetic force with which the telephone magnets are imbued is a permanent characteristic, how is it, the reader will naturally ask, that a portion of this influence can be lost? Without going into the question of the theoretical nature of magnetism, it may be stated that a permanent magnet can lose a part or the whole of its magnetism in several ways. First of all, if a magnet is subjected to constant blows, it quickly loses a part of its magnetism. Again, if it is heated, the magnetic influence departs. And thirdly, a portion of the magnetic influence, instead of flowing from pole to pole of the magnet, flows out into space, thus resulting in a gradual loss to the magnet of some of its influence.

Why Magnets Weaken.

A telephone magnet gradually weakens in its attractive influence in consequence of

(*Continued on next page.*)

Fig. 4. The working parts of a telephone receiver "earpiece."

WHY HEADPHONES WEAR OUT.

(Continued from previous page.)

being shaken or knocked about. Every time a pair of headphones are dropped, or even carelessly thrown down upon the table, the delicate magnets contained in the earpieces suffer a certain amount of mechanical shock, and, in consequence, a quantity of their magnetism is lost.

Again, the constant flow of H.F. currents around a magnet will in time cause it to undergo a certain amount of weakening. Thus, especially when the 'phones are being used with a crystal set, the magnets are very often continually subjected to this deteriorating influence. It is well known that crystals allow a small proportion of H.F. current to pass through them unrectified, and if this current is not short-circuited by a telephone condenser it flows into the headphone windings, and, in time, results in a decrease of magnet strength. Such, therefore, are some of the main factors which eventually result in magnet deterioration in the headphones, and, in consequence, create a gradual (and, let it be said, in the majority of cases, an extremely mysterious) weakening of signals.

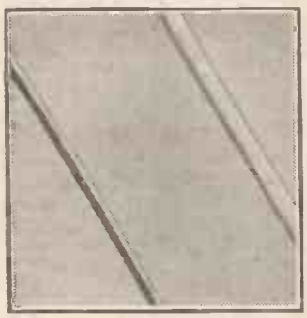


Fig. 5. A "high magnification" photo of (right) a human hair, and (left) a piece of wire as used in winding 'phone magnets.

Testing the Magnet's Strength.

Headphone magnets, if in an efficient state, should be able to support at least three small light iron or steel articles, such as pins or paper-fasteners. Fig. 3 illustrates a very useful test which may be made when the efficiency of the headphone magnets is doubted. If the magnet poles can support a chain of pins or paper-fasteners in the manner shown, there is nothing very much wrong with their efficiency.

Now, let us turn to the consideration of some of the many mechanical causes of headphone deterioration. Fig. 4 shows the working "innards" of a typical headphone earpiece. "Strong enough," you may say. But consider. The average headphone winding is made with No. 47's S.W.G. enamelled wire, which has an approximate diameter of ·0023 in. This wire, even with its enamel covering, is considerably thinner than a human hair, as the photograph, Fig. 5, taken with the aid of a microscope, will show.

Fig. 6. Magnified photograph of a headphone bobbin.

There are an enormous number of turns of this fine wire on the magnet bobbins. In fact, a telephone bobbin when magnified up to three or four times its actual size looks like a fairly hefty spool of wire, as the reader will realise from a glance at the magnified photograph, Fig. 6. Naturally, these telephone windings are very delicate things, and any slight fault, short circuit, or breakage in the windings will give rise to a headphone trouble which will be considerably difficult to trace to its ultimate source.

There is a fallacy existing among some amateurs that very strong signals will affect headphone efficiency. In fact, a few people talk about headphone windings "burning out." Such a thing is rather absurd, however. Six inches of No. 47 wire requires a current of slightly less than 1 amp. to fuse it. Now a few thousand turns of this wire would possibly take less current to become dangerously hot on account of the fact that the heat generated by the passage of the current would not be so readily dissipated from the coil winding as it would be from the straight length of wire. However, allowing a wide margin, we may say that it would take a continuous current of something between a quarter and half an amp. to heat up a telephone magnet winding. Consider this fact, and then dwell upon the fact that the average valve set delivers a current of about 4 milliamps. (four-thousandths of an ampere), whilst a crystal set passes a current of 40 micro-amps. (forty-millionths of an ampere). It will then be perfectly clear that telephone windings, employed for normal purposes, cannot possibly "burn out."

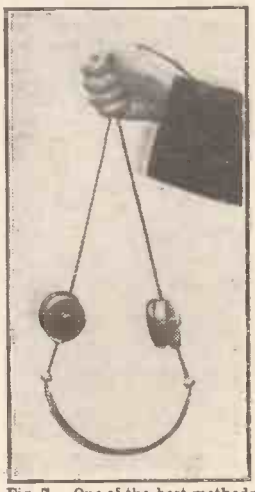


Fig. 7. One of the best methods of ruining a pair of headphones.

It has been shown by some experimenters that telephone windings through which strong pulsating currents are flowing from a powerful valve set sometimes actually move in sympathy with the currents. In fact, in some instances it has been possible actually to hear signals with the telephone diaphragm removed, the sympathetic vibrations of the magnet windings being sufficiently intense to set up feeble sound waves.

Little Suspected Cause.

Here, then, is one cause of telephone deterioration. Continual vibration of this nature, even although it be small, will in time set up a strain in some part of the winding, and finally a breakage will result.

Breakages of the soldered joints in headphones which connect the magnet windings to the external leads are fairly common, and they are a prolific cause of headphones "wearing out." For instance, Fig. 7 indicates one of the best methods of "wearing out" 'phones in the most rapid way possible. 'Phones should never be held by their cords or leads, for, besides being a direct cause of soldered junctions coming asunder, such a procedure often results in the magnet assemblies being pulled slightly out of position, an effect which will, of course, cause considerable deterioration in the efficiency of reception.

There is still another and little suspected cause of headphone deterioration, and it is one which is worthy of investigation. The dyes which are used for the dyeing of the coloured silk wrappings with which telephone windings and joints are covered belong to a class known as "basic" dyestuffs. Now, it has been shown some considerable time ago that all basic dyes have a very injurious influence upon copper. For instance, if copper turnings are boiled for some hours in a solution of these dyes, the metal

Fig. 8. "Copper crystals" obtained by the corroding action of dyes on metallic copper.

corrodes and gives rise to crystals, the composition of which is unknown. Some of these "copper crystals" are shown in the photograph, Fig. 8. Recently, it has been pointed out that the dye of silk coverings which are used to protect fine electrical windings very probably causes very deleterious changes to take place in the metal. In fact, I believe, cases have been investigated in which the action of the dye on the silk wrapping covering a fine winding has resulted in the gradual eating away of the enamel and of the attacking of as many as a dozen layers of wire.

Buckled Diaphragms.

Dealing finally, and briefly, with the causes of headphone deterioration, let us now turn our attention to the diaphragms of those instruments. When a 'phone diaphragm is removed, the operation should be proceeded with *gently*. Do not pull the diaphragm away from the magnet poles. The correct way to remove a diaphragm is to *slide* it off the magnet poles. If a 'phone diaphragm gets into a buckled or distorted condition, reception suffers accordingly, and for the reason that under these conditions the pulling power of the magnets is not exerted equally, and also on account of the fact that a buckled diaphragm is not able to vibrate evenly.

Fig. 9 is an actual photograph of a badly buckled diaphragm. This was taken from a pair of headphones which were in actual use, and which their owner considered to have "worn out." The exact nature of this

Fig. 9. Actual photograph of headphone earpiece with a badly buckled diaphragm (containing case removed).

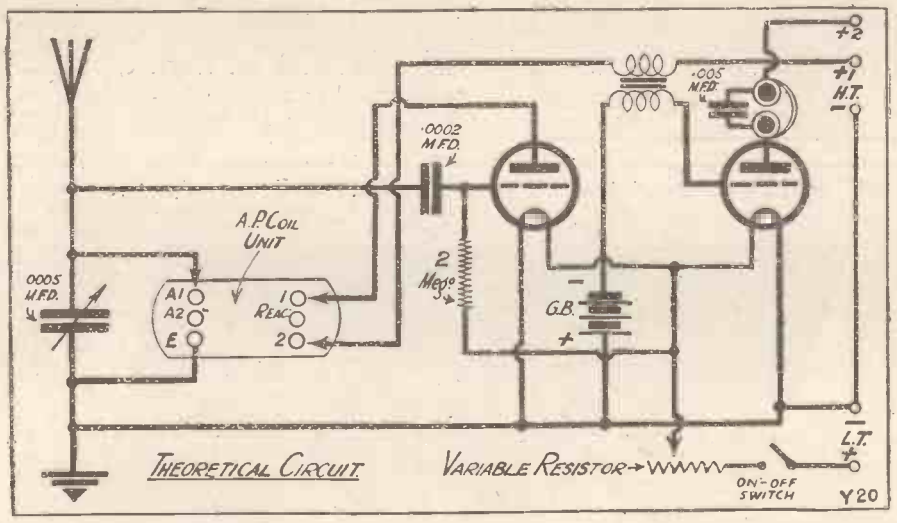
"wearing out" the reader will be able to appreciate from the enlarged photograph, which shows the working parts of the telephone, stripped of its containing earpiece. In this case, the magnets and windings were found to be in good order, and the substitution of new diaphragms for the old ones rendered matters quite O.K. again.

The "All Wave" Two

A neat little Det.-L.F. capable of useful local loud-speaker work.

Designed, built and described by G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

TWO valves cannot possibly be used in any much better way than in a circuit similar to that employed in the receiver which forms the subject of this article. With all the modern refinements such as separate H.T. tappings, grid bias, and a small power valve, the plain, straightforward Det.-L.F. has no rival either as a "reacher out" or as a household loud-speaker set for use with the local station or the more powerful Germans. That is, of course, "valve for valve," and that is, of course, also the writer's opinion; but it is based upon a great deal of experience with all kinds of sets.



No "Crowding."

There are many things which go to make a really satisfactory receiver beside actual range and volume capabilities. For instance, stability, reliability, economy in running costs, purity, ease of control and compactness, are all most desirable factors. And I think the "All-Wave" can be said to embody all these. It makes a very "dinky" little set altogether, and I find it all that could be required for loud-speaker work from the local station, Daventry, and one or two Continentals.

The "ten by seven" panel front and 6½ in. baseboard depth would lead one to imagine that the sin of "crowding behind the panel" had been committed, for these dimensions are standard for one valve. But this is not the case, as readers will be able to see by examining the back-of-panel photographs. As a matter of fact, there is plenty of room for everything. Credit for this desirable state of affairs must be given to the very compact tuning unit employed and to Messrs. Brandes' variable condenser. Although this latter is an S.L.F., it is so designed that the sweep of its vanes covers an area no greater than that of an ordinary variable.

The A.P. coil embodies both the aerial tuning inductance and the reaction coil. As I have hinted before, the circuit embodied in the "All-Wave" is a perfectly straightforward Det. and L.F.; but, as you will see by the theoretical diagram, it embodies all the refinements which go to make it first class both in point of sensitivity and purity of reproduction. With its on-off switch and simple controls it is an ideal receiver for household use, while remembering that no additional coils of any kind are required it is inexpensive to construct. It is easy to build, too, will take any make of valves of a more or less suitable type, and is not critical in respect of the values of the minor components.

LIST OF PARTS.

1 Panel 10 in. by 7 in.
1 Cabinet (baseboard 10 in. by 6½ in.).
1 L.F. transformer 4-1 ratio.
1 Variable condenser ·0005 mfd.
1 A.P. coil unit.
2 Baseboard mounting valve holders.
1 Terminal strip 5½ in. by 1⅜ in.
1 2-meg. grid leak.
1 ·0002 mfd. fixed condenser.
1 ·005 mfd. fixed condenser.
1 Baseboard mounting "Variable Fixed" resistor.
1 On-off switch.
9 Terminals, quantity of wire, screws, etc.

Purchasing the Components.

Now, talking about components, there are good components and there are components that are not so good. Do not be inveigled by an unscrupulous dealer (most dealers are good enough fellows, but there are a few who are just a little too keen on shifting junk lines!) into purchasing

(Continued on next page.)

Although the panel measures but 10 in. by 7 in., and the baseboard 6½ in. in depth, there is no undue back-of-panel "crowding."

THE "ALL-WAVE" TWO.

(Continued from previous page.)

unbranded gear. To buy such is always attended by a grave risk. Components manufactured by reputable British firms invariably carry guarantees.

In this present set the L.F. transformer is undoubtedly the most important of all the components. A Gecophone having a ratio of 1–4 is used in the original model, but any other good make of a similar ratio can be used. There is a very wide choice, as reference to the advertisement columns of "P.W." will show. But it must be remembered that there is not a *vast* amount of spare space behind the panel of this little set, so that if another make is decided upon it should be ascertained that it is of suitable dimensions.

Mounting the Components

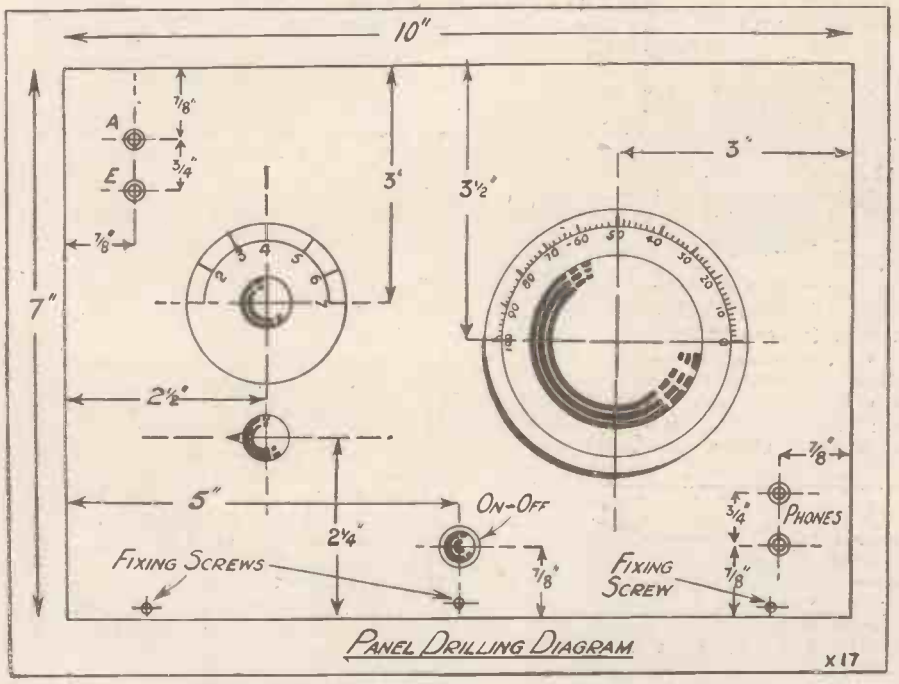
Having got together all the components, it will not be found difficult to assemble them. By the way, the A.P. coil is produced by The Wireless Apparatus and Battery Charging Co., 256, Narborough Road, Leicester.

A "Mic" low-loss tuner could just as easily be fitted, although the wave-length range of this latter is not quite so extensive as that of the A.P. Against this, however, it is only fair to add that the A.P. calls for terminal adjustments to cover the whole available band, whereas the Mic covers its whole range without the necessity of terminal rearrangements.

Of the panel drilling I do not think there is any need for me to say much about. A template is supplied with the A.P. coil, while the same will be the case with the variable condenser if it is not a single-hole mounting component as is the Brandes. One hole for the condenser, another for the on-off switch, four for terminals, and three for three $\frac{5}{8}$ in. panel fixing screws, and the task is completed. If desired, the loud-speaker terminals can be accommodated on a larger terminal strip at the back of the baseboard. Personally, I rather prefer them on the front of the panel.

The terminal strip measures $5\frac{1}{4}$ in. by $1\frac{3}{8}$ in. by $\frac{3}{16}$ in. It could easily be exactly 5 in. by $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. and still take the five terminals very nicely, but the first measurements are those of a standard terminal strip as supplied by several firms. The terminals are spaced exactly 1 in. from each other—centre to centre. The terminal strip can be held in position with two $\frac{5}{8}$ in. screws. I find screws of this size extremely useful. I always have a supply in both steel and brass, round-headed and countersinking, on hand. These and the $\frac{1}{2}$ in. size will do practically everything in the way of mounting components, etc.

It will be advisable to leave the mounting of the L.F. transformer until most of the wiring is completed, carefully taking note that none of the leads will foul this when it is brought into position.



PANEL DRILLING DIAGRAM

x17

The Wiring.

Most of the wiring is quite straightforward, but there are just a few of the leads which call for individual comment. First of all, the connections to the tuning unit. These should all be carried out with rubber-covered flexible wire. A twin flex is sold by practically all electricians which yields just the material for this job. It is rather a lightweight flex—slightly thinner than the usual lighting flex, it is used for suspended bell pushes—and it sells at about $1\frac{1}{2}$d. per yard. Untwisted and the fabric slipped off—this comes away quite easily without scraping when short lengths are being dealt with—the rubber covering is exposed.

A piece $3\frac{1}{2}$ in. will be required for the aerial terminal. To one end should be soldered the soldering tag belonging to

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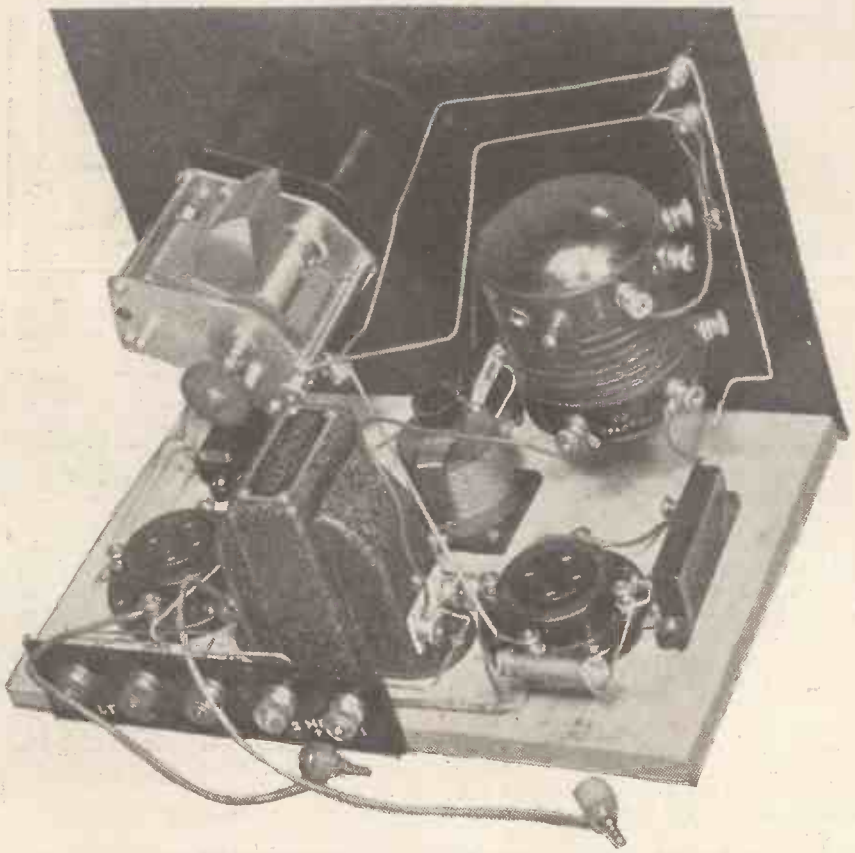


As the back of panel shows the grid leak is soldered directly into circuit. Two small clips could be used and there would be room to mount the component on the baseboard.

THE "ALL-WAVE" TWO.

(Continued from previous page.)

As will be seen, the layout of components makes the wiring fairly simple.

terminal A1 of the coil unit. To the other, another soldering tag if available. Another piece of flex of a similar length is then required between the earth terminal on the panel and the earth terminal on the coil unit. Two further pieces are required to connect the reaction terminals up in accordance with the wiring diagram. Having completed the other wiring, including that to the transformer, the grid bias batteries leads should be prepared. For these more of the above-mentioned flexible wire can be used. Two lengths about 8 in. each should be cut. Two wander plugs can then be fitted, one to one end of each lead. If soldering tags are not fitted to these grid bias leads carefully twisted loops should be formed and the ends of the leads should not be merely bared and screwed down, for this method is sure to lead to disconnections.

Operating Notes.

The grid-bias battery itself can be held in clips screwed to the inside of the back of the cabinet. Suitable clips can now be purchased, but, if desired, they can very easily be shaped out of pieces of scrap brass or aluminium. Although in many cases a grid-bias battery of 4½ volts will prove all that is necessary in a set of this type, it is distinctly advisable to arrange for a 9-volter in order to have a fair margin available.

Now in the small space remaining to me I will endeavour to cover as many operating points as I can. As a common resistor and no filament rheostats figure in this set, the valves should be chosen so that they will operate together without individual filament adjustments. For instance, if 2-volters are employed, see that their filament voltages are both 1·8–2 or both 1·6–2, and so on. Perhaps this point is an obvious one, but I do not want any one constructor to purchase, say, a valve specified as requiring 5 volts, and use it with one needing a full 6, for there would be a danger of over-running the former. However, valves are fairly robust these days, and if just a little discrimination is introduced in their choice there will be little danger of anything like this happening.

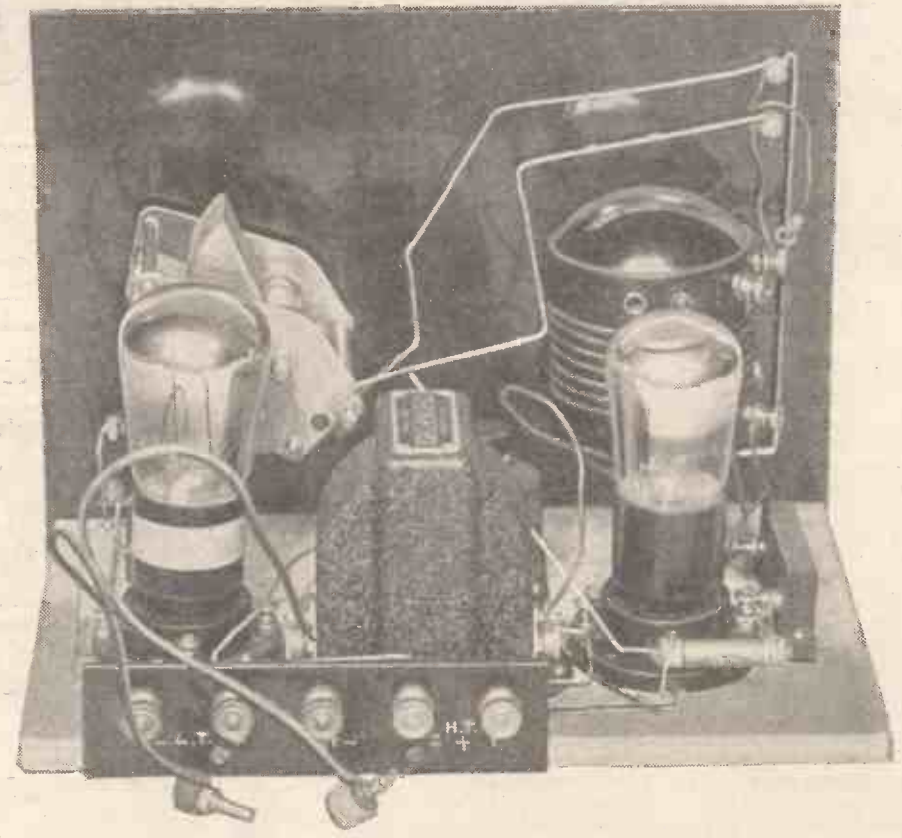
The Valves to Use.

Any general-purpose valve will make a good detector in this set. Preferably employ one having a fairly low impedance—say eight to ten thousand ohms. It is a valve that operates better as an L.F. amplifier than as an H.F. valve that is required here. I strongly advise the use of a power valve in the second position, not just an ordinary L.F. valve. On the other hand, a super-power valve would be both wasteful and quite out of place. The H.T. will vary with the valves used. For best results at least 100 volts should be available, the full amount being used on the last valve and about 60 on the detector.

Probably but 4½ or so volts grid bias will be needed, but this all depends upon the valve used and upon the H.T. voltage.

Generally speaking, the greater this latter the more bias is required, but in many instances definite instructions concerning this and the H.T. battery are included in, or on, the valve carton.

(Continued on next page.)



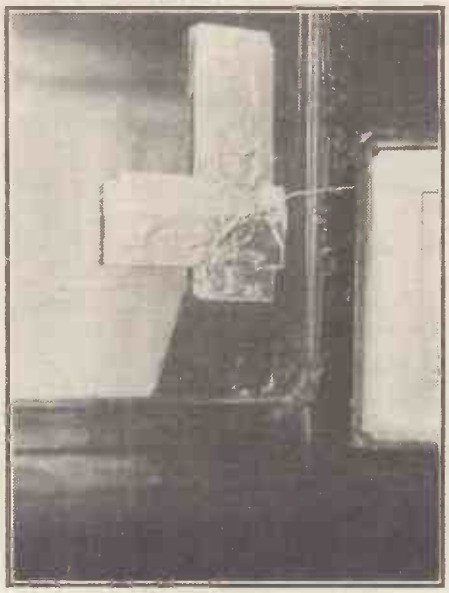
Even with the valves in position, there is a fair amount of space, and crowding is not in evidence.

AN AERIAL IN A MIRROR.

AMATEURS who wish to put any hot-stuff multi-valve receiver which they may possess to a rigid test for sensitivity, may easily do so by taking advantage of the simple means described below.

The Victorian era, although historically over and finished with, still lingers on in many a household, and no doubt the reader will be able to obtain access to one of those large Victorian mirrors which are still to be seen fitted to the wall above a dining-room mantelpiece.

Now, these mirrors, which cover a very great area of wall space, owing to the silvering on their backs, are quite capable of being put to a modern use, to wit, that of a collector of radio energy. A mirror aerial of this nature can be made in a moment or two. Gum one or two strips of silver paper or lead foil over the surface of the mirror, in the manner shown in the accompanying photograph, and from the



Showing the mirror aerial in operation.

silver paper or lead foil take a lead to the receiving set.

The mirror aerial will now be complete. It functioning, of course, is due to the fact that the metallic deposit of mercury on the back of the mirror acts as a collector of radio energy, such energy being conveyed to the silver paper or lead foil through the glass of the mirror by means of capacity effects.

Used with a sensitive valve receiving set, such a readily made aerial will produce perfectly clear signals on a nearby station. It should be remembered, however, that an aerial of this nature is a tremendously directional one, and therefore if it fails to work in conjunction with a sensitive valve set, the fault may probably not lie in the receiver itself, but in the actual position on the wall in which the mirror is fixed.

Despite this fact, a few experiments with the mirror aerial will be of interest to amateurs who wish to try out novel modes of reception, and as the present form of indoor aerial is one which may so readily be fixed up, I can commend it to the amateur.

THE "ALL-WAVE" TWO.

(Continued from previous page.)

POINT-TO-POINT CONNECTIONS.

Join aerial terminal to one side (fixed vanes) of variable condenser and to one side of ·0002 mfd. fixed condenser, and to a short flex for A.P. coil connection.

Join earth terminal to remaining side of variable and to another short flex for A.P. coil, and to F – socket of first valve holder.

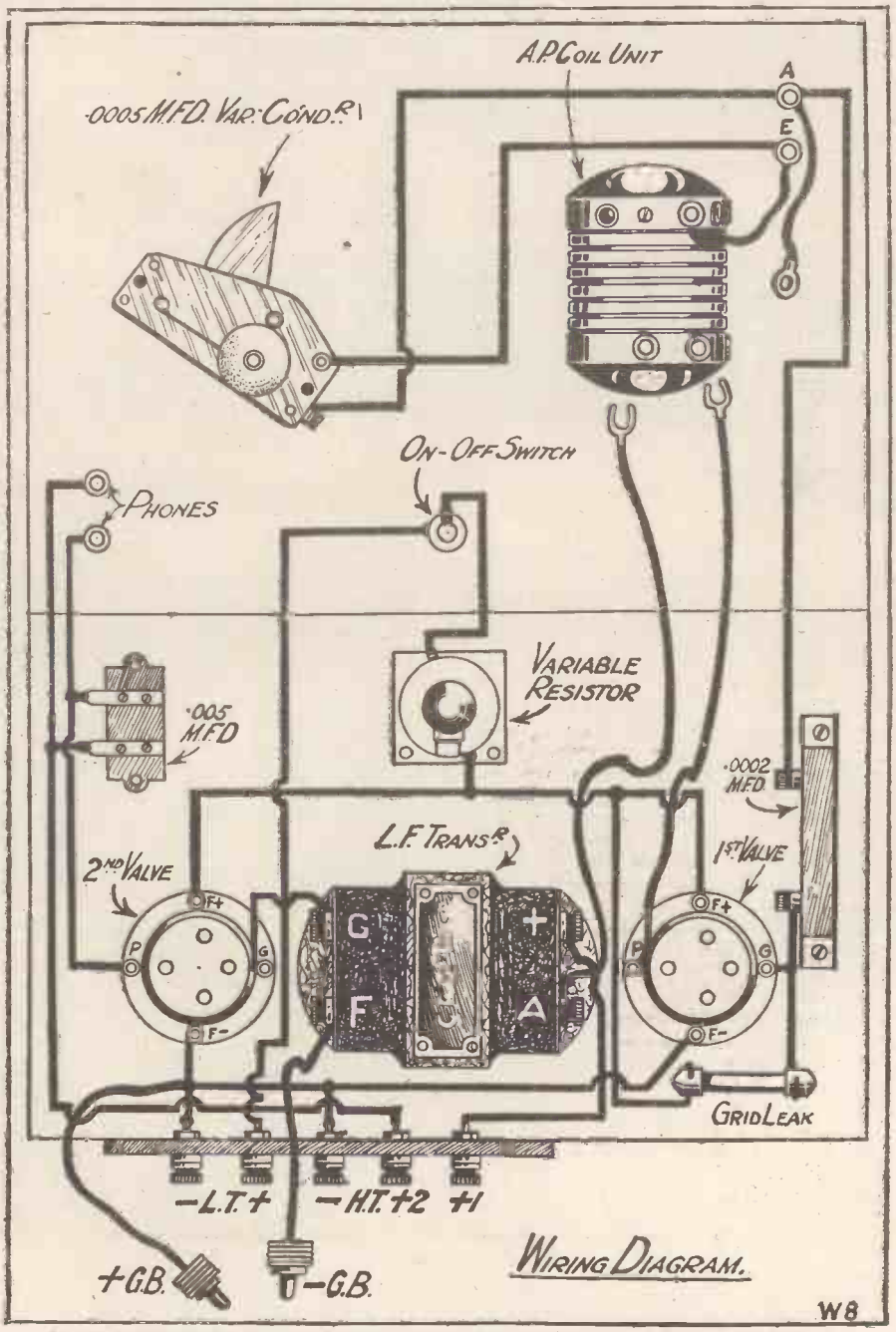
Join F – socket of first valve to H.T. minus terminal, taking same lead on to L.T. minus terminal. Take L.T. minus terminal also to F – of second valve holder. Take a grid bias battery flex with socket from this F – terminal.

Join L.T. plus terminal to one side of on-off switch. Join other side of on-off switch to one side of resistor.

Other side of resistor is connected to both F plus terminals of valve holders and to one side of grid leak. Other side of grid leak goes to remaining side of ·0002 mfd. fixed condenser and to G socket of first valve holder.

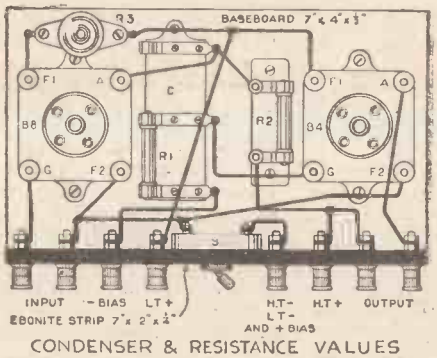
Join one H.T. plus terminal to one side of ·005 fixed condenser and to one 'phone terminal. Other 'phone terminal goes to other side of ·005 mfd. fixed condenser and to P of second valve holder.

Join plus of L.F. transformer to remaining H.T. plus terminal, A to one A.P. coil flex, G to G of second valve holder, and F to a grid bias flex lead and plug. This completes the wiring.



Note the lead connecting the Earth terminal to F—of first valve holder is not shown in this diagram.

THE "RESISTOR" AMPLIFIER



CONDENSER & RESISTANCE VALUES

R.1.····· 2 megohms
R.2.····· 2 megohms
R.3.····· 25 ohms
C.····· ·001 uF.

Transformers are NOT needed with B8 VALVES

IT is, we believe, generally understood that transformers are not needed when B 8 Valves are employed in resistance-coupled circuits. We wish, however, to emphasise this point, because there seems to be an impression in certain quarters that a 2-valve R. C. Amplifier must have a transformer in the first stage. With the B 8 Valve this is entirely unnecessary.

The "Resistor" 2-valve amplifier gives as much volume as any ordinary 2-stage transformer-coupled amplifier. Apart from the question of volume, the "Resistor" amplifier has the definite and obvious advantages of :—

Greater Purity. Lower Cost. Simpler Construction.

Other valves than the B 8 *may* need the help of transformers—we can express no opinion on this point. But we do know, not only as a matter of theory, but also from practical tests and from the evidence of constructors who have built the "Resistor" Amplifier, that it gives all the volume of transformer-coupling with much greater purity.

Successful resistance-coupling cannot be achieved with any valve. You must use the B 8 if you want 100 per cent. results.

The circuit for the "Resistor" 2-valve amplifier is given above. Fill in the coupon for a free copy of the "Resistor" Book.

Characteristics of the B.8 Valve.

Fil. Volts	Fil. Amps.	Anode Volts	Amplification Factor	Impedance
2	0.1	90 to 120	50	180,000 ohms.

Price 14s. 0d.

The above price is applicable in Great Britain and Northern Ireland only.

B T-H

FOR RESISTANCE CAPACITY COUPLING

B8 VALVE

AMPLIFICATION FACTOR 50

COUPON

2787C

The British Thomson-Houston Co., Ltd.,
Publications Department, Rugby.

Dear Sirs—Please send me a free copy of your "RESISTOR" Book of Resistance-Capacity Coupled Receivers.

Name .....

Address .....

.....

PLEASE WRITE IN BLOCK LETTERS

2787

BROADCAST NOTES.

By OUR BROADCASTING CORRESPONDENTS.

Derby Preparations—Summer Plans—The Wimbledon Broadcasts—A Special Mike for O.B.'s—Stacey Aumonier's Programme—A Trade Union Series—The Songs of Birds—Dressmaking by Radio—B.B.C. Salaries—Mr. Michael Faraday and the B.B.C.—Those Sunday Programmes!

Derby Preparations.

PAST efforts to broadcast the Derby have not met with any great success. Two years ago the land lines between the course and Savoy Hill went out of action at the critical moment and a much-boosted event, which millions of listeners had been anticipating for weeks, failed to materialise. Last year another attempt was made, and although a transmission did take place, I doubt very much whether a single listener was thrilled by what was heard. The B.B.C. were not then permitted by their agreement with the newspaper proprietors to broadcast either a description of the race or its result; what was sent out was merely some "funny talk" by a well-known wireless comedian.

This year things will be entirely different. Past events—the Grand National and the Boat Race—have shown what can be done. Nothing could be more exciting than to hear the vivid description of the broadcast of the Boat Race, which, incidentally, brought scores of telegrams to Savoy Hill immediately after the race from people all over the British Isles. The Derby this year will be similarly described. The B.B.C. have been fortunate in obtaining permission to erect their microphone on the roof of the Epsom Club Stand, which is in a direct line with the winning-post, and gives an uninterrupted view of the whole course.

Another microphone will be installed in the unsaddling enclosure, into which it is hoped the winning jockey and other well-known racing authorities will speak and give their opinions of the great race. Arrangements are also under consideration to broadcast short talks of well-known racecourse characters, among them being "Kate," who, as a race card seller, has attended every Derby for thirty years.

Summer Plans.

Every year in May, since broadcasting started, the B.B.C. has introduced for the summer months certain changes in programme timings, by which a substantial part of the transmissions has been available to listeners after 9.30 p.m. The object has been that when listeners return from the tennis court, the golf links, the garden, or wherever they spend their outdoor recreation, they shall have a programme complete in itself, and not just a part of one, in which they are never able thoroughly to become interested. These changes were always dependent on the timing of the second news bulletin, which really divides the week-night evening programmes into two well-defined parts. In the winter months the news was given at 10 p.m., and in the summer months at 9.30 p.m., an arrangement which worked admirably. It permitted some good late evening entertainments to be given during the summer, other than on the three nights each week when dance music starts from the main stations at 10.30.

This year no alterations will be made in the programme timings, as they exist at present. Since the beginning of the year the second news bulletin has been broadcast at 9 p.m., a great boon to hundreds of thousands of people living in small towns and country districts where evening newspapers do not circulate. Only the direst necessity would ever warrant any interference with this arrangement.

The reading of the news at 9 o'clock in the summer is even preferable to 9.30, because nearly two hours still remain for music. Some change in the composition of the programmes themselves will, however, be necessary, because the general policy of the B.B.C. at present is that items of the lighter kind shall be given before the second news, and items of the more serious type to finish the programme.

During the particularly long evenings which "summer time" brings, most people will probably do their listening after 9 p.m.,

A popular Chinese artist who broadcasts from the Shanghai station.

so that programmes at this time will now be varied, with perhaps a predominance of the lighter items.

The Wimbledon Broadcasts.

The negotiations between the B.B.C. and the All-England Lawn Tennis Association, exclusively announced in POPULAR WIRELESS, have now concluded successfully. A special stand for the microphone and other gear will be erected in the famous centre court, and there will be running narratives broadcast of all the chief events of the championship.

A Special Mike for O.B.'s.

The ordinary microphone picks up so many extraneous noises that it is not satisfactory for most sporting events. The B.B.C. are now experimenting with a special desensitised microphone with certain selective properties. The "effects" and crowd noises will be given as a background through a separate microphone suitably modulated.

Stacey Aumonier's Programme.

Mr. Stacey Aumonier, the well-known novelist, will give one of the "My Programme" series from London and Daventry on Monday, May 9th.

A Trade Union Series.

The history of the Trade Union movement is the subject of a special series of talks, the first of which will be given at the London Station on Friday, May 6th, by a staff tutor in the London District of the Workers' Educational Association and joint secretary of the Working Men's Club and Institute Union.

The Songs of Birds.

This is what Professor Garstang will talk about from London on Thursday, May 5th.

Dressmaking by Radio.

The B.B.C. have decided to give regular courses of instruction in dressmaking, starting with Miss Pauline Hardy's ideas on a two-piece costume for Whitsun, which will be broadcast S.B. on May 7th.

B.B.C. Salaries.

The national organisations of journalists and pressmen include quite a number of B.B.C. employees. Inquiries were instituted recently to ascertain whether the B.B.C. are paying these people the recognised minimum rates. It has emerged that such is not the case. The B.B.C., in common with other employers, are taking advantage of the economic situation to get their employees cheap. But there are no outstanding cases of hardship. The deficiencies are not considerable, and it is doubtful if the societies concerned will take drastic action at this juncture.

Mr. Michael Faraday and the B.B.C.

Mr. Michael Faraday's opera, "Amasis," was given in a radio version on January 1st. Six weeks or so later Mr. Faraday wrote to an evening newspaper complaining, in bitter terms, of the ignorance and incompetence of the conductor and the producer of the radio version of his opera. The conductor was Mr. Ansell, and the producer Mr. Rose. Inquiries at Savoy Hill have elicited the information that there is no record there of any direct complaint from Mr. Faraday. On the contrary, Mr. Ansell remembers quite clearly that Mr. Faraday, who was consulted throughout the rehearsals, expressed his satisfaction with the production and the necessary adaptations. The B.B.C. are naturally taking up the matter, and there is a chance of interesting developments.

Those Sunday Programmes!

Another attack is pending against B.B.C. Sunday programmes. This time the advocates of change are not insisting on jazz; they would be satisfied with light "restaurant" secular music. Petitions are being signed and sponsored among the members of certain wireless societies.

Whatever type of programme is decided upon it certainly is time that Sunday afternoons were cheered up a little. We have been having a great deal of heaxy and and almost dismal stuff lately.

The Crystal Gazer sees the condenser of the future

The Condenser of the future is evolved on the logarithmic principle—thus avoiding in the only possible manner the defects inherent in both Square Law and Straight Line Frequency types. Only by designing a condenser on the "log" principle is it possible to spread stations really satisfactorily over the whole dial, without any falling out of step at the beginning and the end. By using individual "log" condensers in multi-tuned circuits remember that all dial readings are the same. Thus tuning is an extremely simple matter.

In time all condensers sold will be designed on the "log" principle, *but so far* CYLDON *Log Mid-line Condensers—just placed on the market—are the first log principle condensers to be made in this country.*

And just as CYLDON Condensers, of whatever type, are reckoned in very highest class of all, so CYLDON "Log Mid-line Condensers" are not only the first out, but will remain the best. Prices:

·001	- 21/-	·00025	- 16/-
·0005	- 17/6	·0002	- 15/6
·0003	- 16/6		

Prices include 4" Knob dial. If dial is not required, deduct 2/-.

This new condenser is such a great improvement that in future all our gang condensers will be built up with Log Mid-Line Units. If you are building a receiver using gang control, bear in mind that the CYLDON Log Mid-Line is the only correct condenser. Prices:

2-GANG £2-10-0. 3-GANG £3-10-0. 4-GANG £4-10-0.

LOG CYLDON MID-LINE

CYLDON Temprytes, the best means of valve control, are guaranteed to function perfectly with any type of valve. Comprehensive valve chart, showing correct Tempryte for every valve, free on application to your dealer.

CYLDON TEMPRYTES, 2/6 each. ***HOLDER MOUNTINGS, 1/6 each.***

Don't be put off with the remark, "CYLDON Condensers and Temprytes cannot be obtained." We have LARGE STOCKS OF ALL OUR LINES AND DELIVERY IS ABSOLUTELY GUARANTEED BY RETURN. If any difficulty send direct. Telephone: ENFIELD 0672. Telegrams: ENFIELD 0672, or use the C.O.D. system.

SYDNEY S. BIRD & SONS,

CYLDON WORKS, SARNESFIELD ROAD, ENFIELD TOWN, MIDDLESEX.

CORRESPONDENCE.

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.

2 L O's MILITARY BAND.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was more than pleased to read in POPULAR WIRELESS recently of the B.B.C.'s intention of having the military band on the programme more. I have often written and praised it. I always leave everything there is to do when that is on, and we down here have missed the lovely music we used to have under the direction of Dan Godfrey. There are bands and bands, but I think without exception the 2 L O military band tops the lot.

Lieutenant O'Donnell is a splendid conductor, and they have got another gem on their staff. You will think that I'm making an awful fuss about the band, but when one is tired and fed up after the day's work, it wants something inspiriting, does it not? And the "as you were" for the Children's Corner will be lovely again (I'm not too old to enjoy that), and there's nobody that can run it like Peter and Geraldine!

Yours truly,
A. NICHOLLS.

Elm Tree Cottage, Station Road,
West Drayton, Middlesex.

ANOTHER "SINGING SET."

The Editor, POPULAR WIRELESS.

Dear Sir,—Re the recent letters in "P.W." on "Beam Interference" and "A Singing Set."

I am using a 2 H.F. neut., det. and 2 L.F., and have tuned in the continuous running of dynamos on a wave slightly below 2 L O, but experience the worst interference on Hilversum and Königswusterhausen, this being in the form of a continuous heterodyne note, and in a choppiness and distortion of signals. When the chopping effect takes place I find this causes interference right down the tuning scale, and even Hamburg and Frankfort, which usually comes in at strong L.S. on four valves, is faint and distorted on five.

If there is any means by which this interference can be eliminated I should be pleased to hear of it.

Regarding a singing set, I have found it possible to hear music from L.F. transformers when used in the second stage of a 2 L.F., low-frequency choke when used in filter circuits, and 2 mfd. condensers in filter circuits, and across 'phone terminals on very strong signals from the local station. Hoping this will be of interest to some of your readers.

Yours truly,
M. SALYEDO.

A regular reader of your excellent weekly.
49, Colvestone Crescent,
Dalston, E.8.

THOSE CLICKS.

The Editor, POPULAR WIRELESS.

Sir,—Perhaps the cause of the clicks heard in the sets of "Eliminator" and other correspondents is the same as one traced in a set at Fleetwood. The "clicks" were caused by the signalling apparatus in a railway signal cabin some 50 yards or so away.

I trust this will solve the mystery as to the cause, but there will be a cure to be found, so among the thousands of tips one gets from "P.W." there is still room for another.

Yours, etc.
E. N. MEAKIN.

173, Scotland Road,
Stanwix, Carlisle.

SHORT-WAVE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was very interested in Mr. Crundwell's letter re K D K A and W G Y. (He means, of course, 2 X A F.)

My experience is very similar to his. Using two valves I find it no easy matter to tune in K D K A; there seems a peculiar distortion present. On the other hand, I regularly get 2 X A F every Saturday night at 11.30 p.m. They are very easily tuned in, and exceedingly steady; fading is nearly always present at the beginning of the transmission and, of course, the degree of fading varies. I might mention the almost complete freedom from static on 32·79 metres, even when present on 63 metres. Strength K D K A, R.2; 2 X A F, R.6-7.

Incidentally 2 X A F's wave-length on Saturday March 26th was announced as 32·77 metres, instead of 32·79.

One evening last week I tuned in a newcomer to this wave-band, viz. Phillip Glow Lampworks, Holland, on about 30 metres. Unfortunately, all the announcing was in Dutch, with which I am not conversant. The programme consisted of two or three dance tunes, and then a short announcement—repeated ad. lib." Strength R.8.

I am, of course not claiming that these results are remarkable. On the contrary, particularly as I am not using a special "P.W." set, but a home constructed and designed Reinartz, which will tune (of course with specially designed coils) from about 20 metres to infinity, and was originally designed for broadcasting and still so used. Detector valve D.E.R. (old pattern).

Can we please have more short-wave articles, constructional and otherwise, in "P.W."?

Your paper is excellent.

Yours faithfully,
C. W. IDLE.

16, Blenkaine Road,
Wandsworth Common, S.W.11.

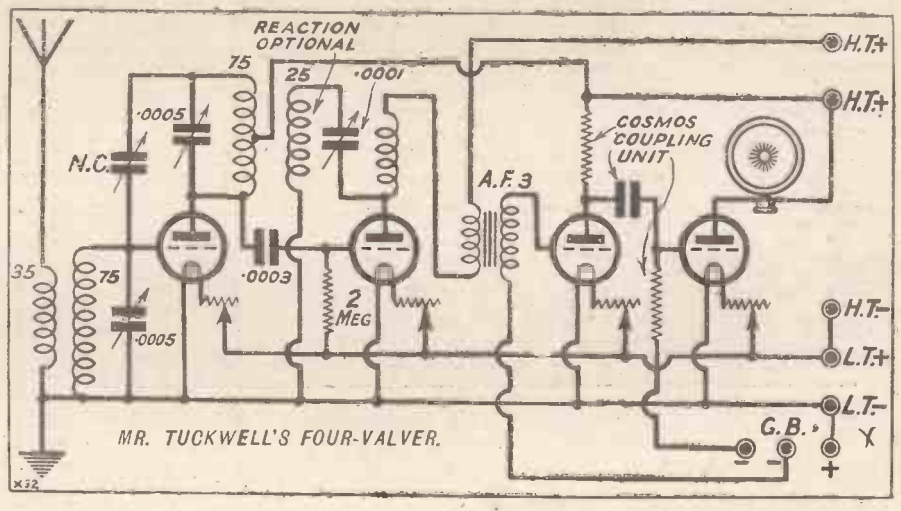
The Editor, POPULAR WIRELESS.

Sir,—I have read with interest the letters of Messrs. Manby and Best, and the comments thereon by Mr. Crundwell, and should like to record my results on the short waves for the benefit of Mr. Crundwell. My results as far as K D K A is concerned have hardly equalled even those of Mr. Crundwell, as I find, on reference to my diary, that since the first week in February (when I first started short-wave work) the loudest it has ever been was good telephone strength, and that only twice.

With 2 X A F the case has been very different, and I have listened to it every Tuesday and Saturday since February 8th. During that period it has come in on the loud speaker every night but two, at strengths varying from weak to very good (considerably better than Radio-Paris). On February 22nd I listened to President Coolidge's address, and it may interest Mr. Crundwell to know that the 14 and 32·79 metres transmissions came through on the loud speaker, but the 63 metre one was only just audible on the 'phones. The set used for all these tests uses a detector and two resistance coupled L.F.

Yours faithfully, A. F. GREEN.

13, Elderslie Road, Eltham, S.E.9.



The Editor, POPULAR WIRELESS.

Sir,—I notice the interest taken in my reception of K D K A on the short waves, and willingly send my further experiences with regard to this station.

Your correspondent is quite right, this was my first really successful reception on short waves. I had tried many times previously with very little result. I did not exaggerate the strength, it really was remarkable, hence my letter.

My set is a very efficient home-made straight detector and 2 L.F., with first-rate components, which receives practically all B.B.C. stations and many foreigners at good strength on the loud speaker without any H.F. stages. With one stage of H.F. it gives me practically anything in reason.

I have since my first letter adapted a set of Eddystone short-wave coils which have proved a great success, as I can tune in K D K A almost any night without using the 'phones. The strength varies, of course, greatly, but I can generally hear K D K A using three valves at medium strength and quite loud enough to hear what the announcer says, atmospherics permitting. I have not tried as late (1.30 a.m.) as on my first reception, as I do not consider American broadcasting worth sitting up all night for, although it may be very interesting to receive stations at such a great distance.

I have been using coils as under: Aperiodic, 4 turns; grid, 9 turns; and reaction about the same, and although I receive a large number of Morse stations at good strength, I cannot find W G Y even though I try all combinations of coils. As this station appears to be heard at better strength than K D K A by most listeners, I cannot make this out.

I am not in a position which is considered good for American reception, as I am screened by the Malvern Hills. My aerial is, however, high, and proves very efficient on the longer waves.

I must take the opportunity of thanking readers who have written to me direct, giving hints which have helped in making my reception a success.

Yours truly,
"Y Nyth," G. B. MANLY.

St. Andrew's Road, Malvern.

POOR B.B.C. STATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I corroborate Mr. Donnelly's remarks in a recent issue?

There is not one of the B.B.C. main stations, except 2 L O, that one can rely on. Here, occasionally, we "strike" one, and think ourselves lucky. Daventry is quite O.K.

I can always count upon getting at least six German stations at full loud-speaker strength on three valves.

Toulouse, a 2-kw. station, is about half as loud again, and infinitely clearer, than 2 L O, which is often "muffled." Leipzig comes through at about four times 2 L O's strength, and one or two Spanish stations of 1 kw. are surprisingly good.

I would willingly pay my licence money to the German authorities, for their stations give me far more pleasure to listen to.

With best wishes for the success of your excellent paper.

Yours faithfully, W. W. PICKARD.

186, London Road North, Lowestoft.

RESISTANCE v. TRANSFORMER COUPLING.

The Editor, POPULAR WIRELESS.

Sir,—I have read with much interest the various and varied correspondence re above.

I entirely agree with Mr. Baggs that the A.F.3 is the best yet when used in a single stage correctly.

There is, however, a great difference in the performance of this and other good transformers when used in different circuits. This is, of course, obvious. What I really wish to point out is that your correspondents do not state the circuits they use.

Take the conventional detector with reaction followed by transformer or resistance coupling. It is practically impossible (if the input on the detector grid is weak, necessitating a good deal of reaction) to do justice to either methods.

Unfortunately, there are a large number of this type of set in use (to my and other conscientious experimenters' and listeners' annoyance) with reaction on to the aerial, and I am convinced that in nine cases out of ten when distortion occurs, as it invariably does, the low-frequency stages are blamed for it.

Perhaps it would be of some interest to your readers if I give them the circuit and details of the set I use myself, which I find after numerous experiments to be the best for ample volume, no distortion, clear, crisp natural reproduction with the lower notes all there.

	Valves used.	Anode volts.
H.F.	Blue Spot Cosmos or Benjamin	100
Detector	Green " " " "	30
1st L.F.	Blue " " " "	120
2nd "	Red " " " "	120

All two-volters.

My advice to constructors is, use an efficient H.F. stage if you desire good reproduction, unless you reside quite close to the station you wish to receive, and little or no reaction.

Yours faithfully,
S. C. TUCKWELL.

P.S.—I read that one or two of your correspondents mention the risk of distortion due to overloading a high impedance valve when used for R.C. coupling. I do not find this at all present with the valve I mention, using a Lissenola at full strength.

36, Lavender Street,
Brighton.

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." test-room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

NEW POLAR NEUTRODYNE CONDENSER.

A YEAR or two ago a neutrodyne condenser was regarded as rather a freak of a component, or at least one that if used at all need not be anything more than two little plates movable relatively to each other. Now, however, many regard such an article as one of the radio necessities of life, and it is one of those components which, in a modern set, are expected to possess an almost disproportional degree of efficiency. Apropos of this it is interesting to note that Messrs. The Radio Communication Co. have replaced their well-known Micrometer Condenser for a new and improved Neutrodyne Condenser. This embodies the main principles of design of the former instrument, but, additionally, it has been made absolutely dustproof, the vanes are now insulated so that they cannot possibly short, while the capacity can be varied either by a longitudinal or a rotary movement of the little knob. A very efficient locking device is fitted, and the condenser can be mounted upon either the panel or baseboard. The control is smooth and in every way quite satisfactory, and the component is very robustly constructed.

A NEW COSMOS VALVE.

We recently had sent us a Cosmos S.P. 18/RR valve which, bearing two distinguishing red spots, is to be known as the "Double Red Spot." Its characteristics are as follow:

Fil. volts, 1·6; fil. amps., 0·3; anode impedance, 4,500 ohms; amplification factor, 6·5. Price 18s. 6d.

Similarly with some, or rather most of the others of the Cosmos range, this little valve has, as will be observed, very pleasing characteristics. Its "mu" is fairly high, although the same can by no means be said of its impedance, which, on the other hand, is commendably low. The "R.R." is, of course, a power valve, and for a 2-volter its curve sizes up very well. It can handle quite a respectable grid swing. This we discovered when the valve was under test. With a fairly hefty input it delivered a full, round tone free from distortion. 100 volts H.T. and about 7½ volts grid bias were employed. We also tried it in first L.F. stages and in a detector position (transformer-coupled sets), and here, too, it gave good results. In a reflex receiver (single valve) it operated very efficiently indeed.

In its class (2-volters) this new Cosmos valve holds its own against anything; in fact, it is distinctly superior to many, and we have no hesitation in recommending it to our readers.

THREE NEW MARCONI VALVES.

Type D.E.H. 410. Fil. volts, 4; fil. amps., 0·1; impedance, 70,000 ohms; amplification factor, 40. Price 14s.

Three new valves have been added to the already extensive Marconi range. All three are 4-volters of an extremely economical nature, each taking but ·1 of an ampere. The characteristics of the first of the new group are given above. As will be seen, it is a high magnification valve, having a comparatively low impedance, and as such makes a very suitable R.C. amplifier. In such a capacity we tested it and found it in every way quite satisfactory. It makes an excellent detector and also operates well in most H.F. circuits.

Type D.E.L.410. Fil. volts, 4; fil. amps.,

(*Continued on page 356.*)

APPARATUS TESTED.

(Continued from page 354.)

0·1; impedance, 14,000 ohms; amplification factor, 13. Price 14s.

This makes a good general-purpose valve. It functions well in detector positions and in L.F. stages where choke or transformer coupling are used. In most H.F. circuits we also obtained good results with this valve.

Type D.E.P.410. Fil. volts, 4; fil. amps., 0·1; impedance, 6,250 ohms; amplification factor, 6·25. Price 18s. 6d.

This is a power valve designed for last stage work. It will handle sufficient energy to operate a fairly large loud speaker. In our opinion, it is the outstanding valve in this new Marconi group—perhaps for the reason that its performance is more spectacular. Certain it is that whereas a major fault in an H.F. valve may merely cause a slight loss of sensitivity, but a minor fault in a "last stager" can make itself heard! Anyway, we tested this D.E.P. on the end of a Det.–2 L.F., and the result was a fairly hefty volume, together with an excellent quality of reproduction. One may require a 6-volt super-power to cope with extremes in the way of inputs, but for average loud-speaker work in the case of the average amateur a valve such as the D.E.P. is infinitely more economical and should prove entirely satisfactory.

These new Marconi 4-volters are as cleanly made as all their dozens of predecessors and in appearance and performance are well worthy of the name they carry.

A TRANSFORMER FOR MAINS UNITS.

Mr. W. Hamilton Wilson, of 125-127, Red Lion Road, Tolworth, Surbiton, Surrey, recently sent us one of his Type T.R.1 transformers, which is designed for eliminators supplying current either to receivers or small-power transmitters. The primary winding is arranged in two halves, which can be connected in parallel for an input of 100 to 125 volts, or in series for voltages between 200 and 250 volts. It will take currents of anything between 50 and 100 cycles. Following are its output ratings:

L.T. 7 volts, 1·6 amperes; H.T. 120-0-120 volts (using centre tap), 50 milliamperes.

We gave the transformer a very careful series of tests—we always spend several hours on such components, realising the necessity for absolute reliability where anything that is used with mains is in question. We had the transformer on fairly high voltage mains—i.e. 240 volts—and we found that it would run for several hours with an output (L.T.) as high as 6 amps. without undue heating. It was run for one hour at 10 amps. without showing any ill effects. A filament winding short circuit test was carried out at 15 amps. and the T.R.1 safely negotiated it. Hooked up in an H.T. eliminating circuit we found this transformer absolutely silent in operation. In fact, its performance in every way was well above the average.

It is a very sturdily built transformer, as it is hardly necessary to add, and the designer has apparently paid commendable respect to that very essential margin of safety. We have only two small criticisms to make, and these are regarding small points which could easily be modified without affecting the instrument's general design. The angle brackets provided for mounting purposes might be arranged to come level with the bottom of the core stampings to facilitate fixing operations, and the ebonite terminal strip could easily be enlarged to provide more space for the nine terminals, which at present are just a trifle crowded.

However, as we said before, these are minor details, and do not detract greatly from the general excellence of the transformer—certainly not from its efficiency in operation. The price of the T.R.1 is £1 17s. 6d.

A four-valve receiver made and presented to the Letchworth Hospital by the Bowyer-Lowe Co., Ltd.

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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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 and 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 enquiries concerning advertising rates, etc., to be addressed to the Sole Agents. Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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.

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked: "Patent advice."

Questions and Answers

HALE CIRCUIT WITH L.F. ADDED.

"JULIUS" (Cannock, Staffs).—"Where can I get a diagram of the famous Hale circuit, with an L.F. valve added to make it a two-valver?"

A circuit of this kind was published in "P.W." under the title of "The Guaranteed Reflex." Although the back number containing full details is now out of print, the circuit has been issued in Blueprint form in the "P.W." Sixpenny Blueprint Series. Application should be made to the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The Blueprint in question is No. 22 and besides the fee of 6d., a stamped addressed envelope should be enclosed.

THE R7 CRYSTAL SET.

P. L. S. (Aylesbury, Bucks).—"In making up the R7 Crystal Set (that was described in 'P.W.' No 253, April 9th issue) I am up against a little difficulty with the coil. On page 264 it says the second coil (70 turns) laps over the first coil (32 turns). Does this mean that a part of this second coil is wound on to the Pirtoid former itself, and then is continued over the top of the 32-turn coil, viz., part of the second coil on the former and part on the wooden separators?"

Yes. The large coil is wound partly on the tube and partly on the separators, the winding being done all in one direction.

The number of turns which are respectively on the former and on the separators is not at all critical, provided the *total* number for the coil is 70 turns.

A ROUGH "SMOOTHING" UNIT.

F. E. (Leatherhead, Surrey).—"I can hear the hum on an H.T. eliminator that I have fitted, and have been told that an extra choke and condenser would cure this. Where should these be inserted in circuit?"

If either of the H.T. main leads has no choke, the new one should be inserted in this lead. The extra condenser should be tried at different points, one side going to the negative lead and the other to the positive. If you do not get rid of the hum, send a sketch of your present arrangement to the Query Department, for correction or criticism. Full details of the charge, etc., can be obtained upon application (See page 360.)

COILS AS CHOKES.

P. E. (Havant, Hants).—"I need a 300-turn coil for some experiments that I am carrying out with a Reinartz reaction set, and instead of a 300-turn coil I have only got a 200-turn and a 100-turn coil. If I add these in series with one another will they do instead of the larger single coil?"

Yes, they will do quite well, but you must remember when connecting them together that if there is a coupling effect between the coils, because they are placed sufficiently near to one another for magnetic interaction to take place, this "mutual inductance," as it is called, will have to be taken into account.

Thus, if one coil is so placed relative to the other that the effective inductance is increased, you will get the turn-values added together, but if not the effect of the second coil will tend to cancel out the inductance of the first coil.

You can therefore either connect them in series and keep them so far apart that there is no coupling whatever between them, or let them interact and then experiment as to the correct connection for maximum inductance by reversing the leads that go to one of the coils.

CONNECTIONS FOR A STAGE OF H.F.

H. R. A. (Evesham).—"I have a Det. and L.F. receiver built from the 'P.W.' Blue Print No. 11, and I should like to add a stage of high-frequency amplification to this for long distance reception. I have the following parts on hand which I should like to use: 1 ·0005 variable condenser; one each 35, 50, 60 (centre-tapped), 75, 100, and 500 coils; 1 valve holder; 1 rheostat; 1 single coil holder; 1 2-way coil holder; various fixed condensers, etc. Are any other parts required, and what are the point-to-point connections, in words?"

You have all the parts that are necessary with the exception of a neutralising condenser. When this has been obtained, connect up as follows:

Aerial to one side of the "fixed" coil in the two-way coil holder, and earth to the other side. The variable condenser is connected across the "moving" coil in the two-way coil holder, and one set of its vanes is connected to the grid socket of the valve holder, the connection from the other set going to the neutralising condenser. The other side of the neutralising condenser connects to the plate socket of the valve holder, to one side of the single coil holder, and to a ·0003 fixed condenser.

The remaining side of the single coil holder goes to H.T. positive. The remaining side of the ·0003 fixed

(*Continued on page* 360.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 358.*)

condenser goes to the aerial terminal of your present set, which preferably should have its grid leak return going to L.T. positive.

The L.T. connections are made by connecting an L.T. negative terminal to one filament socket on the valve holder, and to the centre tapping of the grid coil, which will be placed in the moving holder of the two-way coil holder.

The remaining filament socket of the valve holder is joined to the rheostat, and the remaining side of the rheostat to L.T. positive.

A 35-turn coil is placed in the fixed coil of the two-way coil holder, the centre-tapped coil in the moving, and the 500-turn coil in the single coil holder. (This latter coil is utilised as an H.F. choke).

There is no need to re-adjust the coupling between the aperiodic aerial coil (35 or so turns) and its neighbouring grid coil, as once a good adjustment has been found it may remain fixed constantly.

The same batteries may be used for the H.F. unit as for the main set.

REVERSED REACTION.

"PUZZLED" (Chester-le-Street, Co. Durham).—"I have made a one-valve set from a diagram given to me by a friend. His own set works perfectly, but although mine is exactly like it, same size panel, same positions for wires, etc., I find I cannot get any reaction. In fact, the closer the two coils are together the weaker is the programme. How can this be accounted for, remembering that I am using practically everything the same as on the other set, the only difference being the variable condenser and the coils, which are of different make but have similar turn-numbers?"

Evidently one of the coils that you are using is wound in a direction opposite to that in your friend's set. Reverse the two wires that go to your reaction coil holder, and you should get full reaction results.

FUSE IN THE H.T. LEAD.

C. B. W. (Aylesbury, Bucks).—"Having burnt out a brand new valve owing to accidentally dropping a coil into the set, I should like to provide some kind of safety fuse to prevent this ever happening again. The valve should only take ·15 amps. Is there any little simple thing that I myself can fit that will act as a safeguard, so that excessive current does not flow in the event of too much voltage being applied?"

Quite a good safety fuse is afforded by the ordinary "pea-lamp." Connect this to the H.T. battery

(*Continued on page 362.*)

THE TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

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 a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," 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 completely to solve your problems.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 360.*)

negative plug, and it will burn out if there is a sudden surge of current due to excessive voltage. Its resistance is less than 20 ohms, so it has no noticeable effect upon the operation of the set, and if accidentally burnt out the cost of replacement is but a small fraction of that of a valve.

TAPPED COIL FOR WAVE-TRAP.

F. H. M. (Leyton, E.10).—"In POPULAR WIRELESS, 19/3/27, there is a reply to IGNORAMUS (Bham) to the effect that a centre-tapped coil in the aerial will cut out the local station. My coils are 35 and 100 and, like your correspondent, I get on my one-valver the local stations over more than half the dial. Will you please be so good as to inform me what value the tapped coil should be, also value required when using a tapped coil for your two-valve circuit (1 Det. and 1 L.F.). I have made several inquiries locally, but can get no satisfaction."

The new method of connecting will not affect the electrical characteristics of the circuit, so the coils will be the same as formerly.

Instead, however, of a 35 coil for the aerial, we should be inclined to use a 40-turn coil, as this gives superior results under nearly all aerial conditions. You will have no difficulty in getting a 40-turn centre tapped coil, and this size should do for the two-valve set as well. The only noticeable difference in tuning will be an alteration in the condenser setting, and, of course, an increase in selectivity.

Incidentally, it is noted that you are using a 100-turn coil for reaction, and this is an unusually large size, denoting low efficiency in some other part of the circuit.

Possibly you have insufficient H.T. If you have never tried the effect of reversing the leads to the L.T. battery, we recommend you to try this also, as it may tend to remove damping of the grid circuits, caused by the present conditions.

DRILLING AND TAPPING SIZES.

S. M. T. (Northampton).—"What are the tapping and clearance sizes corresponding with 2 B.A. and 4 B.A. drills?"

For a 2 B.A. use a 25 tapping and 12 clearance. For 4 B.A., 33 tapping and 27 clearance.

WHAT SIZE OF ACCUMULATOR?

E. S. T. (Brighton).—"For over a year I have run a one-valve set, and now I am changing over to a three-valver, H.F., Det. and L.F. My present accumulator lasts nicely for the 6 volt ·25 amp. valve, but for economy's sake I am thinking of going in for valves that take only ·1 amp, instead of ·25 amp.

"I particularly want to reduce charging troubles and cost as far as possible, so would it be as well to use *two-volt* valves, even if it means buying another accumulator?"

In the circumstances we should use two-volt valves, which are much more moderate in charging cost, etc., and which give practically the same results as valves of the 6-volt type.

This will mean buying three 2-volt valves, but probably there is no need to buy another accumulator. Your present one is in all probability convertible into 2-volt units quite easily, and these would make either 1, 2, or 3 two-volt batteries, capable of supplying current to the three-valve set for sufficiently long periods.

We should be inclined to ask your electrician to convert the 6-volt battery into *two* separate 2-volt batteries, one being twice as large as the other.

This larger one will run the three ·1 amp. valves for a longer period than the present battery runs one valve. And when recharging is necessary you will have quite a useful small accumulator to carry on with, whilst the other one is at the charging station.

ADDING AN AMPLIFIER.

"TROUBLED" (Lechlade).—"I have bought an amplifier (two valves) to add to my one-valve set, but find they won't work together. When I connect up I get no signals at all, but there is a spark on joining up, and the wires to the accumulator get warm. What is the matter?"

You must not join the amplifier to the set as, owing to the present internal connections, you

(*Continued on next page.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

short the accumulator. On no account must you try the two together until you have made the following alteration:

Open the amplifier's case and note the wiring of the H.T. negative terminal. If it goes direct to one of the L.T. terminals cut this wire, so as to leave the amplifier's H.T. negative terminal without any internal connection at all. Then try connecting up again.

If you cannot open the case, or if the internal wiring appears too complicated to alter, you may find that the set will work O.K., *provided you do not connect up the amplifier's H.T. negative terminal to the H.T. battery.*

Often it is through this lead to the amplifier that the short is caused, and as a matter of fact, the amplifier should not require a connection to the H.T. negtive at all, so leaving this terminal unconnected may cure the trouble. But, if possible, it is better to get some one of experience to look at the set, or else to sketch the back of panel connections (of both set and amplifier), and get this sketch checked over by the Technical Queries Dept.

REACTION WITH A FRAME.

S. R. (Brentford, Middlesex).—"Using a set with a frame aerial and no aerial coil, how is reaction obtained?"

Reaction effects can be obtained by winding an extra turn or two round the frame, and connecting this as a reaction coil is connected; or by breaking the lead from the frame and inserting in series with it a small coil, coupled to a reaction coil in the usual two-coil method.

RINGING NOISES.

L. F. (Clacton-on-Sea).—"What causes a ringing noise when the set (two valves) is tapped?"

Such a noise occurs when the valve is "microphonic," and it is caused by small vibrations of the filament, which cause corresponding variations in the flow of plate current. The cure is to use "anti-microphonic" valve holders, or to mount the whole set upon shock-absorbers, such as rubber pads or cushions.

MORE ABOUT FIXED RESISTORS.

(*Continued from page* 338.)

If we could embody the resistor in the design of the valve holder, or, better still, place it in the base of the valve, we should be getting much nearer to those things which must come eventually, and although the latter development must, for obvious reasons, be left to valve manufacturers, there is no reason why the amateur should not try his hand with an "all in" valve holder. It would be difficult to imagine anything more simple. At W, in Fig 9, we have a view of the underside of an ordinary baseboard-mounting valve holder, the sockets, except one, being connected as usual to the terminals. Between the excepted socket and its terminal we place the resistor, this being wound on a fibre strip which is secured across the opening of the hollow base, and connected up as shown in both examples, W and X. We have seen that a resistor of this type, when wound, has a thickness of $\frac{1}{8}$ in. plus two diameters of the wire; with certain types of valve holders there is ample accommodation providing, of course, the resistor can be made in a very compact form. The unit might possibly clash with the method of fixing the holder to the baseboard, in which case it would seem better to design a holder which could be suitably adapted to the system, rather than design and adapt resistors to existing holders. In this direction there is much scope for the experimenter. Consider the idea shown in Fig. 8, and then consider the possibility of arranging part of the holder moulding as the resistor former.

TECHNICAL NOTES.

(Continued from page 336)

in the standardising laboratory of the West Lynn works of the General Electric Company (U.S.A.) as a part of the equipment which replaces the human eye in making tests of an incandescent lamp, leakage current through insulators and through wireless valves, and so on. The instrument is known as a thermionic microammeter, and has a full scale reading of one ten-millionth of an ampere, with sub-divisions of $\frac{1}{100}$th of that amount. It is the most sensitive instrument of such a long-scale length working in jewel bearings that has ever been made. An ordinary 40-watt electric lamp, for instance, uses an amount of current which would register—if the instrument could read sufficiently far—200,000,000,000 divisions on the scale. The instrument makes use of the photo-electric cell for converting light energy into electrical energy.

Constructing a Loud Speaker.

The production of an inexpensive and efficient loud speaker unit, as a separate component (that is to say, as distinct from a complete loud speaker) is a matter which seems to have achieved very great popularity in this country. It was, I believe, first started by the Lissen Company, or, at any rate, they certainly seem to have "set the pace" with their Lissenola unit. I notice that, in several journals from various places abroad, similar units are now offered for sale, and all instructions are given for the purchaser to make up an efficient loud speaker by the aid of these units.

It is really not surprising that these units should have "caught on" as they have done, for, by their aid, what was previously one of the most expensive components of wireless outfit can be made up by the constructor at a cost of only a few shillings. Provided a really efficient unit is employed it is not a matter of any difficulty to make up the sound amplifier or trumpet.

New Diaphragm.

Talking about loud speakers, I see that an improved type of diaphragm has recently been patented which is something like a cross between a cone and a plane diaphragm. In this new sound radiator the diaphragm is stiffened or reinforced by means of radial triangular pieces, which are suecred to the back in an edgewise position. The diaphragm itself is also strengthened by means of a spiral cane which is secured to its surface, and also radial pieces of cane are used for further strengthening.

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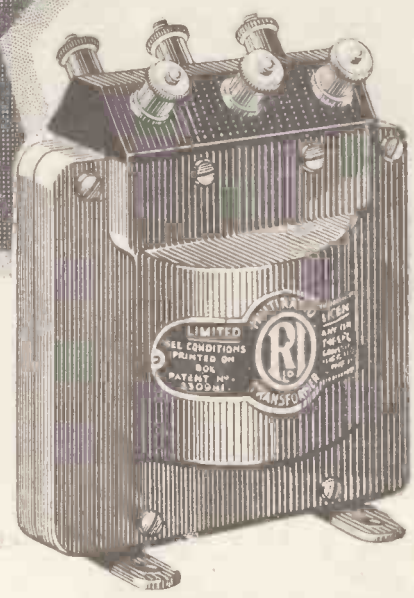

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