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# Popular Wireless

No. 194. Vol. VIII.

February 13th, 1926.

and Wireless Review

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

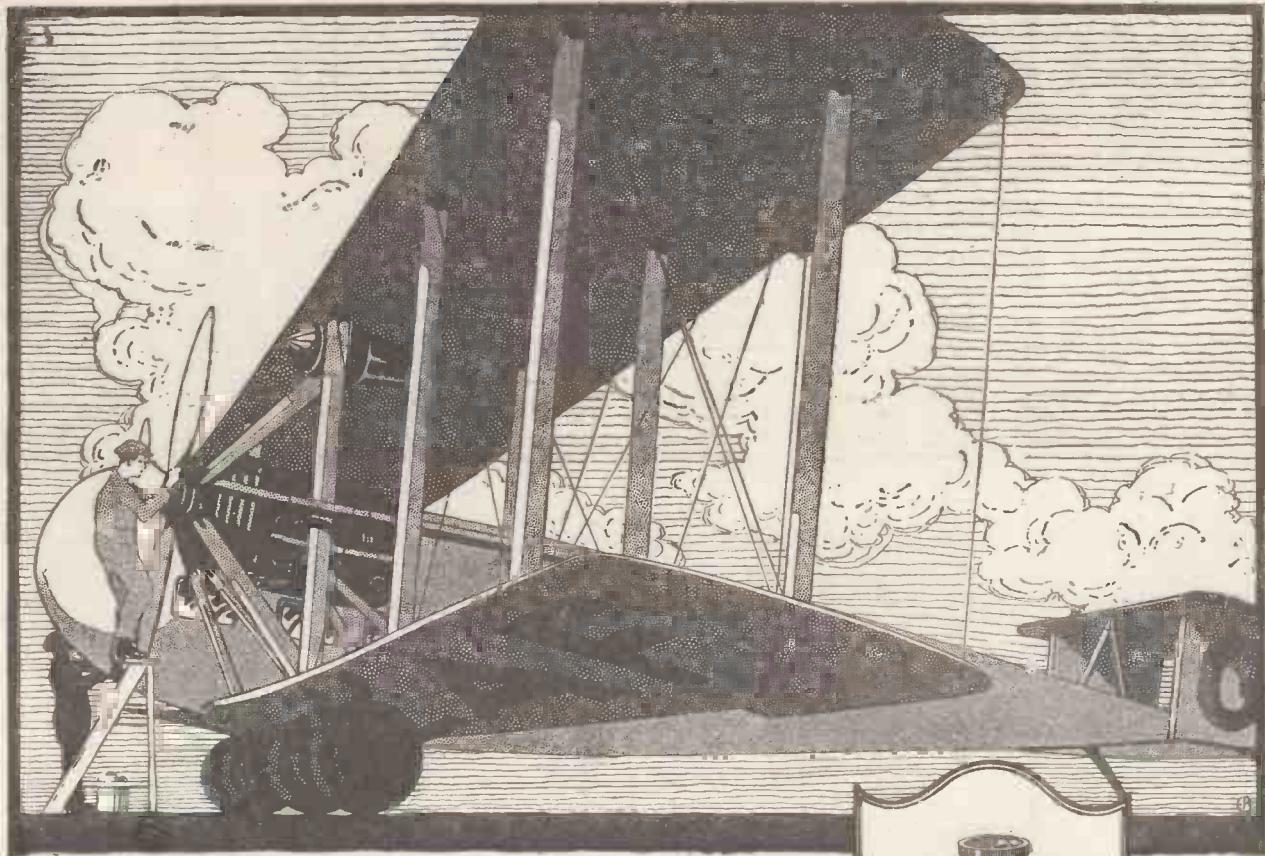
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**Contents.**

How to Make  
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A Two-Valve Amplifier, and  
A Two-Valve and Crystal  
Reflex Receiver.

More Practical Ideas.  
Hard Circuits Made Easy.  
"A Talk on Clerk Maxwell,"  
by Sir Oliver Lodge, F.R.S.

Our cover photograph this week shows some American naval cadets listening to a broadcast programme on the bowsprit of their ship, which they find is the best spot aboard for reception.



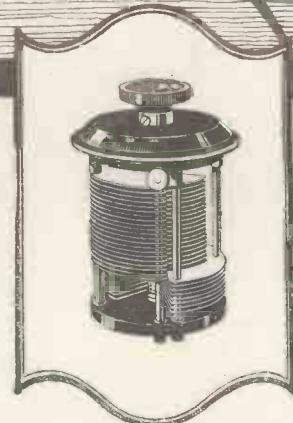
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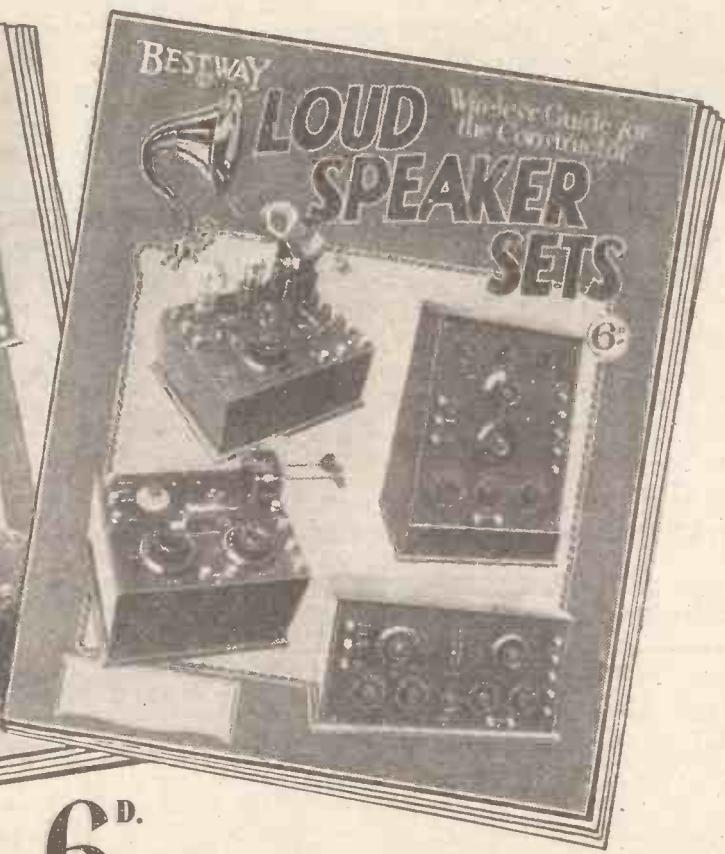
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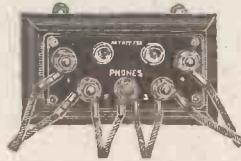


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# DULL EMITTERS

## —now is the time to face the facts

CLEVER advertising can sell anything once—but if the commodity does not live up to its advertised reputation then the manufacturer gets no repeat orders. His business is built upon shifting sands, the product declines in popularity and eventually disappears. On the other hand, if the article is a good one users are only too glad, not merely to keep on buying but also to testify to its merits and further its sales.

When the Cossor Valve was first introduced its novel constructional features created great interest. The sceptically-minded bought Cossor Valves deliberately to prove to their own satisfaction the fact that an arched filament almost totally surrounded by a hood-shaped Grid and Anode could make no material improvement in sensitiveness or volume.

But those who came to scoff remained to praise. Throughout the length and breadth of the land you'll find Cossor users enthusiastically acclaiming the superiority of their valves. Not merely because actual experience proves them to possess a longer life—not merely because comparative tests show them to be more sensitive to weak signals—not merely because they are entirely free from annoying microphonic noises—not merely because they yield a much purer tone. Their popularity cannot be ascribed to any one of these features but to the rare combination of them all.

And now comes the Wuncell—the first really *long life* Dull Emitter. Dull Emitters are no new discovery. They have been in existence for several years—but there is a vast difference between the laboratory specimen and the valve produced under modern manufacturing conditions in mass production. Two bugbears have always been present in the evolution of the perfect dull emitter. One the difficulty of obtaining absolute uniformity of performance, and the other, of producing a robust valve.

Not until these difficulties were definitely overcome was the Wuncell placed upon the market. The wonderful reputation enjoyed by the Cossor Bright Emitter valve could not be prejudiced by the hasty manufacture of a dull emitter merely to meet a clamorous demand.

Uniformity of performance and exceptional sturdiness are the two outstanding features of the new Wuncell. These are no idle platitudes as many thousands of Wuncell users can already testify. They are due solely to its unique filament.

Instead of whittling down the filament to secure low current consumption at the risk of fragility, that used in the Wuncell, by reason of a most elaborate process is *built up layer upon layer*. The result is a filament quite as stout as that used in any bright emitter valve. Its electron emission, however, is so vastly increased that only very little electrical energy is required to operate it. In daylight, for example, its glow is practically invisible, while at night it can only be compared to the luminescent figures on a watch.

With such a filament mounted in arch formation and further secured at its centre by a third support, it is small wonder that the Wuncell was described by *Amateur Wireless* as being "almost everlasting." Valve users would do well to note that this type of filament is not obtainable in any other make of valve.

Uniformity of construction is safeguarded in the big Cossor factory through the provision of the most accurate machinery that human ingenuity can devise. Gauges accurate to one ten-thousandth part of an inch—workers long skilled in the most delicate operations—systematic tests taken during every process—the courage to discard every valve which does not reach the pre-determined standard of excellence—these are some of the reasons why the Wuncell is rapidly supplanting all bright emitter valves.

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## RADIO NOTES AND NEWS.

**Low-Power Feat — New 5 X X Feature — Hilversum's Harmonics — Railway Radio — "P.W." in Siberia — Dame Nellie Melba.**

### New Loud Speaker.

A NEW type of loud speaker has just been invented by Dr. N. W. McLachlan. Claimed to be a most important advance towards the perfect reproduction of broadcasting, it has been demonstrated by the inventor to the R.S.G.B. The whole arrangement is designed to prevent any possibility of distortion, but unfortunately it is not yet on the market.

### One-Valve Results.

HOW many broadcasting stations should a good one-valve set be able to scoop in? It's a fascinating question, the answer depending upon all sorts of things such as locality, skill in handling, etc.; and some favoured mortals can collect about a dozen stations any evening, whilst others can't get away from the local. A Tunbridge Wells reader informs me that he has secured over forty stations upon a straight single-valve set, including the following:

### Periodical Tours Abroad.

DUBLIN and thirteen B.B.C. stations, five French, two Dutch, nine German, six Spanish, three American, and Radio-Bern, Prague, Oslo, and Rome.

He says: "This lot I receive periodically, but not every time I try for them." I know a lot of people with super-hets who spend their time wishing they could say as much as that.

### Fight by Radio.

SOME time ago it was announced that an imitation prize-fight would be broadcast from 2 L O. Now I hear that, instead of realistic imitations, the

actual contest for the Lonsdale Belt, at the National Sporting Club, on Feb. 22nd, will probably be broadcast. Twenty-five

completed, but most listeners are hoping that the B.B.C. will give every encouragement to the development of this form of broadcast. It certainly seems to get more good fun over the ether in a given time than almost any other kind of entertainment.

### The Wide, Wide World.

BRITAIN'S giant radio station at Rugby, the range of which is world-wide, is now undertaking a radio-telegraph service to liners at sea in any part of the globe. This applies to vessels fitted with C.W. receivers, and the rate is to be 1s. 6d. per word. Full particulars of the service can be obtained at any Postal Telegraph Office, where a list of the vessels which can be reached under the new arrangement is available.

### Low-Power Feat to India.

AN excellent low-power feat has been accomplished by Mr. L. Bland Fagg, A.M.I.R.E. (2 G O). He has been working with a station in India, nearly 6,000 miles away, with an input of only 12 watts. This must be something like a record for low-power transmission, so far as Great Britain-India is concerned.

### New 5 X X Feature.

THE Daventry station, with a "parish" that measures hundreds of miles across, has always been a bit of a problem as regards its "local news." Other stations could prattle of municipal measures and give residents little tit-bits about the neighbourhood; but 5 X X has too powerful a voice for local gossip, and consequently it was always at a loose end (*Continued on next page.*)

minutes are allowed for, so there will be time for a short talk by Lord Lonsdale, or another well-known sportsman, as well as for the noises of the actual fight in progress.

### Listening Time.

THE new broadcast revue, which is to take the place of "Radio Radiance," will be called "Listening Time."

At the time of writing the arrangements for the "opening night" have not been



Birmingham's popular Station Director, Mr. Percy Edgar, at work at 5 I.T.

## NOTES AND NEWS.

(Continued from previous page.)

whilst the other stations gave out their local items. Now the B.B.C. has decided to include a shipping forecast in the 5 X X programme at 10.25 on week-days, and 9.10 p.m. on Sundays. And in future, while other stations are engaged upon local news, 5 X X will tell the trawlers and in-shore shipping all about the tides and channels, and the way the wind blows.

## Hilversum's Harmonies.

I HAVE just heard from "P.W.'s" correspondent in Holland, Mr. W. Peeters, that there is no truth in the rumour that Hilversum has been intentionally transmitting upon short waves. It will be remembered that a Southend reader picked up signals from the Dutch station upon a low wave-length, but Mr. Peeters assures me that this must have been a harmonic. Certainly Hilversum is still up on 1,050 metres, and means to stay there.

## Railway Radio.

THE G.W.R. (Bristol) Radio Society carried out a very interesting experiment recently, when an attempt was made to pick up broadcasting in a train passing through the Severn Tunnel. A Burndept 7-valve super-het. was employed, and though signals faded away in the tunnel, the carrier-wave of the Cardiff station could be heard faintly. Half a mile from the Welsh end, when the train had travelled clear of the waters of the Bristol Channel, music was picked up at good strength.

## Tuning-in Through the Tunnel.

PLenty of stations were picked up and reproduced upon twenty loud-speakers whilst the train was travelling at full speed in open country. San Sebastian was the star turn, but Brussels was a good second of the distant stations, that included Dortmund, Berne, Hamburg, and Radio Catalana (Barcelona).

There is little wonder that the tunnel damped results, for it has a maximum depth of 50 ft. below the surface, and is covered by about 80 ft. of water. The thickness of the tunnel casing itself is fifty bricks!

## The "P.W." Two-Valver.

A WEST Croydon reader—Mr. V. C. Moggs, 12, Pawsons Road—tells me that he heard Prague Radio Journal (Czecho-Slovakia) on 368 metres one Sunday evening between 11 and 12. The announcer was thanking British readers for the reports of reception sent in, which shows how well signals have been received here from this new station. Mr. Moggs was able to hear musical items 8 ft. away from his 'phones, using "The 'P.W.' Two-valver."

## —And Thirty-nine Others.

AFTER Prague had closed down at 11.50 a turn of the condenser brought in what appeared to be Seville, and this station provided entertainment until 1 a.m., closing down with chimes in the studio.

At the end of his report this reader says: "I have made up about forty 1 and 2 valvers from 'P.W.', and not one was a disappointment."

## "P.W." in Siberia.

DO you know where Tomsk is? Not Tom, but Tomsk.

Well, it's a little old home town right away in Siberia, and apparently "P.W." has found its way there, for this week I've had a letter from a comrade in Tomsk. His address is A. Kalachnikoff, Tomsk, Siberia, Russia (Krasnoarmeiskaja St. 66). And this is what he says:

## "Non Money."

"I BEG your pardon if I take away your time, but I understand it will be a great kindness from your part, if you'll accomplish my begging because I've

## FROM DAME NELLIE MELBA

1st February, 1926.

The Editor, "Popular Wireless."

Dear Sir,—Amid the sadness of bidding goodbye to so many good friends of mine up and down the country it has been a pleasure to note almost everywhere a quickening in musical appreciation. To-day there are gratifying signs that the British audience begins to hear as well as listen; and if the result is to be a musical revival the credit for it will be due in no small degree to men like Halle, Henry Wood, Eugene Goossens, Landon Ronald, Albert Coates, Hamilton Harty, and a number of other pioneers in London and certain provincial centres.

Yet mainly, so it seems to me, the secret of this new interest is to be found in the astonishing enlargement of the audience for music accomplished by the gramophone and broadcasting. Although I believe I was the first prima donna to make a gramophone record and the first to broadcast, I have not, whilst recognizing the possibilities of these devices, ever accepted either of them uncritically, and I am well aware of the flaws in wireless as that science is practised to-day. But, just as I have followed the gradual perfecting of the gramophone, so I think one may look forward to like improvements in wireless. Broadcasting and the gramophone are certainly the two most eloquent missionaries to the musical heathen in our midst.

Yours truly,  
NELLIE MELBA.

5, Cheesham Place,  
London, S.W.1.

non money to pay you. I understand it is a great insolence from my part such a asking, but if you'll stand in my situation you'll understand me, and send me your remarkable journal. I beg you give a place in your excellent journal to following lines:

## A Friendly Correspondence.

ENGLISH Amateurs, An Russian Amateur will put in touch with you, and have a friendly correspondence and close acquaintance. Also I am interested very in receiving radio books and different radio parts, variable condensers, dials, potentiometers, rheostats, knobs, ebonite panels, and so on, and so on.

From my part I am able to give only following things: Russian post stamps, and paper money emitted during a revolution, Russian postcards with views. To enable me answer and help me pay a postage, please send each time some international reply coupons on amount about one shilling. I wait your letters with impatience!"

## The Personal Touch.

A POSTSCRIPT says, "Please send magazines only register. If to you will be of interest my stamps, paper-money, and postcards, I with great pleasure will send them to you. I regret very that I unabl to send you money, but if ever I'll have them, it will be my first duty to send them to you. It will be very pleasant to me if you will have a personal correspondence with me, and send me your photo. Write what interested you in our life and radiolife—I'll try to satisfy you by writing you a particular letter, about this. Hoping that from this on we will be friends."

So if you feel that a friend in Tomsk would be a friend indeed, you should drop a line, but don't forget about the "P.W.'s," components, registration, and bobsorth of reply coupons!

## A Disappointment.

Did you ever know the ether more soggy and turbid than it was during International Radio Week? One night I stuck it till 4 a.m. and tried every set I own, finally going to bed in high dudgeon, without logging anything worth losing beauty sleep for. It's comforting to know it was the same all over the world as in Britain, and we must just hope for better luck next time.

## The Dublin Station.

THE Editor of "The Irish Radio Review" asks me to make public the following notice: "With reference to the transmissions of 2 R.N., the Dublin broadcasting station, we beg to advise you that your readers' reports of the reception will be welcomed. Reports should be addressed to the Editor, "The Irish Radio Review," 179, Great Brunswick Street, Dublin, Ireland.

## Flying Wireless.

ACCORDING to the "Morning Post," passengers travelling in one of the French London-Paris aeroplanes are now able to listen in to broadcast programmes. A twin-engined Farman Goliath, belonging to the Air Union, has been fitted with a 7-valve set, placed in the front part of the cabin. The mechanic attends to it, and tunes in London, or Paris, and the 12 passengers are able to listen in on 'phones.

It is stated that in spite of the roar of the mighty engines, reception is good. That's nothing; I used to own a 7-valve set that roared so loud that you'd never get a chance to notice the buzzing of any mere aeroplane engine!

## "Happies."

TEIGNMOUTH Radio Society is being inaugurated to-night (Thursday), and I should like to take the opportunity to wish them "Happies" on their birthday.

"Look in the ether, Teignmouth, and you will find some beautiful concerts, jazz, and jam-ming. And whatever you do, don't forget to put your 'P.W.' in the wireless cupboard, every week, Teignmouth; Uncle Arie's got something good for you every Thursday, you know."

"Happies" to all you other children, too. I must go now, 'cos Eddie Tor wants me. Good-bye, children, Good-bye—"

ARIEL.

# A Talk on Clerk Maxwell

by Sir Oliver Lodge  
F.R.S.

THE work and influence of a great man cannot be measured by his length of years. It is sometimes said that the best and most original work, even of a man of science, is done during the years between twenty and forty, or even, some say, between twenty and thirty, before he gets too much absorbed in the work of the world, and before the freshness of his genius has crystallised into habit.

Certainly some of the greatest men have died young, sometimes amazingly young, considering what they accomplished and the influence they have exerted on posterity. The world was redeemed by a Life lasting only thirty-three years.

Apart from statesmanship and politics, which seem to require a measure of seniority, the chief advantage of long life is that great men become better known to their contemporaries, and receive more appreciation from the generation immediately following. They become, in fact, better known to the public.

#### Unrecognised Genius.

But in so far as actual achievement is concerned, their best work is usually done while they are still young, before the enthusiasm of youth has evaporated, and before their vitality is impaired, or their time consumed by the cares of this world and the demands of social and family life.

Men who die young, before they have reached the public ear, cannot become well or generally known; their subsequent reputation must depend on the piety of their co-workers, who appreciate them and are able to understand and expound their work. Posterity has a much better and truer comprehension of them than their immediate followers have.

So it has been in science with Hertz, and Carnot, and Fresnel, and Moseley, and FitzGerald, and Thomas Young; and in another branch of activity so it has been with Keats and Shelley. So also it is with Clerk-Maxwell.

Everyone is familiar with the name of Lord Kelvin, who acquired years and honours, but comparatively few know much about the work of James Clerk-Maxwell; yet he was a man of equal magnitude, some think even greater. But it is not for us to make comparisons. Some think that in his influence on the progress of science and in his innate powers of perception and mathematical ability he was comparable to Isaac Newton! However that may be, there is no doubt that his life work was far greater than is generally known.

Some men are fortunate in their biographers, others are not. Clerk-Maxwell was one of the unfortunate ones. And, indeed, his own modesty and simplicity may have tended to lead his contemporaries to take him more nearly at his own valuation than was reasonable or right.

#### "Kinetic Theory of Gases."

The outward circumstances of his life were merely these. He was born in 1831, and died forty-eight years later. He was Professor of Physics first at Aberdeen; then at King's College, London; then at Cambridge, where he built the Cavendish Laboratory with funds provided by the then Duke of Devonshire, a member of the famous house of Cavendish. His scientific writings began at a very early age, for he might almost have been called an infant prodigy; and they have been collected into two large rather unwieldy volumes. Like Newton, he did some fine work on the Theory of Colour and of Colour Vision, devising a geometrical scheme of representation which has been used by all explorers in this field since.

But a great deal of his work was connected with the behaviour of atoms and what is called the "Kinetic Theory of Gases." A gas is a structure in which the atoms or molecules are independent of each other, and fly about in all directions at random, colliding with each other and rebounding, filling every vessel in



James Clerk-Maxwell.

which they are put, and exerting pressure on its walls by the bombardment, but not cohering together in the least. If they cohere, the gas liquefies.

The gaseous laws of pressure, temperature, and volume can be elaborated by the behaviour of random flying perfectly elastic particles, independent of each other; and that is what a gas is.

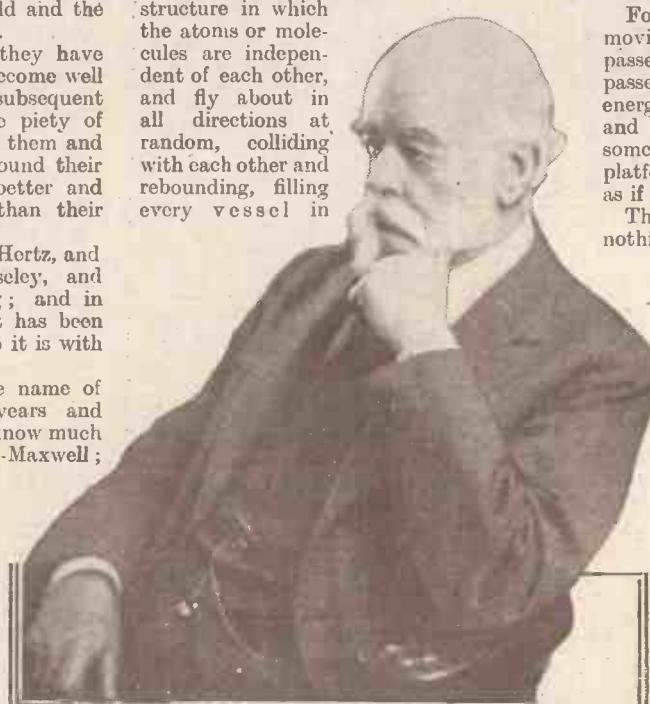
But a gas has a certain amount of viscosity, a property possessed in an exaggerated manner by treacle. If air in a vessel is stirred, it soon comes to rest, sooner than if it were water; the motion is wiped out by friction. But it must be a peculiar kind of friction in a gas; for if the molecules are independent of each other, how can they rub and cling together? As a matter of fact, they do not; and Maxwell gave the theory of gaseous viscosity as due to diffusion—the diffusion of particles among each other.

#### Interesting Damping Effect.

For instance, a perfectly frictionless moving train might be brought to rest by passengers getting in and out of it; every passenger getting in consumes some of the energy of the train in getting propelled, and every passenger getting out wastes some of the energy of the train on the platform. So the train would be stopped as if by friction when there was no friction.

Thus, by the diffusion of particles and nothing else, viscosity between layers of moving gas can be simulated. By considering the problem in detail he made the unexpected prediction that the viscosity of a gas within certain limits would be independent of the pressure—that is, independent of the amount of gas in the vessel. For in a rarefied gas the greater mobility would make up for deficiency in number; and this prediction he subsequently verified by careful experiment. He also showed that the energy of all gaseous particles, whatever their nature, and whether light or heavy, would be on the average the same—a law which, as the "law of equi-partition of energy," has had a great effect on science.

(Continued on next page.)



A recent photograph of our scientific adviser, Sir Oliver Lodge, F.R.S.

## A TALK ON CLERK MAXWELL.

(Continued from previous page.)

and has led to brilliant discoveries of exceptions. Hence the Quantum.

But, after all, the greatest work of Maxwell's life was the assimilation of Faraday's experimental researches in electricity and magnetism, and with great ingenuity throwing them into a mathematical form, the advantage of which is that thenceforth their consequences can be deduced in a semi-mechanical or algebraic manner by people not possessing the intuitive genius of Faraday himself; and, moreover, refined calculation enables results to be obtained



One of the new 10 kw. water-cooled valves in use at the Rugby Station compared with the average valve used for reception.

far beyond the possible range even of a Faraday.

It was thus, that in 1865 Maxwell discovered the true nature of light, which, though used by humanity from time immemorial, had never been understood. Numberless attempts had been made to work out a theory of the ether which should explain light on mechanical principles, the principles of ordinary vibration of a medium.

These had carried people a certain distance, but sooner or later they all failed. Maxwell showed that light was not a mechanical vibration at all, but a purely electrical or electro-magnetic phenomenon.

### Electrical Character of Light.

Just as Benjamin Franklin had identified lightning with electricity—which was comparatively a simple though rather sensational thing to do—Maxwell identified light with electricity and magnetism: an iden-

tification which was by no means simple, and not at all sensational in the popular sense. He did this first in 1865, and in 1873 published his great and standard two-volume treatise on "Electricity and Magnetism," in which "Light," so to speak, became one of the Chapters, being incorporated with Electricity as a Province or self-governing State in an Imperial constitution.

### Commencement of Wireless.

The discovery was received, as usual, with conservative hesitation by the senior Authorities of the period, and was not fully accepted till long after. It was hardly known on the Continent, and was looked at askance by some in this country. But among some of the younger men, beginning their scientific career, it aroused great enthusiasm and led them to wish to find a means for making light or radiation by purely electro-magnetic methods.

This was reserved for Hertz, who, in '87 and '88, a quarter of a century after the discovery, brilliantly verified it, and began the actual production of those waves which makes broadcasting possible to-day.

Hertz developed their theory on Maxwell's lines, and showed how every detail could be explained on Maxwell's theory when more fully developed and worked out. Indeed, until the discontinuity of electricity was discovered, and the electron and the quantum made their appearance, everything in electrical science and engineering could be explained by Maxwell's theory.

But it was a continuous theory of the Ether; it did not allow for discontinuities, or rather it only suspected them in an initial manner, and made no provision for them in the equations. All that represents work which has been done since. Maxwell's discontinuous work in the kinetic theory of gases is now pressed into the service of electricity, and by the two together he still dominates the field. Gas theory is now applied to electrons, and even to radiation. Astonishing!

### Foundation Stone of Modern Science.

James Clerk-Maxwell has been the inspiration of most of the brilliant young mathematicians and experimenters who disport themselves with such admirable results in this twentieth century. Maxwell might have been alive to this day; he would have been only ninety-four.

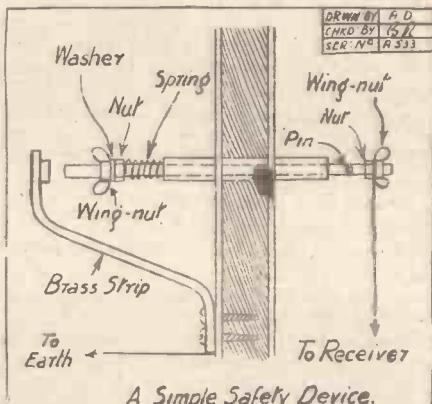
But for all practical purposes his influence is as live as ever. He has written his name large on the history of science; and posterity will rejoice, not only at the wonderful discoveries that are being made now,

but at the astonishing genius which laid their foundations and made the superstructure possible.

## A SIMPLE SAFETY DEVICE.

By a Correspondent.

THE earthing of the aerial during severe local thunderstorms is purely a matter akin to insurance. If you do not do it you may have reason to be sorry. The simple device about to be described enables the aerial to be earthed outside the house by an operation performed inside the house. The operation consists only of pulling out a pin, and the apparatus can be made from oddments. (See Figure below.) Through the ebonite wall-tube passes a brass rod having a sliding fit. On the outdoors end of the rod is placed a bit of spiral spring, then a nut, a washer and a wing-nut. A piece of brass



strip is bent, as shown, and fastened to the wall. A contact piece soldered to the strip is a refinement well worth while. From the strip a lead is taken to earth.

### Simple Action.

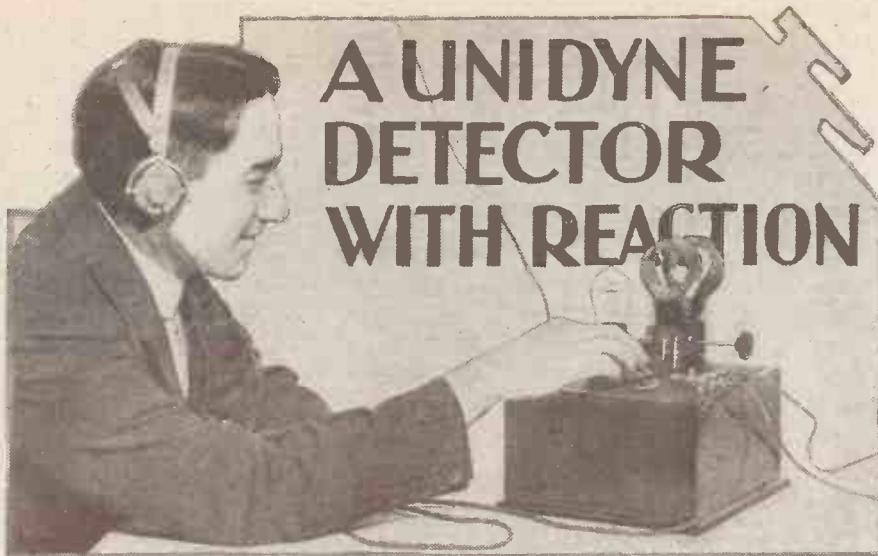
In the indoors end of the brass rod a hole is bored to receive a pin, which can be made of metal rod or stout wire, with an easy fit. A nut and wing-nut also are fitted, as shown in the diagram. This nut and the outside brass contact must be adjusted so that when the brass rod is pulled inwards far enough to bring the pin hole clear of the ebonite tube the other end of the rod breaks contact with the brass strap.

This action puts a tension on the spring. When it is desired to earth the aerial the pin is removed, the spring relaxes and carries the rod outwards to make contact with the strap, thus securing connection to earth. To unearth the aerial all one has to do is to pull back the rod slightly and reinsert the pin.

## NEXT WEEK.

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GIFT.



The Set designed, described and constructed by the "P.W." Technical Staff.  
The diagrams for this set are on the Blue Print given away with this issue.

MOST of our readers will be familiar with the principle of the Unidyne receiver, which was introduced to the public in the pages of this journal in 1924. For the benefit of new readers, its characteristic feature can be expressed in a few words—it requires no H.T. battery.

#### No H.T. Battery Needed.

The trouble and difficulty attached to the maintenance of an efficient high-tension supply led to an investigation as to the possibilities of reducing this to a minimum, or abolishing it altogether. The Unidyne circuit, as shown in the blue print, gives the receiver which was evolved as the result of many experiments, and, although there is no H.T. battery whatever in the circuit,

of an unusual type, which is known as a "four-electrode valve." Nearly all the other valves used for wireless reception have three electrodes, namely, the filament, grid, and plate (or "anode"). These are extended through the base of the valve in the form of four legs, two for the filament, one for the grid, and one for the anode.

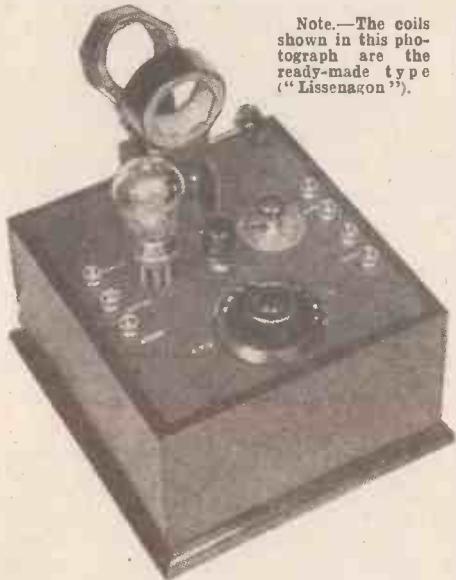
In the four-electrode valve (that is necessary for the operation of the Unidyne circuit) there is one filament, one anode, and two grids. The filament has the usual two legs, and the other electrodes one leg each, so that the complete valve has five legs, and is inserted into a five-leg socket, which is shown near the aerial terminal on the blue print.

#### What the Set Will Do.

Before considering the actual connections to the valve, it may be as well to supplement the statement regarding results obtainable with the Unidyne one-valve receiver. It has been found to work with great efficiency under all sorts of conditions, and has attained tremendous popularity as a long-distance receiver. In innumerable cases readers of POPULAR WIRELESS have succeeded in picking up broadcasting direct from America upon the receiver shown, but this, of course, is only possible when conditions are good and when skill in handling the receiver has been attained.

Like all ordinary one-valve sets, the Unidyne is quite unsuitable for loud-speaker work, but it excels in 'phone-signals, and it has one noteworthy peculiarity. This is its "crystal clearness" in reproduction, which is so marked in comparison with reception using an H.T. battery that it has been testified to and remarked upon in innumerable cases. Probably this crystal clearness has something to do with the excellent long-distance reception which has been achieved, for when the noisy background due to the use of an H.T. battery is removed, very weak signals become extraordinarily clear, thus making a vital difference to the clear reception of announcements from stations across the Atlantic, or at other great distances.

Another advantage of the Unidyne receiver is the fact that it is distinctly more selective than the ordinary one-valve



This photograph shows the complete Unidyne set ready for connecting up.

the volume obtainable is at least as good as the ordinary one-valve set, which requires a potential of from 30 to 80 volts from such a battery.

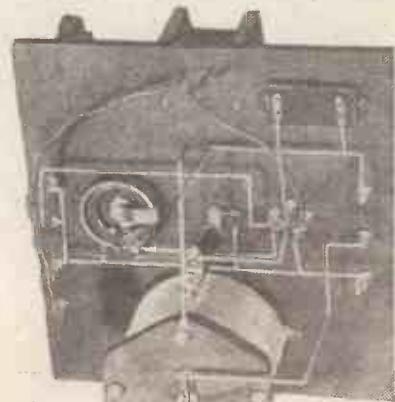
In order to accomplish this result, standard components are used throughout, with one exception, viz., the valve. The Unidyne receiver requires a special valve

set, and this, again, partially accounts for its great success as a long-distance receiver. It will be found to be unusually responsive to its controls, but nevertheless the set is in no way difficult to handle.

The photograph of the complete receiver shows that it is a neat and compact little instrument. The tuning is carried out by means of coils in the usual two-coil holder, in conjunction with a variable condenser. On the left of the receiver are the two aerial and the earth terminals. The provision of two aerial terminals allows the tuning to be placed either "in series" or "in parallel," thus rendering the set suitable for the reception of either long-wave or short-wave broadcasting.

#### The Coils and Valve.

By comparing the photograph closely with the blue print, it will be seen that the lay-out of the latter need not be strictly adhered to, so long as the circuit connections are unaltered. For instance, instead of the "precision" rheostat (which is of the wire-wound type), a carbon compression filament resistance could be used. Similarly, a different variable condenser could be



The wiring at the back of the panel. This view should be compared with the blue print.

employed (provided that its maximum capacity is .0005 mfd.).

One of the details upon which a great deal of the success of the set will depend is the type of tuning coil employed. Probably the best coils to use are the home-made spider-web or basket type, but if a ready-made coil is preferred, the "Lissenagon" is recommended.

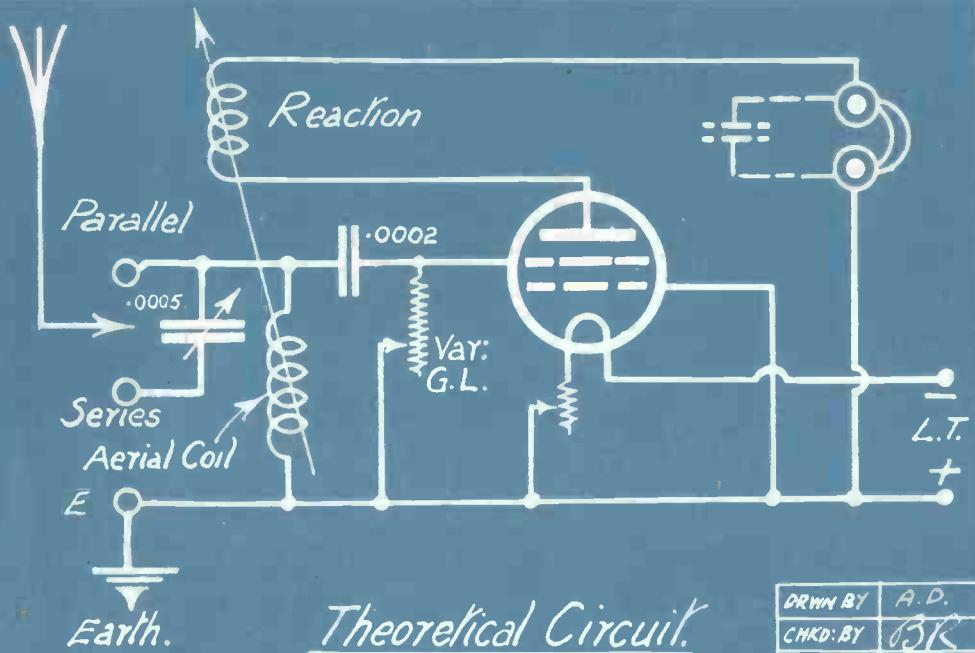
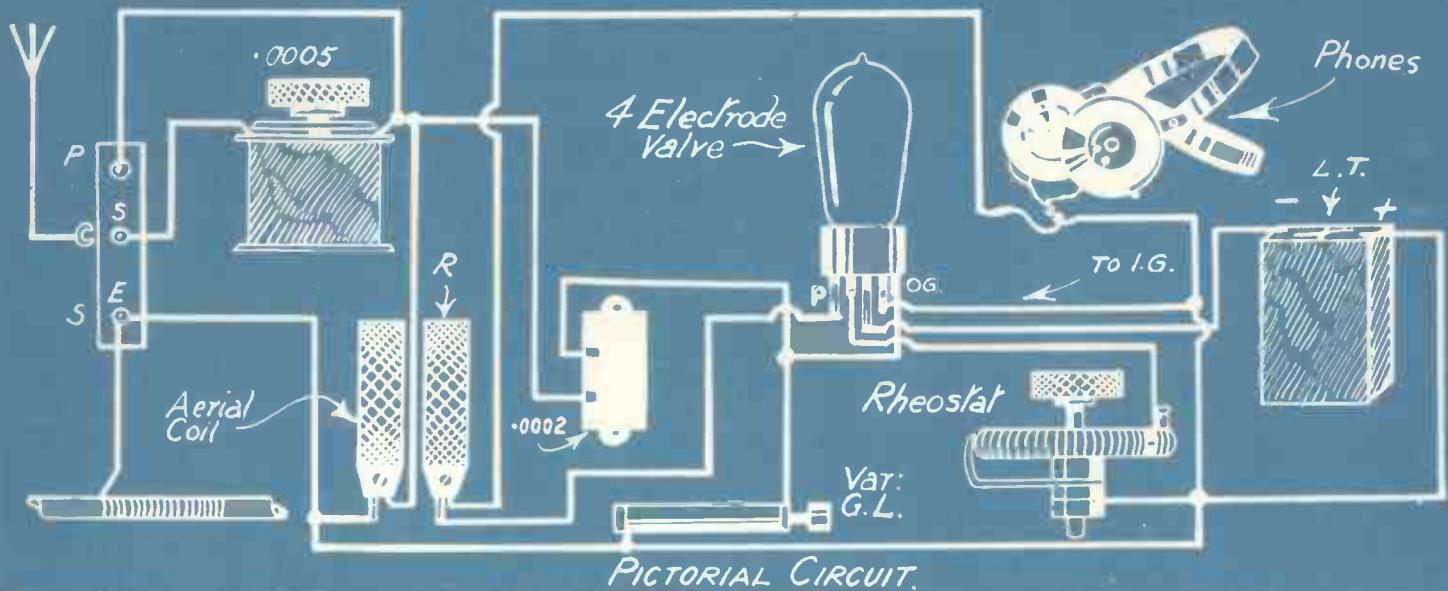
For ordinary B.B.C. stations the best size of coil to use is a 75-turn ("Lissenagon," basket, or spider-web), with the aerial condenser in series. It is essential that a good variable-grid leak which is capable of adjustment over a wide range of resistances should be employed. The grid leak shown in the photograph is a "Bretwood," which, on test, gave extremely good results. The actual two-way coil holder used in this instance was one of the Polar cam-vernier type, which is capable of both fine and coarse adjustment, and is, therefore, a great asset when tuning in to long-distance stations.

The valve itself, which, it has already been stated, must be of a special type, is called the "U.C.5 valve," but there is an earlier valve equally suitable for this circuit called the "Thorpe K.4." Either one or

(Continued on next page.)

# THE P. W. BLUE PRINT CIRCUIT No. 2 UNIDYNE DETECTOR VALVE WITH REACTION

6d.



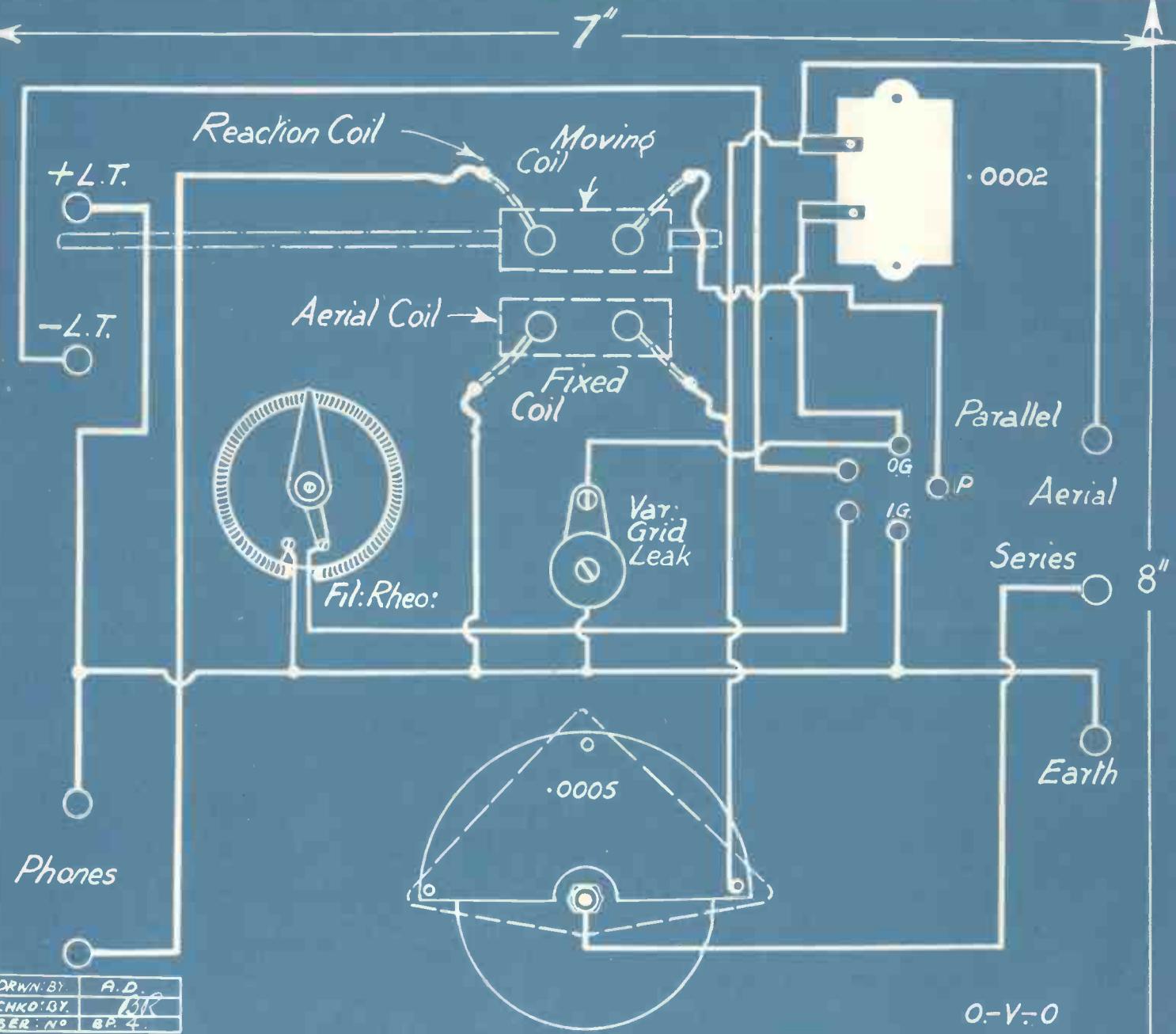
## LIST OF COMPONENTS.

- 1 panel  $8 \times 7 \times \frac{3}{16}$  ins.
- 1 cabinet to fit panel,  $4\frac{1}{2}$  ins. deep.
- 1 variable condenser, .0005 mfd.
- 1 variable grid leak, .5 to 5 megohm.
- 1 rheostat of good quality.
- 1 two-way coil holder.
- 1 fixed condenser .0002 mfd.
- 5 valve sockets.
- 7 terminals.
- Wire, screws, transfers, etc.

## ACCESSORIES.

- 1 pair high resistance phones.
- 1 phone condenser .002 (optional).
- 1 accumulator (4 or 6 volt).
- 1 U.C. 5. or Thorpe K. 4 valve.
- 2 Lissenagon coils (75 and 100 turns).  
(For 5XX 150 and 200).

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SER. NO	BP. 3



DRWN. BY	A.D.
CHKD. BY	BR
SER. NO	BP. 4

**THE P.W. BLUE PRINT CIRCUIT No. 2.—UNIDYNE DETECTOR VALVE. WITH REACTION**

This is a simplified H.T.-less circuit for one valve. It is unsuitable for loud-speaker work, but phone reception over very long distances is possible under good conditions. NOTE.—If the set does not oscillate try the effect of reversing the leads to the reaction coil. For "Series" tuning connect aerial lead to "Series" terminal, leaving "Parallel" terminal without external connection. For "Parallel" tuning connect aerial lead to "Parallel" terminal, and join "Series" terminal to the earth terminal externally.

## A UNIDYNE DETECTOR WITH REACTION.

(Continued from previous page.)

other of these valves should be used, and it cannot be too clearly emphasised that the ordinary wireless receiving valve is quite unsuitable for the circuit.

Both the U.C.5 and the Thorpe K.4 valves are of the bright-emitter type, requiring a filament voltage of 4.5, with a current consumption of about .5 amp.

Although rated at 4.5 volts, and therefore requiring a 6-volt accumulator for maximum efficiency, excellent results are obtainable upon a one-valve set with a 4-volt accumulator. (When a two-valve Unidyne set is employed, a 6-volt accumulator is essential.)

### Easy Oscillation.

An examination of the theoretical circuit given on the blue print will disclose the fact that it is sometimes better to place a fixed condenser across the telephone terminals. In a great many cases this is

### POINT-TO-POINT CONNECTIONS.

Aerial parallel terminal to fixed plates of variable condenser, socket of fixed coil holder, and one side of grid condenser. Other side of grid condenser to one side of variable grid leak and outer (main) grid socket of valve holder.

Aerial series terminal to moving plates of variable condenser. Earth terminal to plug of fixed coil holder and to L.T. positive, to which is also joined the inner grid socket of the valve holder, one side of the rheostat and the other side of the variable grid leak. The other side of the rheostat is taken to one filament socket of the valve holder, and the other filament socket joins L.T. negative.

Plate socket of valve holder is connected by a flexible lead to socket of moving coil holder.

The plug of the moving coil holder is joined by a flexible lead to the lower 'phone terminal. Other 'phone terminal is taken to L.T. + lead and this completes the wiring.

quite unnecessary, but, should the set fail to oscillate easily, the addition of a condenser with a capacity of .001 or .002 mfd. will cure the trouble.

Construction of the receiver is very easy, as it is perfectly straightforward, and there is no danger of excessive H.T. being applied to the filament. If the right components are used, no difficulty whatever should be experienced in following the blue print, but great care must be taken not to make a mistake in the wiring of the valve. The unusual arrangement of five legs may lead even an experienced constructor astray, but the blue print is invaluable here, and should be followed carefully.

The wiring of the model illustrated was carried out with No. 18 S.W.G. square-section tinned-copper wire, but any other fairly stout copper wire will do. Great care must be taken to keep the panel free from flux and perfectly clean, as with no H.T. battery to supply a high potential there is no superfluous energy to spare.

When the wiring is completed, it should

be checked over from the list of connections given on this page.

It is quite possible to add an L.F. amplifying valve to the one-valve Unidyne, or the receiver may be preceded by H.F. amplification; but its long-distance-getting properties are such that this latter is not so necessary as in the case of the ordinary one-valve circuit using H.T.

### Components Used.

With regard to the aerial employed in conjunction with a one-valve Unidyne set, it has been found that the smooth and easy control of reaction which is possible will often overcome the disadvantages of a poor or indifferent aerial-earth system. Nevertheless, the aerial should, of course, be as good as possible, especially if long-distance results

are contemplated. Good reception has been attained on an indoor aerial, and many readers have been able to tune in Continental stations at good strength under these conditions; whilst close to the broadcasting station good results have been obtained even when using a frame aerial. The latter, however, is not recommended.

For the benefit of those readers who wish to make their set correspond as closely as possible with the one shown in the photographs, it should be stated that the variable condenser employed in this instance was made by Messrs. Peto-Scott. The model shown had no vernier plate adjustment, but such a refinement is well worth while if long-distance work is to be attempted. The cabinet was obtained from the Caxton Wood Turnery, Co., Ltd., of Market Harborough, and is priced at 6s. 6d.

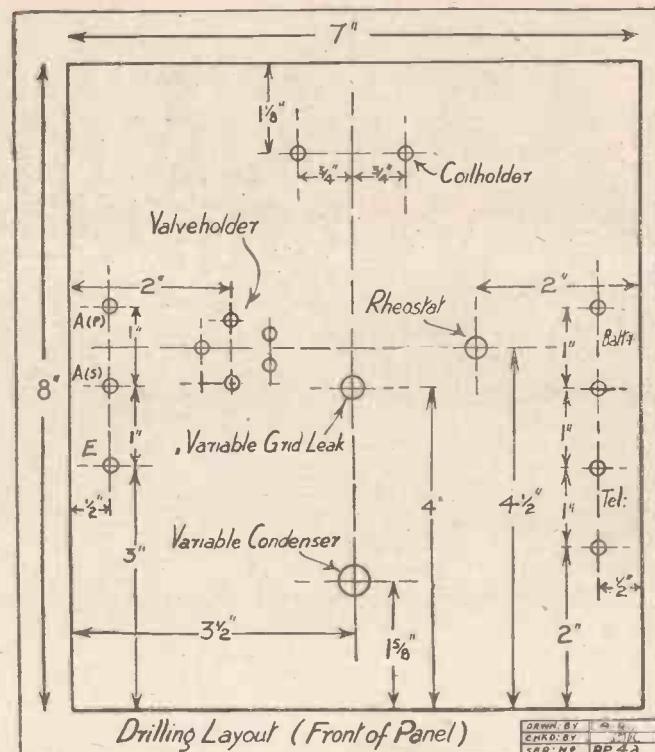
The specification includes a polished mahogany cabinet combed together, fitted with corner blocks, packed and delivered in case; (but a charge of 1s. 6d. is made for the case, which amount is refunded when the case is returned to the makers in good condition, carriage paid.)

### Home-made Coils.

The total cost of the components listed on the blue print is not more than £2, but when purchasing components and accessories for a receiver with which he is unacquainted, the constructor is often in doubt as to the best way in which to spend a limited capital. The question arises, for instance, "Shall I purchase a first-class rheostat and economise upon the coils?" or "Would it be better to purchase both these cheaply and get a really first-class pair of telephones with the money saved?"

In order to assist in such a difficulty the following hints will be found useful as to the relative importance of the various parts of the Unidyne receiver.

The valve itself must be a U.C.5 or a Thorpe K.4. (These are both bright



emitters, and to meet the demand for dull-emitter valves having four electrodes, various makes of dull emitter valves with an extra grid have been placed upon the market. Some of these have given quite good results, but in general they are not recommended as being suitable for Unidyne work.)

Coils are of the utmost importance. Basket or spider web coils are as good as any, but they must be of the old-fashioned single layer type, and not double weave. If ready-made coils are to be purchased, the Lissenagon tuning coils are recommended. For ordinary broadcasting a 75-turn coil is required for the aerial, and a 100-turn coil for reaction. For reception of 5 X X the coils (Lissenagon) will be 200 and 250 turns.

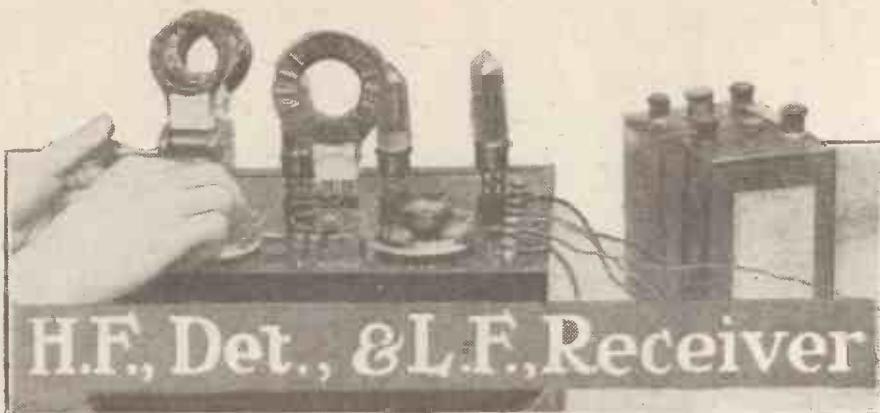
### Some Final Considerations.

Next in importance are the rheostat and grid condenser. The latter should be a Dubilier, or other good make, and it is equally important that a good rheostat should be used capable of smooth adjustment. That shown in the photographs is a "Precision," which proved to be thoroughly reliable in action, and has the merit of being very cheap.

The Bretwood grid leak is also inexpensive and efficient. If long distance work is contemplated, two further great assets will be the variable condenser with Vernier adjustment, and a coil holder capable of fine as well as coarse adjustment, of the moving coil.

The telephones may be of standard design, the ordinary 2,000 or 4,000 ohms being perfectly suitable, whilst low resistance 'phones (120 ohms) have given excellent results.

Oscillation with the Unidyne, despite the absence of the H.T. battery, should be just as fierce as with the ordinary set. Should the set not oscillate readily and strongly, or appear sluggish in this respect, a .001 or a .002 fixed condenser should be connected across the 'phones.



## H.F. Det., & L.F. Receiver

The Set designed, described and constructed by the "P.W." Technical Staff.  
The diagrams for this set are on a Blue Print given away with this issue.

**I**N last week's issue of "P.W." it was stated, with reference to the H.F. and Det. receiver described, that an L.F. amplifier could be added if desired. For the benefit of those who desire this extra amplification, a 3-valve set, similar to that described last week, but with a stage of L.F., has been designed and will be described hereunder.

when trying to pick up stations whose wave-lengths are within, say, 30 metres of that of the local.

Local reception on the three valves should be loud enough to operate a loud speaker within a distance of 15 miles or so from a relay station, 40 to 50 from a main station, and about 150 or so from 5XX. These ranges are only approximate, and in many cases will be exceeded if local conditions are good. The wave-length range of the set is, of course, universal, as plug-in coils are utilised, and these can be changed at will.

There is nothing difficult about the construction or operation of the set, if the constructor carefully follows the enclosed blue print of the circuit and checks his wiring from the photographs and point-to-point list of connections.

The main components used in the set photographed were as follows: Wates K type variable condensers, Yesly two-coil holder, Dubilier leak and condenser, "Goltone" L.F. transformer, Lissenstat Minor rheostats. These can be

substituted by wire-wound resistances if desired, while any of the above components can be replaced by other makes, provided reliable apparatus is employed.

The wiring was carried out with Glazite wire, this forming a very neat and efficient means of connecting up the components, while the insulation provided ensures freedom from accidents due to two or more wires inadvertently touching. It is not necessary to solder all the connections though by so doing more permanent and efficient joints are made.



A photograph of the complete set showing the lay-out of the main components.

This receiver has a switch incorporated in it, so that the L.F. valve can be cut out if desired, and reception upon two valves can be carried out.

### Results Obtainable.

Thus the DX properties of the H.F. and Det. 2-valve set are available with an optional stage of L.F., which can be switched in at will when louder signals are desired, or to operate a loud speaker. No additional controls—save that of a filament rheostat and a switch—are necessary for the third valve, so that the set is as easy to handle as the 2-valve set described last week.

For the benefit of those who did not see the article mentioned, it will be as well to run over the various qualities of the receiver, giving a rough idea of what may or may not be expected from it.

As regards selectivity, the set is quite up to the average, and will enable the listener to cut out his local station, if he is not very close, and receive a large number of other B.B.C. and Continental stations. It is usually better to switch off the last valve

The panel-drilling diagram provided with this description is correct for the components mentioned above, and will not necessarily hold good if different types and makes of components are employed. The blue-print wiring diagram has been made as simple as possible, so that whatever makes of components are used there will be no difficulty in following the various connections.

### Easy to Build.

The receiver is an easy one to build and to operate, so that the constructor can expect success with it, even if it is his first attempt at a valve receiver, provided that he takes care over the connecting up, and handles the set carefully when he has built it.

Special care must be taken that the coil holder connections are good. A great many failures can be traced to the use of faulty coil holders, for many of the cheap variety do not make efficient contact between the screws on the holders and the brass sockets and plugs. It is advisable, therefore, to pay a few shillings more and make certain that the holder is efficient. Economy on such items very rarely pays, and may be the cause of endless trouble and dissatisfaction.

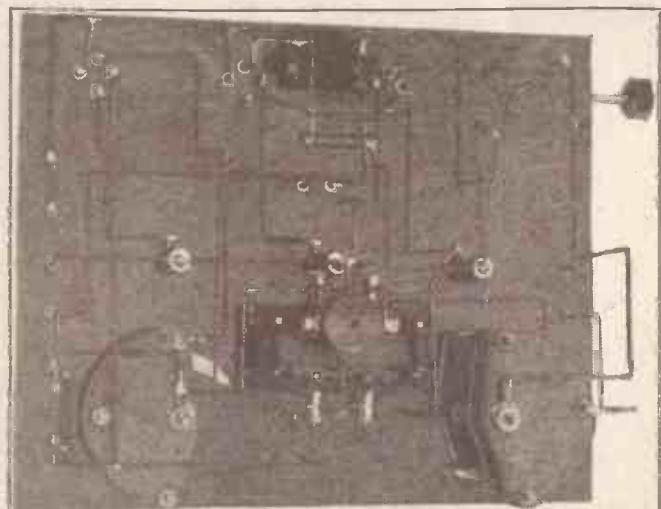
The L.F. transformer should be one suitable for "first stage" amplification, and it is essential that this be of good design and reliable manufacture if satisfactory loud-speaker results are to be obtained.

### Suitable Valves.

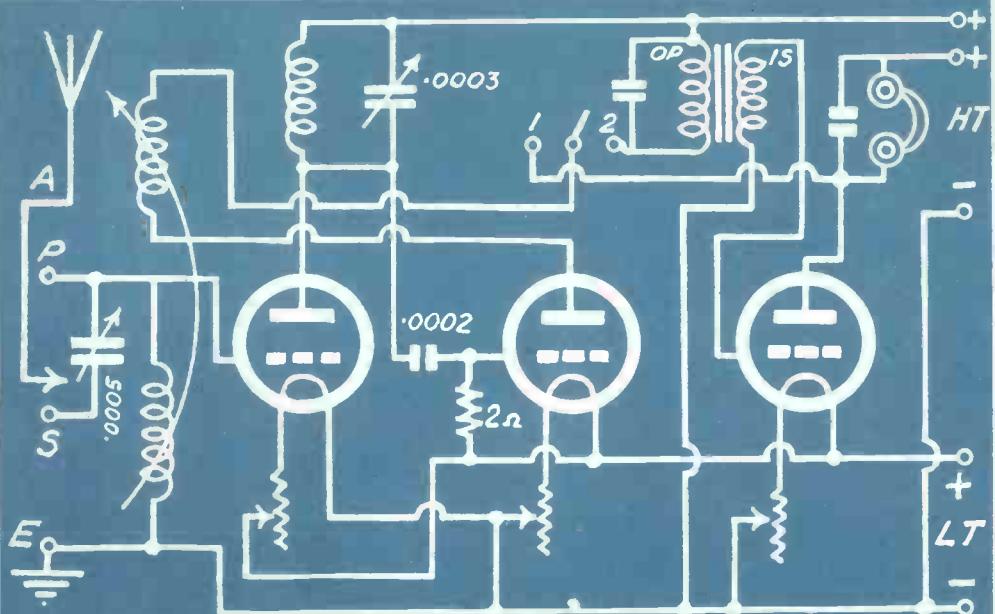
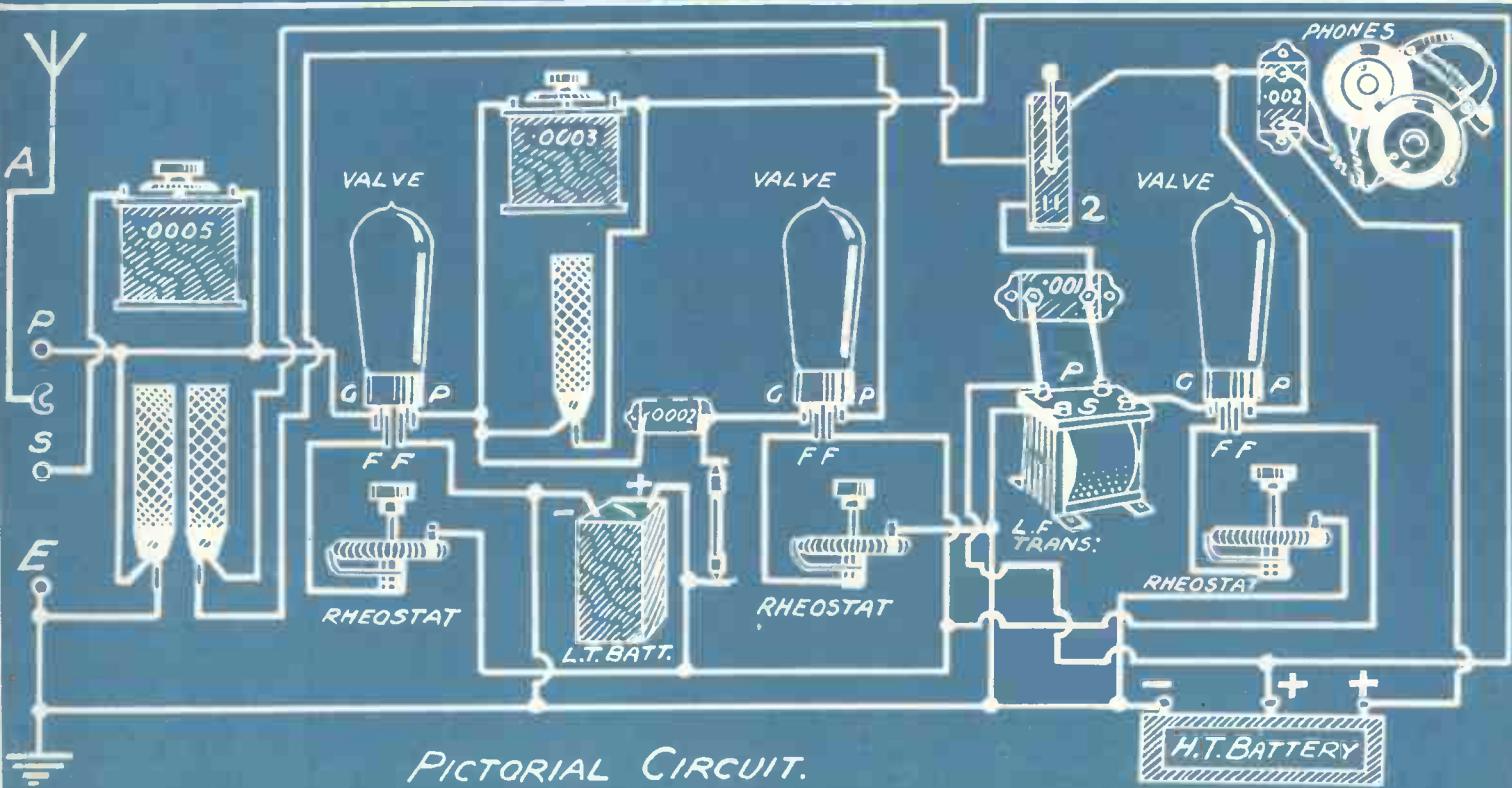
After wiring up, the set should be thoroughly cleaned and all traces of flux should be removed from the connections. Stray beads of solder should also be unearthed from their hiding places between variable condenser vanes, etc., and removed. Small traces of solder in between the vanes of a condenser can give rise to the most baffling troubles and may defy detection for a considerable time. It is best, therefore, to suspect their presence at the outset and search amongst all moving parts before connecting up the receiver for test.

As regards valves, general purpose types of either dull or "bright" emitter class may be used, but it is best to utilise valves specially designed for the task they have

(Continued on next page.)



This view of the wiring should be studied in conjunction with the point-to-point directions when the connections between the components are made.



THEORETICAL CIRCUIT.

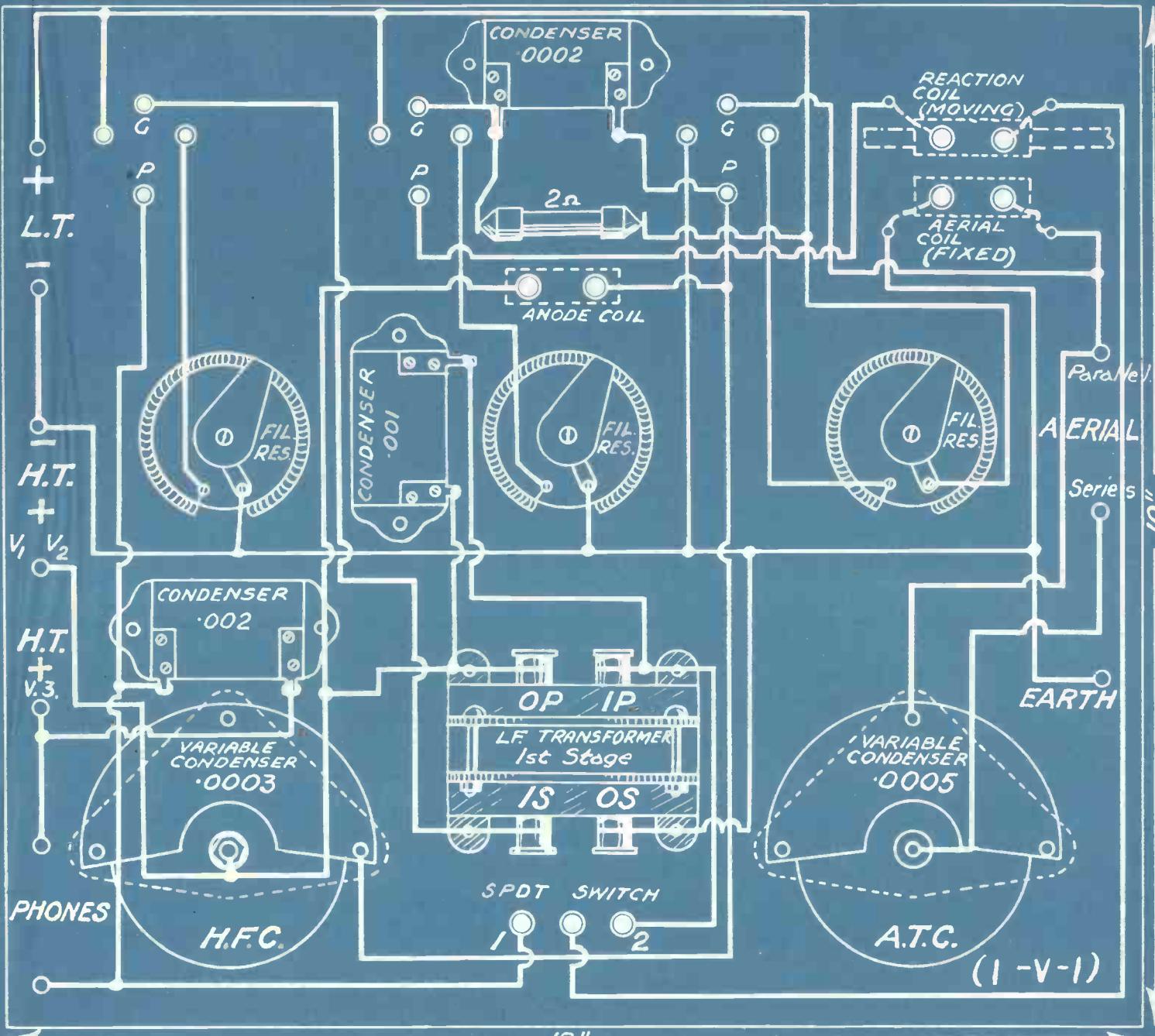
**THE P. W. BLUE PRINT CIRCUIT No. 19  
H.F. DETECTOR AND L.F. (WITH  
SWITCH TO CUT OUT L.F.).**

**LIST OF COMPONENTS.**

- 1 panel 12 x 10 x  $\frac{1}{4}$  ins.
- 1 box to fit 4 $\frac{1}{2}$  ins. deep.
- 3 valve holders.
- 3 filament resistances.
- 10 terminals.
- 1 L.F. transformer, 1st stage.
- 1 S.P.D.T. switch.
- 1 two-way coil holder.
- 1 single coil holder (for panel mounting).
- 1 2-megohm grid leak.
- 1 .0002 variable condenser.
- 1 .0003 variable condenser.
- 1 .0002 fixed condenser.
- 1 .001 fixed condenser.
- 1 .002 fixed condenser.
- Wire, screws, transfers, etc.

**ACCESSORIES.**

- 1 H.F. valve.
- 1 detector valve.
- 1 L.F. valve.
- H.T. and L.T. batteries, according to valve makers' specifications.
- 3 coils, two 50's, one 75. For 5XX, A 150, reaction 100/150, and 250 anode.
- 1 pair phones and or loudspeaker.



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CHKD BY [Signature]  
SER. NO. BP.38.

THE P. W. BLUE PRINT CIRCUIT No. 19—H.F. DETECTOR AND L.F. (WITH SWITCH TO CUT OUT L.F.). Good all-round circuit for long-distance reception, or for short-range loud-speaker work.  
 NOTE. For "Series" tuning connect aerial lead to "Series" terminal leaving "Parallel" terminal without external connection.  
 For "Parallel" tuning connect aerial lead to "Parallel" terminal and join "Series" terminal to the "Earth" terminal externally.  
 As L.F. transformer design is not standard it may be necessary to reverse the leads to O.P. and I.P., or to O.S. and I.S.  
 In some cases it is an advantage to reverse the leads to the L.T. battery.

## H.F., DET. AND L.F. RECEIVER.

(Continued from previous page.)

to perform. For instance, the first valve should be one recommended for H.F. amplification, and having a fairly high impedance. The second valve can be either a general purpose valve or one of the special detectors now on the market and made by the Mullard Radio Valve Co.

In the last stage a specially designed L.F. valve should be employed, or a "power" valve can be used, there being a large number of the latter designed to suit all convenient voltages.

### Handling the Set.

The tuning of the set is not a difficult matter, both condenser dials being rotated at the same time, while reaction is used as a means of bringing up signal strength when required. It will probably be found that the tuning on the aerial condenser is sharper than that on the anode owing to the fact that the reaction is obtained by coupling the reaction coil to the aerial coil, and reaction always increases the selectivity of the circuit to which it is applied.

Constructors are advised to practise tuning on the nearer stations before expecting results from more distant transmissions, as in all receivers it is necessary to tune with care and to be familiar with the set before the best can be expected.

The L.F. stage can be used for increasing weak signals, but it must be remembered that the sudden switching in of the L.F. stage may throw the reaction control slightly out of adjustment. The filament rheostat of the L.F. valve must be turned on or off, according to whether the valve is required or not, as well as the S.P.D.T. switch provided for cutting in or

out the plate circuit, and bringing the phones or loud speaker into the plate circuit of either the third or second valve.

Further L.F. amplification of either transformer, choke or resistance-capacity type, can be added without difficulty if desired, while a second stage of H.F. could be used, a separate unit being added to the set without necessitating many alterations in the latter.

A good outdoor aerial is best with this set, though fair results can be obtained using an indoor aerial. A "frame" is not advised, as this decreases the range by at least 80 per cent.

Separate H.T. control is provided on the set for the last valve, and this should be varied according to the valve used. A rough idea may be obtained by the information that under test the valves used were of the '06 general purpose type (D.E. 3 valves being employed) and the H.T. used was 48 volts for the first two valves and 75 volts for the last valve. A power valve in the last stage would take more H.T. and would give louder results, but would cost a little more to provide and would need a larger H.T. battery.

### Details of Coils and Valves.

Atlas plug-in coils are shown in the photographs, but any well-designed coil can be used or home-made spider-web coils may be inserted if desired. The sizes of coils used will depend upon the wave-lengths required, but those suitable for B.B.C. wave-lengths are given in the blue print. Series tuning (explained on the blue print) should be used for stations whose wave-lengths are below about 400 metres, as louder results are then obtained, though a larger coil will be necessary. A rough rule is that with series tuning the aerial coil should be of the same number of turns as the anode coil, and for parallel tuning one or two sizes smaller. Thus for 2 LO 75 aerial (series) and 75 anode should be O.K., while

for parallel a 50 or 35 aerial and 75 anode will be required. Reaction of 50-75 turns should be sufficient.

### POINT-TO-POINT CONNECTIONS.

Aerial parallel terminal to fixed plates of .0005 variable condenser, socket of fixed coil holder, and grid socket of first valve holder.

Aerial series terminal to moving plates of .0005 variable condenser, earth terminal to plug of fixed coil holder and to L.T. negative.

L.T. negative is also connected to H.T. negative, to one side of the second and third rheostats, and direct to one filament socket of the first valve holder. L.T. positive is connected direct to one filament socket of the second and third valve holders and to one side of the first rheostat.

The remaining filament socket of each valve holder should be connected to the remaining tag of the corresponding rheostat.

Plate socket of first valve holder to plug of anode coil holder, fixed plates of .0003 variable condenser, and one side of grid condenser. Other side of grid condenser to one side of grid leak and grid socket of second valve holder. Other side of grid leak to L.T. positive.

Socket of anode coil holder and moving plates of .0003 variable condenser to the first (top) H.T. positive terminal.

Plate socket of second valve holder to plug of moving coil holder, socket of which goes to the centre contact of the S.P.D.T. switch. Right-hand contact of switch to I.P. of L.F. transformer, O.P. to top H.T. positive terminal, I.S. to grid socket of third valve holder, O.S. to L.T. negative.

Plate socket of third valve holder to bottom phone terminal, left-hand contact of switch, and one side of .002 fixed condenser. Other side of .002 fixed condenser and top phone terminal to bottom H.T. positive terminal.

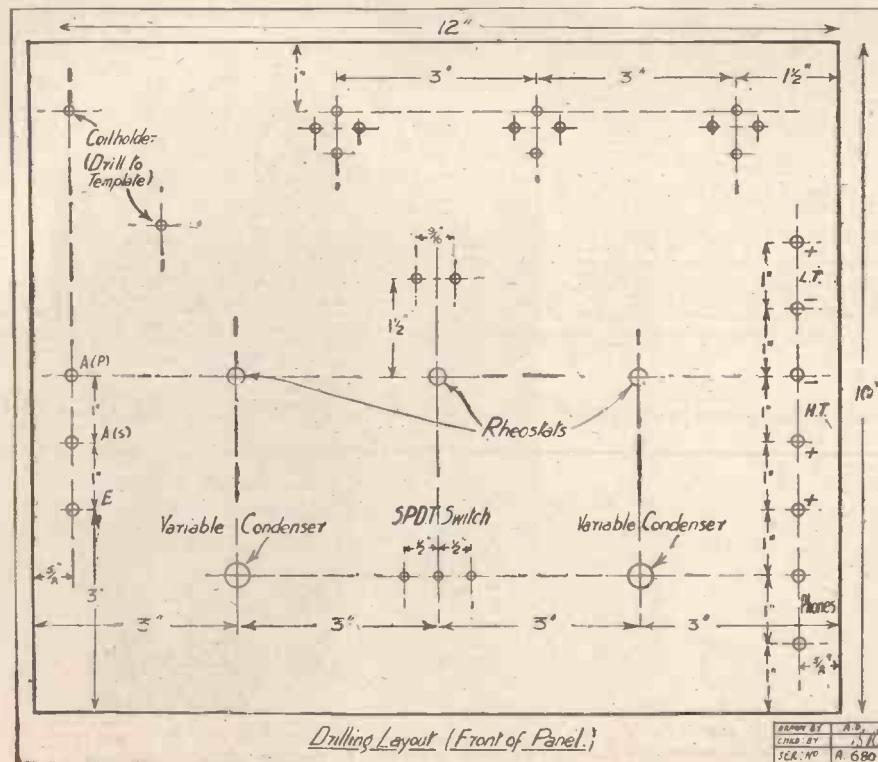
A fixed condenser is connected across the primary (O.P. and I.P.) terminals of the L.F. transformer.

Total cost of receiver about £4 18s. 6d.

### SUITABLE VALVE COMBINATIONS.

L.T. Volts (Accumulator)	H.F.	Det.	L.F.
2 volts	A.R.D.E. (Red) W.2 D.3 (H.F.) D.E.2 H.F. B.3	A.R.D.E. (Red) W.1 D.3 (Det.) D.E.2 L.F. B.3	P.V.6 D.E. W.1, W.3 D.3 (L.F.) D.E.2 L.F. B.3
4 volts	D.06 (H.F.) P.2 ORA Red Ring (Mullard), etc.	D.06 (Det.) P.1 ORA Red Ring, etc.	D.06 (L.F.) P.1 Green Ring (Mullard), etc. P.V.3 L.S.3
6 volts	G.P. Bright following Power V B.4	Emitte rs and Power V B.4	B.4 B.4 P.V.5 D.E. D.E.5 D.E.5 A, etc.

In the case of the use of bright emitters for the H.F. and Det. stages, we advise D.E. power valves for the L.F. position, any of the valves mentioned in the L.F. column at 6 volts being suitable.





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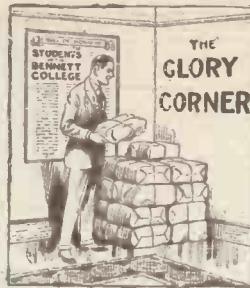
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# MORE PRACTICAL IDEAS

READERS who are interested in the spade method of tuning crystal receivers should experiment with various different metals, and finally adopt the one considered most suitable. The most convenient way to do this is to use the spades in conjunction with a standard plug-in coil which is mounted in the fixed

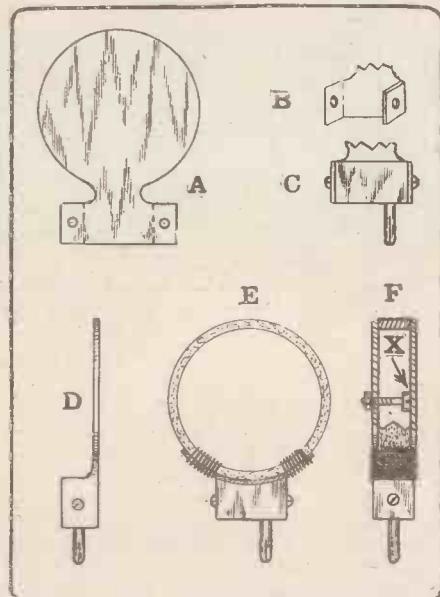


Fig. 1. Fitting "spades" to ordinary coil plugs.

socket of a two-coil holder, and arrange each spade on the plug-in system by employing either of the simple methods outlined in Fig. 1.

Diagrams A to D show how the spades may be fitted to standard coil plugs. Cut out each spade as shown at A, and bend to right angles at the dotted lines so as to form a simple clip, as at B, which is then clamped firmly to the ends of the coil plug, as shown at C and D. Alternatively the spades may be arranged as shown at E and F where a cardboard ring, cut from a 3-in. diameter cylindrical coil former, is mounted in any convenient manner to a standard coil-mounting plug, and permanently closed on one side with a disc of thin sheet ebonite which is drilled through the centre.

#### Interchangeable Spades.

A small bolt is soldered at X to the exact centre of each circular spade. Thus any spade may be quickly fitted over the open side of the mounted ring and clamped to the ebonite disc by means of a small nut or fly-nut. With this arrangement only one

coil plug is required for any number of different spades; with the former arrangement each spade is fitted with a plug.

Most experimenters are well acquainted with the circuit arrangement of the so-called fool-proof crystal set which is designed to receive the usual local station and also the high-power station, 5 X X. (See upper diagram in Fig. 2.) A simple D.P.D.T. knife-switch, S, is wired up as shown to effect the change over from the "local" coil, C1, to the loading-coil, C2, so that the two coils, being then in series, may be tuned to the higher wave-length of the high-power station.

#### Automatic Tuning.

A most convenient arrangement, especially when the receiver is fitted with a reliable fixed detector; but old or obstinate people will not tolerate those condenser adjustments every time the change is effected. It follows, therefore, that the fool-proof crystal set would become a more attractive proposition if the switch and condenser could be set simultaneously. Here surely is a chance for the serious experimenter;—only one remaining fly to extract from the ointment—eliminate the condenser adjustments.

Think of the wasted movement of those switch arms, and consider the possibility of switching the coils and setting the condenser by moving only one control—the switch. No easy problem, yet it is a possibility. The lower diagram (Fig. 2) indicates

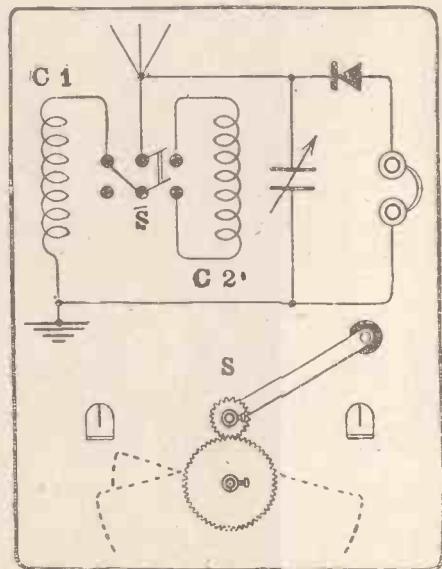


Fig. 2. An idea for a "fool-proof" set.

a fairly good starting-point. A fibre pinion might be fitted to the hinged end of one of the switch arms and made to engage a fibre gear attached to the condenser spindle. (For obvious reasons metal gears could not be used.) The complete throw of the switch arms sets the condenser accurately with C1, or with C1-C2, providing

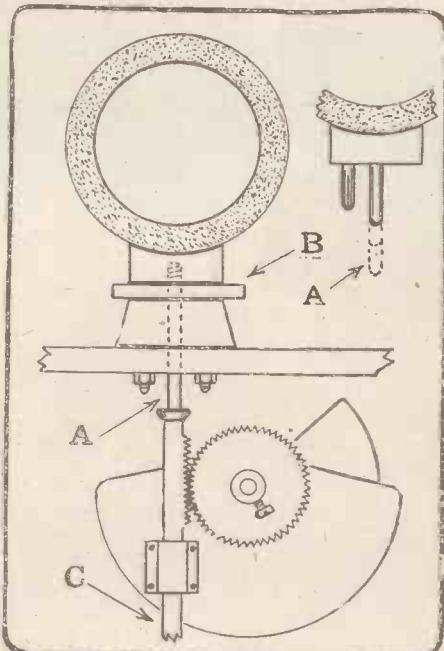


Fig. 3. A method of automatically setting the condenser.

the two adjustments are previously ascertained, that the ratio of the gears is correct, and that they are set so that the condenser plates are in the correct position when the switch blades are pressed hard down into the clips.

#### The Condenser Mechanism.

Such an arrangement would be of little commercial value, for when once adjusted to any particular aerial and earth system, it is extremely unlikely that it would function on another, since there are no two aerial systems alike. It is, therefore, only suitable where it is possible to experiment with the gear settings on the actual aerial to be used in conjunction with the set.

The same remarks apply to the arrangement shown in Fig. 3, where a similar device is adapted to standard plug-in coils. Here a small ebonite rod, A, is screwed into the lower portion of the coil plug,

(Continued on next page.)

## MORE PRACTICAL IDEAS.

(Continued from previous page.)

between the metal plug and socket, this being made to depress and actuate a brass rack which engages a fibre pinion fitted to the condenser spindle. A suitable compression spring should be fitted to the lower end of the rack at C, so that the condenser plates and rack are returned to a normal setting every time a coil is withdrawn from

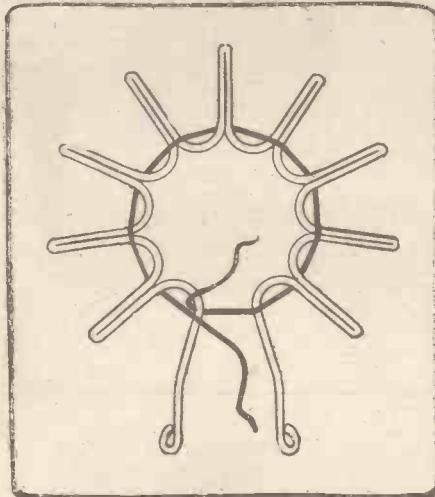


Fig. 4. A method of winding aperiodic coils.

the socket. The travel of the rack, will, of course, depend upon the length of the ebonite plungers fitted to the coil plugs, and the diameter of the pinion.

### Aperiodic Coils.

A positive stop, B, consisting of a small piece of sheet ebonite, should be fitted to the coil-socket as shown, and the condenser should be set accurately with the coil when the latter is pushed hard down on the stop. The method of mounting the condenser, and the arrangement of the rack and pinion is, of course, purely a matter of

"tinkering." When experimenting with gadgets of this description one's aim should be simplicity. Unnecessary complications can only result in failure.

The aperiodic aerial coil is very popular among

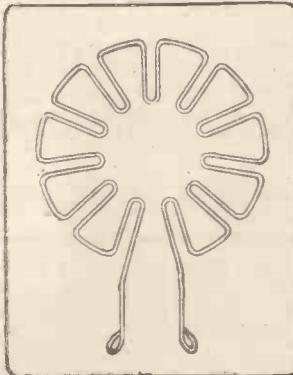


Fig. 5. Another aperiodic winding.

DX experimenters. This usually consists of one, two, or three turns of thick wire wound over the tuned coil and connected direct to aerial and earth. With the arrangements suggested in Figs. 4 and 5, the tuned coil is wound over the

aperiodic coil, the latter consisting of a thick wire structure which forms a simple spider former (Fig. 5). The coil and the "former-coil" may be mounted on an ordinary coil plug which is provided with two extra contacts, or two plugs may be bolted together and used in conjunction with specially arranged sockets.

A simple jig will be required for the arrangement shown in Fig. 5. This may consist of a piece of thick board and a few nails, which are driven in at the points where the bends are made. A glance at the sketch will suggest the design and general arrangement of the jig; two circles are marked off on the board, eleven nails being driven in round the inner circle, and twenty nails round the outer circle. An ordinary card inductance former may be used as a template for marking off the board.

### Novel Variometer Mounting.

Fig. 6 suggests what is considered to be an improved method of mounting small card variometers. It will be seen that the inner coil is fixed and the outer coil movable, this somewhat drastic plunge from the orthodox arrangement permitting much finer adjustments, especially when an extension handle is fitted to the right-hand side of the outer coil. A stout brass bracket, A, a similar bracket made from spring brass, B, and a sheet ebonite bracket, C, form the main supports, the inner coil being clamped to the end of the ebonite bracket by means of a small terminal to which is joined one end of the winding.

The other end of this winding is joined to the terminal at the opposite end of the bracket, the ends of the outer coil winding being soldered to the two spindles, which are kept in good contact with the brass brackets and their clamping terminals by means of the spring bracket at the lower end, and a spring washer with lock-nuts at the top end. Thus dangling flexible leads are avoided, and the instrument may be used either as a vario-coupler or as a variometer, the latter effect being obtained by simply joining the central left-hand terminal (beginning of inner coil winding) to the lower left-hand terminal.

The problem of fitting the metal spindles to the movable coil often presents a difficulty, and it may be well to consider a few possible methods

which, although far from being perfect, will be found more or less satisfactory in the hands of the careful operator. It is high time that experimenters directed their efforts to this distressing state of affairs; the simple card variometer is most efficient electrically, but (vulgarily) a "wash out" mechanically, and simply because nobody has bothered about improving the spindles and mountings.

The inventor's dream of a manufacturer swooping down upon him and swallowing him up before seeing his invention might

almost be realised if some experimenter could produce a simple, cheap and efficient pair of detachable spindles and sockets for variometers. Possibly the ideas outlined in Fig. 7 may provide a little food for thought.

The most usual "home-made" arrangement is shown at A, where a small metal plate is soldered into a recess filed on one end of the spindle and attached to the edge of the card by means of small bolts or rivets. Diagram B shows how an improvement is made by providing a simple clip, so that both sides of the card are supported

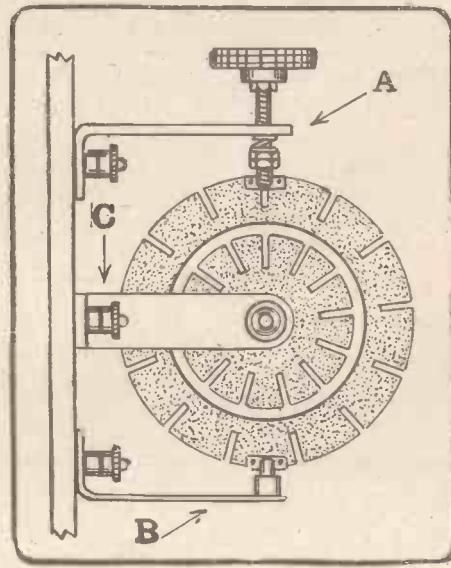


Fig. 6. Using the outside variometer winding as the rotor, and the inner as the stator.

at the joint, and Diagram C shows a little idea which is well worth pursuing. Here the clip is arranged as shown, so that the two points may be pushed through the card and fastened down in the same manner as an ordinary paper clip (See E). The clip might consist of a simple stamping as shown at D, but the difficulty to be overcome here is the attachment of the round spindle to the curved portion of the clip. Other designs are shown in figs. F, G, H and I.

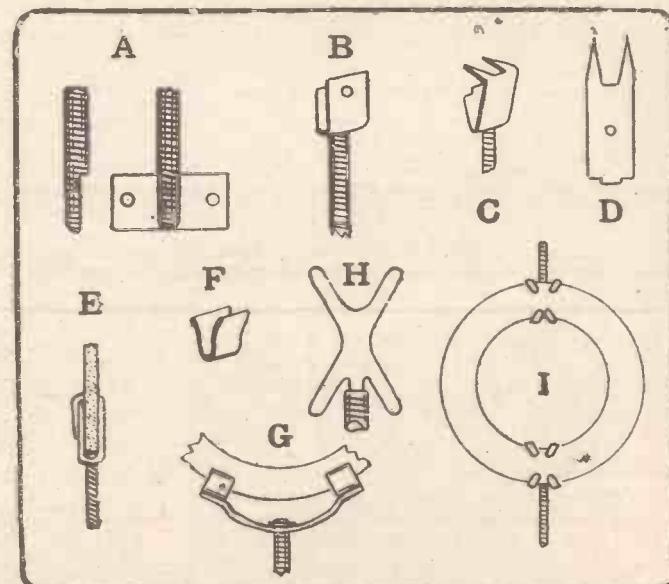


Fig. 7. Some useful ideas for the mounting of variometers so that detachable spindles are available.

**REFLEX** circuits have proved themselves to be not merely of experimental interest, but of real value to those who require maximum amplification with the least possible number of valves. It is often a somewhat difficult matter to sort out a theoretical circuit diagram of a multi-valve reflex set, so we will consider how to build up a few circuits employing dual amplification, from a knowledge of first principles.

In Fig. 1 is shown a popular circuit for the reception of broadcasting, which comprises an H.F. amplifier, a valve detector, and a note magnifier. The action of this circuit is as follows:

Signals received by the aerial produce currents in the aerial coil, and these impart impulses to the grid of the first valve. By the action of the valve, magnified variations of current flow in the plate circuit, through the primary winding of the H.F. transformer,  $T_1$ . Similar currents are

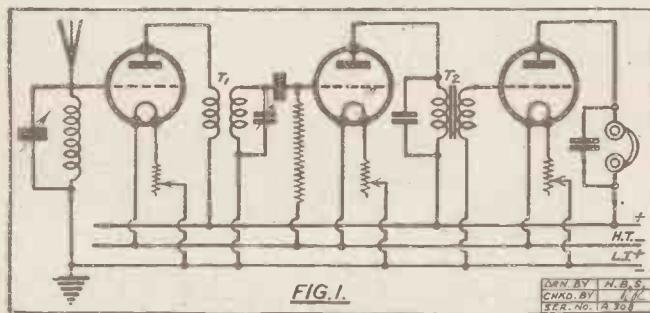


FIG. 1.

produced in the secondary winding, and impulses are applied to the grid of the detecting valve.

On account of the rectifying action of the grid leak and condenser, L.F. variations are sent out from this valve, through the primary winding of the iron core transformer,  $T_2$ . Similar currents in the secondary winding apply impulses to the grid of the last valve, which sends magnified speech or music currents through the telephones. So much for an ordinary three-valve circuit, which is probably quite familiar to all readers.

#### Reflexing the First Valve.

Now, since each valve in the circuit magnifies signals, it is evident that the first valve has not nearly so much energy to deal with as either of the other two. In other words, the first valve is having an easy time of it. It would, therefore, be a great economy if we could give this valve the additional duty of magnifying the output from the detector, and so dispense with the third valve altogether.

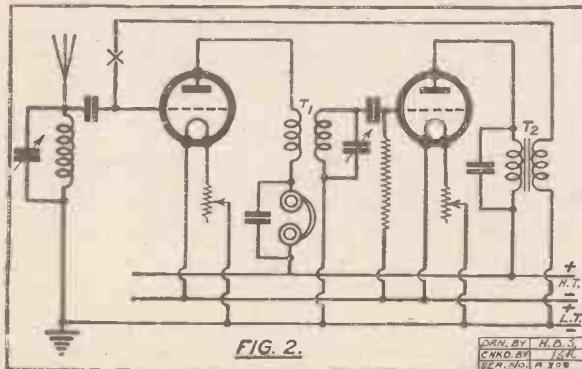


FIG. 2.

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By C. E. FIELD, B.Sc.  
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### III.—Multi-Valve Reflex Circuits.

This is the third of Mr. Field's popular series of "easy explanations" of various complicated circuits used in reception.

The most obvious way of carrying this out is by simply joining the secondary winding of the L.F. transformer to the grid and filament of the first valve instead of to a third valve, as in Fig. 1. Here a difficulty is encountered, for the transformer winding would be connected directly to the ends of the aerial coil, which would short-circuit it.

This trouble is easily overcome by connecting between the grid and the aerial coil a small fixed condenser, which will effectually prevent L.F. im-

pulses from leaking down the aerial coil, and at the same time will allow H.F. signals to be applied to the grid, the circuit being then as shown in Fig. 2. By simply changing two connections and inserting a fixed condenser, therefore, we have dispensed with one valve, and obtained a thoroughly reliable circuit.

If the L.F. transformer is of a good design, no serious leakage of H.F. currents from the aerial should take place through the secondary winding, but it may happen that the self-capacity of the latter is sufficiently great to rob the grid of a portion of the H.F. impulses. In this case (or

in any case, as a precautionary measure) a 400-turn duotriangular coil should be inserted at the point X to serve as a radio-frequency choke.

The telephones must, of course, be connected in the plate circuit of the last note magnifier, which in this case is the first valve, so that they are joined, as shown, in series with the primary winding of the H.F. transformer, and shunted by a condenser which bypasses H.F. currents. If the self-capacity of the telephone windings is relied upon for the conveyance of H.F. currents, signals may be choked, and capacity effects may be noticeable when handling the telephone leads.

#### A Powerful Circuit.

An alternative method of feeding back the L.F. impulses to the dual valve is to take the upper connection from the L.F. transformer secondary to the bottom end of the aerial coil, instead of directly to the grid. In this case, a condenser must be connected across the ends of the transformer winding, to allow the passage of H.F. currents, and at the same time to force L.F. impulses through the coil on to the grid.

This circuit, with the addition of a note magnifier, is shown in Fig. 3. As in any other circuit the addition of a stage of note magnification is effected by replacing the headphones by the primary winding of an L.F. transformer. Hence, in the arrangement given in Fig. 3, the plate circuit of the first valve contains the primary windings of an H.F. and an L.F. transformer in series.

A very powerful dual amplification circuit is obtained if two dual valves and a

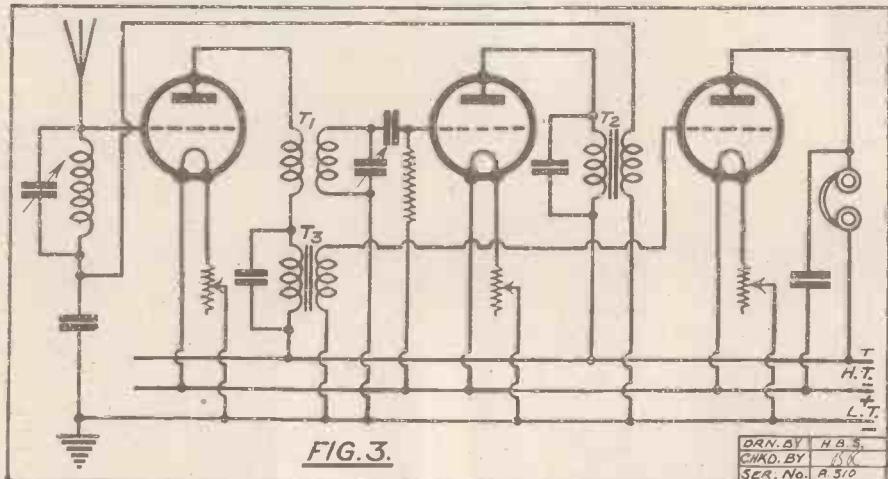


FIG. 3.

detector are employed, the results being nearly equal to those from a corresponding five-valve straight circuit, although the H.F. side of the circuit suffers, because, in order to avoid distortion due to overrunning of the valves, the dual valves must be of a type suitable for L.F. rather than for H.F. amplification.

In a circuit of this type, the question arises as to which valve shall first receive the L.F. currents fed back from the detector. The best arrangement is to feed back from the detector to the last H.F. valve, so that the valve which is handling the strongest radio-frequency signals deals with a smaller amount of L.F. energy than does the valve which deals only with the weak initial impulses from the aerial.

(Continued on next page.)

## HARD CIRCUITS MADE EASY.

(Continued from previous page.)

This is carried out in the circuit shown in Fig. 4, the action of which is as follows: Signals from the aerial are amplified in the ordinary way by the first valve, the output from which, passing through the transformer,  $T_1$ , causes impulses to be applied to the grid of the second valve. These are again amplified, and, by means of the transformer  $T_2$ , passed into the detector. The rectified current from this valve is then made to affect the grid of the second valve by means of the L.F. transformer  $T_3$ . This valve now amplifies the signals at L.F., and passes them on to the first valve by means of  $T_4$ .

### A Long-Range Receiver.

The condensers  $C_1$  and  $C_2$  provide paths for H.F. currents in the plate circuits of the first two valves, and  $C_3$  and  $C_4$  cause the outputs of the L.F. transformers to be applied between the valve and filaments.

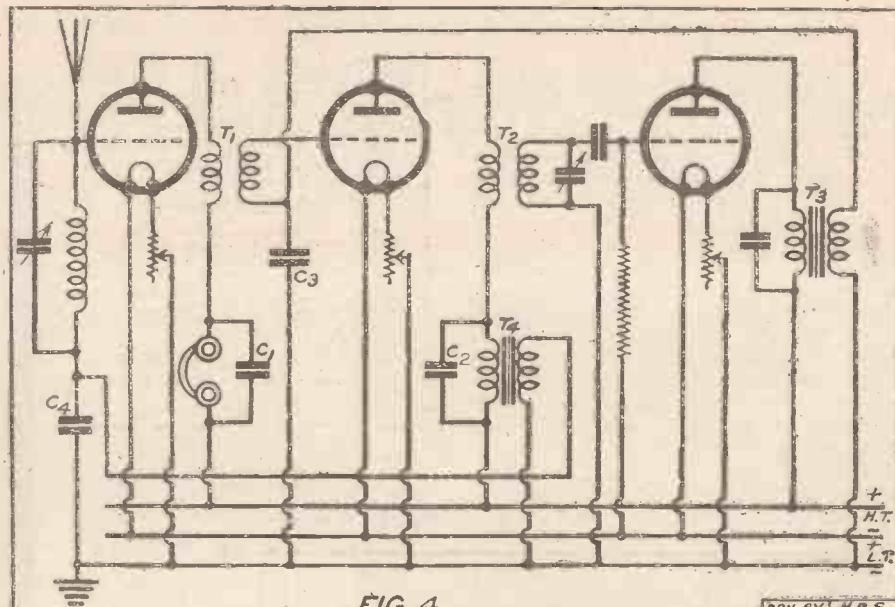


FIG. 4.

DRN. BY H.B.S.  
CHD. BY B.C.  
SER. NO. P. 31.

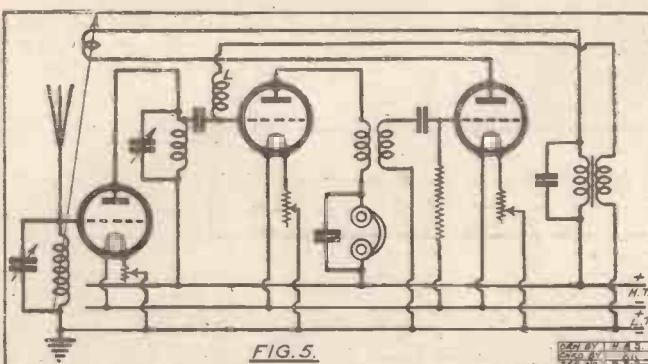


FIG. 5.

On account of the loss of efficiency for H.F. amplification which almost inevitably occurs in a dual valve, it is in many cases advisable to keep one valve solely for H.F. use. Thus a set may consist of one H.F. valve, one dual valve, and a detector. In this case, especially when reaction is introduced, the first valve should be the H.F. amplifier, L.F. currents being fed back into

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the grid circuit of the second. This arrangement, a diagram of which is shown in Fig. 5, is more stable and sensitive than one in which the first valve is dual.

In the circuit shown, it will be seen that L.F. currents are fed back by the method first discussed in this article, through the choke coil  $L$ . Tuned-anode coupling is employed between the H.F. and dual valves, and a reaction coil in the detector plate circuit is coupled to the aerial. This is an excellent circuit for both long-range and loud-speaker work.

## 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.

### THE B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to make a few remarks on what I think of R. S. Rudland's criticism of the B.B.C.'s programmes. Firstly, as to the Spluttered Talks, I should like to hear our dear friend R.S. make a few remarks before a microphone. For myself, I do not think I should like the job, and I admire the speaker's pluck, as I should imagine it needs some nerve. Besides that, some of the talks are highly educative, and are not twaddle. I take it that the B.B.C. are out to satisfy everyone, and their attempts so far, in my opinion, have been very successful. If you do not like a certain item, do not listen to it—there are others that do. Now, if we had more dance music, would not that get a trifle monotonous? Lastly, the programme that is sent out to us at the cost of less than a penny per day is remarkably good.

Trusting you will see some of my logic.

Yours faithfully,

S. F. BULL.

8a, Henderson Road, West Croydon.

The Editor, POPULAR WIRELESS.

Dear Sir.—I have been reading the very straightforward letter of Mr. R. S. Rudland, criticising the B.B.C. I disagree with him. Like all great concerns the B.B.C. is subject to much abuse, chiefly because it is a success, but our friend is very unfair. To the majority of listeners the talks and lectures given by the B.B.C. are very interesting, because they are educative and instructive and, needless to say, are essential features to the success of wireless broadcasting. In his letter Mr. Rudland compares the Sunday programmes given on the Continent with our own. Does he expect jazz or tango to be broadcast on Sunday? I have listened to both stations on Sundays, but for real music give me the B.B.C.'s. Where can he listen to better programmes than our own? Such as symphony concerts, operas, and various other musical programmes. On one point in his letter I agree with him, that is with reference to the late hour dance music is broadcast, the reason being, I suppose, the better programmes come first.

I would finally like to add my congratulations to the thousands of others in praise of the B.B.C.

Yours faithfully,

FRANK MORGAN.

28, Temple Street, Newport, Mon.

### UNIDYNE SUCCESS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a line re the Unidyne. I feel sure it is worth pushing and is second to nothing for the first two valves of any set. I have messed about with the Reflex two-valve for a fortnight and given it up as not to be compared with the straight O.V.I. I have added a second stage of Unidyne L.F. and am delighted with its performance on loud speaker. I have a four-valve H.T. set on the top front of cabinet, using the A.C. current for L.T. and an 80-volt H.T. accumulator. Below this I have four variable condensers mounted in dustproof compartments, then below this I have the O.V.I. Unidyne loose tuning condenser with vernier on left, and a Hare & Parham three-coil stand in front of set so that I can use this outfit for any set I feel inclined to use.

I now couple the output of Unidyne to centre of D.P.C.O. switch, the 'phones to one end and the other to the primary of first L.F. transformer in four-valve set above; by turning over switch from 'phones 2 L.F. stages are added, and these are permanently coupled to loud speaker and one switch to cut out one stage of L.F.

This makes the best four-valve set I have ever heard, and can be regulated by Unidyne detector rheostat in a wonderful manner. With one L.F. stage added with H.T. it is better than the majority of four-valve sets and with two it is most powerful.

Again thanking Messrs. Dowding and Rogers, and wishing the best of luck to POPULAR WIRELESS, an easy first in wireless journalism,

Yours faithfully,

ALFRED FRANCE,

33, Church Street, Rotherham.

### A SURPRISING COINCIDENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—The following incident may be of interest to you. At 11 p.m. on a recent Friday I put on my 'phones to listen for anything that may have been on, when the first signal which I heard (a weak D.C. note) was calling "Studley thanks for Q.S.L." and it was an Argentine amateur!

The remarkable part is I had only heard this amateur once before when I sent him the report he was thanking me for, and the chance that I should put on my 'phones when he was calling me was one in a hundred.

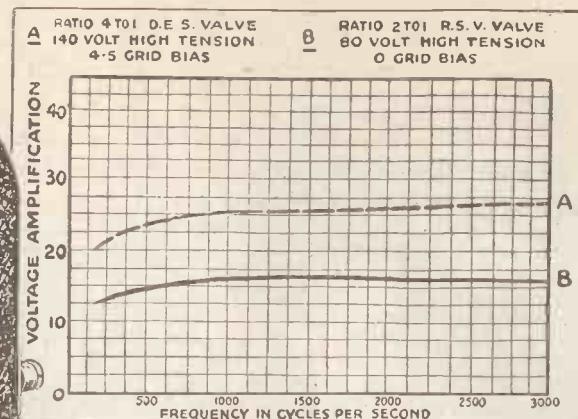
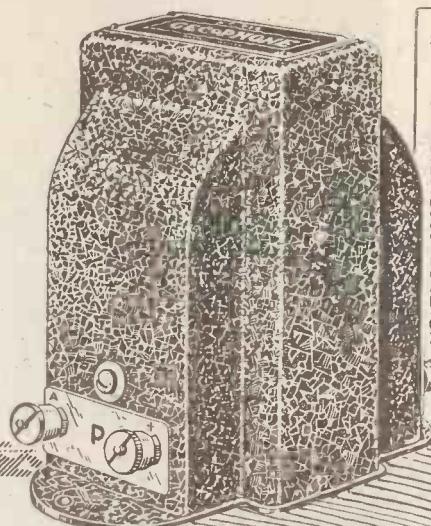
I think when one hears one's name called in Morse 8,000 miles away unexpectedly, it makes wireless a thrilling pastime.

Yours sincerely,

T. A. STUDLEY.

6, Rutland Road, Harrow, Middlesex.

(Continued on page 1376.)



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# BROADCAST NOTES.

By O. H. M.

Another Mystery Play—"Listening Time"—Weather Forecasting—Caruso Records—B.B.C. and Unified Control—Broadcasting a Diver.

THE new mystery serial, successor to the "Mayfair Mystery," has been arranged for March 1st, 3rd, and 6th. The mystery of the death of Robertson attracted widespread interest just before Christmas, but I gather that the new mystery will be even more popular. A friend of mine in the cast told me the other day that he regards the new broadcast serial as the best thing that has been done in Radio drama so far, either here or in America.

The plot is intriguing. Three men and one woman are cast on a desert island from a derelict ship. Each man represents a distinctive type in society. All four are destined to spend the rest of their lives on the island. The problem is—Which, if any, of the three will the woman marry? Substantial prizes are to be given for the correct solution and the most concise explanation of the solution.

\* \* \*

The speech of his Royal Highness the Prince of Wales, which is to be relayed from a public dinner on the 15th, promises to be of a particularly stirring character from the point of view of the broader Empire vision.

\* \* \*

"Listening Time" is the name of the new B.B.C. revue, the first edition of which will be given on February 13th. It is a sign of how advanced is the dramatic organisation of the B.B.C. that already the second and third editions are being rehearsed.

#### The B.B.C. Dance Band.

It is good news that the suggestion that I made on this page some time ago about the B.B.C. Dance Band is being acted upon. I hear that George Grossmith is hot on the job, and that the London Radio Band will soon make its bow. In addition to its studio work, the London Radio Band will be available for restaurants and outside dances. This is all to the good.

\* \* \*

A friend of Lord Dunboyne, the expert on long-range weather forecasting, tells me that Lord Dunboyne has proposed to the B.B.C. that he should be given a chance to try out some of his methods through the microphone.

There appears to be evidence that although the B.B.C. is favourably disposed to the idea, there are deep-rooted objections on the part of the orthodox weather experts of the Air Ministry, who are responsible for providing the day-to-day weather broadcasts. I know something of the remarkable results attained by Lord Dunboyne, and I sincerely trust that he will be given a run for his money.

On purely entertainment grounds, it would be of wide interest to listeners to be told what the weather is to be like during the summer and autumn.

But, apart from this, there is really a scientific aspect to the whole thing, although one which naturally would not appeal to the official mind at "Bolo House." Another issue is involved, and that is the tendency of the B.B.C. to allow certain Government

Departments to exercise undisputed sway over their respective programme features.

In this connection I am not quite happy about the relations between the B.B.C. and the Ministry of Health and the General Medical Council. It seems to me that the G.M.C. has a very strong influence over our broadcasters through the Ministry of Health.

#### Future Musical Items.

On the anniversary of Caruso, February 22nd, it is proposed to broadcast from London the best gramophone record of the great singer at the height of his career.

This reminds me that we have not yet had the promised voices of the distinguished dead which we were told some months ago were being dug up in the British Museum. I am sure many listeners would like to hear the voices of Gladstone, Tennyson, Queen

On other points it is gratifying to know that the tendency of the Committee is increasingly in the direction which I forecast on this page six months ago. The probable outcome of the enquiry will be that the Committee will recommend the Postmaster General to introduce legislation to constitute a permanent regime of broadcasting. The present Board will be recast. The members of the B.B.C. will be paid off at par, and the Company liquidated.

Lord Gainford will preside as Chief Commissioner over the new broadcasting authority. Mr. Reith will be the chief executive Commissioner, and Sir William Bull the Parliamentary Commissioner.

The new Board will consist of about seven other members in addition to the three I mention. Not more than two of these will represent the wireless trade. The five remaining members will be nominated by the Government, and I should not be surprised to see all of them drawn from the Broadcasting Committee itself. One woman is bound to be included, and I would back the chances of Dame Meriel Talbot. For the remaining vacancies there will be some competition, and I am not ready as yet to hazard a guess.



A photograph of the recently opened studio at the Birmingham Broadcasting Station.

Victoria, and others, broadcast of course, in appropriate settings.

\* \* \*

Sir Edward Elgar's masterpiece "The Apostles," performed by the Hallé Orchestra at Manchester, will be broadcast simultaneously from all stations on March 11th.

This should be a red-letter day for music-loving listeners.

#### The Broadcasting Committee.

The Broadcasting Committee completed its hearing of evidence on Thursday, February 4th. Two dozen witnesses have been given hearings, and more than a hundred other varying expressions of opinion have been received. One point emerges with absolute certainty. That is that British broadcasting is to continue under a system of unified control.

I hear that on March 8th there will be a special broadcast from a diver submerged in a good many fathoms of water. Listeners will hear straight from the diver what he is doing and how he feels at the bottom of the sea. I confess that stunts of this description interest me enormously, and I was alarmed the other day to hear from a prominent programme official of the B.B.C. that in his opinion the era of stunts in broadcasting had finished. If there were to be no more stunts, then broadcasting would decline. Even the highbrows must recognise the fact that we live in an age of stunts.

Journalism, business, politics, and even religion, are kept alive through periodical stunts, which excite the public imagination. If broadcasting is to be vital it must go on stunting more and more.

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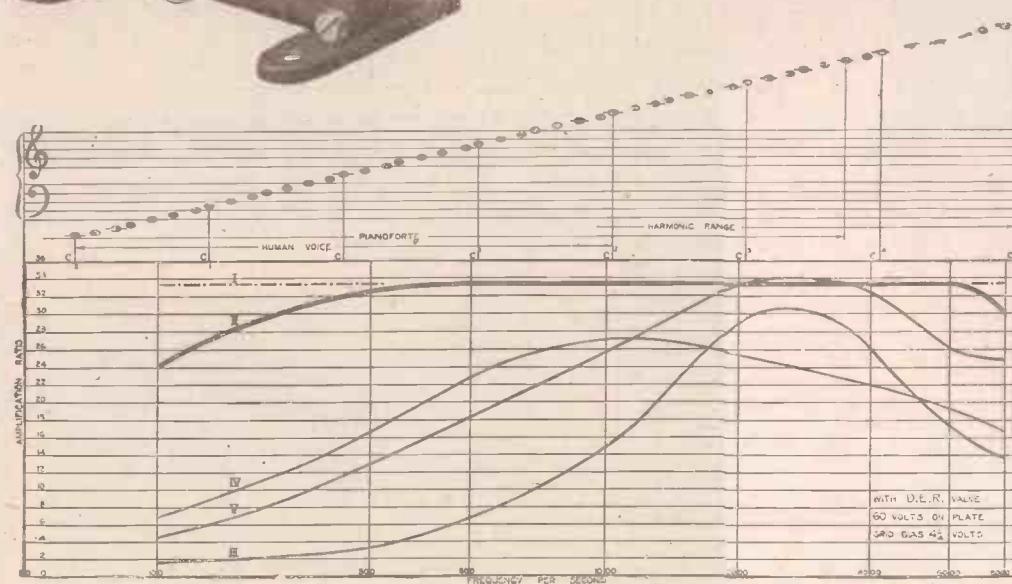
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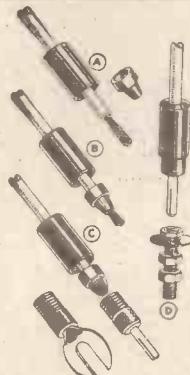
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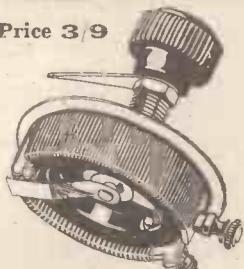
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THE Government Broadcasting Committee of Inquiry, having heard evidence given by at least two dozen people, has now commenced the interesting task of sifting the wheat from the chaff and is preparing its official report.

A good deal of time has inevitably been wasted by the hearing of evidence offered by people who find the limelight of a public inquiry rather dazzling; but, on the whole, the Committee has shown a praiseworthy patience and a real desire to learn what all critical schools of broadcasting have to say.

One of the last sittings of the committee was arranged in order that Mr. J. D. Chisholm, of Secret Wireless Ltd., might offer evidence. He said his company had perfected a system of secret wireless which enabled signals to be received only by those for whom they were intended.

It was possible by the company's method for individuals to communicate privately with each other by wireless. A head office of a newspaper might communicate with its branch offices, or vice versa, whilst at the same time a competitive journal might be doing likewise, neither knowing what the other was doing. By the Secret Wireless system a great range of programmes operated by different broadcasting companies from different stations could be made available.

#### How Many Pirates?

Mr. Chisholm stated that it was understood that there were 1,700,000 receiving licences in force, and that there were probably no fewer than 5,000,000 "pirates" who evaded payment. This company's system, he believed, would eliminate the "pirates," and the increased demand for the new type of instrument would reduce the price of valve sets. By selling 6,000,000 copies of their weekly programmes at a penny each the broadcasting companies would secure a sufficient revenue. The State might charge 1s. a year for a licence for a receiving set.

Mr. Chisholm said the system involved the using of three wave-lengths, but there was only one wave-length in use at a time. The official programmes of the companies would tell the listener in the combinations to be worked on his receiver.

Mr. Chisholm, it will be seen, estimates that there are 5,000,000 "pirates" in this country—a figure which, we venture to say, errs on the side of generosity. We should estimate the "pirates" at half a million; but then we are, perhaps, less generous than Mr. Chisholm. When asked how he arrived at the conclusion that there were 5,000,000 "pirates," his answer was to the effect that the B.B.C. had stated there were 10,000,000!

We have no recollection of the B.B.C. making this statement; and, according to the Chairman of the Committee, 10,000,000 "pirates" would mean that there are more "pirates" than there are houses in the country!

#### Highbrows and Lowbrows.

Sir Hugh Allen, in giving evidence before the Committee, dealt with a subject which should prove of great interest to those gentlemen who, for want of a better word, are known as "lowbrows."

Sir Hugh referred to the evidence given by Sir Walford Davies, who, he said, had stated that the mass of the people was starved

## CURRENT TOPICS.

By THE EDITOR.

Evidence and the Broadcasting Committee—The Future of Broadcasting.

as regards good music, and that they were getting a surfeit of the bad. Sir Hugh imagined that no one was obliged to listen, and therefore it seemed to him that it would be hardly right to say that listeners were "starved" to-day. If one could hear one good thing a day every day of the year, one could hardly be starved in that direction. The whole nation had been enfranchised as regards music and they found it rather difficult to make proper use of it. Sir Hugh maintained that no bad music should be broadcast, and on this point he was tackled by Captain Ian Fraser, M.P., who asked him to define "bad music."

We were present at this sitting of the Committee, and there was no doubt that Captain Ian Fraser's question made Sir Hugh put on this thinking-cap. Said

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Captain Fraser: "Is a tune bad which is only worth remembering for a short time?" and Sir Hugh replied: "Probably, because all good tunes are permanently wearable. Good music is like good material; you can wear it for many years."

"If a tune is bad," asked Captain Fraser, "because it only wears a short time, you would not have it broadcast?"

"I would rather have a selection made of such tunes," replied Sir Hugh, "as, in the opinion of those who really know, will stand the test. There are some experts who will say which music will wear and which will not."

"Is there any merit in a tune which gives people pleasure, even for a short time?" was Captain Fraser's next question. "I think some people get pleasure out of things which are obviously bad for them," was Sir Hugh's rather trite reply. He went on to explain that children eat a large amount of sweets which are not good for them, and drew the rather far-fetched analogy that, although there is a lot of pleasure in eating, it may be harmful; and just as there is a lot of pleasure in listening to bad music (in the case of the lowbrows), there is also a lot of harm. But Captain Fraser would have none of this.

"I hear a new tune," he said, "and I get violently sick of it, but for the time I get intense pleasure. Should I resent and resist this because it is bad music?"

Sir Hugh said some of the tunes might be good ones, and he added that there is good jazz and bad jazz, good dance music and bad dance music, good classical music and bad classical music.

At this point the chairman interposed, and said:

"But we do not hear bad classical music?" And in shocked surprise Sir Hugh replied, "Oh, sir!"

No doubt many of our readers who take a wicked pleasure in listening to the "Rachmaninoff Prelude," "In a Monastery Garden," "Poet and Peasant," and other delectable melodies, will side with Captain Ian Fraser, and no doubt an equally large number will agree with the somewhat austere views of Sir Hugh Allen.

#### Pleasing Listeners.

But whatever arguments the highbrows may advance, and whatever argument the lowbrows may advance, the fact remains that so long as the B.B.C. pleases, or attempts to please, an audience which, at a conservative estimate, amounts to 10,000,000 people, there will be an internal warfare between these two musical camps.

We maintain that it is no business of the B.B.C. to decide a musical standard of test for its auditors. Its primary business is to give the public what it wants, and the best way out of the difficulty is to make a 50-50 proposition of it. If some listeners are frankly pleased at what Sir Hugh describes as "bad music," let them have it. You can take a horse to the water, but you cannot make it drink; and you can bring a listener to the telephone or loud speaker, but you cannot prevent him not listening if he does not want to listen to the musical programmes sent out by the B.B.C. based on intellectual standards, or unintellectual standards, as argued by Sir Hugh Allen and Captain Ian Fraser.

We have already suggested that the future of broadcasting lies in the direction of fewer and more powerful stations. As our readers know, this policy is favourably regarded by the B.B.C., but it appears that this policy has created some qualms among listeners, especially among those who have sets capable only of receiving programmes broadcast by the relay stations.

We should like to make it clear that if the new scheme of substituting high-power stations for the present low-power stations is put into practice, listeners will not be deprived of any of the essential facilities which they now enjoy.

As has been pointed out in the daily Press, the very essence of the new scheme is to provide still greater facilities for those now within the range of relay and main power stations. The new scheme would also provide easier reception for listeners who, at the present time, are somewhat outside the official area of the B.B.C. stations. And the B.B.C. have definitely stated that no station, however small the number of listeners served by it, will be closed unless its functions can be better undertaken by another.

The advantages of the new policy are obvious. For one thing, the limitation of B.B.C. stations in this country would go a long way towards removing the bugbear of interference.

It has been estimated that on the present wave-band allotted to the B.B.C. there are at least one-third too many stations in this country.



# Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

## A New Super-Het. Development.

SOME interesting results are reported in a recent issue of the "Radio World" (New York) as a result of tests on the new "antenna coupler" developed by the Superadio Company. The purpose of this coupler is to form an effective link between the super-heterodyne set and the outside aerial. It has long been one of the aims of the super-heterodyne enthusiast to find some means of availing himself of the extra distance-reception qualities of the extended or outdoor aerial. For example, to be equal in pick-up sensitivity to, say, a 70-foot aerial, it is estimated that a specially wound loop of at least 30 feet square would be necessary. Thus any efficient means of coupling the super-heterodyne receiver to an outdoor aerial, or indeed to a good indoor aerial, should afford many advantages.

The outside aerial is not, of course, connected directly to the frame-aerial terminals of the super-het. for, if this were done, the ordinary coupling coil would act as a miniature loop and the selectivity would be much impaired.

The new coupler has a special three-circuit coil, which, with the tuned circuit, maintains the selectivity, and is, in fact, claimed to improve it. Each instrument is tested separately before being despatched, and is accompanied by an individual calibration chart and blue print.

In tests on this device, which were made by the "Radio World," using an outdoor aerial, it was found that a 20 per cent. increase in distance-reception was obtained, 40 per cent. increase in volume, and 50 per cent. increase in selectivity. Many distant stations were obtained which could not previously be brought in with the loop aerial, and the great increase in signal strength permitted economy in current consumption. This coupler is marketed by the Superadio Company, 136, Liberty Street, New York City.

## An American Innovation.

An innovation in connection with receiving sets is the introduction of what is described as a Wheatstone bridge. This has been introduced by Mr. Powell Crosley, jun., the very well-known American radio manufacturer, who states that he has incorporated for the first time in a receiving set a Wheatstone bridge, a laboratory measuring instrument for balancing in each H.F. stage. It is claimed that this feature makes it possible to obtain great cascade amplification at long wave-lengths and at the same time to secure perfect balancing at all wave-lengths.

## Dealing With Interference.

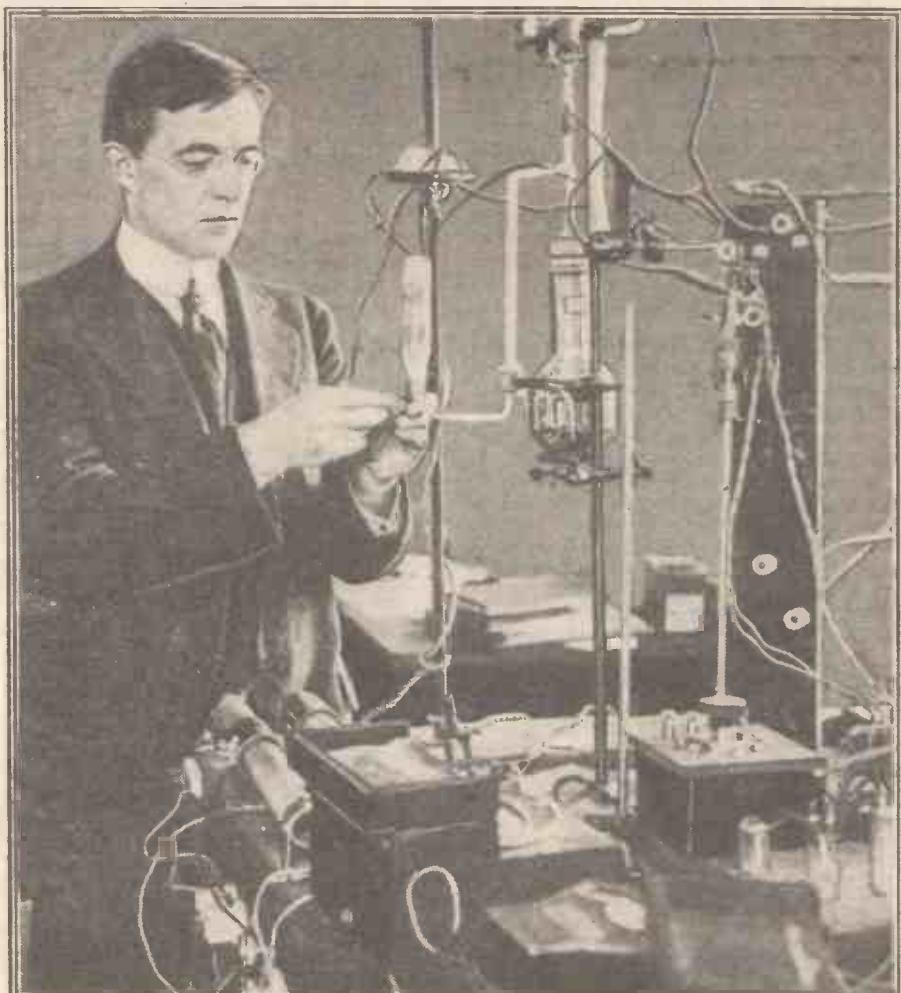
Complaints are frequently received from listeners that they suffer interference from local causes, such as electrical machinery, high-frequency medical apparatus, and so on. One of the principal offenders in this

respect is the battery charger of the vibrating reed type, and this trouble has become so acute in certain parts of the world, notably in the United States, that special local bye-laws have been enacted, making it an offence to operate a battery-charger of

H.F. resistance and inductance. A published paper containing the data will soon be available.

The coils which were used were of different shapes and were wound with different kinds of wire. Of the coils, the loose basket weave coil and the single layer coil appeared to have the lowest H.F. resistance; 24 gauge D.C.C. wire is a suitable size of conductor, although 32 to 38 Litz wire appeared to have somewhat less resistance. This apparently holds good for the entire broadcast range and for all the shapes of coil which were investigated.

Collodion was found to be a suitable binder for supporting the turns of coils of certain shape. There was a noticeable reduction of resistance obtained by suitably spacing the turns of an ordinary single layer coil.



Dr. Irving Langmuir, who has succeeded in establishing his right to important valve patents after a twelve years' legal struggle in America, at work in his laboratory.

the vibrating type between certain hours, such as between 6 o'clock in the evening and 5 o'clock in the morning.

## Important Coil Investigations.

Referring to the remarks which I made recently in these Notes on the subject of varnishes or binders for high-frequency coils, some very important and interesting tests have recently been made by the Bureau of Standards, Washington. The investigation embraced many types of so-called "low-loss" coils designed for broadcast frequencies, and had particular reference to

This investigation is probably the most complete and most important which has yet been carried out on the subject of the H.F. resistance, the inductance and the various other properties of receiving coils, and a full account of the results obtained will be given in these columns, as mentioned above, as soon as they are available.

## Television a Close Possibility.

Monsieur Belin, the famous French scientist who is so closely identified with researches on television, has recently made

(Continued on page 1378.)

THE handsome and spacious ballroom of the Savoy Hotel is only half lit.

A subdued pink lighting reveals an empty floor and unoccupied chairs and tables, but at one end of the ballroom there is great activity.

The Savoy Orpheans, prior to starting their evening performance, are rehearsing a new number. The conductor, Mr. Debroy Somers, (he has not had time to change his brown suit), is a contrast to the austere black and white of his band. Mr. Somers is just as pleasant and satisfying to watch as his band is to listen to. He is a young Irishman of thirty-four, but looks considerably younger.

#### Wireless Enthusiast.

"I am a great enthusiast of wireless," he told me during an interval of the rehearsal, "and whenever I have a spare moment, and alas! it is so seldom, I listen-in to America. We have a splendid set here at the Savoy, and the reception is really remarkably perfect. I think wireless is the greatest invention in existence, and when one views its possibilities, one cannot but realise how powerful an asset it is.

"While I have the greatest admiration for the entertainment side of wireless," he told me, "I must say that I think the broadcasting of so much syncopated music is overdone. Too much of any kind of entertainment belittles its popularity, and just now there is so much of what is known as 'jazz' music that it is apt to become monotonous."

#### Classical Music Preferred.

In Mr. Somers' opinion the listeners who use the broadcasting of syncopated music for dancing purposes are in the minority. Wireless serves a bigger and better purpose than the gramophone by the fact that it is a first-hand entertainment.

He would not be surprised to learn, he added, that only about ten per cent of the listeners danced to broadcast music.

"I would suggest that the kind of music they like is the kind we include in our special performances, such as we gave in London at the Queen's Hall. We included such items as Gershwin's 'Rhapsody in Blue,' which is regarded as the classic in 'symphonised-syncopation,' as I would prefer to name this music. I was never in favour of the word 'jazz,' and how out of place it is can be imagined when we play Wagner, or the Slavonic dances. I am sure listeners-in would welcome more classic music on the wireless, and that is the music I prefer to broadcast.

"New numbers are so few and far between that we shall have to revert to the classics. Symphonised syncopation has lost its novelty and its 'newness,' so if it does not remain of first-class entertainment value it will diminish in popularity."

#### Fifty New Tunes per Week.

Broadcasting has given the Savoy Orpheans the largest audience of any band—an audience of millions. The story of how this band started is too well-known to repeat it here, except perhaps to mention that Mr. Somers collected the men from all over the world. They are all "stars," and journeys totalling 110,000 miles were made to bring them together. The result has been a perfect band.

Almost 8,000 different tunes were tested to obtain the band's original repertoire of

## THE ORPHEANS.

Mr. Debroy Somers  
Views on Broadcasting.  
By "ARIEL."

200 tunes. Fifty different tunes are tested each week to bring the repertoire up-to-date.

"On the nights we broadcast I do my best to make my programmes just as suitable to listeners as to the Savoy clientele. I suppose I am something of a highbrow, for if I had my own way I would play nearly all classical music and special exhibition numbers," said Mr. Somers.



A recent photograph of Mr. Debroy Somers.

As an example of the tremendous popularity of the Savoy Band he receives a huge correspondence from wireless "fans." The mail from Berlin and Vienna is particularly heavy, and only the other day a letter from Germany asked that they should make gramophone records of Franz Lehár's latest operetta, "Paganini." This was a happy coincidence, for the Orpheans have made these records.

#### World-Wide Requests.

"We have been heard in all kinds of places," continued Mr. Somers. "I was told recently by Senator Marconi that we have been heard in China. We have also been one of the chief amusements behind the Riff lines during the Moroccan war.

"We receive many curious requests for special numbers. Quite often I get requests from liners leaving the South African coast for dance numbers to be played two days later for their ship dance. As far as possible I accede to these requests. Many liners at sea wireless their requests."

An amusing incident occurred at the hotel the other evening. A Scotsman, who had listened-in at Glasgow to the band for the last year came to hear them play. Great was his astonishment when he saw they were

white men. He had always thought they were negroes, and he went away slightly disappointed!

#### Broadcasting from the Air.

"For the first time recently we broadcast from an airplane," continued Mr. Debroy Somers, "and they tell me it was very successful. So great was the noise inside the machine, and there was so little room to move about, that I had to shout in the ear of each of my men what I wanted done. I would not like to conduct always in this way!"

I asked Mr. Debroy Somers whether he was in favour of broadcasting being run by a government department when the B.B.C. licence expires in 1926.

"Certainly not," was his emphatic rejoinder. "I don't like a government department running anything. There would be too much red tape about it. I hope to see the B.B.C. licence renewed. Considering the enormous difficulties they have had to cope with they have done very well."

"But I will say that, much as I like and admire broadcasting, I feel that an orchestra loses a lot on the wireless. A great many of the finer points of the band are lost. I have often listened-in to my own band playing, and I must say that I have been disappointed. The result is not the same."

#### The Last Broadcast.

"But the B.B.C. is rendering a great service to the world. I often receive letters from invalids and bed-ridden listeners-in who greatly appreciate the musical programmes. This is where broadcasting is so valuable, and in making those who suffer happy is a task to which we are all eager to contribute."

"In 1926," concluded Mr. Debroy Somers, "I, for one, feel convinced that broadcasting will come into its own as a perfect and enjoyable entertainment."

"According to present arrangements, the Savoy-Orpheans and the Savoy-Havana Bands and, of course, the Savoy-Tango Bands, will be heard by listeners in Great Britain and Europe—and, I expect, American fans will be listening for us also—for the last time on the evening of February 27th.

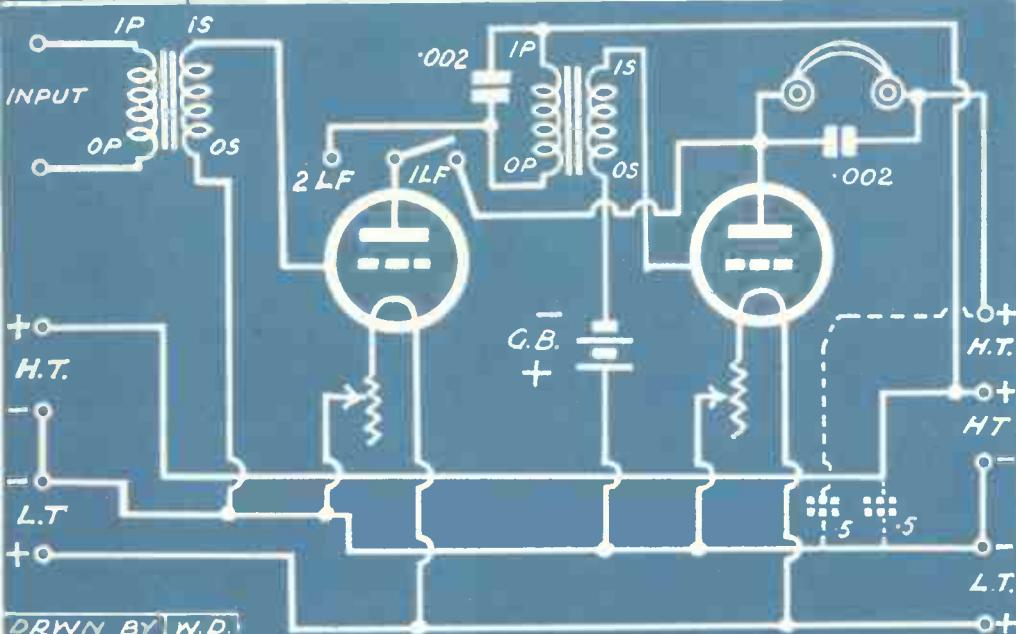
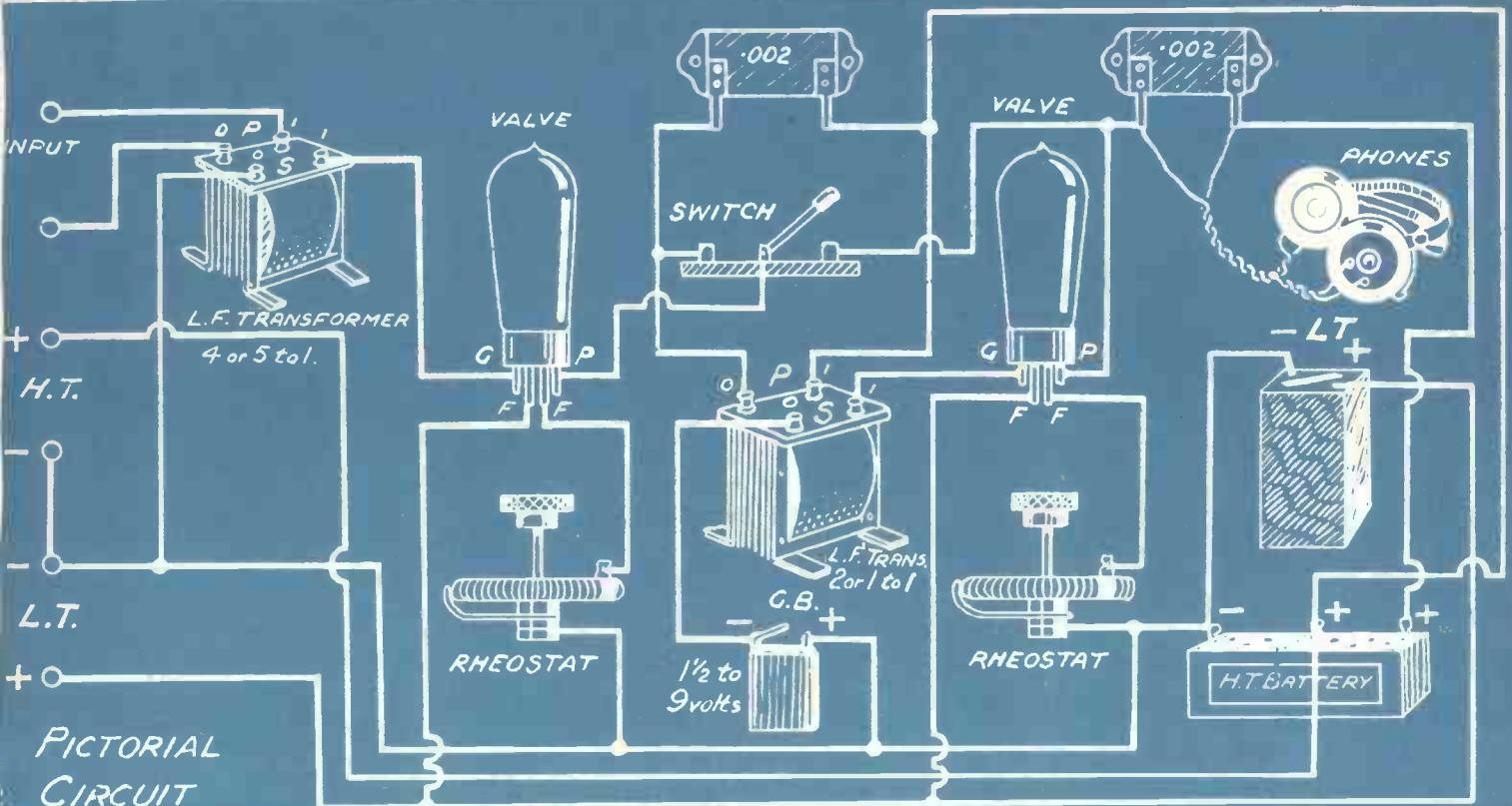
It is a strange thought, and although we have now been broadcasting for so long, we are apt to forget that as we play in the Savoy ballroom, people are listening to us thousands of miles away. At the same time, I shall be very sorry to lose my radio audience from a sentimental point of view."

"Apart from everything else, a radio audience is to my mind a most useful, helpful, and informative one. Their letters help and stimulate one to an extent that can only be given by the most rapturous concert audiences, like those, if I may modestly claim, which came to the concerts at the Queen's Hall, and on our Provincial tour."

The radio critic, I have found, if he has any criticism to offer, generally makes it in a constructive form.

"To my mind, broadcasting owes a great part of its success to the criticisms which are being continually offered by listeners."

"I take this opportunity of sending, through POPULAR WIRELESS, my greetings and farewell for myself and my band to our millions of friends of the air."



**THE P. W. BLUE PRINT CIRCUIT No. 14  
TWO-VALVE L.F. AMPLIFIER  
WITH SWITCH TO CUT OUT  
LAST VALVE**

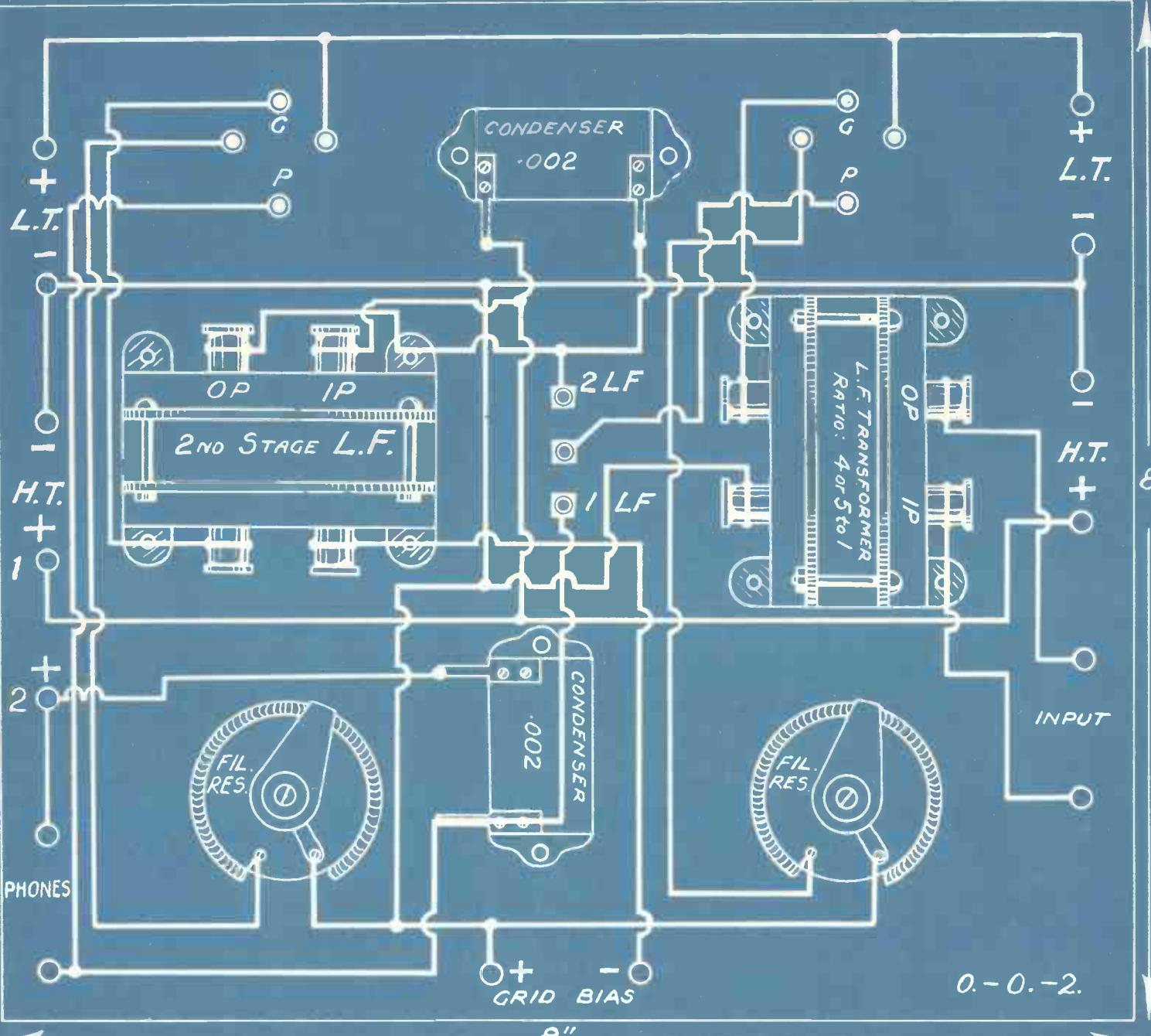
**6d.**

**LIST OF COMPONENTS.**

- 1 L.F. transformer (first stage).
- 1 L.F. transformer (second stage).
- 2 filament resistances.
- 2 valve holders.
- 15 terminals.
- 1 panel  $8 \times 8 \times \frac{1}{2}$  ins.
- 1 box to fit  $4\frac{1}{2}$  ins. deep
- 1 S.P.D.T. switch.
- 2 .002 fixed condensers.
- Wire, screws, transfers, etc.

**ACCESSORIES.**

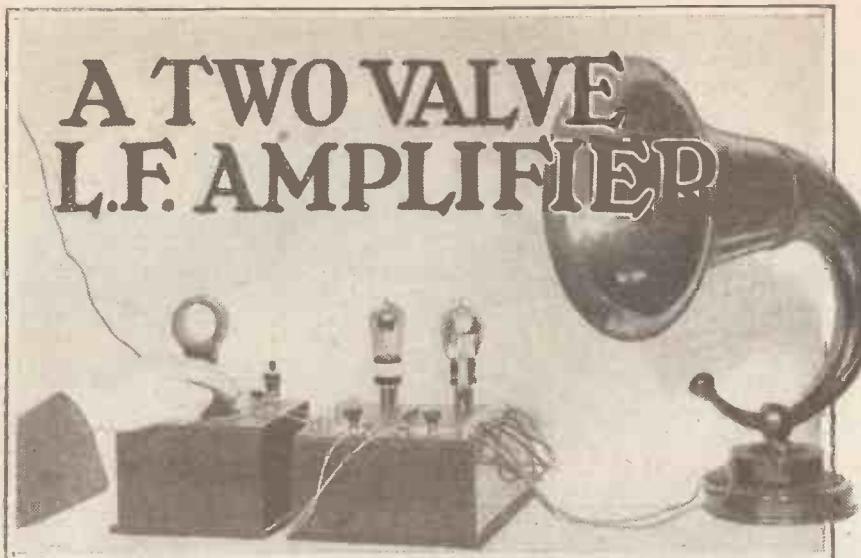
- 1 valve (for first stage L.F.).
- 1 "Second stage" or "Power" valve.
- H.T., L.T. and grid-bias batteries, to valve makers' specification.
- 2 .5 fixed condensers for placing across H.T. terminals (optional).
- Phones and/or loudspeaker.



DRAWN BY	W.D.
CH'KO BY	65R
SER: NO	B.P.28.

THE P. W. BLUE PRINT CIRCUIT No. 14—TWO-VALVE L.F. AMPLIFIER, WITH SWITCH TO CUT OUT LAST VALVE. This circuit is suitable for adding to valve or crystal set for loudspeaker work.

NOTE.—When added to a valve set, the wires in the amplifier which connect L.T. negative to H.T. negative are unnecessary and these terminals should *not* be joined, or the H.T. negative terminal should be left without any external connection. As L.F. transformer design is not standard it may be necessary to reverse the leads to O.P. and I.P., or to O.S. and I.S.



The Set designed, described and constructed by the "P.W." Technical Staff.  
The diagrams for this set are on the Blue Print given away with this issue.

THE purpose of an amplifier is, as its name suggests, to amplify, although in the case of an L.F. amplifier it would, perhaps, be more correct to say magnify. An L.F. amplifier does not increase range of reception to any considerable extent, or at least, if any such increase eventuates it must be regarded as incidental and therefore as a gain. Its purpose is to take received signals from a set and magnify them—make them louder so that either clearer telephone reproduction is obtained or a loud speaker operated.



The neatness and symmetry of the amplifier will appeal to constructors.

In the case of a crystal set it is generally necessary to employ two valves to obtain the volume required for a loud speaker, for such an instrument in itself is not the efficient magnifier of sound as it is apparently thought to be by many people. A valve set, on the other hand, is capable of delivering much louder signals than a crystal set, so in certain cases one extra valve employed as an L.F. amplifier will be all that is needed.

Therefore, the two-valve amplifier described in this article is provided with a switch so that either one or two valves

can be used. It forms an instrument that will prove useful to both listeners and amateurs.

#### Suitable L.F. Transformers.

L.F. amplifiers are very easy to build and very easy to handle, for they embody none of the tuning controls or critical apparatus of H.F. amplifiers. Constructors must not tackle the job too lightly as, nevertheless, L.F. amplifiers demand a certain amount of care in assembly and operation if optimum efficiency is to be obtained.

Distortion can very easily occur if unsuitable transformers or valves are used. The first consideration is the transformers. These must be chosen carefully for the work they will have to do. One will occupy what is known as the first stage and the other the second. The Lissen T1 and the Energo used in the original set operate very well together. Other makes can, of course, be used if desired. The first stage transformer should have a 4 or 5 to 1 ratio, and the second 2, 3, or 4 to 1. It is very advisable to use high-class transformers of reputable make, for they are the "life centres" of an instrument of this nature.

#### The filament rheostats should

have ample resistance, the 30 ohm Precisions are to be strongly recommended. The only other components required are fixed condensers and any good make such as Lissen, Dubilier, etc., can be used, a single pole double-throw switch and the various valve-sockets, terminals, etc.

#### Commencing the Wiring.

The panel drilling is quite straightforward, as will be seen by the accompanying diagram. Templates for the valve sockets and other panel drilling information has, of course, appeared in our new Radiotorial series "For the Constructor."

The transformers are mounted on the back of the panel by means of countersinking screws and nuts. After the various terminals, etc., have been mounted, the wiring can be proceeded with. The blue-print shows this, while a separate check is provided in the point-to-point guide accompanying this article.

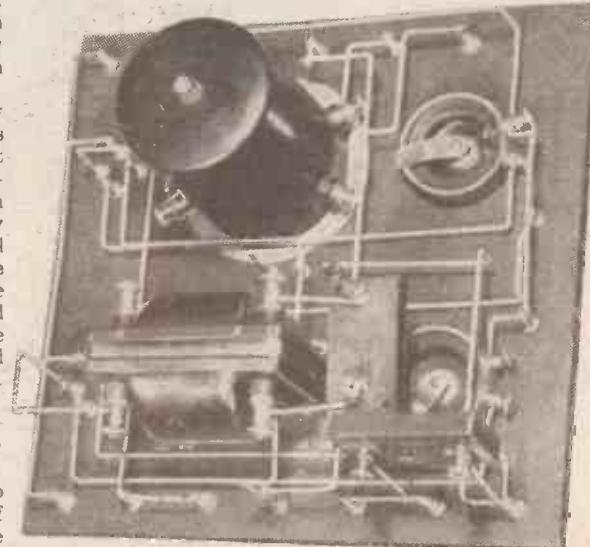
It will be noticed that, both in this guide and the theoretical circuit, specific transformer connections are given, while in the wiring diagram the secondaries are not marked, the reason for this is given in the note at the foot of the blue print. Reference is also made to a point concerning H.T. and L.T. minus connections.

#### Optional H.T. Condensers.

Glazite was used for wiring the original amplifier and can be thoroughly recommended to constructors. There are rather a large number of connections and, in the panel space available, the use of bare wire would be difficult and, indeed, rather dangerous. Glazite has a very attractive appearance, however, and can be soldered as readily as the "bare tinned."

Soldering is, of course, advisable whenever possible, although such must be carried out carefully and a good non-acid flux, such as Fluxite, used.

The wiring completed, transfers can be fixed on the panel and a case or cabinet prepared. This should be 4 in. deep and can be 8 x 8 in. internally or externally. In the latter case, the panel is merely dropped over it and screwed down by means of countersinking screws:



The wiring is carried out with Glazite, which gives the under panel lay-out a neat appearance.

the former, fillets must be provided as the panel will drop into the case, its surface being either level with the top edge or slightly above, according to taste.

Two large fixed condensers of about 5 mfd. capacity can be connected, one across H.T. minus and one H.T. plus, and the other across H.T. minus and the other H.T. plus if desired. This is purely a refinement, but one that can be included in the amplifier if desired. Probably no difference at all in reproduction will be noticed subsequent to the addition,

(Continued on page 1359.)

# ORMOND(E) still leading — as in 1886

MANY people will recall the victories of "ORMONDE," who in 1886 carried off the Triple Crown—winning the Two Thousand Guineas, the Derby, and the St. Leger. In the whole of his career he was never beaten, and is generally regarded as the best horse of all times.

Since then the name "ORMOND" has repeatedly been associated with success. To-day, in the World's Long Distance Race, the "ORMOND" Condenser Mount easily comes in first, leaving behind it a field of straggling components.

*For a magnificent finish, back "ORMOND"*

## SELECTIONS FOR TO-DAY:—

### BALL-BEARING FRICTION CONTROL CONDENSER

·0005	...	...	15/-
·0003	...	...	14'6
·00025	...	...	13'6

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Brass End plates, highly  
nickelled finish.

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FIRST IN EVERY FIELD

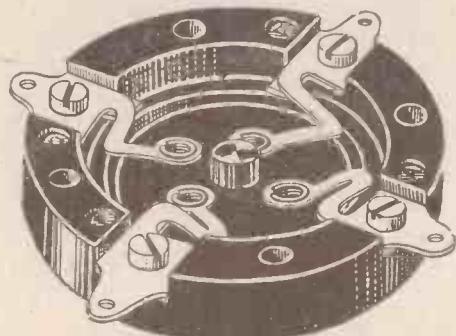
## Another "Lotus" Triumph!

THE delicacy of your Valve filaments are subject to microphonic elements from numerous sources. The LOTUS Buoyancy Valve Holder has been specially designed and constructed to counteract and dissipate these disturbances, and will, by its original and unique spring construction, absorb any shock, protect your valves and eliminate all microphonic noises.



TOP VIEW.

Valve sockets and springs are locked together by a mechanical process, making a definite and permanent connection. Bakelite mouldings, nickel silver springs and phosphor bronze valve sockets. Nickel plated.



UNDERSIDE SHOWING SPRINGS.

## The LOTUS Buoyancy VALVE HOLDER

Anti-Microphonic

*Designed and made by the manufacturers of the  
LOTUS VERNIER COIL HOLDER and  
obtainable from all reliable Radio Dealers.*

Garnett, Whiteley & Co., Ltd.,  
"LOTUS" Works, Broadgreen Rd., LIVERPOOL

2  
3



*Patent  
applied for*

## The New Duplex Terminal

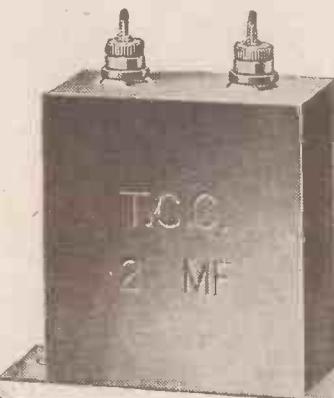
WHILE it has not been found possible to improve the design of the T.C.C. Mansbridge Condenser, important alterations have been effected in the actual metal case. The new T.C.C. Mansbridge is fitted with Duplex terminals. A quick connection can now be made by means of the milled head. Soldering can still be carried out—a lug being fitted as shown.

One further improvement to be found in the use of a metal top instead of a pitch sealing compound. Thus the danger of heat affecting the Condenser during soldering is now completely abolished.

Once more T.C.C. demonstrates its ability to lead the way in condenser design—its 20 years' experience places it in a unique position for building genuine Mansbridge Condensers accurately and economically.

T.C.C. Mansbridge Condensers are now supplied in green metal cases in all values from .005 mfd.s to 4 mfd.s. Your Dealer stocks them.

Get the new T.C.C. Mansbridge



**T.C.C.  
Mansbridge Condenser.**

Telegraph Condenser Co., Ltd., Kew, Surrey.

Gilbert Ad. 4554

## A 2-VALVE L.F. AMPLIFIER.

(Continued from page 1356.)

but should the H.T. battery be a little off colour, it is liable to make a difference.

### The Amplifier in Use.

When the amplifier is used with a crystal set, the 'phone terminals of the crystal set must be connected to the "input" terminals. The H.T. and L.T. batteries are connected to the battery terminals so marked on the right-hand side of the amplifier, those on the left being ignored. When it is desired to use the amplifier with a valve set, the batteries from this latter are disconnected and joined to the right-hand side of the amplifier. Short lengths of wire should then be used to connect the H.T. plus from valve set to left hand H.T. plus on amplifier and similarly the L.T. plus and minus. H.T. minuses need not be connected, as H.T. minus will be connected internally to L.T. in the receiver itself. (See footnote on diagram.)

Two H.T. plus terminals are provided on the right-hand side of the amplifier, and these are marked in the blue print as "1" and "2." These enable separate values of H.T. to be supplied to the two amplifier valves. The same H.T. battery can be used, but two H.T. plus wander plugs are necessary. The second valve (H.T. plus 2) will require a greater H.T. voltage than the first—anything up to 120 volts in the case of a power valve.

### Concerning the Switching.

When only one valve is required, the switch is arranged accordingly and the grid bias terminals are ignored. The grid bias is for the second valve and should be supplied by a 9-volt battery tapped at every  $\frac{1}{2}$  volt, similarly to an H.T. battery. Special grid bias batteries are made and are readily obtainable at any wireless store.

Suitable valves to use are B 4's with a 6-volt accumulator or an Osram D.E. 2.L.F. (1st position) and a D.E. 6 or Cossor W.1 and W.3, or Ediswan A.R.D.E. (green line) and P.V. 6 D.E. with a two-volt accumulator. H.T. will vary round 60 for the first valve and 100 for the second, and grid bias from 3 to 9 volts.

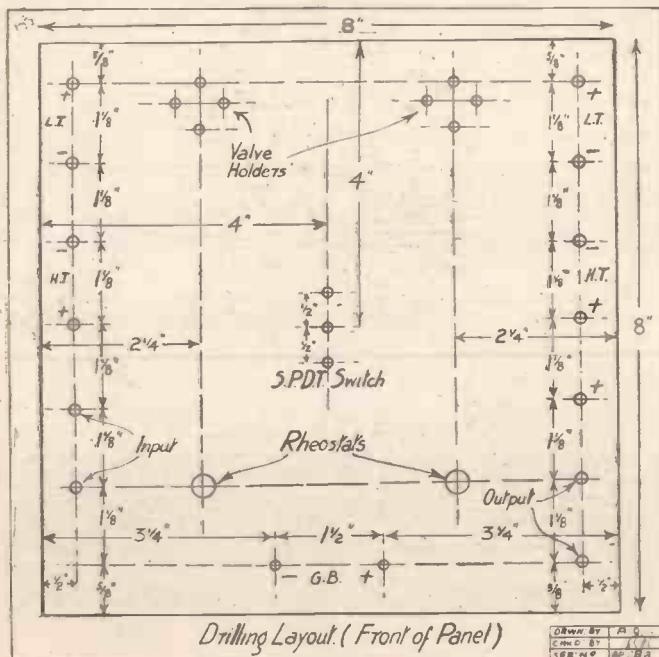
### POINT-TO-POINT CONNECTIONS.

The two "input" terminals of the amplifier are connected to the terminals of the first L.F. transformer marked "O.P." and "I.P." I.S. terminal to grid socket of 1st valve and O.S. to L.T. negative completes the wiring of the first transformer.

L.T. negative is also connected to H.T. negative and to the corresponding terminals on the opposite side of the panel, grid bias positive and to one side of each of the rheostats. The other side of each rheostat is connected to one filament socket of its respective valve holder. The other filament socket of each valve holder is connected to the lead joining the two L.T. positive terminals.

Plate socket of 1st valve holder to centre contact of S.P.D.T. switch, top contact of switch to O.P. of 2nd L.F. transformer. I.P. of transformer to both top H.T. positive terminals. Bottom contact of the S.P.D.T. switch is joined to the lower telephone terminal and to the plate socket of the second valve holder. The top telephone terminal goes to lower H.T. plus. A .004 fixed condenser is connected across the 'phone terminals (output), and a .002 across the primary of the 2nd transformer. I.S. of second transformer is joined to grid of second valve and O.S. to the grid bias negative terminal. This completes the wiring.

High resistance telephones or loud speaker should be used and must be connected to the terminals marked "output." The switch is not arranged to cut out the L.T. when over to the "1-valve" position; the valve not in use must be switched off by the filament resistance. It should be noted, however, that when the second valve is switched off and only one valve is in use, the second H.T. plus connection is still required. The first H.T. plus, which is used with the first valve when both valves are employed, is automatically taken out of service. It need not be disconnected from the H.T. battery, but it must be remembered that the second H.T. plus is now acting for the first valve. The second valve requires much more H.T. than the first valve so the necessary rearrangement when the switch is over to the one valve position is to place the second plus H.T. wander plug in the H.T. battery tapping previously occupied by the first plus.



## ODD HINTS.

FROM A CORRESPONDENT.

THE annoyance of a carelessly broken 'phone-lead which, perhaps, spoils an evening's entertainment can easily be avoided if a little care is given to the leads before they begin to wear badly. There is a good deal of strain upon the flexible connection between the set and the ears, especially at the ends of the cord. Some 'phones have a little ebonite bush or a cotton loop near the two little tags which are placed under the 'phone terminals; and where such provision is made the bush or loop should be fixed by a screw into the panel or woodwork of the set, in such a position that the strain of all the little pulls and jerks to which the cords are subjected is borne by this screw, instead of the little tags which form the connection. Protecting 'Phone-leads.

If no loop of this kind is provided it is an easy matter to fit one made of string, and this little precaution will double or treble the life of the leads.

Where the silk or cotton insulation has become frayed, and the flexible wires show through, the lead should be bound round with silk thread or strong cotton, which not only restores the tidiness of the lead, but strengthens it just where support is most needed. The final secret of long life in telephone leads is to keep them free from kinks. This is a habit that is very easily formed, and if the 'phones are never put aside with kinks in them the cord will remain strong and give perfect service.

From lengthy experience the writer feels confident that it is false economy to purchase cheap valves. Many of these have been tested and excellent results have been obtained from some, but the quality is not so uniform as with British valves of the standard kinds.

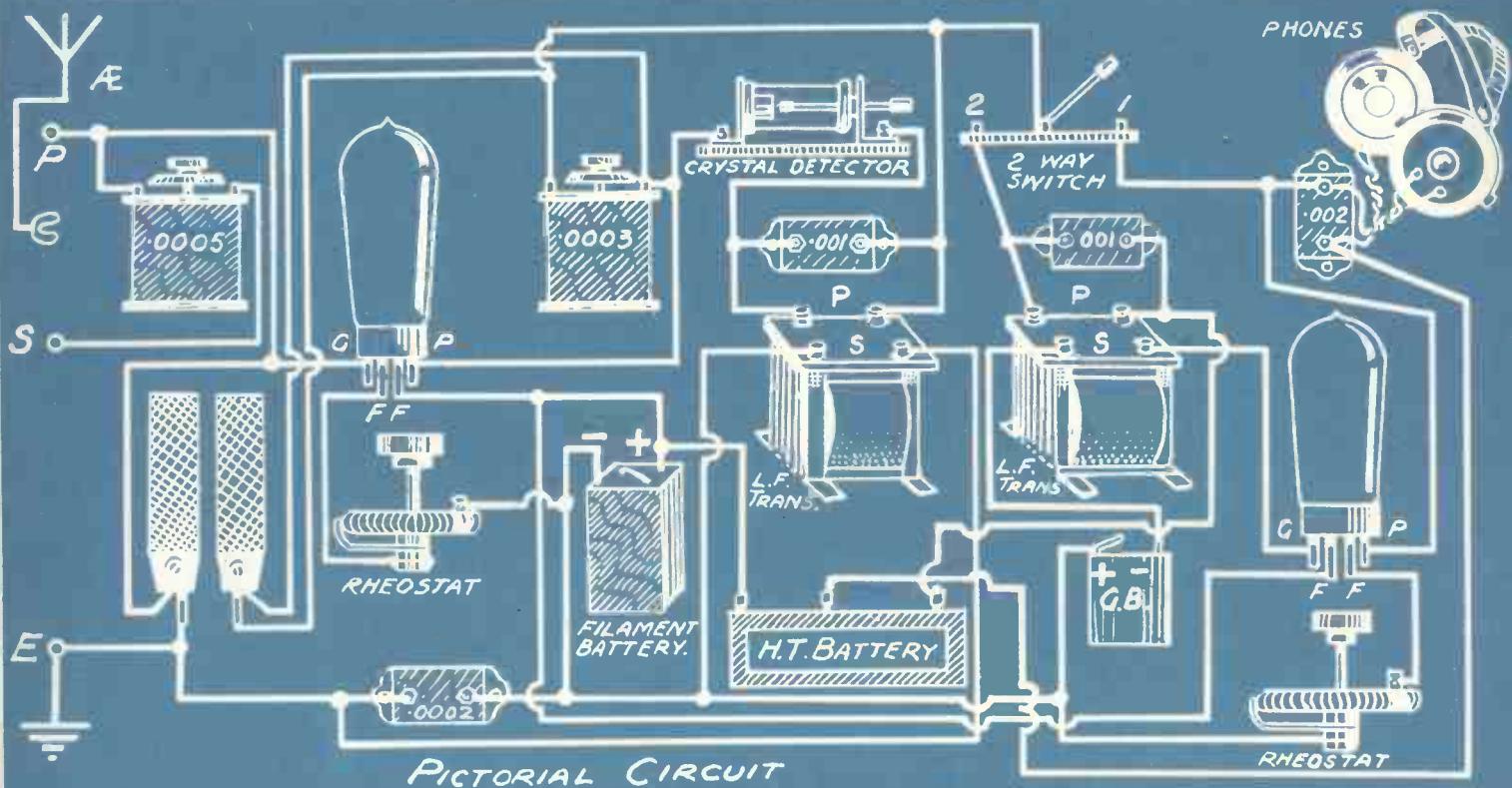
### Valve Considerations.

Another important consideration is the fact that the British manufacturer is willing to stand by the quality of his products, and to exchange any goods found to be faulty. A similar consideration cannot be expected with the cheap Continental valves.

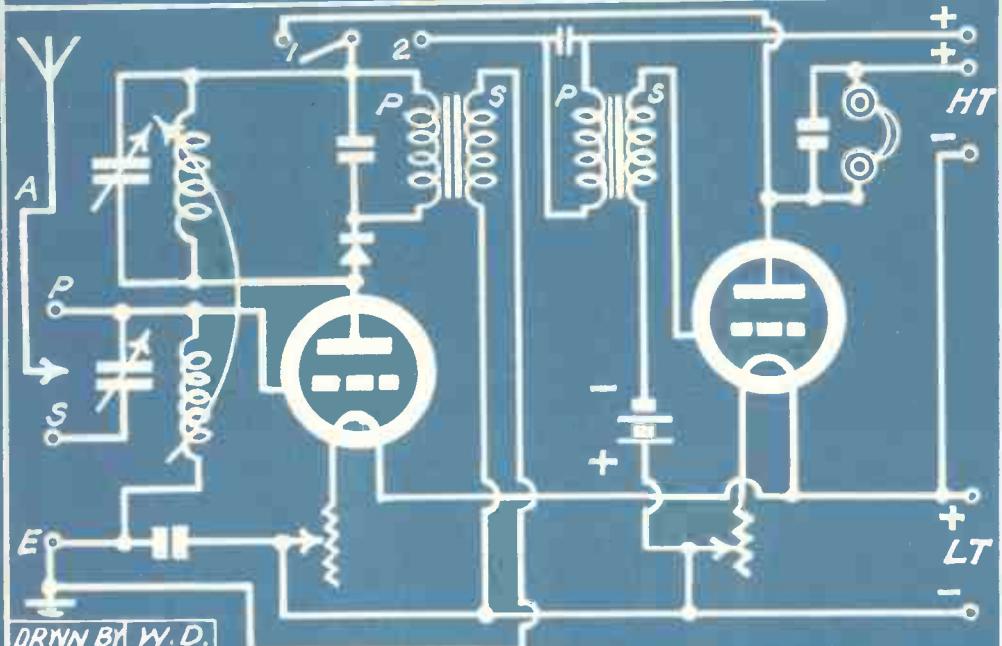
Valves should always be used in accordance with the instructions given by the manufacturer. If these instructions are followed, you can expect to get the best results out of the valve, and if you do not, you have a legitimate reason for expecting the manufacturer to exchange the valve. Valve characteristics vary with different makes; therefore it is well to arrange your set so that the different requirements in L.T., grid bias, and H.T. voltage can be met.

If you can afford it, valves of the low-capacity type (not 4-pin type) prove most satisfactory in H.F. positions, but excellent results can be obtained with general purpose valves if proper attention is paid to the wiring of this part of the circuit.

One of the dull-emitter power valves should be used for last stage for loud-speaker work, and will be found to give better reproduction.



PICTORIAL CIRCUIT



THEORETICAL CIRCUIT.

DRWN BY	W.D.
CHKD BY	B.R.
SER. NO.	B.P. 35.

THE P. W. BLUE PRINT CIRCUIT No. 18  
VALVE-CRYSTAL REFLEX AND L.F.  
AMPLIFIER (WITH SWITCH TO CUT  
OUT L.F.).

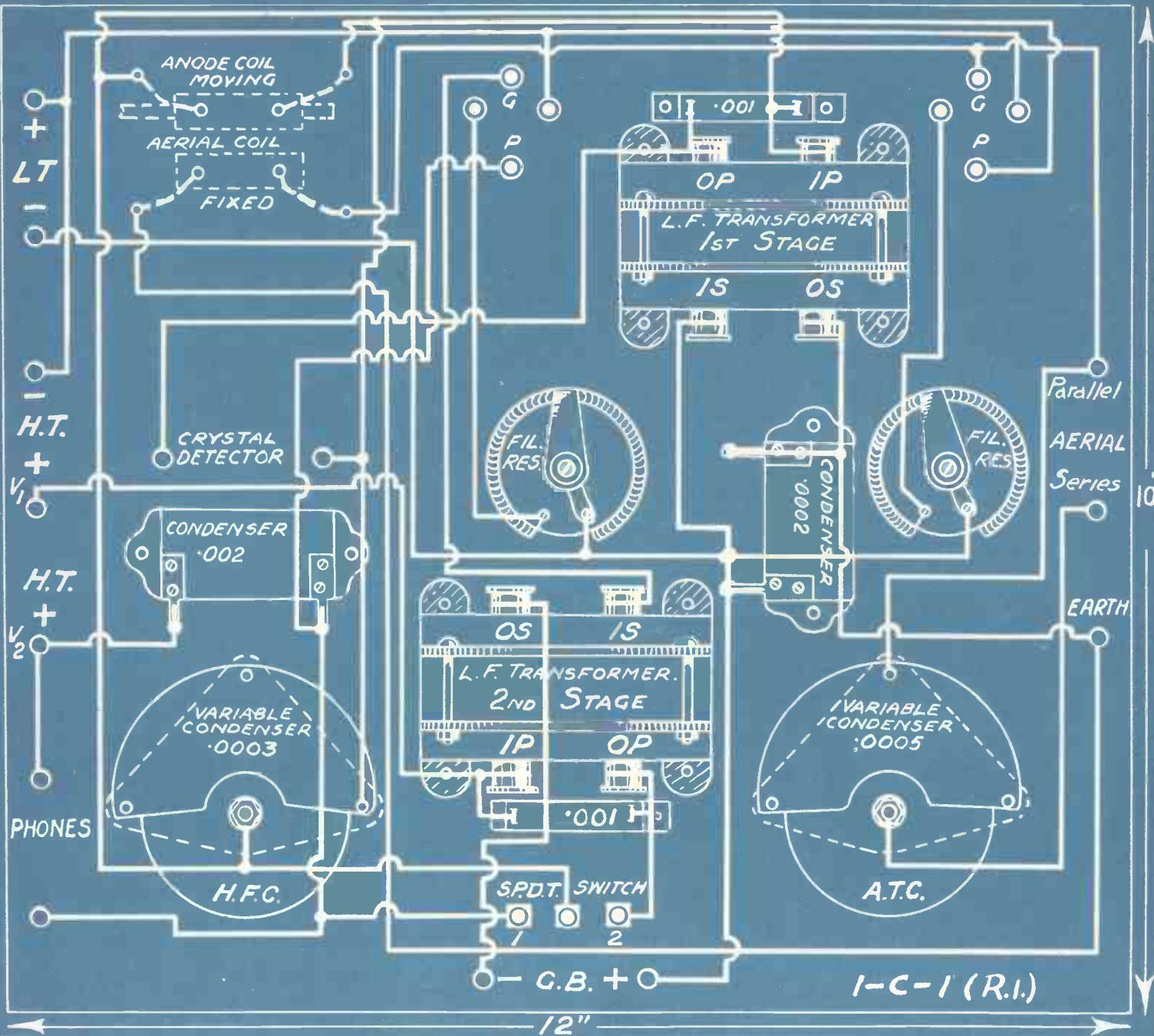
LIST OF COMPONENTS.

- 1 panel  $12 \times 10 \times \frac{1}{4}$  ins.
- 1 box to fit,  $4\frac{1}{2}$  ins. deep.
- 2 filament resistances.
- 2 valve holders.
- 1 two-way coil holder.
- 1 crystal detector.
- 1 L.F. transformer, 1st stage.
- 1 L.F. transformer, 2nd stage.
- 1 S.P.D.T. switch.
- 12 terminals.
- 1 '0005 variable condenser.
- 1 '0003 variable condenser.
- 1 '002 fixed condenser.
- 1 '0002 fixed condenser.
- 2 '001 fixed condensers.
- Wire, screws, transfers, etc.

ACCESSORIES.

- 1 "General purpose" valve.
- H.T. and L.T. batteries, according to valve makers' specification.
- 1 pair of phones.
- 1 L.F. or power valve.
- 2 coils, 75 and 50 (200 and 250 for 5XX).
- 1 grid bias battery.
- Wire, screws, transfers, etc.

6d



THE P. W. BLUE PRINT CIRCUIT No. 18—REFLEX EMPLOYING CRYSTAL DETECTOR, WITH SWITCH FOR L.F. AMPLIFIER. Useful loud-speaker circuit, similar to the famous "P.W. Combination Set," capable of fair long-distance reception. It is rather non-selective as a rule, but will work a loud-speaker up to about 20 miles from a main broadcasting station.

NOTE. For "Series" tuning connect aerial lead to "Series" terminal, leaving "Parallel" terminal without external connection. For "Parallel" tuning connect aerial lead to "Parallel" terminal and join "Series" terminal to the "Earth" terminal externally. As L.F. transformer design is not standard it may be necessary to reverse the leads to O.P. and I.P., and O.S. and I.S.

DRWN BY	N.D.
CHKD BY	BS/
SER. NO.	BP.36.



The Set designed and described by the "P.W." Technical Staff. The diagrams for this Set are on the Blue Print given away with this issue.

**A**LTHOUGH the enormous popularity attained by reflex sets has tended to wane slightly of late, this type of circuit remains one of the most popular and economical it is possible to use for loud-speaker results.

As is now generally known, the first valve of such a receiver is a dual amplifier, handling both H.F. and L.F. currents simultaneously. The first valve amplifies at H.F., passes on the amplified currents to a crystal for rectification, and then amplifies

merely for switching in or out of circuit the second valve, which acts as the second L.F. amplifier.

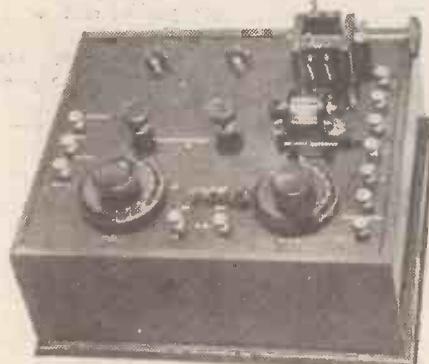
Even when only one valve is employed this circuit is sometimes capable of extremely long distance telephone reception, but it does not excel in this, as it does in clarity of reproduction, on account of the fact that a reflex receiver is invariably less selective than one employing a straight circuit.

When situated close to a broadcasting station it is quite possible, in some cases, to work a small loud speaker from the one valve alone; but, generally speaking, it will be found that the fact that a further stage of amplification is available renders the receiver an extremely good all-round set, suitable with one valve for 'phones or local loud-speaker work, and with two valves for still greater volume when required.

#### All Wave-lengths Covered.

It will be seen from the blue print that either series or parallel tuning can be employed, the change over being readily made by means of the two aerial-terminal system, which is explained at length on the next page. This modification means that the receiver can be employed with equal facility either upon long waves (5 X X), or upon the shorter waves used by the various main and relay B.B.C. stations.

Results with this receiver will, of course, partially depend upon the aerial employed, and there is no doubt that a good outdoor aerial is by far the most satisfactory one to use. Where this is impossible an indoor aerial (similar in shape, etc., to the outdoor type, but under the



The appearance of the complete receiver is clearly shown by this photograph.

them again at L.F. A further stage of straightforward L.F. amplification is provided by the second valve.

Since the introduction of the "P.W." Combination Set," receivers of this kind have been in use under all sorts of conditions and in all parts of the country, and there is no doubt that it is one of the best two-valve hook-ups it is possible to obtain for clear reproduction. This is partially due to the fact that the detector employed is a crystal, which, it is well known, is capable of giving clearer results than the average valve detector.

#### One or Two Valves Available.

The circuit now to be described, although on the lines of the "P.W." Combination Set," is much simpler, and the switching has been reduced to a minimum. The S.P.D.T. switch in the photographs is employed

rafters or strung beneath the ceiling) can be utilised.

Very near to the broadcasting station it is possible to use a frame aerial with this set. But this is only a last resort, as an indoor aerial is greatly to be preferred to this, and, of course, an outdoor aerial is still more efficient.

This set is not at all difficult to build; but, nevertheless, the blue print should be carefully studied, and where possible adhered to, as regards spacing, etc.

#### Constructional Details.

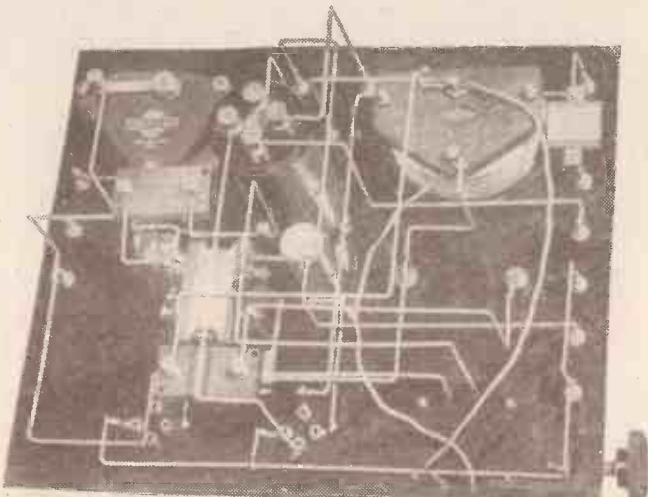
Construction is commenced by drilling the panel, the dimensions for this being given in the drilling lay-out on the next page. It will be noticed in the photograph that both of the L.F. transformers employed are of compact size. If larger transformers are used, the spacing may have to be modified slightly, and it is advisable to keep the two as far apart as possible, unless, of course, they are shrouded, in which case this precaution is unnecessary.

Little need be said about the wiring, as the blue print is self-explanatory; but care should be taken in the choice of the components. Either the wire-wound or the carbon-compression type of rheostat may be employed, the former being extremely robust, and the latter having the advantage of requiring little panel space. The total resistance of the filament resistances will, of course, depend upon the requirements of the valves employed, and details of these are invariably given by the manufacturers of the valves.

#### Suggested Components.

In this receiver the filament rheostats used were "Lissen majors," and two small fixed condensers were also of Lissen make. The '002 fixed condenser which is fixed across the output terminals is a Cosmos Permacon. The variable condensers used can, if desired, be fitted with a vernier adjustment, although those used in the original model shown in the photographs did not embody this refinement. The '0005 aerial condenser shown is a Lamplugh, whilst the '0003, which tunes the anode circuit, was supplied by Messrs. Peto-Scott. This firm also provided the coil holder, which is of the usual two-coil type, giving very satisfactory adjustment; and also the

(Continued on page 1363.)



This photograph should prove of assistance to constructors when the wiring of the set is being undertaken.

# Silvertown

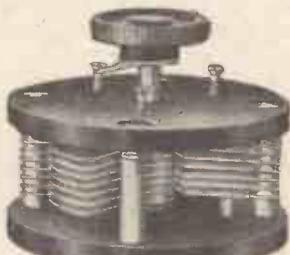
## WIRELESS ACCESSORIES

Quality guaranteed by over 50 years electrical manufacturing experience.



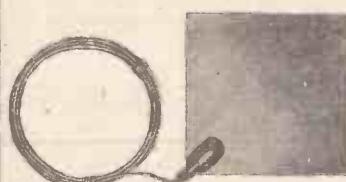
**B.570. 10-WAY INDUCTANCE OR CAPACITY SWITCH (Patent 226245.)**

This is a simply and compactly constructed component, suitable for numerous and varied circumstances where it is desired to vary the impedance of a circuit, or for opening and closing a plurality of circuits by the manipulation of a single member. It enables the experimenter to build up large capacities, and is an invaluable addition to any set. Price 5/- each.



**VARIABLE CONDENSERS (For panel mounting).**

Strongly constructed. Moving vanes are shaped to give low minimum capacity. Fitted with a stop to allow of a movement of 180 degs. only. From 5/- each.

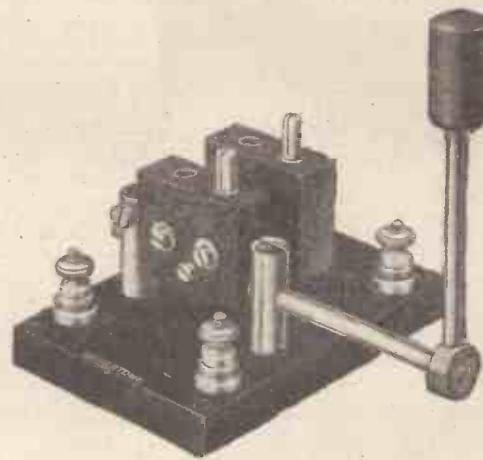


**1752. EARTH PLATES.**

Size, one foot square, complete with 10 ft. of insulated lead-in wire well soldered on. Price 4/- each.

**B.565. DOUBLE COIL HOLDERS.**

Comprising one fixed and one moving coil holder, mounted on ebonite panel  $3\frac{1}{2}$  in.  $\times 2\frac{1}{4}$  in.  $\times \frac{1}{8}$  in. thick, together with four finished and lacquered double terminals. Weight 8½ oz. Price 6/- each.



**B.601. SILVERTOWN VERNIOMETER.**

(Patent Applied for).

The Silvertown Verniometer is a most ingenious device for applying slow motion to variable condensers, coil holders, variometers, etc., consisting of an ebonite dial and knob (0-180 degs.), fitted with wormwheel bracket and wormspindle, micrometer barrel and pointer, complete with fixing screws. Gear ratio 240:1. Fitted with instantaneous release. Backlash entirely eliminated. Hand capacity reduced to a minimum. Suitable for the following makes of condensers: Silvertown, Burndep, Igranic, Polar, Sterling, Ormond, Jackson, Devicon, Utility, Ashdown, Lamplugh, Ediswan, Edison-Bell, Bowyer-Lowe, Atlas, W. & M., A.J.S., etc., etc. Price 6/- each.



### AN AID TO ENTHUSIASTS.

We have prepared a logging chart for recording wavelengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart, printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

### Makers:

## THE SILVERTOWN COMPANY,

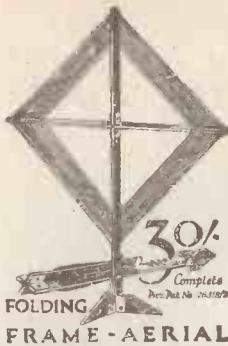
106, Cannon Street, London, E.C.4.

Works: Silvertown, E.16.

BELFAST: 73, Ann Street.  
BIRMINGHAM: 15, Martineau Street.  
BRISTOL: 4, Victoria Street.  
CARDIFF: Pier Head Chambers, Butte Docks.  
DUBLIN: 70, Middle Abbey Street.  
GLASGOW: 15, Royal Exchange Square.  
LEEDS: 1, New York Road.

LIVERPOOL: 54, Castle Street.  
LONDON: 100 and 102, Cannon Street.  
MANCHESTER: 16, John Dalton Street.  
NEWCASTLE-ON-TYNE: 59, Westgate Road.  
PORTSMOUTH: 49, High Street.  
SHEFFIELD: 88-90, Queen Street.





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Where fine tuning is required, use the Climax Folding Frame Aerial, by far the best and most efficient aerial obtainable.

Combines the advantages of both the pancake and solenoid types of windings and has a centre tapping for use with special circuits. Made to open or fold in a few seconds.

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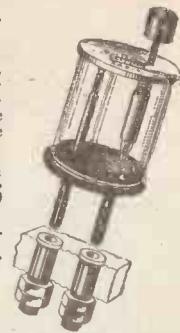
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**CLIMAX POPULAR PLUG-IN DETECTOR**, fitted with Climax Auto-micrometer Catwhisker and Climax Superb Crystal. Price 3/6



**CLIMAX AUTO-MICROMETER CAT-WHISKER** (Prov. Pat. 21,001/25) With Climax Superb Crystal. Price 2/-

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Telephone: Putney 2599.  
All Communications to above address.

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Although hundreds of wireless enthusiasts have responded to our advertisement which offered for sale the Ormsby Long Range Selective Circuit, there are undoubtedly many who are perhaps a little sceptical. To dispel all doubts concerning the extraordinary performance of this circuit, we give in illustrated form the results of an evening's actual test on 4 valves, under normal conditions with a 75 feet aerial 25 feet high, eight miles from London.

This circuit is extremely selective without loss of volume and for purity of tone it is irreproachable.

## 500 MILES ON LOUD SPEAKER.

This circuit will give loud speaker results 500 miles away and will

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The Circuit Envelope contains 2 simple wiring charts, layout and template for baseboard and valves, and full instructions for building. Send Postal Order for 2/6.

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CUT OUT LONDON.

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PRAGUE on speaker results

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PARIS speaker results

Please state if for 3 or 4 valves, and write name and address clearly.

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11.0c  
MADRID speaker results

2/6

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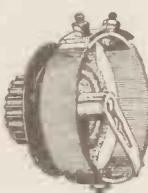
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ohms, whilst a continuation of this is of 30 ohms resistance. The resistance element is wound on a hard fibre strip under great tension. One hole fixing is provided and the terminals are placed in convenient positions. The contact arm has a smooth silk action, and all metal parts are nickel-plated.

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LEAFLET  
TO-DAY.



Every one of these highest grade instruments is FULLY GUARANTEED.

## A 2-VALVE & CRYSTAL RECEIVER.

(Continued from page 1369.)

first L.F. transformer and the Nesthill switch (S.P.D.T.).

The other L.F. transformer is made by the General Radio Company, whilst the crystal detector is the well-known "Mic-Met," which was supplied by Messrs. Peto-Scott. The wooden cabinet was obtained from the Caxton Wood Turnery Company (Market Harborough), and the panel from the American Hard Rubber Company (Radion).

(*Continued*). Any fairly stout copper wire may be employed for the connections, that shown being the well-known Glazite. If other makes of transformers are to be tried, it might be advisable to wire the connections to these with flexible leads, so that the primary and/or the secondary leads may be reversed, to find which way round gives the best results.

### The Crystal Employed.

The Crystal Empire.

When the connections have been completed the back of the panel should be carefully cleaned, as it is, of course, essential that no brass dust nor fluxite should remain to impair the efficiency of the receiver. The connections should then be checked over from the list of point-to-point wiring which appears on this page.

With regard to the accessories to be used, there is no doubt that one of the main considerations is the crystal detector. It is quite possible to employ a fixed crystal detector requiring no readjustment, but, unfortunately, reflex sets depend very largely upon the crystal. This is more easily changed if the detector is of the usual cat's-whisker type; but these suffer from the liability to easily lose adjustment. It was for this reason that the "Mic-Met."

detector was chosen, as this is one of the types that incorporates a very fine adjustment of the cat's-whisker, and thus reduces the chances of trouble from this component.

It is not generally realised that a piece of crystal which has given good results when used as a straightforward crystal detector is not necessarily suitable for inclusion in a reflex circuit. Most of the popular crystals will give good results, but, if several pieces are on hand, it is always advisable to try them in turn, and probably it will be found that one piece shows a marked improvement on all the others.

### Bright or Dull Emitter Valves.

Grid bias terminals have been provided, as shown on the blue print, and it will generally be found that results are greatly improved by the inclusion of a suitable battery here. If, however, the particular valve which is in use does not happen to require grid bias, these two terminals should be shorted by a bare wire or metal strip.

either bright or dull emitter valves may be employed and, although the former have a great reputation for reflex work, it is very doubtful whether they can better the performance of dull emitter or low-consumption valves. Almost any general purpose valve will give good results in the first stage, and any power valve or L.F. valve in the second stage. The value of L.T., H.T., and grid bias will, of course, vary according to the particular valve chosen.

#### **Adding Further Amplification.**

It is frequently asked whether it is possible to add a further stage of H.F. amplification, or of L.F. amplification, to a two-valve reflex receiver of this type. The answer is that both of these modifications are possible, but neither is recommended. For general purposes the limit of the reflex system is reached when two valves are employed in this way, and if further stages of amplification are necessary, it would, in nearly all cases, be preferable to use a straight circuit.

### Terminals for Tuning.

For the benefit of readers not familiar with series parallel tuning it may be advisable to explain that the earth lead remains on the earth terminal in either case, but the position of the aerial lead will depend upon whether short wave or long wave broadcasting is to be received. For short waves it is generally better to connect the aerial lead to the terminal marked "series," leaving the parallel terminal without any external connection.

For parallel tuning, which is generally employed for longer waves, the aerial is joined to the terminal marked "parallel." In this instance it is necessary, in order to complete the circuit connections, to join the terminal marked "series" to the earth terminal by means of a bare wire or short metal strip.

An Economical Set.

It is important to note that the 2nd L.F. transformer should be of a low ratio (i.e., 2nd stage type). When using the components shown in the photograph on the preceding page the total cost of the panel, case, and components, as shown, works out to about £5 5s. 0d., so that although the receiver is not inexpensive for a two-valver, it is economical when it is remembered that the circuit arrangement includes H.F. amplifier, detector, and two low frequency amplifying stages.

The handling of the receiver is apt to prove just a little tricky at first, but once it

#### **POINT-TO-POINT CONNECTIONS**

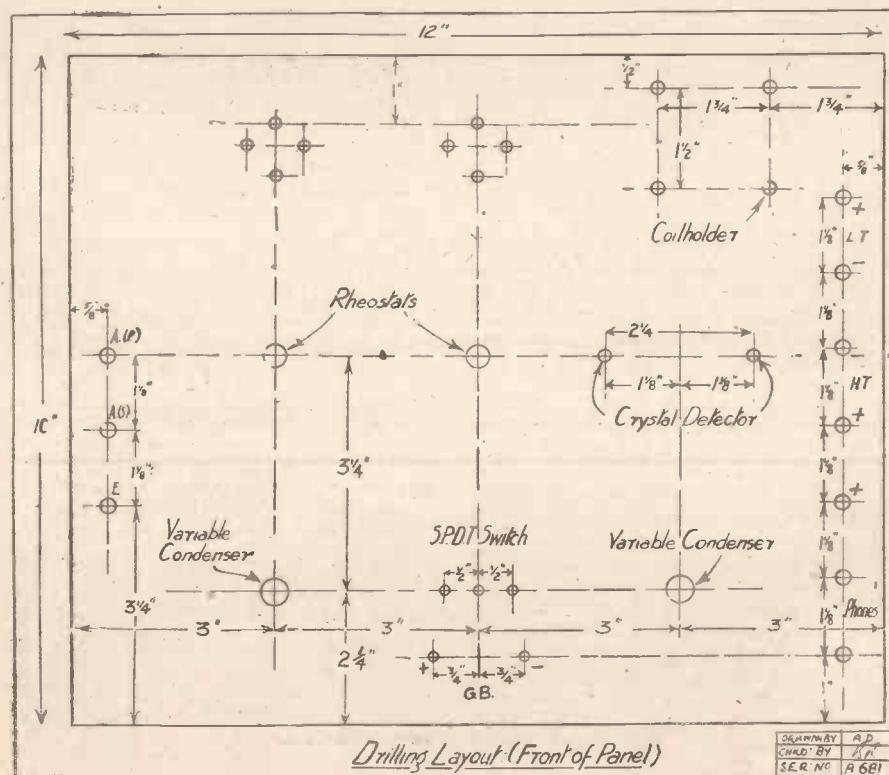
Aerial parallel terminal to fixed plates  
of .0005 variable condenser, plug of  
fixed coil holder, and grid socket of first  
valve holder.

Aerial series terminal to moving plates of '0005 variable condenser, earth terminal to socket of fixed coil holder, to O.S. terminal of first L.F. transformer and to one side of '0002 fixed condenser. I.S. terminal of transformer and other side of '0002 fixed condenser to L.T. negative, which is also connected to grid bias positive and to one side of each rheostat. The remaining connection of each rheostat is joined to one filament socket of the corresponding valve holder. A connection is taken from the remaining filament sockets to L.T. positive, and H.T. negative.

Plate socket of first valve holder to one side of crystal detector, fixed plates of '0003 variable condenser, and plug of moving coil holder. Other side of crystal detector to O.P. terminal of first L.F. transformer. I.P. terminal to moving plates of '0003 variable condenser, plug of moving coil holder, and centre contact of S.P.D.T switch. Right-hand contact of switch to O.P. terminal of second L.F. transformer, I.P. to top H.T. positive terminal, I.S. to grid socket of second valve holder. O.S. to grid bias negative.

Plate socket of second valve holder to bottom 'phone terminal and left-hand contact of switch. Top 'phone terminal to bottom H.T. positive terminal.

A .002 fixed condenser is connected across the 'phone terminals and a .001 across the primary (O.P. and I.P.) terminals of the first L.F. transformer.



# SOME BROADCAST CRITICISMS.

(BY OUR SPECIAL B.B.C. CRITIC.)

IT is generally recognised that broadcasting is in its infancy, but the lustier an infant happens to be the more essential it is that his early years shall be accompanied by just and reasonable correction.

It would obviously be unjust and unreasonable, however, to rebuke a child of three because he has not yet contrived to gain the knowledge and experience of thirty years, but that is the treatment that the majority of wireless critics obstinately mete out to the B.B.C. when they cavil at the composition of its programmes.

Having regard, not only to the diversity of interests for which it has to cater, but also to the appalling magnitude of selecting suitable items for many more than 365 programmes per annum, the B.B.C. is doing wonderful work, and is developing its ability at an incredible speed.

When it is remembered in addition that, prior to three short years ago, there was literally no standard by which to estimate the suitability of items of entertainment for the microphone, it must be obvious that the only just and reasonable course is to encourage the infant to develop, and to restrict criticism to the elimination of palpable faults that have already arisen, in the hope of obtaining the best value from the entertainment that is already at our disposition.

#### Over Elaboration.

The best entertainment in the world will inevitably fail to be appreciated if it be marred by faults in presentation. Broadcasting to-day is being criticised captiously by listeners, and by the many who are (not only from motives of unselfishness) opposed to progress.

It is essential, therefore, to eliminate ruthlessly those general faults that tend to irritate the casual listener, before delving into the major issues. If a desultory listener can detect no concrete cause for complaint, the B.B.C.'s real audience must surely derive the acme of satisfaction from what is placed before them, on the score that a dish of food is appreciated primarily for the way in which it is cooked and served rather than its food-value. In the hope of helping, I am going to call attention to some of the easily-to-be-corrected faults I have recently observed.

Over-elaboration of announcements strikes me as being very irritating to a listener. Every item, with the personnel involved, is fully set forth in the "Radio Times," and also in the columns of all the daily papers, but the announcers insistently waste time by going through the entire rigmarole before each item—sometimes more than once.

Incidentally, the announcers are not alone in this. Mr. James Agate, in his Dramatic Talk recently, afforded a concrete example by reading out a list of questions that he proposed to answer, and by announcing again each individual question as he dealt with it. I would mention here that I could hear a band practising, presumably in another studio, throughout his talk!

Another improvement would be achieved if announcers and others who read their items would eschew the use of paper that crackles audibly as each page is turned.

I maintain that, with the exception of news that may have come to light after the publication of the evening papers, the news bulletins are redundant. Mild excerpts from the less hectic news that listeners already know scarcely constitutes either information or entertainment, and the recent innovation of the inclusion of the winner of the 2.30 race in the 10 p.m. bulletin can only be described as feeble to a degree.

#### An Outstanding Success.

Programmes should be timed more accurately—or perhaps performers should be compelled to adhere to the time allotted to them. It often happens that an item has to be eliminated in order to regain lost time; if, however, the inclusion of such an item was justified in the first place, it follows that a section of listeners must have been looking forward to it, and must therefore be disappointed by its omission.

The "Pickwick Club" was an excellently-conceived appeal to Dickens lovers, but was marred by the fact that, apart from being too long for its entertainment value, most of the characters lacked personality, and many were not clearly audible. I blamed my "set" for this, until the advent of "Mr. Micawber" lifted the show right up, and the artiste in question scored a personal success. The concerted laughs, too, were woefully ragged and lacking in spontaneity.

The concluding presentation of "Radio Radiance" marked an outstanding success for Eddie Morris, who, I am glad to know, is being retained by the B.B.C. It is true that some of the material could have been improved, but I am not concerned with that point of view at the moment. In one sketchlet, however, the hoof-noises, introduced to give colour to the idea that the performers were riding in a hansom cab, were rather indicative of a horse that is weary of standing about too long. Also, the laughter and applause in the studio may have been justified by some action or grimace on the part of the artistes, but listeners were often unable to reconcile it with anything that had immediately preceded it.

#### "By Request."

Without joining in the discussion as to whether Talks should be curtailed, I urge that lecturers should be instructed to adhere to normal language. For instance, Mr. Filson Young couched his interesting description of the Battle of Jutland in melodramatically adjectival phrases that I am sure he would never have dreamed of utilising in his always enjoyable literary work.

The inclusion of women's voices in the soldiers' choruses in the recent revival of the Military Tattoo was a palpable mistake, and in his talk on "Production for Amateurs" Mr. C. Harold Ridge allowed his voice to drop to inaudibility at the end of his sentences.

A very bad instance of duplication of items was permitted to occur on January 31st, when Joseph Slater played Schubert's "Moment Musical" as flute-solo during the afternoon and William Murdoch rendered the same morceau on the pianoforte in the evening. Each rendering was duly announced in the published programmes, so that it cannot be urged that the artistes surprised the B.B.C. by unwittingly selecting the same piece.

It is to be hoped that the B.B.C. will not suffer a development of the bad concert-world custom of announcing items as being "By Request." This formula generally cloaks an artiste's belief that the item in question is the cream of his repertoire, and is always unconvincing, especially in the case of a little-known performer.

## FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

#### Talks to Farmers.

SOME time ago the Radio-Toulouse station started broadcasting some "Talks to Farmers," giving technical advice by experts, both experienced practical men and lecturers of agricultural colleges.

This has proved of such benefit to the farming community that the provincial General Council has petitioned the directors of the station to make this a regular feature. In future, there will be a daily "talk to farmers" at 5.45 p.m. (French time), while every Tuesday at 9.15 p.m. there will be a technical lecture on the practical application of chemistry to agriculture.

#### Radio a Necessity.

The Federation of French Radio-clubs has issued a manifesto announcing the most strenuous opposition to the principle of state taxation of radio in any shape or form.

"Radio," the document claims, "is a necessity nowadays, not a luxury. It is one of the most democratic of institutions, a powerful help to school instruction and to the diffusion of knowledge on hygiene, morality and social questions."

#### Cologne's Radio Show.

Radio has taken its share in the festivities which marked the evacuation of the Cologne zone by the Allied troops, and a radio exhibition was opened there on January 30th, which lasted a week.

Although it is being held in connection with the "liberation" of this part of the Rhineland from Franco-British occupation, the show is not restricted to German firms, but includes a number of interesting exhibits by British and French as well as Swedish firms. As is the case at most radio exhibitions on the Continent, American firms are conspicuous by their absence.

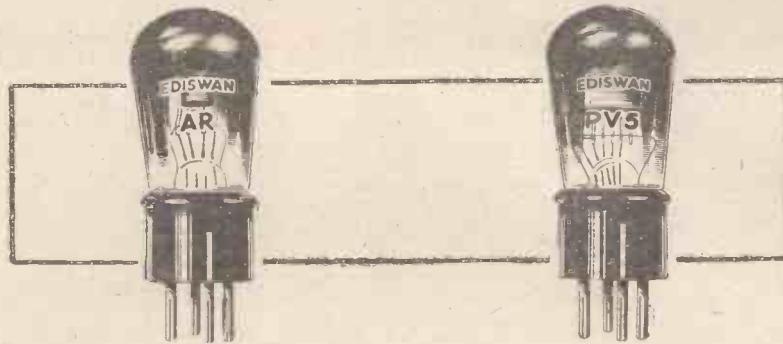
#### Radio in Rhineland.

The unexpected difficulties raised by the German authorities in granting radio licences in the Rhineland after the Allied prohibition had been removed have apparently now been solved, and some indication

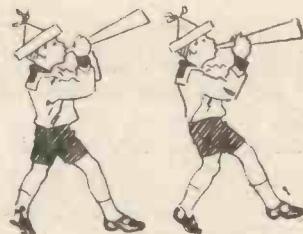
(Continued on page 1380.)

# THE HAPPY FAMILY

*Affinities*



There is a decided affinity, a quite definite link between each Ediswan Receiving Valve and Ediswan Power Valve. The Receiving Valves are supplied either H.F. or L.F. and the best Power Valve to use is shown in the table opposite.



They always get on well together. It's like that in every large family. Always two that will work—or play—better with one another than with anybody else. Every Ediswan valve has its family affinity.

It gives good service

in any conditions . . .  
the best service when  
it is employed with  
its "twin."

#### The Valves to Use.

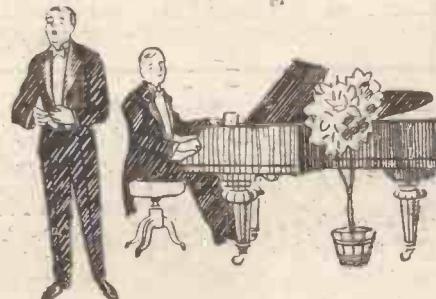
Receiving.	Accumulator or Battery Volts.	Power.
A.R. - -	6	P.V.5
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With these groups and Ediswan H.T. and L.T. Accumulators the ideal is attained.

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## EDISWAN VALVES

Will Improve  
ANY Set



Ediswan Valves  
are entirely  
British Made.



Traders and manufacturers are invited to submit wireless sets and component parts 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.

A VERY attractive tear-off Calendar has been produced by the Mullard people for use in wireless showrooms. It is both artistic and original in design. Radio dealers are advised to get in touch with the Mullard Wireless Service Co., Ltd., before their stock is exhausted.

The days of cat's-whisker "crystal tickling" are numbered, for the automatic type of detector is rapidly becoming exceedingly popular. Quite recently we received a very excellent example of this up-to-date type of instrument for test, known as the Cymosite Auto Detector. It is a very solid little piece of apparatus, and its mechanism is both novel and effective in its simplicity. A small knob, which can be rotated in either direction, is the only adjustment, and this provides both a

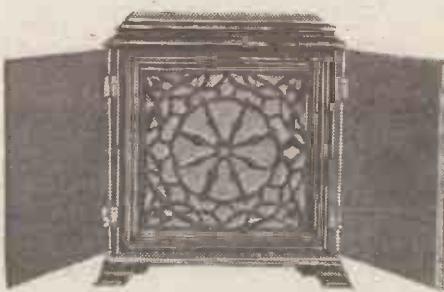
continuous series of pressures and a continuous series of surfaces between the two crystals employed. Very sensitive adjustments are possible, although none is by any means critical from a mechanical point of view. On the contrary, excellently stable settings are available throughout the whole range of movements. Results were very good indeed when this Cymosite Auto Detector was used in a straightforward crystal set; while further tests showed it to be eminently suitable for valve-crystal reflex work.

It makes a neat panel fitting, and its connections in a circuit can immediately be reversed merely by turning the whole detector round, as it is supplied with slotted brass "feet" for slipping under two terminals. It retails at 7s. 6d., and should attract considerable attention.

A coil plug of interesting design has been produced by the Reflex Radio Co., Ltd., of 198, Lower Clapton Road, London, E.5. Instead of consisting of one solid block of insulating material with a socket and plug embedded in it, the article is moulded so that two pillars rising from the base are formed. There is, therefore, a reduction of solid insulating material, air being introduced instead. It follows best "low loss" principles, and, as bakelite of good quality is used, is highly efficient in its "overall" insulating qualities, as was proved on a "megger" test.

An L.F. transformer, reasonably priced at 15s. 6d., which deserves to command attention is the Telsen, made by the Telsen Electric Co., 207, Aston Road, Birmingham. It is shrouded and given a black crystalline finish. With its neat, bright terminals generously and symmetrically spaced and its neat indicating plates, it has the attractive appearance of a "Lilliputian" power station transformer.

(Continued on page 1368.)



An artistic loud speaker: the "Beco" de Luxe.

## —Ripaults—

L.F. INTERVALVE TRANSFORMER  
FOR PURE  
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S H R O U D E D

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In the LEWCOS Coil the makers of "Glazite" have achieved another outstanding success.



CLEAR as a bell the typical French orchestra came through as the listener tuned in with his LEWCOS Coil. Coil after coil had been tried and discarded in an endeavour to realise that rare selectivity and fine tuning so essential to complete radio enjoyment.

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**LEWCOS**  
*Inductance Coil?*

THE LONDON ELECTRIC WIRE CO. & SMITHS, LTD.,  
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*Why*  
**LEWCOS COILS**  
*give better tuning*

1. The LEWCOS Coil embodies high electrical efficiency with great mechanical strength.
2. The LEWCOS Coil is very selective, resulting in extremely fine tuning.
3. The LEWCOS Coil has an exceptionally low high-frequency resistance with a corresponding increase in signal strength.

**All LEWCOS Coils  
bear this LEW seal**

This  
Mark



Guarantees  
Quality

JUDD

## APPARATUS TESTED.

(Continued from page 1366.)

It is interesting to note that its primary winding consists of 6,100 turns of 42 S.W.G. and its secondary 28,000 turns of 45, giving a ratio of 4·6 to 1. From this it will be judged that the component has ample primary impedance, and does not gain in ratio by losses in that direction. Amateurs may criticise the fineness of the wire and wonder how 42 stands up to "surges"; but, as a matter of fact, 42 is quite a usual gauge to employ in wireless transformers, and purchasers of the Telsen are covered against breakdowns by a guarantee issued by the makers.

On actual test we found the Telsen to be pleasingly efficient. Frequency distortion was inappreciable even at the limits of the middle ranges, while amplification was robust and the tone mellow. Owing to its high primary impedance and moderately high ratio it can be used in both first and second stages with advantage.

\* \* \*

Some plug-in coils, especially those that fit rather tightly into their holders, begin to look rather "secondhand" after a few months' service. Constantly pulling them out by giving them a series of combined transverse shakes and vertical tugs loosens their settings and sometimes damages their windings. Messrs. Aston and Manders (1917), Ltd., of Willesden, N.W.10, have produced a coil with a patent handle that cannot succumb under such treatment. It

must be remembered that a good contact is necessary, and some coil holders err on the side of tenacity, so that there is not much else that can be done to solve the problem. However, the "Compton" coil sent us by the above firm, and fitted with their patent handle, gets over the difficulty, for it will stand a pull or push to the extent of a 28-lb. pressure without damage.

\* \* \*

Owing to a typographical error which occurred in the announcement of the Radi-Arc Electrical Co., Ltd., the postal district was shown as W.1, whereas the correct address is Bennett Street, Chiswick, W.4, to which all communications should be sent.

\* \* \*

The need for geared variable condensers has long been felt in the States, and American practice is gradually influencing the design of British radio components. Straight-line frequency variable condensers are also becoming extremely popular, and we have just tested a model of this description marketed by the Service Radio Co., Ltd., of Stoke Newington.

The condenser has a gearing system of wheels and bevels and gives a steady drive with a "step-down" of 100-1. This enables very accurate tuning to be done, and as this gearing only comes into action if the smaller of two concentric knobs is used, the condenser is one that should appeal to the radio enthusiast. Constructed on the low-loss principle, the condenser is well made of heavy gauge brass and is altogether an efficient job. For short-wave work the condenser should be extremely useful.

Resistance-capacity coupling has for some time been popular in this country for low-frequency amplifiers, and now that there are plenty of valves specially designed for this type of amplifier there is no excuse for listeners to put up with distorted results. Amongst the valves we have recently tested must be mentioned the Mullard D.F.A.4 which is eminently suitable for resistance coupling. With an impedance of 27,000 ohms and filament voltage of 5·5 volts at 2 amp. the valve makes an economical amplifier with a good amplification factor. We have had three of these valves going in a set for some time, and can heartily endorse the makers' claim that they are "master" valves.



Testing the sections of a Marconiphone "Ideal" transformer before assembly.

# A Wonderful Battery

**T**HE Fuller "BLOCK" Batteries are unique. They retain their charge for extraordinarily long periods of intermittent service and are practically proof against mechanical injury. Block Accumulators are ideal for Car lighting, &c., while in Radio Work the High-Tension Block Battery has decided advantages over Dry Cell Batteries.

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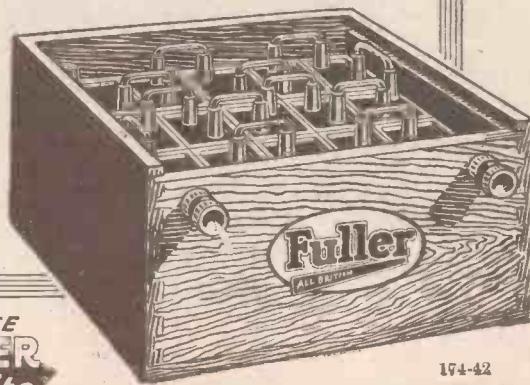
**Made and Stocked in a wide range of types and sizes.**  
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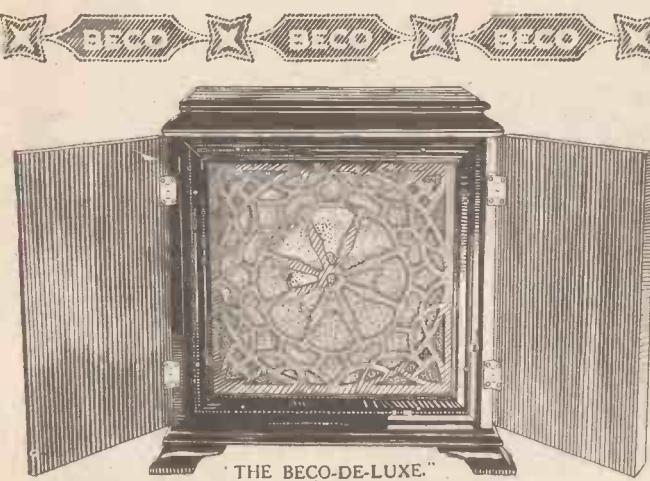
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**BECO**

### HORNLESS LOUD SPEAKER

*Extract from "BROADCASTER":* "We can unhesitatingly recommend the new 'Beco-de-Luxe' Loud Speaker, for we are of the opinion that on account of its exceptionally pleasing appearance and splendid qualities as a reproducing instrument it has a great future before it."

THE small 1926 "Beco"—  
a very efficient and  
attractive model—gives unusual  
volume, with crystal clarity.

Nickel 52/6 Oxydised Sil-  
ver or Copper 55/- "The 1925-26 BECO."



Dept. P.W., British Electrical Sales Organisation,  
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# Announcing the New Range of Six Sixty Valves



THE increasing demand for all types of Receiving Valves has proved to us that, despite the excellent all-round qualities of the original 660 Electron Dull Emitter Valve, the general Radio public require specialised valves for definite circuits.

Our new range, embodying the latest developments of modern scientific research, will prove the continued and greater success of Electron 660 Valves.

And remember, no matter what type you choose, each valve is carefully designed to carry out its particular job, and bears the Six Sixty Mark of **PERFECTION OF QUALITY**



Write for leaflet  
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particulars.

S.S.1 (Blue Disc). Bright Emitter General Purpose Valve. Voltage—3·7 volts, consumption .66 amps ..	8/-
S.S.2 H.F. (Red Disc). D.E. Suitable as a Detector when followed by Resistance or Choke. Voltage—2 volts, consumption .3 amps ..	14/-
S.S.2 L.F. (Green Disc). D.E. Suitable for small and medium-sized Loud Speakers. Voltage—2 volts, consumption .3 amps ..	14/-
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S.S.4 D.E. L.F. Amplifier and Loud Speaker Valve. Voltage—5 volts, consumption .25 amps ..	22/6
S.S.5 D.E. H.F. Amplifier and Detector Valve. Voltage 5·5 to 6 volts, consumption .06 amps ..	24/6
S.S.6 D.E. Resistance Capacity Amplifier and Detector Valve. Voltage—5 volts, consumption .25 amps ..	22/6
S.S.7 D.E. Power Valve. Voltage—3·7 volts, consumption .1 amp ..	22/6



**BETTER BY SIX TIMES SIXTY**

The Electron Co. Ltd., Triumph House, 189, Regent Street, London, W.1.

# 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and 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 trader would be well advised to obtain permission of the patentees to use the patents before doing so.

#### PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. 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.

#### TECHNICAL QUERIES.

Letters should be addressed to:  
Technical Query Dept.,

"Popular Wireless,"  
The Fleetway House,  
Farringdon Street,  
London, E.C.4.

They should be written on one side of the paper only, and **MUST** be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions : (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

**IMPORTANT.**—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large and as clear as possible.

No questions can be answered by 'phone.  
Remittances should be in the form of Postal Orders.

## Questions and Answers

#### BROKEN CIRCUIT PUZZLE.

"AMATEUR" (Glasgow).—Why is it one can obtain signals on a one-valve set when the grid circuit between the earthed side of the inductance coil and the filament is broken?

Leakage through the panel or other intervening "insulating" material is the probable reason.

#### H.T. FROM MAINS.

H. G. D. (Fleetwood) and others.—I am desirous of making the chokes shown in the diagram of H.T. from mains, as per "Valve Experimenter's Handbook" (P.W. 176). What are the constructional details?

The chokes are wound on a solid cylindrical former 1 in. x 5 in., consisting of 22-gauge soft iron wire. After arranging this in a neat bundle, the whole should be given a coat of shellac, and over this a layer

(Continued on page 1372.)

## VOLUME AND LONG-DISTANCE RECEPTION are the CHARACTERISTICS of the

### "GOLTONE" (Regd.) VALVE SETS

EXTREMELY SELECTIVE. (BRITISH MADE) SIMPLICITY IN TUNING.

Polished Oak Cabinet, high-grade finish. Ample space is provided inside the Cabinet for the Batteries, whilst the Loud Speaker can be placed on top. The only Wires on view are those connecting to the Aerial, Earth and Loud Speaker, and the whole presents an extremely neat and tidy appearance.

Complete with ALL Accessories, including "Goltone Junior" Loud Speaker, Sampson Accumulator, Volex Battery, Valves, Aerial Set, Plug-in Coils, Marconi Royalties. No extras required.

#### TYPE "B" TWO-VALVE SET

Gives Loud-Speaker reception within 40 miles of main B.B.C. Stations and 150 miles from Daventry High-Wave Station. Complete with All Accessories as above. Price £12:2:6

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Gives greater volume over a much wider radius than the Two-Valve Set. Complete with All Accessories as above. Price £15:17:6

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Receives the majority of British and Continental Stations with extraordinary volume on Loud Speaker. Complete with All Accessories as above. Price £18:8:0

B.D.P., George Road, Mossill Bay, South Africa, writes: Oct., 1925.

I have a 4-Valve "Goltone" Receiver giving me perfect results. I can work out Stations on the Loud Speaker any time during the day, our stations being 200, 600 and 700 miles away.

Send for large Illustrated Radio Catalogue No. R/113, post free on request. Dealers should enclose Business Card or Memo. for Trade Terms.

**Ward & Goldstone**  
PENDLETON LTD.  
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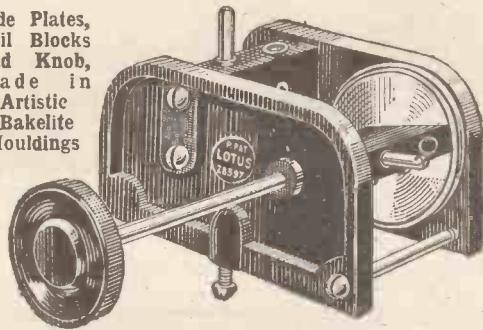


**Get more out  
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*Fit a*

# LOTUS Geared Vernier COIL HOLDER

Side Plates,  
Coil Blocks  
and Knob,  
made in  
Artistic  
Bakelite  
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You have experienced that annoying and irritating fading away of volume after tuning your coils. This is due to the moving block falling. The Lotus Moving Block **CANNOT FALL**.

The Vernier movement comprises three sets of enclosed precision machine-cut gears, and reduces the speed of the moving coil block by eight times.

**Has the Largest Sale  
of any type of Vernier  
Coil Holder**

There are Two Types of Lotus  
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For Outside Panel Mounting :  
Two-way, 7/-; Three-way, 10/6

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The dielectric is mica and each condenser is tested at 500 Volts during inspection. Nickel plated cases give them a particularly neat appearance.

'0001 mfd. . . . .	1/6
'0002 " . . . . .	1/6
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'0003 " (with clip for grid leak)	1/8
'001 " . . . . .	1/8
'002 " . . . . .	1/10
'005 " . . . . .	2/8
'01 " . . . . .	3/9

**"COSMOS" GRID LEAKS**  
are uniform and permanent.  
1, 2 and 3 megohms, each 1/6

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R  
P29



## RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1370.)

of empire tape is wound. The core should then be roughly divided into five sections (a good plan is to make a number of small discs of cardboard with a hole in the centre so that they fit tightly on the former). The choke should be wound with  $2\frac{1}{2}$  lbs. of 28 S.C.G. wire.

As this constitutes approximately 1300 yards in each of the five slots, 260 yards of wire should be wound in each. One slot having been wound, the wire is carried on to the next slot until the five slots are wound. The whole can then be covered with empire tape and the choke conveniently mounted on a board, the two ends being brought out to two terminals.

### EXTRA FILAMENT RESISTANCE FOR DULL Emitter VALVES.

T. B. S. (Croydon).—Can you tell me how to work out what extra resistance is required when using a dull emitter instead of a bright emitter on the same accumulator?

First of all, it is necessary to discover the resistance of the dull emitter valve when it is to be used. If it is one of the types which take .06 amps. at 3 volts, then the resistance of its filament will be .56 (in accordance with Ohms, law  $R = \frac{V}{C}$ ) that is, 50 ohms.

Now if a 6-volt accumulator is to be used, obviously the total resistance in circuit must be such that when it is divided into 6 it gives .06, and no more. .06 divided into 6 will give this value, which is 100 ohms, and this will be required in the circuit. The filament of the valve will contribute 50 ohms, leaving another 50 to be provided; 10 ohms will be covered by the wiring and the ordinary filament resistance, and thus a fixed resistance of 40 ohms should be employed in the particular example given.

$$\text{In formula form, } R = \frac{V^2 - V^1}{C} \text{ ohms}$$

where  
 $R$  = total additional resistance required, which will include that provided by the filament rheostat in use;

$C$  = normal current consumption of the dull emitter valve which it is desired to use;

$V^1$  = the voltage specified for the dull emitter valves by the makers;  
 $V^2$  = the voltage of the accumulator or battery in use.

### PERIKON DETECTOR.

J. P. (Manchester).—Will an applied potential through a potentiometer increase signals on a receiver employing a perikon detector, copper pyrites and zincite?

Sometimes this does so, but not in every case. Any way, the applied potential must be very small. A single dry cell would suffice as an experiment.

### LOOSE-COUPLED TUNING.

"MORSE-JAMMED" (Southend-on-Sea).—What is the best form of tuning for a valve circuit, not too difficult to operate, which will overcome the intermittent jamming due to ships?

I wish to use a detector and L.F., but with some form of selective tuning that is adjustable for the various conditions of the jamming, that is sometimes fierce, and at other times comparatively quiet.

The circuit reproduced herewith shows an excellent method of minimising such interference. The tuning arrangement includes an aerial (primary) coil, and a secondary coil, which can be switched in or out of circuit as required by means of a D.P.D.T. switch.

When the switch is thrown to the left the primary acts as a simple aerial coil, and is joined through

the switch contacts to grid and filament in the ordinary way.

Primary and secondary coils are mounted in a two-way coil holder, and if the secondary is moved right away from the primary straightforward searching can be carried out. If jamming from one particular station is troublesome, the secondary coil can be made to act as an inductively-coupled wave-trap.

It will be seen that the secondary coil is connected to a variable tuning condenser, but not to any other part of the set. If, therefore, it is brought near to the primary coil and tuned sharply to the interfering oscillations, it will act as an absorption wave-trap. Much of the interfering energy will be absorbed by this circuit, especially if the degree of coupling is varied carefully until the best possible results are obtained.

Such an arrangement is specially suited to counteract interference from one particular station, because the tuning condenser can be left adjusted (and also the degree of coupling), so that the jamming is at a minimum.

If, however, several ships are working intermittently, it is generally better to use a primary and secondary tuning circuit. This can be accomplished by throwing the switch over to the right, which disconnects grid and filament from the aerial circuit, and places them instead across the tuned secondary,

The primary (aerial) circuit is now tuned to the desired signal, and although the jamming is present in this circuit, the secondary circuit (which is controlling the detector) is comparatively free, especially if the coupling between primary and secondary coils is loose.

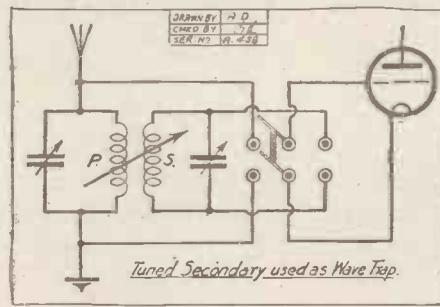
### TUNING-IN DISTANT STATIONS.

"NOVICE" (Bedfordshire).—I have purchased a 2-valve set, which, I am told, consists of an H.F. and a detector valve.

Having no friends interested in wireless in the immediate neighbourhood I cannot obtain any information as regards tuning the set, which appears to be working O.K., but on which I cannot receive distant stations, although I receive whistles (which I take to be their carrier waves).

Can you inform me how I can receive distant stations?

(Continued on page 1374.)



# EDISON BELL RADIO

IMPROVE YOUR RECEPTION BY USING EDISON BELL INDUCTANCE COILS

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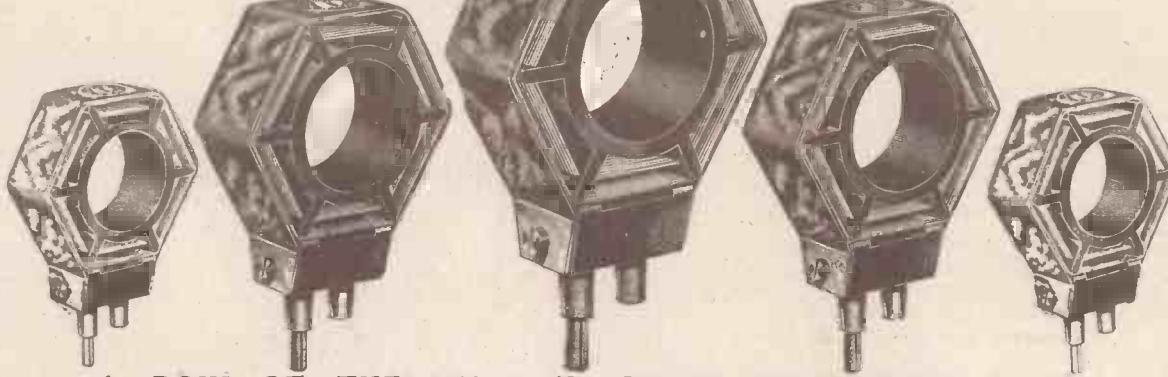
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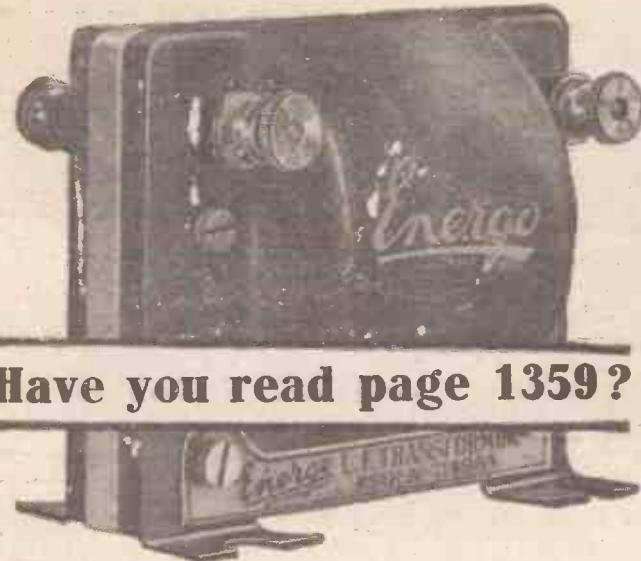


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## Have you read page 1359?

IT'S well worth while studying. For there you will find, not only constructional details of a really first-class receiver, but also the secret of L.F. Amplification. Do as the experts of POPULAR WIRELESS do—fit the Energo "Orphean"—the shrouded, low-frequency transformer that gives distortionless, clear-toned reproduction throughout the complete range of audible frequencies. That it is used by a number of leading receiver manufacturers is additional proof of its superiority.

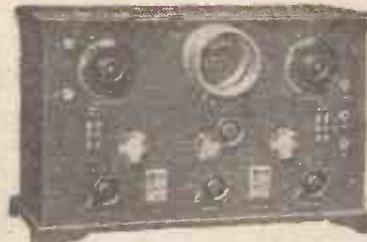
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Finished Instrument complete with 3 B.T.H. B5 Valves, 4 volt 20 act. amp. hour Acc., Sterling Baby Loud Speaker, 99 v. Hellesen H.T. Battery

20/- down and 13 monthly payments of 30/-

### 4-Valve Family Receiver, Type B.

Finished Instrument complete with 4 B.T.H. B5 Valves, 4 volt 20 act. amp. hour Acc., Sterling Baby Loud Speaker, 99 v. Hellesen H.T. Battery

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Finished Instrument complete with 2 B.T.H. B3 Valves, 4 volt 10 act. amp. hour Acc., 100 volt H.T. Battery, Ultra Loud Speaker.

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Bend us your name and address on a post card and we will send you a copy of our latest 56-page Booklet which describes in detail a large number of well-known Receiving Sets. Not only can you purchase ready-built Sets from us on our generous instalment terms, but we will supply you with the complete kit of parts so that you can construct the Set yourself, and gain experience in so doing.

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P.S.1609.

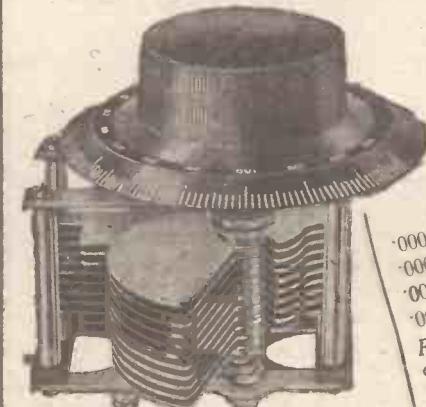
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VARIABLE CONDENSER**



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Telephone: Enfield 672.

## RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 1372.)

I know my aerial and earth are all right as I have had a crystal set working from 5 X X on them.

You are evidently receiving the carrier waves but do not know how to resolve them.

On a set of your description there are usually two variable condensers, a 2-way coil holder, an isolated coil holder, and two filament rheostats.

Assuming you know the correct coils to plug-in and that everything is connected up correctly, you proceed as follows: First turn on the filament rheostats. If the valves take 4 volts and a 4-volt accumulator is used they should be turned right on, so that all resistance is out of circuit. Should you, however, be using a 6-volt accumulator, the rheostats must only be turned on about two-thirds of the way round, otherwise the filaments of the valves will be over-run.

Having adjusted the filaments the reaction coil should then be moved towards the coil to which it is coupled.

Usually the reaction coil is coupled to the aerial coil, but on some sets it is coupled to the anode coil.

The important thing to remember, however, is that whatever coils are coupled together, they should never be so close together that the set howls, as this causes interference to nearby sets.

A good method of adjusting the reaction coil is to bring it gradually nearer the anode or aerial coil and while doing so keep on tapping the aerial terminal with a wetted finger.

While a series of clicks will be heard even when the reaction coil is at 90 degrees with the anode or aerial coil, these will be suddenly intensified on bringing the reaction coil closer.

In practice, it will be found satisfactory if the set starts oscillating silently when the reaction coil is brought up to within approximately 45 degrees of the coil it is coupled to, although if it oscillates (heard by the intensified click) when the reaction coil is farther away, a smaller reaction coil should be used, and the same process repeated.

Having got the set almost oscillating, the reaction coil is left in this position. The two variable condenser dials are then rotated simultaneously, both starting at about the same number of degrees.

It is always a good plan to start at 90 degrees on each dial, as then you can tune down so many metres, and also (by rotating the condenser toward 180 degrees) tune up an equivalent number.

If the set gets away from the oscillation-point when the condensers are set at 140 degrees or more, then the reaction coil can be brought slightly closer to the other coil.

When the carrier wave of the transmitting station is heard the condensers are rotated until it is at its maximum volume, and the reaction coupling is loosened as far as possible.

Should, however, speech or music be distorted, the reaction should be "loosened" further by moving it away from the other coil. Signal strength will then decrease slightly, but it will be found that the distortion has disappeared.

It is always advisable to incorporate vernier adjustments on the variable condensers, as without their use weak signals are sometimes passed by, while they give a certain amount of selectivity and often rid distant stations of interference.

(NOTE.—This reply has been reprinted at the request of many readers.)

### SIMULTANEOUS BROADCASTING.

**A. B. C. (Torquay).**—When the B.B.C. stations are simultaneously broadcasting, does one receive the sum of the transmissions, or only the one station, as in a usual separate programme transmission?

Each of the stations, although all are transmitting the same programme, is using its own particular wave-length, as is the case when it is broadcasting its own individual programme, so that one only actually hears the station to which one's receiver is tuned.

### CRYSTAL SET PHENOMENA.

**J. T. W. (Essington, near Wolverhampton).**—Can you tell me what caused the following? I am using a crystal set, with a D.P.D.T. switch for switching from 5 X X to 5 I T, and I left the switch open last night while I was talking.

After a while I put the 'phones on, and forgetting the switch was open, I thought the crystal was "off," so I touched it. As soon as the cat's-whisker touched the crystal there was a very loud crackling noise in the

'phones, and a small blue light was on the crystal where the whisker was in contact with it.

What with the noise in the 'phones and the blue spark on the crystal I dropped the 'phones thinking there was lightning about, but it was a quiet night and was snowing slightly.

I came in and touched the crystal again, with the same result, except that the noise in the 'phones had changed to a loud buzzing, which could be heard ten feet away. I then thought the 'phones were at fault, so I put the switch over for 5 X X, which was as loud reception as ever. What caused this?

By the way, I can "work" a "Tom Tit" speaker from 5 X X, about sixty miles away, and from 5 I T, twelve miles, and can hear Manchester faintly on the speaker.

I can get Stoke-on-Trent and Nottingham on 'phones, and hear words quite plainly without any effort. London and Cardiff are much fainter.

I have got all stations named repeatedly for persons who have come to hear my set, for which I have to thank "P.W."

The cause of the crackling noise and of the blue sparks was an electrical charge upon the aerial. This would appear to have been a fairly powerful static charge, caused by the snow. The flakes of snow had been electrified in the clouds, and each one touching the aerial had imparted a slight charge to it, as it was insulated from earth (by the open switch). It thus became heavily charged, and when earthed through the crystal a fairly large current passed, causing the phenomenon you noticed.

### QUERIES RECEIVED.

**G. C. (Wrexham), F. C. (Rathmines, Dublin), T. D. (West Kensington),** and numerous others.

—Your queries are not of sufficient interest to be answered in the "Radiotorial" columns. If a reply by post is required, the rules of the Query Department (as set out under the heading "Radiotorial") should be carefully observed, and the questions repeated in full.



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No.	Size	No.	Size
25	2/8	200	4/9
30	2/8	250	5/3
35	2/8	300	6/2
40	2/9	400	7/1
50	2/10	500	7/6
60	2/11	600	8/1
75	2/12	750	8/9
100	3/2	1000	10/1
125	3/6	1250	11/1
150	3/8	1500	12/1
175	4/3		

From all good dealers.  
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By Order of the Liquidator. Without Reserve.

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HENRY J. SHAW is instructed to sell BY AUCTION WITHOUT RESERVE, ON THURSDAY, FEBRUARY 18th, at 11.30 prompt, the Complete Stock of a Wireless Goods Factor, including 200 POLAR RADIOPHONE 7, 3 & 2-Valve Sets in Chippendale, Jacobean, and Globe Wernicke Cabinets, Polar L.F. & H.F. Amplifiers, 120 POLAR BLOK Crystal Sets, Combined Crystal and Valve Sets, and 1, 2, 3, 4, 5-Valve Sets, 40 ELWELL Portable Sets, ELWELL ARISTOPHONE 1, 2, & 4-Valve Sets, ELWELL Loud Speakers, 500 POLAR CAM VERNIER Coil Holders (3 and 2-way), 3,000 POLAR UNIVERSAL 2-way Coil Holders, 500 DUBILIER Fixed Condensers, 500 prs. POLAR Headphones, 80 prs. Gambrico Headphones, B.T.H. Headphones, 100 IGRANIC TRANSFORMERS, 300 Holderstats, 150 Lissenstats, 400 POLAR Variable Condensers, 50 ELWELL VARIOMETERS, ELWELL Rectifying Units, ELWELL H.F. Transformers, ELWELL H.F. & L.F. Tuning Units, 22 MAGNAVOX Loud Speakers, WESTERN Electric Loud Speakers, POLAR BLOK Cabinets, fittings and parts, POLAR BLOK large assortment of small accessories, 4,000 Coils of Aerial, 200 Coils of Flexible, Large Quantities of Lead-in and Connecting Flex and Insulated Wire, 300 New 2, 4 & 6 Volt Accumulators. On view day previous and morning of sale. Catalogues from the Auctioneer: 85, Newington Causeway, S.E. 1. Phone: Hop 3862.

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'Phones Rewound and Remagnetized... 4/-  
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Loud Speakers and Transformers Rewound.  
Farcaps, Leads, Diaphragms. Postage extra.  
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Price each: 1d. 1d. 1d. 2d. 2d.  
DAREX RADIO CO., Standard Works, Forest Hill, S.E.13.

The BROWN A at 22/6 or A2 at 15/- are the best for use with the P.W. Paper Diaphragm, Loudspeaker, Frames, &c. Stamp for List.  
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**WHEN** replying to advertisements please mention "Popular Wireless and Wireless Review" to ensure prompt attention. **THANKS!**

**L.F.A.R.**  
**L.F. TRANSFORMERS**  
ALL RATIOS.  
Maurice Bobin.  
21 Warwick Lane, London, E.C.4  
Phone. Cen. 4872

## CORRESPONDENCE.

(Continued from page 1348.)

### JAZZ AND THE CRITIC.

The following is a copy of a letter we have received from Mr. Jack Hylton:

The Editor, POPULAR WIRELESS.

Dear Sir,—I should be most glad if you can find it convenient to be present at a rendering of "The Selfish Giant," a symphonic phantasy by Mr. Eric Coates, which my band is to broadcast on Thursday evening.

I gather from an address given by you at Hull, in which you refer to jazz as

"vulgar,"  
"blatant,"  
"grotesque,"  
"boisterous,"  
"degrading."

and "a lapse from the normal," that your acquaintance with this form of musical expression is less exact than your mastery of oratorio. In all fairness, then, it seems to me that you owe it, if not to yourself and your considerable public, at least to us who express ourselves in jazz, to hear this phantasy by Mr. Coates, which is to be played by a purely jazz band for the great public of listeners in prior to being recorded in a more permanent form.

I cannot think that either the work itself or our rendering of it will impress you as in any sense "degrading."

Believe me,

Yours faithfully,

(Signed) JACK HYLTION.

Dr. Henry Coward, M.A.,  
2, Moorgate Avenue,  
Sheffield.

### LIMITATIONS OF DX RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—In the issue of "P.W." No. 192, you ask readers to let you know about DX reception. It would be of extraordinary interest if only some of them will accept your invitation. It is such nonsense the way some people write, and the way advertisements are worded so often, both give novices in radio such wrong ideas and often cause much heart-burning. I refer to 30 programmes in an evening; or any of 40 stations at will, etc., etc.

Now, as regards this part of the world, with a fairly powerful 5-valve neutrodyne receiver the following is a fairly representative statement. In two hours after dinner I can pick up some 30 different stations, all on the loud speaker, and a great many at fair volume. But to say one can listen to 30 different programmes, with pleasure, is absurd!

Five or 6 is the utmost one can expect; 5 X X, 2 LO, 6 B M, of course, can always be counted on, loud, only using 4 valves. Then Radial and Berlin (K W) will come in, also one or other of the following: Berne, San Sebastian, one of the Madrids, Toulouse, Hamburg (slightly heterodyned by Bournemouth), and one or two other German stations; also Birmingham.

But it is very seldom that one can listen to a programme from any of these (lower wave) for more than ten minutes at a time, then the eternal Morse starts, and if it is a foreign station it fades right out. Occasionally I've got Berne or Brussels so loud that I've switched off one valve. On 'phones one sometimes can listen better, on four valves, but bad Morse on 'phones is a terrible infliction.

This brings me to another point, of consolation to those who don't own powerful sets. It is quite possible for a two-valver, using 'phones, to listen to several distant stations far more pleasantly than can the five-valver. There is no doubt that one or two stages of H.F. do bring in a lot of unwanted noise. I only hope more readers will write to you, and that you will then be good enough to give us a digest of their various experiences.

Yours truly,  
C. LANG (Lt.-Col.).

Whytegates,  
Church Crookham,  
Hants.

### POLARITY TESTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent number in a reply to "P.M.", who asks for details of a cheap polarity indicator, you recommend a mixture of sodium sulphate and phenolphthalein.

This is certainly cheap, but I should like to recommend to "P.M." and to your readers generally, a method which is just as efficient, far cheaper, and far more convenient—because the materials are already in every home—than the one suggested by you.

If "P.M." will cut an ordinary potato into two, and if he will fix two wires from the mains into this, he will find that the potato will first bubble at one lead, and that then it will turn green by the other lead. The lead turning the potato green is the positive. The wires should be placed about two inches apart in the potato on the house mains, and closer together for lower voltages.

Yours truly,  
D. S. SAHLAVALA.

2, St. Albans Villas,  
Highgate Road,  
London, N.W.5.

### MORSE CODE LESSONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—On looking through some foreign radio papers, I notice that several Continental broadcasting stations have taken up the practice of giving lessons in the Morse code.

This seems to me to be a very good idea, and I have little doubt that it would prove popular in this country.

I have already written to the B.B.C. concerning this, and am awaiting a reply.

You will no doubt admit that the percentage of listeners in the British Isles who are able to read Morse is deplorably small, and yet there must be many thousands who would be delighted with the idea of picking up a message in code and being able to understand what it was all about.

If put to the vote, I am almost certain that an overwhelming majority in favour of the adoption of this idea would result.

Yours faithfully;  
M. WILLIAMS,  
39, Tottenham Court Road,  
London, W.1.

### RE SUNDAY PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read J. H. Horsley's letter re above in a recent issue of POPULAR WIRELESS, and admit the two paragraphs are a little misleading, but I had in mind the fact that De Groot only figures on the Sunday programmes at irregular and well-spaced intervals.

Being cognisant of the fact that criticism does its value unless a suggestion or constructional policy accompanies it, I suggest the only solution to the difficulty is that the B.B.C. wash out all their stations (except 5 X X), and erect three, or perhaps four, high power stations, situated so that they will cover the whole of England, Scotland, and Wales. The wave-lengths to be arranged so as to give fair margin for tuning, and each station to have an entirely different programme. This would, I believe, give everyone the choice of at least two programmes. Technical difficulties may arise, but no doubt these could be overcome, and I certainly think the position would be more economical, both from a maintenance and a programme point of view.

It would certainly clear the ether of at least fifteen or sixteen stations that are struggling for a hearing.

After all said and done the majority of listeners settle down to one programme for the evening, and it is only due to the fact that they have no alternative programme, which gives rise to so much searching and the oscillating nuisance.

I always experience more interference from oscillators on Sunday evenings than at any other time during the week.

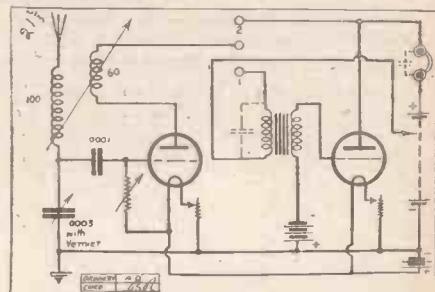
Yours faithfully,  
R. S. RUDLAND,  
36, Gipsy Road,  
Welling, Kent.

### A STRAIGHT THREE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to my recent letter giving results obtained from my straight 3-valver, I have been inundated with requests from readers asking for particulars, and I find it impossible to reply in detail to all of them individually.

I should be grateful, therefore, if you could find space to publish the enclosed "back-of-panel" wiring diagram, which I think is self-explanatory. I constructed the set from various diagrams, etc., I saw from time to time in your columns, and the set gives excellent selectivity and is very easy of control, although tuning is very sharp.



The Improved Chitos referred to on page 1377.

Using 2-volt D.E. valves, which I find the most reliable type, although any type almost will do, best results are obtained from the three H.T. + leads as follows: H.T.+1, 15 volts; H.T.+2, about 36; H.T.+3, about 45, but best values of H.T. are, of course, only found by experiment, and these have a large bearing on results.

(Continued on next page.)

## CORRESPONDENCE.

(Continued from previous page.)

If the H.T.+1 wander-plug is taken from H.T. battery, and plugged into grid socket of H.F. valve, we get a rather interesting circuit—I can work my L.S. from 2 L.O or Bournemouth with it, quite easily. (Of course, the valve has to be taken off!) Since I last wrote I have logged, in addition, R, Barcelona (325 m.), Voxhaus, Hanover, the two new Cadiz stations, Bilbao, Zurich, Geneva, and I think Moscow.

Hoping this will not take up too much of your valuable space, and wishing all my correspondents the best of luck with this circuit.

Yours faithfully,

B. M. FARRAR.

41, York Road,  
Hove, Sussex.

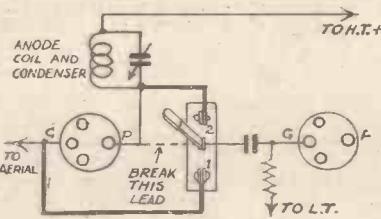
## IMPROVED CHITOS RECEIVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose an improvement I have worked out on our old friend Mr. Childs' Chitos (see

## For the Constructor

## No. 5.—Cutting Out an H.F. Valve.



How to insert a single-pole double-throw switch for cutting out an H.F. valve (tuned anode) is shown above.

The existing lead from plate to grid condenser is broken, and the grid end is joined to the centre of the switch. Two new leads are then necessary, as shown by the heavy black lines.

One connects the lower switch contact to the grid of the preceding valve, and the other joins the top contact to the plate of that valve.

(page 1376). I have tried this, and have given it to several friends, who have also tried it out, while one has told me he has just won third prize with it at an exhibition in Manchester.

I find it slightly more selective than Mr. Childs' original. L.F. can be added without separate H.T. batteries. Trusting this will be of interest to "P.W." and readers.

Yours faithfully,

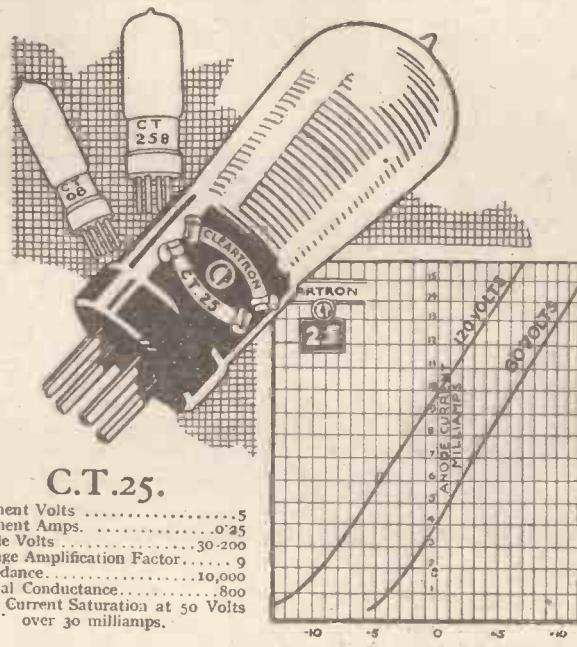
5, Cowley Road, Waton, J. T. MULLIN.  
Liverpool.

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Voltage Amplification Factor	.....	9
Impedance	.....	10,000
Mutual Conductance	.....	800
Plate Current Saturation at 50 Volts	.....	over 30 millamps.

HERE we show you the electrical characteristics of the CLEARTRON Dull Emitter C.T.25; we could talk to you for hours about its general excellence. But charts and talk cannot convince like an actual trial. Give it a "try out" and prove by your experience that CLEARTRON valves in your set mean vastly increased volume and greater distance; operatic purity, keener selectivity and longer life. And unless the C.T.25 produces all these claims and all these advantages it will be replaced without cost or question—our IRONCLAD GUARANTEE sees to this.

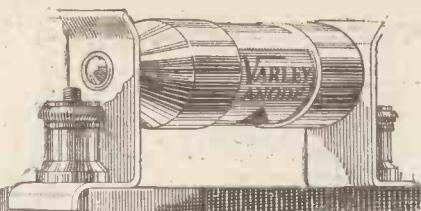
Type	Accumulator or Battery volts	Fil.volts.	Fil. amp.	Purpose	Price
C.T.08.	Dry cells	3	0.08	H.F., L.F. Detector	12/6
C.T.15.	2 volt Accumulator	1.8	0.15	H.F., L.F. Detector	12/6
C.T.25.	6 volt Accumulator	5	0.25	H.F., L.F. Detector	15/-
C.T.25.B.	6 volt Accumulator	5	0.25	General purpose resistance coupled amplification	15/-

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Latest Standard Model  
General Radiophones  
(made by the well-known  
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Sensitive and Highly Efficient.  
Receivers matched in tone. Magnets of  
highly expensive Cobalt steel. Diaphragm  
triple tested. Beautifully comfortable.  
Highly finished. Weight 7 ozes. Fully  
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in full, send 2/6 on receipt and balance by instalments  
of 3/- monthly until only 21/- is paid. Price, full  
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**2-VALVE AMPLIFIER, 35/-**  
1-Valve Amplifier 20/-, both perfect as new;  
Valves, 4/6 each. Smart Radiophones, 8/- pair;  
new 6-Volt Accumulator, celluloid case, 13/-; new  
66-Volt H.T. Battery, guaranteed 7/-; 2-Valve  
All-Station Set, £4. Approval willingly  
given. P. TAYLOR 57, Studley Road, Stockwell, LONDON.



## TECHNICAL NOTES.

(Continued from page 1354.)

an important announcement to the effect that he has succeeded in reducing television to a really practical proposition. At a recent demonstration between Paris and Malmaison (where Monsieur Belin carries out his experiments) the inventor telephoned his assistant, who was in Paris, and as the assistant, Monsieur Lumière, answered the call, his face was visible on a small screen attached to the telephone instrument at Monsieur Belin's end of the wire.

The principle of the apparatus is the use of a steel disc which revolves at a very high speed, and which has a large number of silvered facets mounted upon it, the purpose of these facets being to reflect, with very high frequency, beams of light which fall upon them. By these means a picture is "decomposed" point by point, and after transmission is effected by wireless methods, the picture is then reconstructed, somewhat after the manner of a half-tone, the dots, however, following one another with such extreme rapidity that the phenomenon known as the "persistence of vision" plays a part similar to that which it plays in the reproduction of cinema pictures.

Monsieur Belin states that before the end of the present year he hopes to perfect the invention, so that there shall be no difficulty in people not only speaking to one another by long distance telephone, but actually seeing one another at the same time by means of wireless.

### Amplification Factors.

Readers frequently ask questions concerning the determination of the amplification factor of a valve. The method is briefly as follows: The filament should be raised to its normal temperature, and the normal H.T. should be applied to the plate. A variable grid bias should be applied, and this should be adjusted, readings being taken until the grid bias necessary to bring the valve near to the centre of the straight part of its characteristic curve has been found.

The anode current should be observed by means of the milliammeter. The grid bias should then be varied by some small amount—say  $1\frac{1}{2}$  volts. This will bring a change in the plate current, but the plate current may, however, be brought back to its original value by a corresponding alteration or adjustment of the H.T. voltage. When this has been done, we have an approximate figure for the amplification factor, which is the alteration of the H.T. voltage necessary to restore the anode current to the original value, divided by the alteration in the grid voltage which disturbed the anode current.

For example, supposing a change of  $1\frac{1}{2}$  volts in the grid bias required a corresponding change of 12 volts in the H.T. in order to compensate for it and keep the anode current constant, the amplification factor would be 12 divided by  $1\frac{1}{2}$ , that is 8.

### Battery Connections.

Questions are often asked also as to the relative advantages of connecting the positive and the negative terminal of the low tension battery to the negative terminal of the high-tension battery. It is common to connect the negative terminals of the two

(Continued on next page.)

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## TECHNICAL NOTES.

(Continued from previous page.)

batteries together, although some experimenters believe that in certain cases an advantage is obtained by connecting the negative H.T. to the positive L.T.

When the H.T. negative is connected to the L.T. positive, it is evident that the voltage of the low-tension battery is added to that of the high-tension battery, and although this amount—perhaps three to six volts—may seem small, it may sometimes make a considerable difference to the performance of the set, particularly where a comparatively low value of the high tension is being used.

By this method, however, most of the anode current is made to pass through the low-tension battery, and it will usually be found, especially for short-wave work, that it is better to have the anode current return directly to the negative lead. It is for this reason that it is usual to connect together the negative terminals of the two batteries, leaving the positive voltages on opposite sides of the common negative.

The advantage gained by the addition of the low-tension voltage to the high-tension voltage is, of course, rendered more insignificant if the low-tension battery is of the 2-volt accumulator or 1½-volt dry cell type, such as are now so largely used in connection with dull-emitter valves.

At the same time, it is always worth while trying the reversal of the connections of the low-tension battery. The question of the grid bias is, of course, another and much more important point that may arise in this connection, and should not be lost sight of.

## A Photo-Electric "Organ."

An interesting experiment was carried out recently at Schenectady by Dr. Peter Wold, Professor of Physics at Union College, when he introduced via Station W G Y the "Song of the Electron."

A photo-electric cell was connected to the broadcast transmitting circuit, and a disc with rows of perforations was placed between the cell and a source of light. A battery, 135 volts, was connected between the potassium coating and the plate of the photo-electric cell. When the perforated disc was rotated slowly, so that an intermittent beam of light of L.F. interruption fell upon the photo-electric cell, a correspondingly low-pitch sound was produced, this sound rising in pitch as the speed of revolution of the perforated disc was increased.

In the demonstration referred to the disc carried four rows of holes, the outer row containing 48, the next row 36, the next 30, and the innermost row 24. By passing the beam of light through different rows the lecturer could obtain different sounds, and by passing through two or more rows simultaneously he could produce a musical chord. It has been said that in this way a photo-electric "organ" could be produced.

The experiment is really a modernised version of an ancient experiment in physics, but the introduction of the photo-electric cell was a convenient and interesting method of adapting it to broadcast transmission.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

**The Spirit of Adventure**

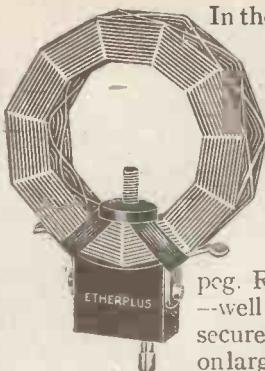
THOSE courageous mariners of old were not content to take life as they found it. For them the humdrum spelt inaction. So leaving the sheltered comfort of their homes they set out to brave the dangers of the unknown—to return, maybe, with rich prizes.

It was this same restless spirit which prompted the designers of the Eureka to forsake the old and seek new ideas in transformer construction. The extent of their success can be gauged by the fact that the Eureka is now the largest selling quality transformer on the market. Obviously such a rapid recognition of merit is proof of the many exclusive features possessed by the Eureka. The non-laminated core—the 2½ miles of wire—the hermetically sealed contents—the coppered steel case. These are the features which have built up a nation-wide reputation for Eureka.

Eureka Concert Grand . . . 25/- No. 2 . . . 21/-  
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## FOREIGN RADIO NEWS:

(Continued from page 1364.)

of the rapid growth which radio may be expected to have in this virgin soil is shown by the fact that in Coblenz alone close on 2,500 applications have already been filed for a receiving set permit.

### Real Radio Canaries.

A novelty was staged last week by the Austrian station in Graz, where a show of canaries was being held.

Microphones were installed near the cages of the prize-winning birds, whose songs were thus broadcast for the edification of listeners.

### Two New Austrian Stations.

The opening of the new Vienna station "Gross-Radio-Wien," on January 30th, marks the opening of a new era in the development of Austrian radio. Simultaneously comes news from Russia of the inauguration of a new broadcasting station at Tuapse, about 75 miles S.E. of Novorossiisk, on the Black Sea. This station has started broadcasting daily between 3 and 4 p.m., with alternative wave-lengths of 1,200 and 1,800 metres. The Tuapse station uses 4 kilowatts and its call sign is XXXX R A N.

### Too Much Radio !

Complaints are being made, apparently not without some reason, that Madrid is over-blessed with radio.

This is due to a queer kind of motor vehicle which perambulates the streets of the capital all day, fitted with a receiving set and four loud speakers, and broadcasting all on its own over the whole city the programmes and messages not only of Spanish, but also of foreign stations.

While radio is an admirable thing at home, many people in Madrid incline to think that they would like sometimes to be able to take a stroll through the streets without being pursued by the strains of jazz bands or the shrill notes of a prima donna.

### Can One Steal a Wave-length?

Considerable attention is being paid in radio circles here to the reports from America that proceedings are being instituted in Chicago against the Zenith Radio Corporation for alleged piracy in appropriating a certain wave-length which is said to belong to some other broadcasting concern.

Whether, so far as continental European countries are concerned, anyone can "steal" a wave-length; whether, in short, there is a property right in a wave-length, seems exceedingly doubtful. Jurists will follow very attentively the legal arguments brought up on both sides during the hearing of this Chicago case, with a view to formulating changes in the law to meet similar cases.

### Radio Poetry.

The competition for the best piece of original verse written specially for broadcasting, which, at the first time of asking, proved barren of suitable works, has, on being repeated, resulted in a "Morning Symphony," by Mlle. Yves Calsennes, being awarded the prize.

The poem, which is quite short, is notable for the qualities that make for good effects in broadcasting. The authoress, on being asked what were the points she bore in mind in this connection, replied :

"I think the words must be chosen, other things being equal, for their sonority. Anaemic words, of which there are many in every language, are utterly unsuited to broadcasting."

"I believe, too, that it is a great advantage to use more than one voice. Simultaneous use of a deep and of a clear high voice, result in a kind of vocal stereoscopic effect. Their separate use is also an advantage, as it varies things for the listener."

In accordance with this view, one male and two female voices are used in the prize-winning poem. The remarkable thing about the work apart from its new form, suggested by the necessities of broadcasting, is that it is purely descriptive. There is no action in it, nothing beyond mere description to hold the listener's attention, which makes the striking success obtained by the work, on being broadcast, all the more remarkable.

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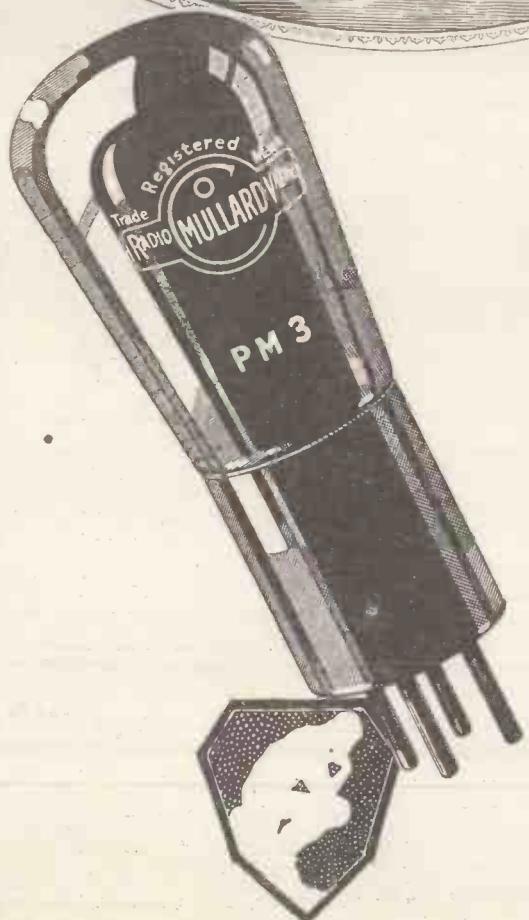
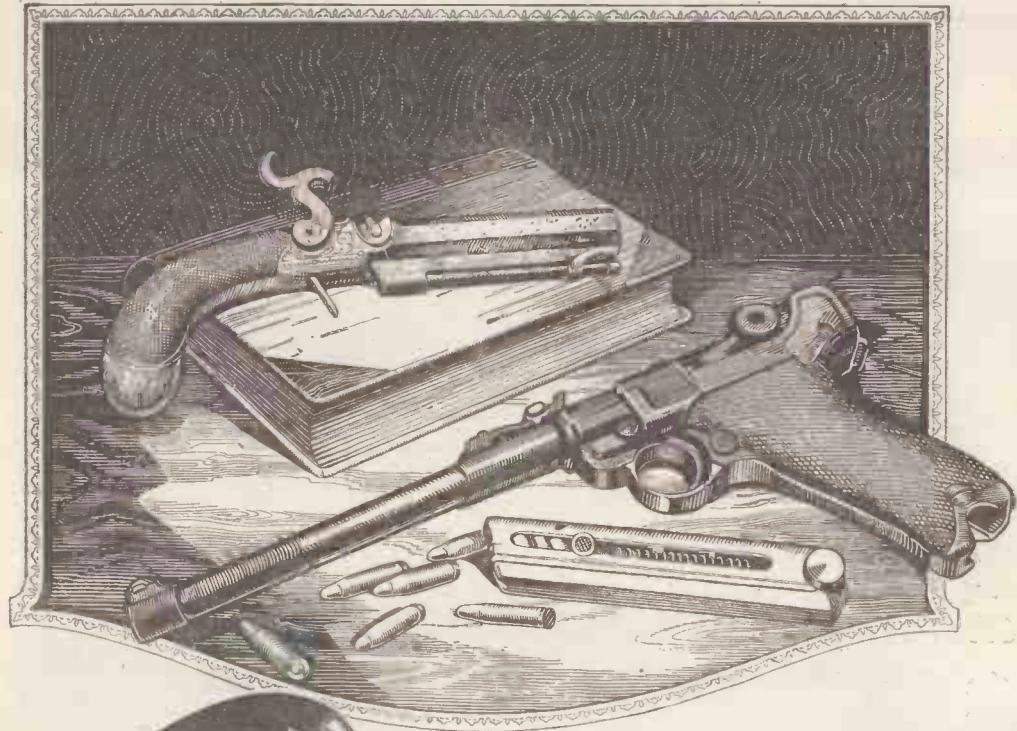
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You can now have the P.M.3, a general purpose valve with the wonderful "N" filament that reduces the total consumption of your set to ONE-SEVENTH and gives pure and powerful reception free from microphonic disturbances.

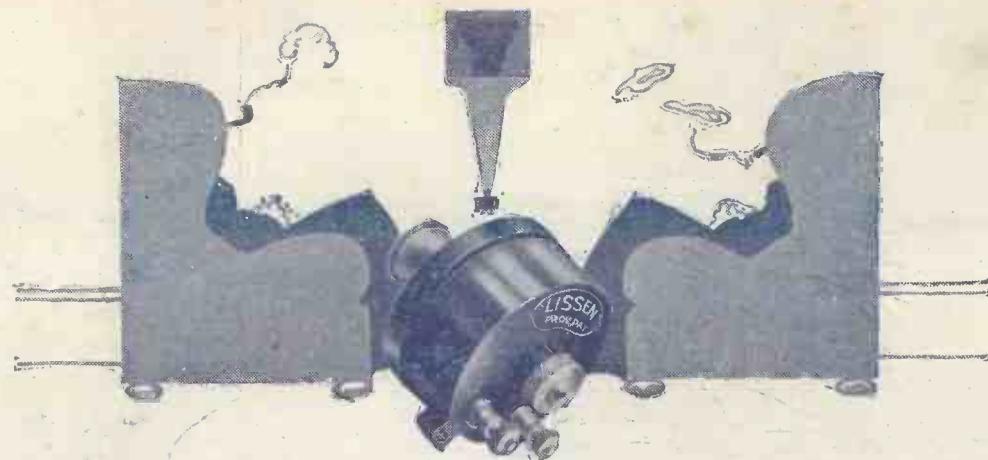
The ideal combination—P.M.3 Valves followed by a P.M.4 in the last stage—the finest loud speaker valve ever produced.

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February 13th, 1926.

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