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Amateur Wireless

Every Thursday 3^d

and
Radiovision

Vol. XIX. No. 480

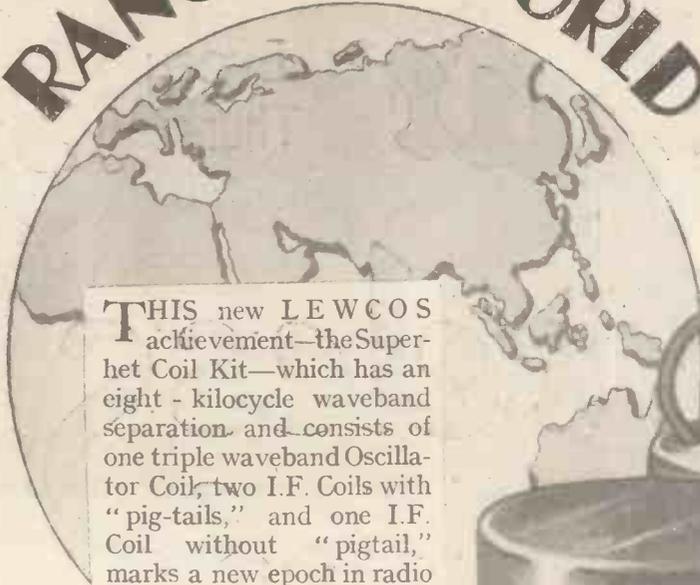
Saturday, August 22, 1931

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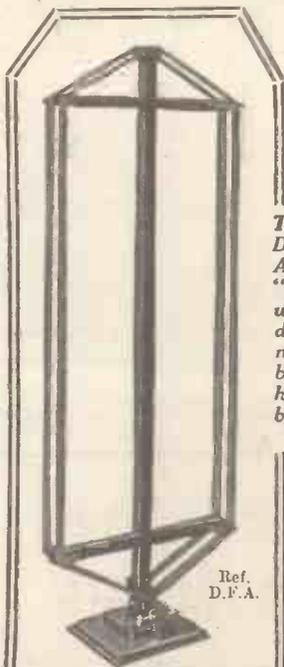
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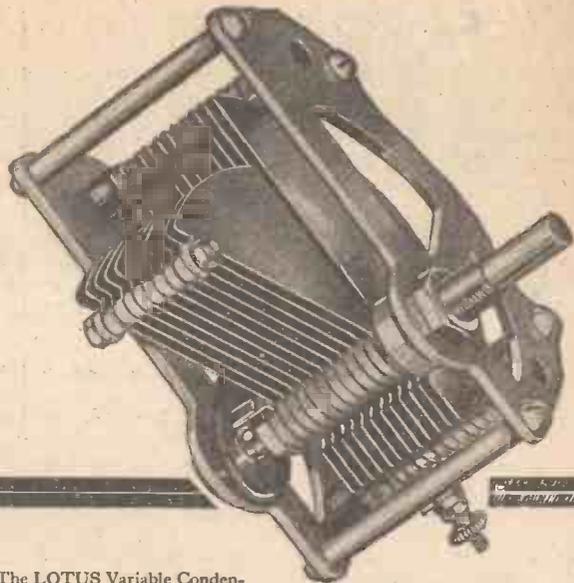
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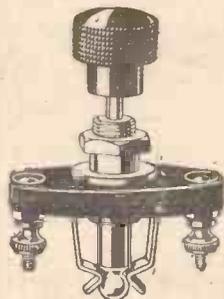
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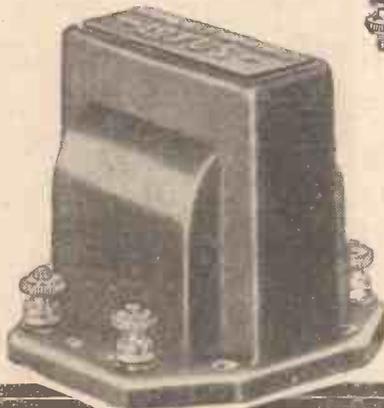
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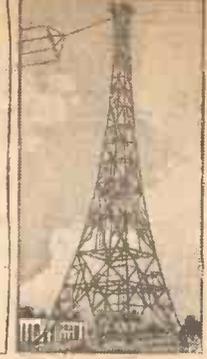
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BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER.

ASSISTANT EDITOR:
H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

CUTTING THE COST!

IN this issue we introduce what must be the lowest-priced big set ever offered to home-constructors—the “£3 3s. Four.” Think of it. A fine four-valver for a great deal less than a £5 note! You may think that in cutting the cost in this way we have had to sacrifice performance, but if you read the description on pages 226 and 227 and take a look at the photographs you will agree that there is certainly nothing missing, and that it is a set guaranteed to “deliver the goods.”

THE REASON WHY

THE “A.W.” Technical Staff has had so many requests for low-priced big sets that plans were put in hand for the production of the “£3 3s. Four,” and it was intended that this should show just what amazing results can be obtained by correct design in conjunction with the new low-priced parts. This really is a good “four.” Build it, and prove our claim for yourself.

CONGRATS!

ALL praise to H. L. O’Heffernan, who owns and operates the amateur station G5BY and who has succeeded in winning

the fourth International Relay Competition run by the American Radio Relay League, with more than double the score returned by any other competing amateur! O’Heffernan is an engineer in the employ of Philips.

THE SCORING

HIS win is all the more remarkable by reason of the conditions under which scoring is governed. For each experimental test message he received from an American or Canadian practice point, O’Heffernan was awarded one point. For each test message he transmitted in reply, he was awarded two points, the total gain being multiplied by the number of U.S. and Canadian inspection districts worked. This win shows that British amateurs don’t mean to be left behind in the international race for supremacy.

FORTHCOMING PLAYS

LORD DUNSANY’S fantasy, *If*, is to be revived on August 24 (National) and 25 (Regional). *The Romantic Young Lady*, Martinez Sierra’s comedy, will be given on August 30 (National) and 31 (Regional). Thus closes the B.B.C.’s summer season of drama.

THE AUTUMN SEASON

THE autumn productions open on September 7 (Regional) and September 9 (National), with Lawrence Housman’s jury play, *Consider Your Verdict*, which ushers in a more serious phase of radio production. After it comes a new comedy by E. M. Delafield, entitled *To See Ourselves* (September 14 and 15); and next a drama by Compton Mackenzie, *The Lost Cause*, dealing with the Young Pretender. *The Emperor Jones*, with Paul Robeson in his original part, will be broadcast on October 18.

NEWCASTLE TROUBLES

IT is common knowledge that there are heaps of troubles in the Newcastle experiment of synchronising Newcastle and Slaithwaite. The engineers are satisfied with their work, and the mush areas fall just where it was anticipated that they would. From the engineers’ point of view the tests are a success, and it is the programme side which is having trouble. It has now been decided to put Newcastle back on the National Common wavelength of 288.5 metres, on programme grounds, and in next week’s issue an authoritative article, exclusive to “A.W.,” will explain the whole position.

PROGRAMME RE-SHUFFLE

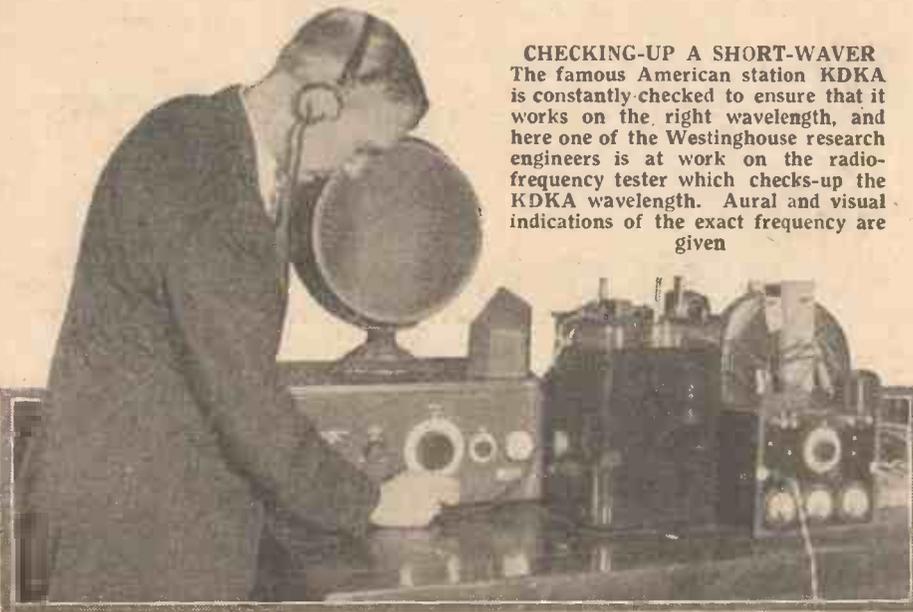
THE re-arrangement of the news bulletin times for the winter season has already been announced. The period 6 to 6.30 p.m. is to be devoted to weather forecast, news, racing results, stock-exchange report, street prices and farmers’ bulletin. Listeners who imagine this is too long a period should remember that football results often take as long as ten minutes.

NO NEW VOICE

NOW that E. H. Wheldon has made his final bow to the London microphone, in order to take up a Civil Service appointment, listeners may be wondering how soon they will hear a new voice. Actually, there will be no need for this, as J. C. S. MacGregor, late of the Glasgow station, has been for several weeks very successfully announcing from the London station. Wheldon’s farewell announcement the other morning imparted a human touch all too rare in present-day broadcasting.

CHECKING-UP A SHORT-WAVER

The famous American station KDKA is constantly checked to ensure that it works on the right wavelength, and here one of the Westinghouse research engineers is at work on the radio-frequency tester which checks-up the KDKA wavelength. Aural and visual indications of the exact frequency are given



NEWS & GOSSIP OF THE WEEK —Continued

A RADIO-PLAY EXPERIMENT

MR. CYRIL WOOD, the Dramatic Producer for the West Region, who is well known as a former adjudicator in drama competitions, is carrying out an interesting experiment. Recently a group of about a hundred enthusiasts pledged themselves to listen to all the experiments in radio drama at the West Regional station, beginning with the short play, *Through the Tunnel*, which was broadcast on July 24. A specially interesting experiment will be made on August 28, when a play entitled *Hamlet in Modern Rush*, by H. C. G. Stevens, will be performed in the Cardiff studios for West Regional listeners. All the characters in Shakespeare's play will be presented with a clever blending of old and new personalities. Mr. Wood is trying to discover native talent in Wales and the West Country and some writers in other branches of art are studying the technique of radio drama in order to write plays specially for the microphone.

NEW STATIONS

STILL more stations! A new transmitter is being erected at Gdingen in Poland which will operate with a power of 12 kilowatts. Secondly, according to the German broadcasting plan, the new Leipzig transmitter will be erected at Pegau some twelve miles from the city. All the more to add to European ether chaos!

MRS. SNOWDEN SPEAKS

MRS. PHILIP SNOWDEN, a B.B.C. Governor, will give an introductory broadcast talk on the autumn programme of morning talks on September 7. A new feature of these talks will be a weekly summary entitled "What's in the Papers?" These will be given on Saturday mornings. Another interesting new series which starts on September 11 will be given by Miss Elise Sprott, whose subject is "Cooking for Beginners."

MORE LANDLINES

UNTIL recently, Norway, Sweden, Finland, and Denmark were unable to participate in international programme

exchanges as no cable existed to carry programmes. To remedy this a cable was recently laid between Zarranzin and Kam-pinge enabling these four countries to take part in European broadcasting activities.

MORE BULLETINS FOR FARMERS

MUST we look to the United States for an example of an ideal radio service for farmers? The National Broadcasting Company has organised two separate services. Firstly, there is the National Farm and Home Hour, a transmission which is given every weekday over thirty-eight stations scattered between the Atlantic and Pacific coasts. The data broadcast in the National Farm and Home Hour is supplied mainly by the American Department of Agriculture.

Another service has been organised for farmers in the Western States. On Mondays, Wednesdays, Thursdays and Fridays a programme is broadcast by eight stations.

THE FIRST NOTE!

THE first note of music has been struck in Broadcasting House. Last week an orchestra—a section of the main B.B.C. orchestra—went up to the new Children's Hour Studio in Broadcasting House and played over a few pieces. This was only in the nature of an experiment to see if this studio, which has a glass wall, is satisfactory. It seems as though some changes will have to be made in the studio, but the important thing is that this new building has been unofficially "opened" by the

first note of music being struck in it! One can hardly call the note produced by the echo tester "music." It is just a ghastly howl.

THE GERMAN RADIO SHOW

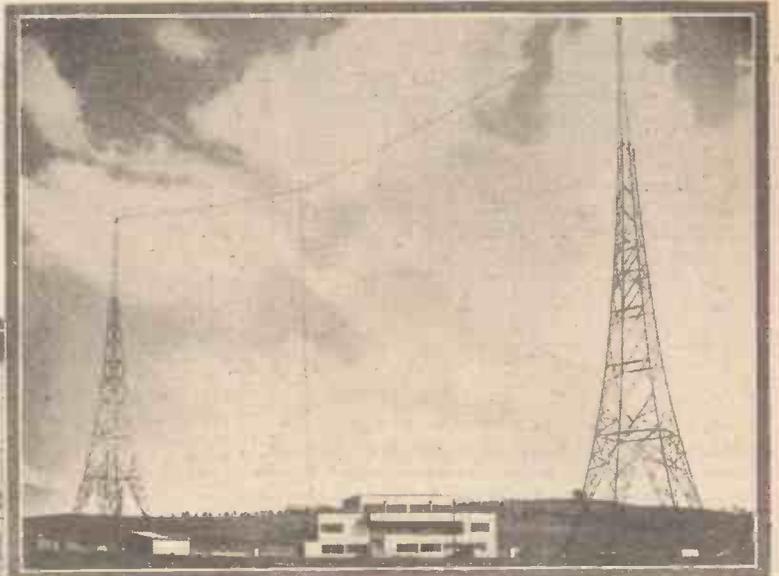
IT looks as though the B.B.C. won't be represented at the Berlin Radio Show this year, which runs from August 21 to 30. The Chief Engineer is very busy over the Newcastle bother, and as the "D.G." is on holiday and his itinerary does not include Germany, there will probably be no B.B.C. official in Berlin.

AN H. G. WELLS TALK

WHEN H. G. Wells spoke before the "mike" after the series of talks on Russia he felt very impressed with the possibilities of radio to reach the millions of ordinary folk who are interested in the bigger things in life. So he has planned a new series of talks and will start the ball rolling with a talk on Monday, September 28. The series will be under the title of "What I Would Do With the World," and will be given by leading scientists and others who will assume that for a period of twenty years they could have possession of the world. The talks will be given on Thursdays and some very "big" people have been booked to speak.

MARCONI TO SPEAK

MARCONI and Sir William Bragg come to the microphone at the Queen's Hall on the occasion of the Faraday Centenary celebrations on September 21.



INSIDE—AND OUT!

Two views of a well-known German station, Münster. Left, is the transmitter, and the control desk can be seen facing the main transmitter panels. This carries the switches for all the big power valves. The fine aerial can be seen above, and this is coupled by means of a high-frequency transformer arrangement with the power stage of the transmitter.

The B.B.C. "O.B." engineers have tackled many difficult problems in relaying programmes from outside the studios



and here an "Amateur Wireless" Special Commissioner describes the arrangements which are used on special occasions

WITH *the* O.B. ENGINEERS -- -- *at the* QUEEN'S HALL

THE "Prom" concerts are now in full swing, and the "O.B." engineers are duly thankful! It is the Outside Broadcasts Department at Savoy Hill which has been entrusted with the task of making the new microphone arrangements, and this is a job which has to be worked out in conjunction with the Control and Musical Departments. It has meant hours of hectic work!

At the Queen's Hall, where the B.B.C. has, of course, an entirely free hand in the matter of the arrangement of the microphones, everything that can be done is done to ensure first-class orchestral broadcasts.

The number of microphones has steadily been increased each year. At first there were only two, and on some occasions

only one of this pair was used, the other being there as a standby.

Now, after exhaustive tests, there are five microphones, and four cables are needed to support these.

Two cables each have one microphone and a centre cable carries two microphones which pick up the sounds from the wings of the orchestra, one being above the first violins and the other above the double basses. The fifth microphone can also be suspended from the ceiling or stood upon a pedestal if this is needed for solo broadcasts.

The four chief microphones can be seen as shown by the arrows in the photograph on the right.

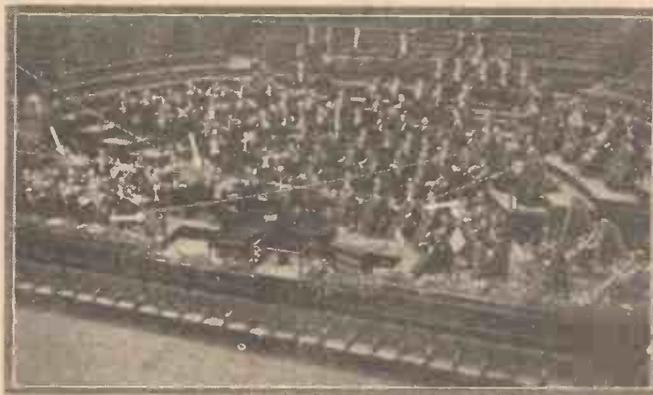
I interviewed the two Control Engineers at the Queen's Hall and asked them what happens before and during the

concert. They showed me five "faders"—elaborate potentiometer devices—which are used for mixing the outputs from each microphone so that a satisfactory balance is obtained.

"These four knobs," said one of the engineers, "operate on the four 'mikes' hung on the cables. The 'sky' mike is controlled by this fifth knob when it is in action. This balancing is done, of course, before the concert and it is only on very infrequent occasions that the microphone balance is ever altered while a concert is in progress. Such an occasion might arise when there is perhaps a special part for the organ and the 'sky' microphone is brought into circuit to

pick up the sound from the organ which is, of course, at the back of the orchestra at the Queen's Hall.

"We have spent hours in getting the right amount of volume from the organ. This year, for the first time for many years, we are giving organ solos from the Queen's Hall. It is a fine organ and quite well placed so that the 'sky' mike can deal with it. Echoes have not been very difficult to track down, and it would be safe to say that



These four arrows show where the chief microphones are placed for the "Proms" orchestra. There is a fifth suspended microphone for the organ

this organ has been a much simpler proposition so far as microphone position and fader setting go than many cinema organs; and cinema organs are generally supposed to be 'easy meat' for the engineers."

By the way, I compliment the B.B.C. on the neatness of the new microphone arrangements, for all microphones are hung up on immensely strong but very slender R.A.F. cable, and it is almost impossible to see the connections. There are no untidy wires straggling about.

The microphones' leads pass along the hall to a small ante-room between the double doors at the end, and here the amplifier gear is installed.

I asked if condenser microphones are ever used at the Queen's Hall and was told that as they need attention, they have never been used outside the No. 10 "wharf" studio.



Here is another form of microphone suspension in the Queen's Hall. The twin "mikes" can be seen at the top right, together with the suspension cables and the microphone lines

THE HOW AND WHY OF RADIO—L

HOW PICK-UPS WORK

Written specially for beginners who want simple and practical explanations of the underlying principles of radio

SO far in this series, I have not dealt with an aspect of radio that grows more important every season. I am thinking of playing records through the wireless. To the beginner, used to picturing gramophones as working on a mechanical basis, the way in which the receiver replaces the acoustical parts such as the sound box and tone arm must certainly seem a little mysterious. So this week let us look into the elementary principles of what might be termed gramo-radio—a combination word invented, I believe, by the Editor himself.

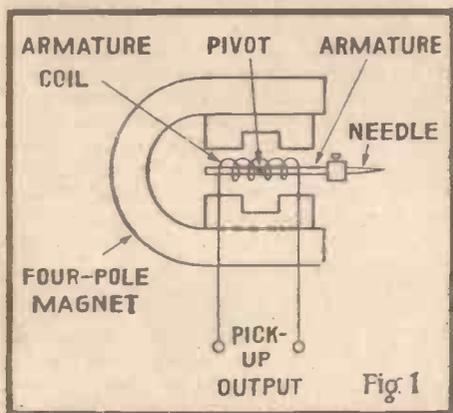


Fig. 1. Diagram showing construction of pick-up

We had better start at the record. Take a look at one. Note that there are distinct variations in the grooves: Under a magnifying glass the wavy line of the more deeply grooved recordings may be easily seen. As the needle rests on the revolving record it is moved from side to side by the wavy formation of the groove. In an acoustic machine these needle vibrations affect the stylus on the diaphragm, which, in turn, vibrates and sets in motion a column of air—the column of air in the horn.

When we replace the ordinary sound box by a pick-up, which is really an electric sound-box, quite a different action occurs. The needle vibrations are first communicated to an armature, a lightly made piece of soft iron, arranged on a pivot, so that it can move in the magnetic field set up by a four-pole permanent magnet. Here we should do well to look at the diagram marked Fig. 1, where a typical pick-up construction is shown.

A study of this diagram shows how the mechanical variations of the needle are interpreted as electric current variations by the pick-up. Note that there is a permanent magnet, usually a four-pole magnet. This creates a strong magnetic field, consisting of lines of force going across the space between the poles. Note also that in this field of force is the armature

and that between the armature and the magnet poles is a coil of fine wire, containing many turns, and known as the armature coil. Finally, note the pivot point on the armature, between the four poles of the magnet. With small variations, that is the standard construction for pick-ups.

How the Pick-up Works

Now for its action. When the needle vibrates, it causes the armature to vibrate likewise. As soon as the armature vibrates it disturbs the magnetic field surrounding it. The variation in the lines of force of the permanent magnet in turn set up voltage variations in the armature coil. So the real effect of the needle vibrations is to set up voltage variations in the armature coil, the two ends of which form the pick-up terminals. These voltages are similar in nature to wireless signals after detection, that is to say, they are low-frequency variations. They can be applied to the grid of an amplifying valve and subsequently turned into sound by a loud-speaker.

As a matter of fact, the simple action of the pick-up just described is exactly the reverse of the action of the balanced armature type of loud-speaker, where, it will be remembered, electric-current variations in the armature coil cause mechanical variations of the armature, which in turn set the cone in vibration and so produce sound.

Natural Frequency

The practical interpretation of the pick-up principle is just as difficult as with loud-speakers, in that it is very difficult to design an armature that will have no particular resonances and yet respond evenly to the whole of the frequencies recorded, namely, those between about 5,000 cycles and 50 cycles.



A typical magnetic pick-up—the Daptacon—with a special carrier arm

Unless particular care is taken, the armature unduly accentuates a particular frequency, usually in the upper register. To overcome this the armature is often damped, but only by restricting the movement of the needle. Such a restriction increases record wear, although this is not

really a great objection, because means can be adopted to counteract this. But in damping down particular resonance the very high frequencies are all too often lost.

One of the ways of overcoming armature resonances, and at the same time ensuring a good frequency response, is to make the needle the armature. More than one needle-armature pick-up is on the market, and the B.B.C. has used this type in all its gramophone broadcasts. I must not give readers the impression that the needle

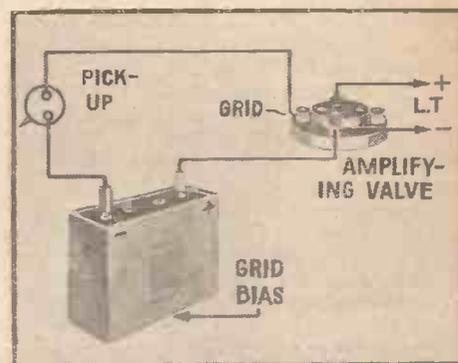


Fig. 2. How the pick-up is connected to the amplifier

armature pick-up is the only type capable of giving good results. There are many lightly-damped armature pick-up constructions on the market. Obviously, one must be prepared to pay for the care needed to design a really good pick-up. The cheaper ones can be used quite successfully in sets and amplifiers where the response is fairly limited. And the addition of tone filters between the pick-up and the amplifying valve often turns a mediocre pick-up into quite a passable one.

With an Amplifier

To use a pick-up with a valve amplifier is quite simple, as shown by the diagram Fig. 2. It is important to note that the input valve must be suitably biased with a negative voltage. This bias can readily be applied to the grid of the valve through the pick-up winding, as shown. Few pick-ups generate more than one volt, so a negative bias of 1½ volts is very suitable for a medium to high-impedance valve.

Such a bias will prevent the pick-up output overloading the valve, but as the succeeding stages will have to handle the amplified voltage it is usually advisable to arrange a volume control between the pick-up and the first valve. A potentiometer is suitable, one with a resistance of not less than 100,000 ohms being specified in most gramo-radio outfits.

HOTSPOT.

Is Your Detector Efficient?

Asks ALAN HUNTER, in writing about a subject of great interest to every owner of a valve receiver

IN all radio developments that really matter, I think it is true to say that the transmitter leads and the receiver follows—if it can! Take modern high-percentage modulation, for example. To avoid dis-

valver with two or three stages of high-frequency amplification. There is a very definite connection, as I hope to show.

Let us take, for example, a two-valver worked say 10 miles from Brookmans Park, or a three-valver at a slightly greater distance employing a stage of high-frequency amplification before detection. In both sets it is most likely that grid detection will be employed, with a .0003-microfarad fixed condenser and a 2-megohm grid leak. These are the usual values. It is also probable that a separate high-tension-positive feed will be provided for the detector, to whose anode not more than 70 or 80 volts will be applied (see Fig 1).

Although the B.B.C. does not indulge in excessive modulation, there is no doubt that the high-power signals from Brookmans Park and Moorside Edge are much more deeply modulated than were the signals from the old 2LO. With high-percentage modulation the values for grid detection mentioned above must be modified in the interests of efficiency and distortionless reproduction.

I should explain that the greater the percentage modulation the greater is the variation in the amplitude of the carrier wave. We can most easily consider modulation as the process whereby the amplitude of the carrier wave is varied at the frequency of the speech or music current. This amplitude variation represents increases and decreases in the carrier wave. Thus with 100-per cent. modulation the carrier amplitude varies between zero and twice the unmodulated carrier.

What we have to do is to see the connection between this deeper modulation, the detector action as affected by it, and the change for the better possible by attention to the values already mentioned.

If we plot rectified voltage output against high-frequency input, a good idea of the detector condition can be seen. If the detector is "linear," the graph showing the relation between the rectified output and the signal amplitude will be a straight line. The slope of this graph—or dynamic characteristic, as it is usually called—gives us the clue to distortion.

What we want is a straight line—how can we make sure of it? By seeing that the greater part of the output voltage is developed across the impedance in the anode circuit of the detector. If this impedance, known as the load impedance, is very large compared with the resistance of the detector, the linear characteristic is obtained.

Now it happens that when the signal input is small, the resistance of the detector is high. So high, in fact, that quite a large proportion of the output voltage is developed not across the load impedance, but across the detector itself. When this happens our straight line does not hold good. In fact, it develops a distinct curve. That is why small inputs cause detector distortion.

We have already seen that 100-per cent. modulation means a wide variation in the signal input, from zero to twice the unmodulated amplitude. The fact that the amplitude drops to zero and so renders the input extremely small, obviously implies

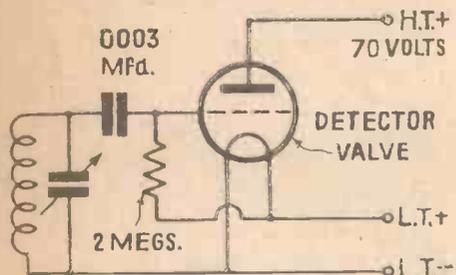
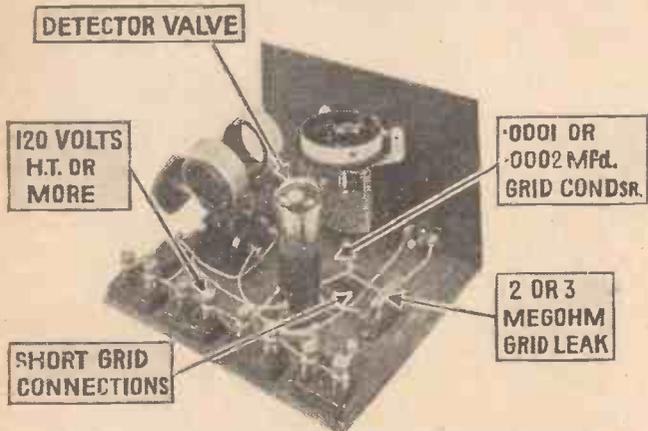


Fig. 1. A straightforward detector circuit for leaky-grid rectification

tortion due to this method of emphasising the change in the amplitude of the carrier wave by the speech and music frequencies we have to modify our detectors.

This is applicable to so many listeners that I think an article devoted to answering the question of whether the detector can be made at one and the same time efficient and distortion-less is more than justified. Let us face the fact that we have, in these days of regional broadcasting, to prepare



Here are some of the points to note in the detector stage of a modern set

the detector for a much more onerous task than in the old days when, owing to the small signal strength, the amount of modulation simply did not count.

Very few amateurs realise the connection between the modulation of the transmission and the working of the detector, whether it be in a simple two-valver or in a multi-

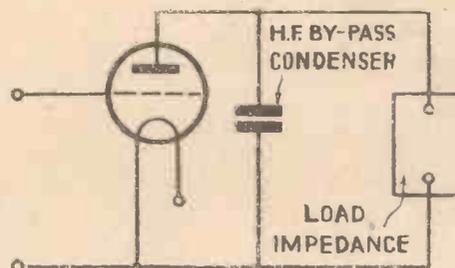


Fig. 2. If the load impedance is too high, "strays" cause a high-note loss

that, with high-percentage modulation, the dynamic characteristic will tend to be curved. In practice we cannot entirely get rid of the bend. All we can do is to apply a fairly large signal to the detector and so ensure that the straight part is large compared with the curved part. Then the effect of the bend is negligible.

At this stage readers may ask why, in order to keep the dynamic characteristic straight, we do not make the load impedance very high. For then we should achieve the desirable state of affairs where the load impedance is considerably greater than the resistance of the detector, even with low inputs. The reason we cannot do this is that the load impedance must, in the interests of quality, be made as nearly constant as possible for all audible frequencies.

(Continued on page 224)

BROADCAST ARTISTES IN PICTURE



GILBERT BAILEY.—A well-known singer who figured early in broadcast music as a soloist



ESTHER COLMAN.— She has been heard from most studios and has sung in quartets, notably The English Singers



GLYN EASTMAN.—A baritone heard from most stations and frequently from Cardiff. He has sung with the National Orchestra of Wales

GWEN KNIGHT.—Though possibly best known now as a soprano and a singer of fine diction, Miss Knight is also a pianist and composer



JELAY D'ARANYI.—She has broadcast frequently, and will be heard again on September 4



FOSTER RICHARDSON.—This well-known singer has been heard on many occasions either as soloist or in part singing



MAXIM TURGANOFF.—A fine Russian tenor, M. Turganoff made a fine broadcast recently with the Serge Krish Septet



EDA BENNIE.—A member of the late B.N.O.C., Miss Bennie has sung in nearly every important role



GEORGE GROSSMITH.—He was closely connected for some time with the dramatic productions of the B.B.C.



BURTON HARPER.—A fine baritone, who has sung from most stations



MEGAN THOMAS.—She sang recently again with Esther Colman, and also at the "Prom" concert in the Tchaikowsky programme



JAMES DONOVAN.—Mr. James Donovan has made wind instruments his special forte, and particularly the saxophone



RITA SHARPE.—She comes of a musical family, of whom Cedric Sharpe is her cousin and also a cellist. She was one of the earliest of noted artistes to broadcast

On Your Wavelength!

THESE MAINS CONDENSERS

I EXPERIENCED a forcible justification the other day for the rather severe rating by the powers that be for mains condensers. Those who want to be really safe use condensers tested at a voltage three times the working voltage. I was overhauling an amplifier which had been in use for some considerable time. It was an A.C. mains job developing 400 volts H.T. and all the reservoir and smoothing equipment was tested at 1,500 volts, so that it conformed satisfactorily to the specifications.

Periodically I have suspected a breakdown on one of these condensers, but a careful examination showed that the insulation resistance was perfectly satisfactory, and I came to the conclusion that I had made a mistake. I therefore overhauled all the connections and straightened things out a bit, tightened up all the joints and gave the amplifier a thorough test. It worked much better than it had done before as a result of my ministrations, and I was quite happy about it and made arrangements to put it back into position and let it resume normal operation. This was the state of affairs one lunch time. In fact, the last thing I had done before lunch was to play a record and then switch off the equipment.

A BREAKDOWN

IMMEDIATELY after lunch I switched on again, and was rewarded by a terrific breakdown. A rather cherished milliammeter endeavoured to turn itself inside out, and a most unpleasant smell of cooking, accompanied by clouds of smoke, permeated the atmosphere, while a hideous din issued from the loud-speaker. Naturally, I switched off at once, but the damage was done. The pointer of the meter was broken into three pieces, the coil spring had completely disintegrated and generally the movement looked as if the cat had been at it.

Mopping my brow, I very carefully started to investigate the damage by testing with a megger and an ohmmeter for continuity and insulation resistance. None of the normal circuits had broken down, and I was distinctly puzzled until at last I spotted the trouble. The set had been designed to work off a frame aerial and was using an artificial earth obtained by connecting two 1-microfarad condensers in series across the mains and using the centre point as an earth point. Now, one pole of the mains, of course, is earthed, although one can never be sure which it is if an ordinary two-way adaptor is used, as this may be inserted either way at random. In effect, therefore, one of the condensers is short-circuited while the other has to withstand the full voltage of the mains, which in this case was 240 volts.

Now, this condenser did *not* obey the same generous ruling as had been observed in the case of the smoothing equipment. It was only rated to work at 250 volts and

had been tested at 500 volts D.C. The peak value of the A.C. was 350, so that the factor of safety was quite inadequate, and, indeed, I was rather surprised that the condenser had stood up for so long. At any rate, there was no question of its having stood up now. It was completely short-circuited and this had placed a dead short-circuit from the mains through the high-tension circuit, blowing up the meter and everything in its path.

DEAR ECONOMY

WHY I used such a small condenser in the first place I do not know. Probably it was one that I happened to have by and I meant to change it and then forgot all about it. At any rate, whatever the reason, my economy in the first place has cost me several pounds and I am not feeling any too happy about it. Verily a chain is as strong as its weakest link, and I think it is interesting to realise that a breakdown of a condenser on the mains side of the equipment may still cause damage in the eliminator portion.

MOONSHINE

THE moon, which has been blamed for all sorts of things at various times and places, is now in hot water over radio. It seems that several listeners in America have noticed that reception, particularly on the short waves, falls off with a bump directly the moon comes up. One observer, who has kept complete records for several years, says that signal strength between Chicago and Boston is almost invariably one hundred per cent. better when the moon is below the horizon, whilst much the same thing has been observed independently in other quarters. The effect is most noticeable on wavelengths below 30 metres, where the Heaviside layer plays so large a part.

The theory is that the moon is negatively charged, relatively to the earth. The Heaviside layer, which is largely made up of free electrons, is also negatively charged, and the two charges repel each other. Accordingly, when the moon is above the horizon it tends to push the layer closer towards the earth's surface, whilst from below the horizon it tends to push the layer upwards. The resulting changes in the level of the layer seem to be responsible for the trouble.

BETTER THAN EVER

THIS year's Radio Exhibition promises to be bigger and better than ever. The organisers have taken over the whole of the Empire Hall, in addition to the National Hall, the present intention being to reserve the gallery of the National Hall for demonstration purposes. In a few weeks from now the doors of Olympia will be open to the public and various carefully guarded "secrets" will be exposed for the first time to the gaze of wireless enthusiasts from all parts of the country.

I remember, last year, my general im-

pression was that whilst the standard of performance had certainly gone up all round, the level of prices had just as decidedly come down. I hope it will be much the same story this year, though I should also like to see one or two really sensational efforts. It's a long time since we have heard anything about the crystal "amplifier" or the "cold" valve, or the Armstrong "flivver" or, in fact, anything with a real touch of romance about it.

TOWARDS UNIFORMITY

THE present aim of designers seems to be all in the direction of standardisation. Two-volt valves for battery users—with a performance just as good as the older four- and six-volt types—and four-volters for the mains. The manufacturers of transformers will at all events bless the day when the four-volt A.C. valve reigns supreme and they can really get down to mass production. Catering for the old "point-eight" valve was certainly a finicky job, and I suppose that helps to explain why this type of valve never really caught on. In set assembly the "unit construction" principle is being more and more widely used. In the course of time we shall probably settle down permanently to a skeleton metal chassis or frame filled with self-contained units, readily accessible for testing, and easy to replace when necessary.

ON THE UP-GRADE

THOUGH it is still very early in the wireless year, there is no question that the general strength of distant stations is already showing a noticeable improvement. Stations, too, which have not been heard for a good many weeks are reappearing in the long-distance log. The night before writing this, for example, I paid a visit to the top of the medium waveband and, rather to my surprise, found our old friend Budapest coming through remarkably well. Budapest was a fine station all through the winter and, in fact, right on into the spring. The fact that he is now showing up again seems to show that he will give us a splendid reception this season.

FEWER SPARK TRANSMISSIONS

THE top part of the medium waveband, too, should be better in another way, for spark transmitters are decreasing rapidly in number, which is a good thing from every point of view. Towards the bottom of the band, too, there are many stations which are now worth attention, since the effects of fading are not so marked as they have been. One cannot say, though, that any particular station down there will be well received on a given night, for trouble of quite a different kind is prevalent from about 280 metres downwards. This is wavelength wandering of the very worst type, particularly on the part of French and Swedish stations. One wonders how those who listen to some of these ever find them, for the transmitters never seem to use the

:: :: **On Your Wavelength! (continued)** :: ::

same wavelength on two consecutive nights and not infrequently they make jumps of many metres at a time. It is high time that the French and Swedish Governments stepped in to regulate strictly the doings of their broadcasting stations.

OUT OF LUCK

APPARENTLY it was not my lucky day that I devoted recently to the construction of a set designed particularly for the reception of the Brookmans Park twins at short range. I use hundreds of components every year, and it is a rare thing to come across any of good make that are "duds"—or even any that contain small defects. There are days, though, when everything goes wrong. You know the kind of thing I mean. First of all, you look everywhere for your B.A. box spanners, and then find that they have been in your pocket all the time. Then your favourite screwdriver conceals itself successfully under something or other. Every nut strips as you put it on and every wire connection that you have carefully made is just a quarter of an inch too short. Well, after spending the whole day in making up this set I switched on hopefully and was rewarded with an expressive silence from the loud-speaker. Fiddling with things produced nothing but more silence. The milliammeter was brought out and disclosed, first of all, that a brand new spaghetti resistance was defective. I replaced that. Still silence. More tests. Detector valve getting no filament juice. Tried other valves. Still no juice. Brand new valve holder defective. I now got pongs when the detector was tapped, but no broadcasting came through. Further tests disclosed that a brand new tuning coil was also a wrong 'un. Can you beat that? These are about the only three bad components that I have had this year, and they all turned up in one and the same set.

A BIG NEW VOICE

I WONDER if you have heard the new Radio-Paris testing? He has been transmitting at various times for some little while now. You cannot mistake him if you do pick him up, for, whereas Radio-Paris never went beyond 17 kilowatts in the past, the station that will soon succeed him for regular programme work is rated at about 85. The new giant is quite one of the strongest of European transmissions as received in this country, and when he gets into regular working some listeners may find that they are pretty well in his swamp area. It may be necessary, in fact, to use the wavetrap on Radio-Paris in order to receive Daventry clear of interference. The B.B.C., however, is already planning a new 5XX, the power of which is to be at least 100 kilowatts, and very likely more. Once the Daventry National's power goes up to this figure, he ought to be able to cover the whole of this country with considerable ease. As it is, he is the only reliable home station for many listeners who live 200 miles and more away from Daventry. The 1,554.4-metre wavelength is extraordinarily good for broad-

casting, owing to the excellent range obtainable with it and to the entire freedom from fading. I have always believed that the B.B.C. would be well advised not to bother about spending money on medium-wave high-power National stations, but to concentrate on a super 5XX.

THOSE TRAMS

INTERFERENCE from trams has become an extremely serious problem in many of our larger towns, and it is good now to hear that action is at last being taken. Edinburgh is an outstanding example. The city has an extensive tramway system whose cars continue to run until midnight. Trolleys are employed as collectors and interference has been extraordinarily bad owing to the sparking which occurs when these pass over the junctions at cable standards. The tramway authorities are, I understand, to move in the matter without delay. With regard to tram interference generally, the Wireless League, which represents a very large body of listeners, has got into touch with the Postmaster-General with a view to obtaining legislation to compel those who have electrical machinery to take every precaution to prevent interference with wireless reception. I pointed out many years ago that such legislation should go through before the evil had reached such large proportions as to make it difficult. As it is now, electrical machinery is being installed every day, and only in isolated instances is it provided with special devices to prevent interference. Flashing signs should most certainly come within the scope of any Act dealing with the question. They can be extremely bad offenders as I know to my cost, and it is surprising to find wireless shops putting them up without taking any precautions.

QUEER, ISN'T IT?

NOT long ago I was in a wireless shop in which a good set of well-known make was being operated for demonstration purposes in conjunction with an equally good loud-speaker. The whole performance was absolutely ruined by loud "tocks" which occurred at frequent and regular intervals. I mentioned to the demonstrator that a background, it was almost a foreground, of that kind would not be exactly attractive to the prospective purchaser. "Yes," he said, "that noise is a dreadful nuisance. I would give a great deal to discover where it was coming from, and to find a way of putting an end to it." Looking at my watch, I timed the tocks that the speaker was producing and then went outside for a moment. Returning, I led the demonstrator gently outside and pointed to a large flashing sign over his own shop. "If," I said, "you will time the flashes you will find that they correspond exactly to the tocks of the speaker. There is the offender, and it may interest you to know that I have now run down the source of interference with my own reception." He looked rather surprised when I told him that if he liked I would show him that with a sensitive set those flashes produced serious interference at a range of a full quarter of a

mile. The whole trouble was due to sparking by the contacts of a rotary switch. Will wireless dealers—and others—please note?

SHOCK ABSORBERS!

THOUGH my business lies with things electrical, I am one of those unfortunate people who are particularly susceptible to shocks. Even 50 volts can often give me quite a twinge, whilst a couple of hundred will send me leaping right up into the air. If you are like me, here's a hint which you may find useful; don't wear a ring when you are fiddling about with the inside of your wireless set. I always mean to take mine off, but as often as not I forget. That wretched ring comes into contact with some H.T. point whilst my other hand is touching an earthed part, and up I go with a Russian ballet leap. The reason probably is that the skin under a ring is always inclined to be slightly damp, and that there is an excellent contact between it and the closely fitting metal. I keep an old pair of kid gloves in my tool drawer, and if I remember to use those all is well. Often, though, I have to be once bitten by H.T. before I become twice shy and remember what the Germans would call my "hand shoes."

THE NIMBLE X

NEVER can I remember a summer when we have had such a dose of atmospheric as has come our way in 1931. I don't know whether you study weather maps or not, but if you do you have probably noticed that right through this summer storm centres, large and small, have formed time after time out in the Atlantic a few hundred miles from our shores. The prevailing drift is always rather north-eastwards from the Atlantic. These storm centres have thus been wafted gently to us and have then passed away over Holland and Germany. We have heard atmospheric slight at first and then rapidly increasing as they approached us; we have had our loud-speakers thoroughly rattled up when they were overhead, and we have gone on hearing atmospheric whilst the storm centres drifted over the Continent. And by the time that one lot of disturbances had reached north-east Europe, another was on its way to us from the Atlantic. A sad state of affairs. One hopes, though, that by this time Dame Nature has more or less got her accumulated atmospheric off her chest.

It has been, mainly on account of atmospheric, rather a poor summer for long-distance work. Stations were "there" right enough, but there was no pleasure in hearing their programmes to an accompaniment of crackles, fizzes, bangs, and thumps. All the indications are that we have a very good time in front of us during the coming autumn and winter. We heard the American stations pretty well last winter on the medium waves, and I shall be very much surprised if this winter they are not quite as well received as they were during that wonderful period that we had six or seven years ago.

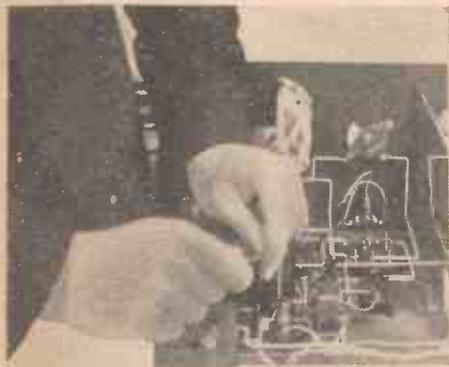
THERMION.



There is no need to wonder whether you have the ability to make up a set at home. KENNETH ULLYETT here explains how simple home construction can be, and he gives many useful hints for set builders

Starting the Construction

I AM worried about my set because technical friends tell me that when the autumn is here I shall not get enough selectivity. I feel that I ought to have another set, but do not want to buy one



Finishing off a set with wiring done on the square-corner system with the leads soldered. You can dispense with soldering as explained below

ready made and rather doubt my ability to make one up."

That is a typical query received by the "A.W." Information Bureau and it does show that there is a little misunderstanding in some enthusiasts' minds about the supposed "difficulty" of constructing a set. The purpose of the constructional descriptions given for each set in "A.W." is that any handy man with the aid of a few wood-working tools, such as a screwdriver, a drill and a pair of pliers, can carry out the whole of the constructional work. Nowadays, with standardised parts, there is nothing to make, and the construction of a set consists merely of mounting the parts in their proper position on the baseboard and panel and of wiring them up.

Making the Connections

"Ah," says the man who has yet to build his first set, "but what about panel drilling, terminal strip cutting, coil winding, metal screen cutting and, most important of all, soldering?"

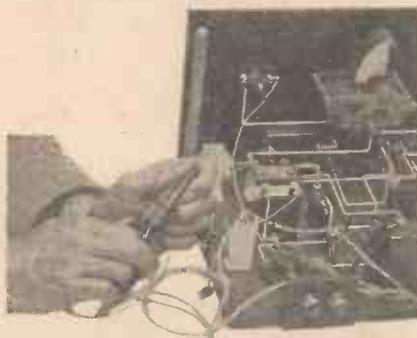
Soldering is not necessary; it is possible to wire up most sets on the point to point system. With this you simply take bare tinned copper wire as specified in the components.

Cut each lead about one inch longer than required to connect between the terminal points as shown on the blueprint and then, using round-nosed pliers, a loop is formed at one end. This is placed over one of the connecting points, a length of insulated sleeving is cut and slipped over the wire, and then a loop is formed at the other end, which is clamped under the second terminal. There is nothing difficult in this. If you want to make an easy job of soldering, then why not buy one of the soldering kits supplied with special flux?

An expert with the soldering iron can wire up a set in less time than a novice takes to use the point to point system.

Panel-drilling

Panel-drilling is easy provided you buy



Here the spade tags and connectors are being fitted to the ends of the battery flexes. This obviates the need for many terminals

a branded make of panel. Unbranded grades of ebonite are often brittle and may crack under pressure of the drill. The tip about panel drilling is to use the full-size blueprint as a guide, attaching it with a spot of adhesive at each corner at the back of the panel and then punching the drilling centres lightly, so that when you remove the print and start drilling the point of the bit does not slip about over the polished surface.

When you buy the kit of parts for your set you will most probably find the dealer willing to supply the panel ready drilled for a small extra charge and, in fact, in some cases the panel is supplied all ready drilled. Several recently produced sets, such as the

"Century Super" and the four-valver described this week have plywood panels, and here, of course, the drilling presents no difficulty at all.

Metal Screens

It is true that nearly every screen-grid set nowadays has at least one vertical metal screen separating the H.F. and detector stages, but there is no need for you to cut this from aluminium sheet, for it is just as cheap to buy it ready cut with the flanges formed for mounting to the baseboard.

There is just one point to note in connection with the screening, though. There are in most sets one or two wires which have to be carried through the screen from one side of the compartment to the other (the low-tension wiring, for instance) and you should make sure that the holes in the metal are large enough to raise no possibility of the wire being chafed. This applies also to the screen-grid anode lead.

Where a definite connection has to be made to the screen for earthing, then if you are not using a soldering iron clamp the wire very firmly between the baseboard and the flange of the screen. If you are soldering



Make sure that the panel components are mounted properly. One-hole fixing nuts should be tightened with a spanner or a pair of pliers

then put a tag on the end of the lead and clamp this in the same way.

Mounting the Parts

There is never any difficulty in getting the correct mounting centres for the parts
(Continued on next page)

"IS YOUR DETECTOR EFFICIENT?"

(Continued from page 219)

As a rule we provide in the anode circuit of the detector a condenser to by-pass high-frequency current in order to prevent it flowing in the low-frequency amplifier. This and stray capacities would tend to shunt the higher audible frequencies if the load impedance were made too high (see Fig 2).

Here we might consider the effect of the grid-leak and grid-condenser values. Both have a very considerable bearing on the problem of efficient detection.

It may be taken that for utmost efficiency the resistance of the grid leak should be high. To keep the dynamic characteristic straight, the resistance of the grid leak must be high compared with the grid-to-filament resistance of the detector, which, remember, assumes a very high

value at low inputs. But if we make the grid leak too high in resistance the grid condenser will shunt the higher audible frequencies!

As it is in the interests of efficiency to have a high-resistance leak, our obvious precaution, if we want to avoid high-note loss, is to keep down the stray grid-to-filament capacities tending to shunt the high frequencies. It is for this reason that grid connections are made short and are well spaced.

With these stray capacities eliminated, we can use a smaller grid condenser without loss of signal strength, thus enabling a high value of grid leak to be used without loss of high notes. In the two- and three-valve sets mentioned at the beginning of this article a .0002-microfarad grid con-

denser and a 2- or 3-megohm grid leak would be suitable.

In considering the effect of high-percentage modulation on the detector action, we must not overlook the fact that the valve used as a detector works also as a low-frequency amplifier. The working characteristic of the valve must also be such that amplification takes place on the straight portion of the grid-volts anode-current curve. In practice this can be achieved only by increasing the anode voltage on the detector and this is where you must be prepared for greater voltages.

So for all sets tuned to high-power signals and especially to high-percentage modulations, the old idea of applying 70 to 80 volts must be abandoned and the maximum voltage of the battery or power supply must be applied. Otherwise distortion due to overloading the valve in its function as amplifier will be inevitable.

"HINTS AND TIPS FOR CONSTRUCTORS"

(Continued from preceding page)

on the baseboard if you have the full-size blueprint, but if you are working from the layout diagram given in "A.W." in connection with each set, then you will have to scale off the centres. Each layout is exactly to scale and a scalestrip made on a strip of paper will help you to find the correct positions; but, of course, it is much easier to have the full-size print, when you can merely lightly mark the screw holes on the baseboard. This is very important in a set where plug-in coils are used and the positions between the coil sockets should be rigidly adhered to, for otherwise the coupling will be upset. The mounting of ganged condensers is easy if you follow the instructions given by the makers of the components.

A Final Test

Never connect up the batteries to your newly made set and plug in the valves before checking the wiring. It is easy to

make a slip, and a faulty connection may mean burnt-out valves. Safety first!

PIONEER WORKERS

THIS year is the centenary of the discovery by Michael Faraday of the fundamental relation between magnetism and electricity. Prior to 1821, these were thought to be separate and distinct phenomena, but Faraday showed that an electric current could be produced by moving a conductor through a magnetic field, and conversely that a bar of soft iron was converted into a magnet when placed inside a coil of wire carrying an electric current. His discovery of the laws of electro-magnetic induction was soon followed by the invention of the electric motor and dynamo, which, in turn, laid the foundation of modern electrical engineering. The same year—1821—saw the birth of James Clerk Maxwell, who was the first to foretell the existence of wireless waves, though he died some years before Hertz actually produced them in 1888.

M. A. L.

HIGH-NOTE VALUES

FREQUENCIES above 7,000 cycles are essential for the proper reproduction of such instruments as the flute or violin, or for tenor or soprano voices. The brilliance of a loud-speaker is, in fact, the measure of its ability to repeat the harmonics lying between 7,000 and say 10,000 or 12,000 cycles. Where the high-note response is poor, noises such as the rustling or tearing of paper, or the jingling of keys are reproduced in a form which bears very little resemblance to the original sounds. One solution to the problem of securing an accurate balance between the high and low notes is to use two or more loud-speakers in tandem, one of them being specially designed to emphasize the high-note values.

B. A. R.

MEASURING THE MILLIAMPERES

HIGH-TENSION voltage is not the only thing to be considered. The high-tension current is often of even greater importance. Mains eliminators designed, say, to give a maximum output of 15 milliamperes are in some cases used with sets, the power valve of which alone may take 12 or 14 milliamperes.

Nearly every eliminator when overworked, gives a lower voltage than is rated, and high-tension batteries are affected in the same way because if their normal discharge value is exceeded, their length of life is considerably affected.

If you have a mains unit which is being overworked, why not use it only for the power stage, and have a dry battery for the other stages in the set? This, at least, is a half-measure towards getting better purity by supplying ample high tension to the anodes of all valves in the set.

K. U.

Brussels (No. 1) is now one of the earliest stations to come on the air, as on Sunday mornings from 5 a.m. reports are broadcast of carrier pigeon races.

It is reported from Norway that an official of the Bergen studio is endeavouring to found a Union of European announcers.



Mr. H. L. O'Heffernan, owner of the amateur transmitting station G5BY, who has again won the International Relay competition promoted by the American Radio Relay League. He had more than double the number of marks of any other entrant!

A Weekly Programme Criticism—By SYDNEY A. MOSELEY

Without Fear or Favour



THE PROMENADE CONCERTS

CATTERALL and WOODHOUSE



SIR HENRY WOOD and DR. BOULT

FROM THE POSTBAG

THIS is my valedictory article. I am off to America, and not knowing when I am likely to return, I am taking the opportunity to suspend an association which has lasted several years and which has afforded me the greatest pleasure.

"I think, on the whole, we have been "without fear and without favour."

Considering the number of programmes I have listened to, I think I have made comparatively few mistakes. When I have, I have not hesitated to admit them.

It is a pity, in a way, that I have to break off here, because it seems, judging from the correspondence column of AMATEUR WIRELESS, that we are beginning an interesting controversy as to the likely successor to Jack Payne's band—or, at any rate, substitute—and, secondly, a discussion as to whether modern musical comedy is equal to the old-time works.

Also, we would have had a lot to say about the Promenade Concerts.

I have been every night up to the eve of my departure for the United States. A lot of interest has been aroused as to Arthur Catterall, the leader of the B.B.C. Symphony Orchestra, not being given a place. I have the greatest respect for Charles Woodhouse. He has led the Promenade Concerts for twelve years, and the applause that greets his entrance is sufficient to show that he is popular.

At the same time, it does seem to be a waste of good talent not to employ both these men.

At the last Symphony Concert, Charles Woodhouse's name appeared on the programme as a "second principal violin," but I understand his contract would not permit him to accept this position, and he must unfortunately fall out.

Now, Arthur Catterall falls out, although his salary is at the rate of £2,000 a year, and he, like Woodhouse, is a hard worker and an excellent violinist.

A good many people think the orchestra is better than ever this year, and I am inclined to agree.

The opening performance, although not composed of the usual popular items,

nevertheless held the excited audience in a spell, and the Wagnerian concert was a special delight.

But let me put on the prophetic mantle. When Sir Henry Wood takes his much-deserved farewell the man who will succeed him will be Dr. Adrian Boult, who bids fair to earn a reputation of international renown. Lately I have been making inquiries as to his activities, and really an account of them ought to be published.

He is doing an immense amount of quiet work behind the scenes, encouraging musical talent all over the country. Listeners certainly should know a little more about this wonderful worker in the cause of music.

Unfortunately, space has prevented me from using many of the interesting letters that have reached me, and, indeed, I have been so overwhelmed with correspondence from listeners in connection with my radio work generally that I have not been able even to thank readers by post individually. I do beg them to accept my apologies.

My trip to the United States will give me the first little relaxation I have had for years, for you must remember I have



A Lissenden impression of Miss Marie Burke

kept this page running without a single break for some years. But it is manifestly impossible to write radio criticisms of the British stations when I am some 4,000 miles away.

I feel bound to reproduce two letters, one from J. C. Mackie, of Waterhouse Street, Halifax, and another from John A. Fletcher, of Carlton Scroop, Grantham.

Here is the letter from Mr. Mackie:—

"I often appreciate your programme criticisms in AMATEUR WIRELESS, and note that on quite a few occasions you have mentioned the popularity of dance bands. You ask in the August 1 issue, 'Do we want another dance band to co-operate with Jack Payne?' Along with a large number of my wireless friends, I say 'Yes—if the band is to be Bertini's.'

"For quality, rhythm, and purity it is popularly unsurpassed by Jack Payne's, Marius P. Winter's, Ambrose's, or any other dance band. We cannot have too much of it when dance-band time is on."

Now for Mr. Fletcher:—

"I note with interest in AMATEUR WIRELESS your reference to the applause from the Spa, Scarborough. I know the Spa well and the concert is really much more excellent to listen to in its beautiful surroundings than over the ether. Alick Maclean is a very fascinating conductor to watch. Have you ever been to Scarborough?"

"I don't agree with you that we get too much 'Heart's Delight.' But, then, I am twenty-four and deeply in love. It makes a difference, doesn't it?"

It does!

And so, farewell. The Editor and the staff of AMATEUR WIRELESS have been very kind during my rather lengthy innings.

The Editor has permitted me full range to my critical vein, and I have said in effect what I wanted to say without fear or favour, and I hope without unkindness.

AMATEUR WIRELESS, after all, was the first weekly to run radio criticism, and I do hope that it will continue to do so, even if such criticism comes from some other, but I hope equally caustic, pen than that of your most obedient servant—

SYDNEY A. MOSELEY.

"CAN you recommend a good four-valve set which I can make up for less than £5?"

That is a typical query received by the Information Bureau, and it is best answered by the production of this new set, appropriately named the "£3 3s. Four."

Naturally, in a set of this description everything is of the simplest and this new receiver is truly one produced without "frills" to satisfy the man who wants to get good reception without spending too much upon his outfit.

A Big Demand

There is a big demand for a four-valver at a reasonable price because listeners who have had experience with simple two-valvers and want to change to something better feel that it may not be worth while adding just one more valve, but that while rebuilding the set they might as well make a good job of the reconstruction and build, say, a four-valver which they know will not only have as good range as a well-designed "three," but owing to the extra low-frequency amplification available will be a more powerful type of set.

The difficulty in the past has been that there was so much increase in the cost of construction when one contemplated a four-valver in place of a three that many amateurs naturally preferred to experiment with high-quality three-valve sets rather than go to the expense of building up a larger set.

Now this position is completely altered. The new low prices of components enable the man of limited means to build a set which compares in performance with the more expensively designed outfits.

This "£3 3s. Four" will meet with a popular reception because it can be built at very low cost—indeed, this is probably the lowest ratio of price to number of valves which has yet been obtained in

any published set—and has all the qualities which one expects to find in a well-arranged four-valver.

You may wonder how it is that the "A.W." technical staff has managed to get down to the exceedingly low figure of three guineas.

For several weeks experiments have been made in the Fetter-lane laboratory to produce a four-valver which will operate in a properly stable manner when shorn of all fittings in the shape of by-pass and anti-motorboating circuits. These are the "extras" in a set which, in most cases, add materially to the cost, and in order to get down to the price limit, a way had to be found in which the set could work without additional stabilising devices.

Stability

It is not an easy matter, but you may rest assured that in this set you will have no trouble with low-frequency howling and spurious H.F. oscillation provided you operate with recommended battery values and valves.

Any amateur who has tried to design a set for himself, using at least 100 volts H.T. and modern valves, will have realised how difficult it is to keep, say, an H.F. stage, a detector and two low-frequency stages (particularly "mixed" L.F. stages) in check without efficient filter circuits for each stage.

The **£3.3**

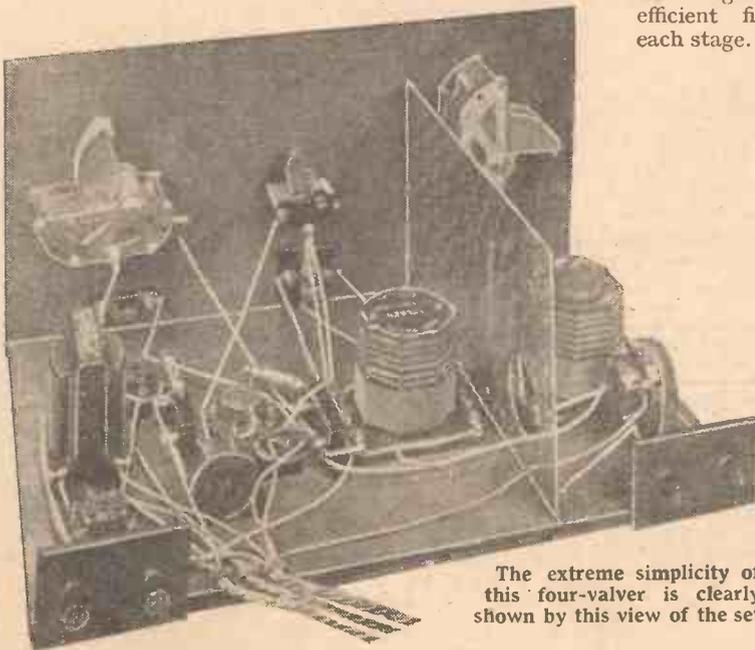


It must be emphasised that with this set you can always let it "grow" as your fancy changes for getting more output. It works well as it is, and forms a fine basis for the "gadget" lover who is never happy unless he is trying a volume control here or a filter circuit there.

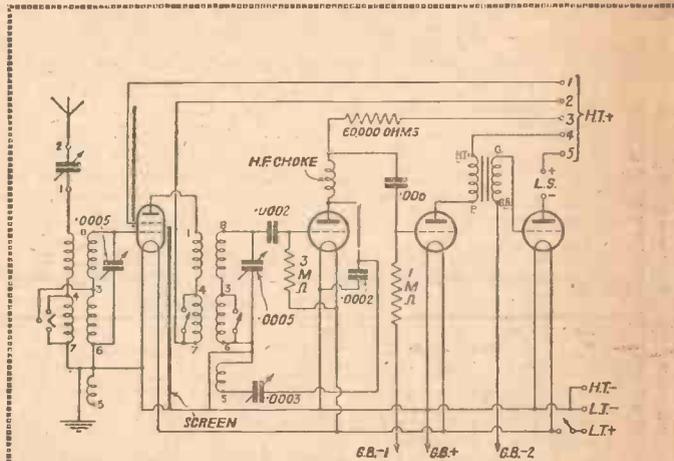
Study the Circuit

Just how it has been possible to produce a circuit, stable and yet at the very lowest possible price, can be gauged from the layout and from the theoretical circuit given here. The spacing of the parts is important, in order to reduce mutual coupling, and as will be further emphasised when the construction of the set is dealt with, it is advisable to adhere rigidly to the spacing shown on the full-size layout.

The circuit is interesting, although quite straightforward. It will be seen that the



The extreme simplicity of this four-valver is clearly shown by this view of the set



The circuit of the "£3 3s. Four" is extremely simple, and the various technical features are dealt with in the accompanying article

O. FOUR

For enthusiasts who do not want to go to unnecessary expense in building up a set, this new low-priced four-valver will appeal. It is cheap, simple and efficient.

new Telsen coils are used; the special aerial coil has a variable selectivity control, being used in the aerial position, and the H.F. transformer coil is used to couple the screen-grid stage to the detector.

A Straight "Four"

The circuit is, of course, of the type known as "trans., H.F., det., R.C., L.F., trans.," which means that there is a stage of H.F. transformer-coupled screen-grid amplification, a detector, a stage of resistance-coupled low-frequency amplification and a final transformer-coupled power stage. This is all quite clearly seen in the circuit, and the various parts can be identified in the photographs and the scale-drawing of the layout given.

You will see that the aerial tuning arrangements are on rather unusual lines, but as all the connections are made inside

position of the control knob you can sharpen up the tuning to any desired amount.

Naturally, this set has not the knife-edge tuning of band-pass sets such as the "Square-peak 3" and the "1931 Ether Searcher," but it is, nevertheless, suitable for operation in all but exceptional districts where there is an abnormally large field strength—close to Slaithwaite or Brookmans Park, for example.

The reaction winding of the aerial transformer is not used, the reaction being on the H.F. transformer so that there is no fear of causing outside oscillation which would, of course, interfere with neighbours' reception.

There is no by-pass condenser for the screening grid, and as will be explained later in the operating notes, pro-

vided the battery values are kept right there is no fear of instability being caused by the omission of this component. This point, by the way, is dealt with by Mr. W. James in his "In My Wireless Den" notes this week.

Ordinary H.F. transformer coupling is used for the H.F.-detector coupling, and the secondary of the transformer is tuned, as is usual practice. Panel-mounting .0005-microfarad condensers are used both in the aerial and H.F. circuits. The detector circuit does not embody any special points, and it will be seen that the values of .0002 microfarads and 3 megohms for the grid condenser and leak respectively are normal for a set of this type

Detector By-pass

The detector valve is adequately by-passed by a fixed condenser connected between the anode and earth. There is, however, no filter circuit for the resistance coupling arrangement. This is not necessary provided the correct valves and not too much H.T. are used, but if one wants to get the greatest output from the set and wishes to have more high-tension voltage on the detector, then it would be advisable to include a by-pass circuit of resistance and condenser.

Detector By-pass

In this resistance-coupling circuit there are values of 60,000 ohms and .006 microfarads for the anode resistance and the coupling condenser. These are rather important, and you are strongly advised not to use resistances or condensers of different values. As the anode resistance has to carry the anode current of the detector valve it is important, too, to choose the type given in the accompanying components list.

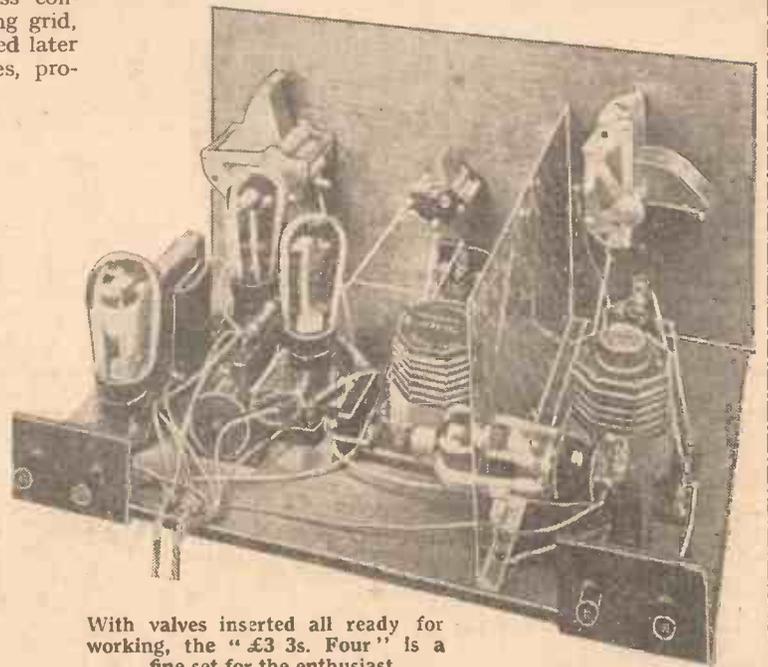
There is no output filter circuit for the set, and if a high value of H.T. is applied, or if the current is taken from the mains, then there are many advantages in having

With valves inserted all ready for working, the "£3 3s. Four" is a fine set for the enthusiast

COMPONENTS NEEDED

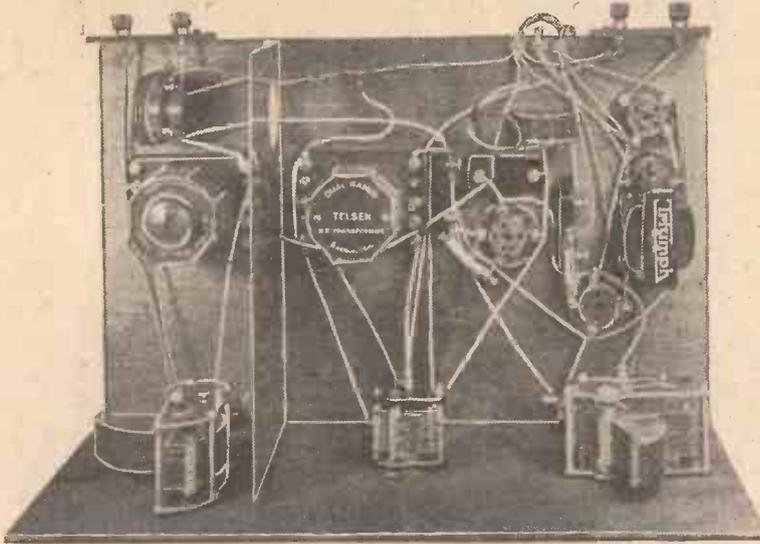
Two .0005-mfd. variable condensers (Lotus, Telsen, Polar, J.B., Cydon, Formo, Utility).
 .0002-mfd. reaction condenser (Burton, Lotus, Lissen, Telsen, Polar, J.B., Cydon, Formo).
 Dual-range aerial coil (Telsen).
 Dual-range high-frequency transformer (Telsen).
 Two slow-motion dials (Formo, Telsen, Lotus, Astra, Polar, J.B., Lissen).
 Filament switch (Busco, Telsen, Lissen, Sovereign, Junit, W.B., Read:Rad, Belling-Lee).
 One four-point wave-change switch (Bulgin, Telsen).
 Three-point shorting switch (Telsen, Bulgin, Busco, Read:Rad).
 Four valve holders (Telsen, Lotus, Benjamin, Lissen, W.B., Junit, Formo, Wearite, Clix).
 High-frequency choke (Telsen, Wearite, Read:Rad, Lissen, Lewcos, R.I., Sovereign, Burton, Bulgin).
 Two fixed condensers, .0001, .0002 (Lissen, T.C.C., Telsen, Dubilier, Formo, Graham-Farish).
 One .006 fixed condenser (Lissen, T.C.C., Dubilier, Formo, Graham-Farish).
 One 2-megohm grid leak (Lissen, Telsen, Sovereign, Dubilier).
 One 1-megohm grid leak (Lissen, Tel-

sen, Sovereign, Dubilier, Graham-Farish).
 Low-frequency transformer (British General, Telsen, Lissen, R.I., Burton, Lotus, Lewcos, Varley, Ferranti).
 One 60,000-ohm spaghetti resistance (Lewcos, Telsen, Read:Rad, Bulgin, Sovereign, Tunewell, Lissen).
 One ebonite strip, 6 in. by 2 in. (Read:Rad, Peto Scott).
 Four terminals marked: A, E, L.S.+, L.S.— (Belling-Lee, Burton, Ealex).
 Nine wander plugs marked: H.T.—, H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.+5, C.B.—, C.B.—1, C.B.—2 (Belling-Lee, Burton, Ealex).
 Two spades marked: L.T.+, L.T.— (Belling-Lee, Burton, Ealex).
 Screen to specification (Read:Rad, Peto Scott, Paret).
 Connecting wire (Lewcos).
 Sleeving (Lewcos).
 Six yards thin flex (Lewcoflex).
 Plywood for panel and base.
ACCESSORIES
 Loud-speaker (Blue Spot, Amplion, Herra, Celestion).
 120-volt H.T. battery (Pertrix, Drydex, Palaba, Ever Ready, Lissen, Fuller).
 9-volt G.B. battery (Pertrix, Drydex, Palaba, Ever Ready, Lissen, Fuller).
 2-volt accumulator (Pertrix, Ever Ready, C.A.V., Exide, Fuller).



With valves inserted all ready for working, the "£3 3s. Four" is a fine set for the enthusiast

THE "£3.3.0 FOUR" (Continued from preceding page)



Compare this plan view of the set with the wiring diagram given below

an output choke or filter.

A good filter circuit which you can simply connect up to the speaker terminals of this set is the unit described on page 189 of last week's issue, "A.W." No. 479.

Do not experiment with components. The accompanying panel gives a full list of the necessary parts, and in most cases there are alternatives so that, if the first-mentioned parts are not available, or if you have one or other of the alternatives on hand, then these can be used.

The Full-size Print

There is a full-size blueprint available, and this can be obtained price 1s. 6d., post free, from the Blueprint Department, Bernard Jones Publications, 58-61 Fetter Lane, E.C.4.

Construction is quite straightforward, and if you follow the photographs in conjunction with the full-size print or with the scale-drawing of the layout given here you should have no difficulty in identifying each part and in carrying out the wiring.

To simplify construction and also to cut the cost down to the very minimum, a plywood panel is used, and not only is it easier to cut and drill this as is needed for the mounting of the panel parts, but it is also a simple job to stain it to match the cabinet and a very pleasing appearance results. It will no doubt be remembered that a wooden panel was used in the "Century Super," and for sets of this type the insulation is quite satisfactory.

Terminal Strips

Ebonite is used only for the terminal strips at the back, and as there are only four terminals (the batteries being connected by flex leads) there is not much drilling to be done.

In next week's issue constructional details will be given for the benefit of those who are making up this "£3 3s. Four" as a first attempt at set construction and who want full instructions for component mounting, panel drilling, wiring, and so on. Operating instructions will also be given.

Simple Control

These are most important, as is the case with any large set such as a four-valver, and in the case of the "£3 3s. Four" they have a special bearing on the quality of the reproduction and on the overall satisfaction to be obtained from the set.

The manner of making the most of the inherent selectivity of the set will be dealt with, and the working of the selectivity control in the Telsen aerial coil will be described.

Novices need have no fear, though, that the working of the set will be beyond their capabilities, for it is extremely easy to keep the aerial and high-frequency stages in tune and to get really sharp tuning so that the local stations won't interfere when you want the foreigners.

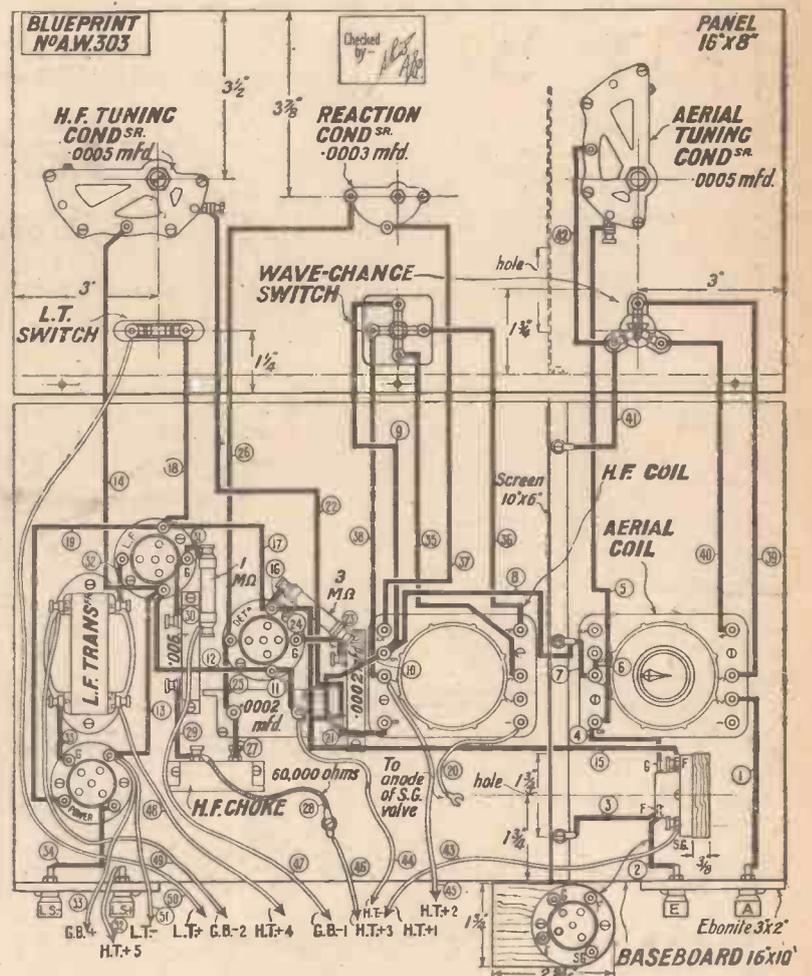
Don't forget that you can see the set this week in the Radio Department windows of Messrs. Selfridge & Co., of Oxford Street, London, W.

VARYING THE H.T.

OF the three main things which cause basic distortion in a set—insufficient high tension, incorrectly chosen valves, and poor loud-speakers—the most common, so far as the set is concerned, is the high tension. One can have too much or too little. On screen-grid valves the anodes should be given a full 120 volts and there will be overloading if only 80 or 100 volts are required. The detector anode voltage is generally in the neighbourhood of 80, and the valve manufacturers' curve and recommendations should be studied.

With resistance-coupled L.F. stages you simply cannot have too much H.T. up to a reasonable limit of 150 or 180, and the same applies to most power valves.

It is a natural temptation for dry-battery users to run a set on too low a voltage, but valve characteristics depend mainly upon correct high-tension voltage, and if you want purity in reproduction then you must use the high-tension voltages advised by the valve manufacturers. U.



A full-size print of the set can be obtained price 1s. 6d., post free from this office

A TOP-NOTCH SET

THE £3 3s. FOUR

1 Polished plywood panel, 16 in. by 8 in., drilled to specification	£ s. d.
1 Baseboard, 16 in. by 10½ in.	1 6
2 Readi-Rad .0005-mfd. log condensers	9 0
2 Brownie slow-motion dials	5 0
1 Telsen dual-range aerial coil	7 6
1 Telsen H.F. transformer	5 6
1 Readi-Rad .0002-mfd. reaction condenser	2 6
1 Readi-Rad filament switch	10
1 Bulgin 4-point switch, model S29	2 6
1 Readi-Rad 3-point shorting switch	1 6
4 Telsen 4-pin valve holders	2 0
1 Readi-Rad "Hilo" H.F. choke	4 6
2 Fixed condensers, .0001 mfd. and .0002 mfd.	1 8
1 Graham Farish fixed condenser, .006 mfd.	1 0
2 Grid leaks, 1 and 2 megohm, with holders	2 8
1 R.I. Parafeed L.F. transformer	8 6
1 Lewcos 60,000-ohm spaghetti resistance	1 6
1 Terminal strip, 6 in. by 2 in. by 3/16 in., drilled	6
4 Belling-Lee "R" terminals	1 0
9 Belling-Lee wander plugs; 6, H.T., and 3, G.B.	1 6
2 Spade terminals	3
1 Packet "Jiffilinx" for wiring	2 6
1 Readi-Rad screen, as specified	2 6
4 Valves to specification; S.G., det., L.F., and power	2 7 6
Flex, screws, etc.	7
TOTAL (including valves)	£5 : 16 : 6

THE £3 3s.
FOUR

KIT A

(less valves and cabinet) **£3:9:0**

or 12 equal monthly instalments of **6/3**

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or 12 monthly instalments of

Kit B - £5:0:0 **9/3**
or 12 monthly instalments of

Kit C - £6:0:0 **11/-**
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Century Super Portable

Kit A - £8:0:0 **14/8**
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Kit B - £11:16:0 **21/8**
or 12 equal monthly instalments of

Kit C - £14:1:0 **25/9**
or 12 equal monthly instalments of

Complete Set, already assembled, including valves and royalties **£17:1:0**
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Kit B - £6:17:0 **12/6**
or 12 monthly instalments of

Kit C - £8:2:0 **15/-**
or 12 monthly instalments of

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IN MY WIRELESS DEN

WEEKLY TIPS—
CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

L.F. Transformer Curves

MANY low-frequency transformers have a rising characteristic, the magnification of the higher notes being greater than that of the medium frequencies.

The actual amount of the magnification obtained from a stage depends, of course, upon the valves used as well as the transformer. You may increase or decrease the relative amplification of the higher notes by altering the valves.

A change in the quality is therefore produced when different classes of valves are used. This is often noticed and shows that the transformer is fairly sensitive. Some transformers are too sensitive in this respect as it is fairly easy to make them oscillate at a high audio frequency. A change in the method of connecting the windings is likely greatly to affect the results and even circuit capacities are enough to produce a noticeable effect.

A rising characteristic is useful provided the results can be controlled, but you should always be careful of the cheaper transformers as they are likely to be troublesome if steps are not taken to prevent distortion. A resistance fed transformer, because of the loading effect of the resistance as well as that of the valve, will usually not give trouble, but the same transformer used directly in the plate circuit may give poor results.

Battery Bothers

Accumulators that have been used for a fair period ought to be overhauled. It does no harm to clean out the cells and to fill them with fresh electrolyte of the right specific gravity. Then a good charge will put the cells in good condition again.

Those who use a trickle-charger may find that the cells are being under-charged. In time the voltage will fall so low that the volume is reduced. The cells may be damaged if they are continually being used in a more or less uncharged condition and a good charge should therefore be given at regular intervals, instead of relying entirely upon the trickle-charger.

These Metal Valves

A valve having a metallised bulb that is placed near a coil is bound to affect the results. The coating of the bulb is a metal and is earthed through one of the contacts of the valve.

It, therefore, will affect the results in the same manner as a piece of metal. The tuning may be altered a little and a bit more reaction will be needed.

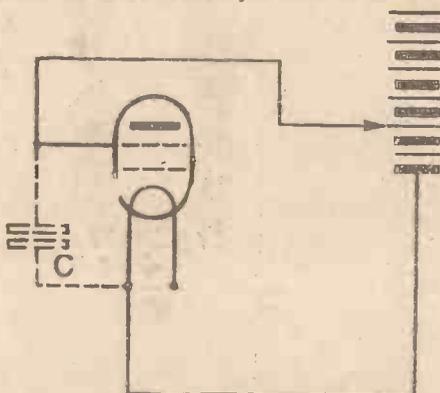
You should not place a valve too close

to a tuning coil. In the case of a non-screened aerial filter, for example, the accuracy of the ganging may be affected by placing the valve near one of the coils. As the effect is to reduce the inductance of one of the coils the circuits cannot easily be ganged by the usual condenser trimming.

When changing from an ordinary to a metallised valve this effect may be noticed and it is advisable to move the valve from the coil. Metallised valves are worth using in a set not having valve shields. If these are fitted ordinary valves had better be used.

The Screen-grid Stage

It is usual to connect a fixed condenser, of about 1 microfarad, between the screen of a screen-grid valve and earth. Sometimes an ordinary condenser is not



Here is a typical screen-grid stage with the by-pass condenser for the screening grid indicated by dotted lines

good enough and a non-inductive type is necessary.

The condenser holds the voltage of the screen at a steady value. High-frequency currents pass from the screen to earth through the condenser shown connected by dotted lines in the diagram. In simple sets the condenser may be omitted and the results be satisfactory.

It is possible that a coupling may occur if the battery has a high-resistance, but it is surprising how much amplification may be obtained without difficulty.

In sets having a highly efficient stage a condenser is usually necessary. One condenser may be used when there are two screen-grid stages, as in the "Century Super," but only experiments can show in a particular set how much by-passing is essential. In simple sets no by-passing at all might be proved not to affect results.

"High-voltage" Pick-ups

Some pick-ups provide about 2 volts from an average record. This is not enough to give a loud-speaker signal, but if a good transformer is used to couple the pick-up to a power valve of the usual 2000-ohms type, taking a bias of about 7.5 volts, it is possible that satisfactory results will be obtained.

As a rule, in a set having a detector and power valve, the pick-up is connected to the detector valve, its grid circuit being arranged for amplification. The magnification is usually too much when a sensitive pick-up is employed and distortion is produced unless the volume control is properly used.

In sets having a transformer coupling with the pick-up joined to the primary, this overloading may be avoided. In fact, better all-round results may well be obtained by cutting out the first valve and using only the transformer and last valve. A simple switching arrangement is possible, and you can easily try the idea by disconnecting the primary winding from the valve and connecting the pick-up directly to the power valve.

Doubtful Fixed Condensers

Fixed condensers are usually correct to within 10 per cent. of their rated capacity, but there are always those that are less accurate.

Sometimes no noticeable effect will be produced by using a condenser having a capacity, say, 25 per cent. greater or less than the specified value. It is possible, though, that poor results will be obtained, particularly if the actual capacity is not enough. Thus when the condenser is in the aerial circuit the tuning may be too sharp and the signals too weak when the capacity is too small.

If you feel that the tuning of the aerial circuit is sharper than necessary and a fixed condenser is included in the aerial lead to the coil, first cut it out and notice the results. It is possible that the tuning will then be too broad, and you may notice a big increase in the strength. Then connect a condenser having a greater capacity than the one fitted, as this one may have too little capacity. It is always safe to experiment in this way.

A Circuit Detail

The diagram on page 174, of the issue of August 8, shows a wire across the grid-bias battery. This should, of course, not be connected, as it would short-circuit the battery.

There's a DUBILIER CONDENSER for every set



No Radio Set is any better than its weakest link and this weak link may often be the condenser. Dubilier Condensers are renowned all over the world for their dependability and long life. See the name Dubilier on the next condenser you buy. It is your guarantee of perfect service.

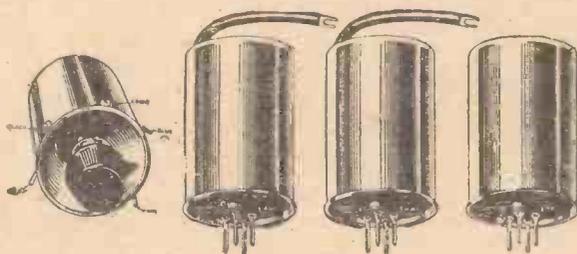
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IF IT'S A SUPER-HET!



—You must fit the original "Century" Super Het coils for the very best results. These coils are supplied only by Wright and Weaire, Ltd. (British Patent No. 349403)



These coils which were introduced by Wright & Weaire Ltd., enabled the Amateur Wireless technical staff to introduce the now well-known "Century Super," "Super 60" and kindred sets. Follow their example and use "Wearite" when building a Super Het. Price complete set of 4: 50/-

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SETS OF DISTINCTION

GEOPHONE

PORTABLE FOUR VALVER



Makers: The General Electric Co., Ltd.

Price: 15 Guineas

NOW that sunny days are temporarily here again, many set-buyers must be thinking of portables. If the need is for an inexpensive portable, with enough selectivity to cope with regional broadcasting conditions, and sufficient power to provide rather more than a moderate undistorted loud-speaker output, there is the Gecophone four-valve portable. I have just finished testing one of these sets and I consider this is an appropriate time to let readers know of my experiences with it.

The Gecophone portable comes within the suitcase category. That is to say, the container is made after the fashion of suitcases, although the description is only accurate inasmuch as one part of the container is hinged to the other. When opened, the hinged part, or lid, can be seen to contain the loud-speaker and frame aerials.

The General Arrangement

The centre part of the loud-speaker fret carries the loud-speaker unit adjuster. Down in the left-hand corner are clearly marked terminals for the connection of an external aerial and earth, should either or both of these be necessary owing to the great distance of the set from the nearest broadcasting station.

Near these two terminals one discovers a neat two-way switch knob for medium- and long-wavelength frame aerials.

In the main body of the set are fitted the batteries in one compartment and the four-valve chassis in another, with the four valves mounted between these two compartments on a neat and accessible platform. A very short examination of the chassis shows that the makers have put into it their best material. The variable condensers, tuning coils and low-frequency couplings are first-rate. The wiring of the chassis is notably robust. It would stand plenty of hard knocks without coming astray.

Batteries

The batteries consist of a 100-volt standard-capacity Magnet unit and a 16½-volt slab for grid bias. There is also a 2-volt unspillable accumulator having a capacity of 20-ampere hours. The battery leads are all plainly marked and are connected to the battery by means of strong split-pin plugs.

The control panel has a simple layout that should be readily grasped even by a radio novice. The two main controls are two 0-to-100 slow-motion dials. These actuate variable condensers associated with the tuning circuits on each side of the high-frequency-amplifying valve.

In the extreme left-hand corner of the control panel is the volume control, working before the detector and thus cutting down the strength of powerful locals. All too few portables of this type include a pre-detector volume control. Just above the volume control is the usual three-way

The Gecophone portable—note the accessible battery compartment



switch knob, providing medium- and long-wave tuning and switching the batteries off.

The remaining control is a knurled disc, fitted between the two tuning knobs. This is for reaction and is needed only for the reception of distant stations, or when the portable is used in an unfavourable reception locality.

The four valves of this portable are arranged in the sequence of high-frequency amplifier, detector, and two low-frequency-amplifying valves, the last valve being a P₂ power type, providing very good quality of reproduction with, of course, somewhat high running costs.

This circuit, because it employs two tuning circuits, one for the frame tuning and the other for the high-frequency-amplifying valve coupling, is very suitable for portables, especially for those worked

near to regional broadcasting stations such as Brookmans Park and Moorside Edge. During tests I found no difficulty in cutting out the London National and Regional stations within a few degrees.

As there are two tuning dials to be rotated for the reception of each station wanted, the makers have thoughtfully provided an approximate calibration for the more important home and foreign stations. London National is marked as 13.5 degrees on the left dial and 22 degrees on the right. In the model tested these calibrations were only 2 degrees out. Similarly with London Regional at 46.5 and 47.5 degrees on the left and right dials respectively.

After dark I was able to verify some of the calibrations for foreign stations. Toulouse and Budapest were quickly found on the medium waves, as well as half a dozen others not included in the calibration list. I made more use of the long-wave calibrations, getting Kalundborg, Zeesen, Radio Paris and Hilversum simply by setting the dials to the degrees specified.

Excellent Control

During the operation of this portable I was impressed with the value of the volume control. Without this the two London stations would have hopelessly overloaded the set. As it was, I reduced the signal input to a degree that made possible the reception of these powerful stations with pleasing quality.

The reaction works very smoothly and certainly increased the strength of the foreign stations logged. One point has to be watched in receiving stations and that is the directional effect of the frame aerial in the lid. In order to facilitate the bodily rotation of the set, a turntable is provided on the battery cover. This can be easily removed and placed under the portable container when the set is in use.

The makers are quite frank about the upkeep cost of this portable. They say that to maintain the efficiency of the set the high-tension battery should be renewed every two months. Towards the end of the life of each high-tension battery a small reduction in grid bias will improve quality. This is a tip mentioned by the makers in their instruction booklet.

• SET TESTER.

The proud claim is made by Edinburgh that no other city in Britain can boast the same number of multi-valve sets. It is also stated that a much larger proportion of the population possess wireless sets than is the case in Glasgow.

For the Newcomer to Wireless : INSIDE THE VALVE

I AM rather puzzled by one thing concerning valves. What's that?

In explanations of the way in which the valve amplifies I always find it shown that changes in the grid voltage produce corresponding but magnified alterations in the plate current. I follow that all right, but there is one thing that I don't understand.

Well, let's see if I can help.

Surely, unless a valve is in the output holder it has to pass on to the grid of the next not current but voltage changes.

That is so.

Well, then, how does it do this if current changes are produced in its plate circuit?

I see your difficulty. As a matter of fact, it is a question that puzzles lots of people when they first begin to think about valves. What you really want to know is how the current changes in the plate circuit are converted into voltage changes before being passed on to the grid of the next valve.

That's it.

Well, here are two 10,000-ohm resistances. If we wire them in series and connect them to a 100-volt battery then the voltage drop across the pair is 100 volts, isn't it?

Yes, that's quite plain.

The total resistance is 20,000 ohms, and as the two resistances are equal, then 50 volts are dropped across the first and 50 volts across the second. Ohm's Law shows that, doesn't it?

Yes, 100 volts drive 5 milliamperes through 20,000 ohms. That current is flowing through each resistance. To find the voltage across each resistance we simply multiply amperes by ohms the calculation being $.005 \times 10,000$, or 50. Now, suppose that we remove one of them and replace it with a resistance of 5,000 ohms. The total resistance is 15,000 ohms. As before, the voltage drop across the two resistances is 100 volts and the current flowing is 100 divided by 15,000, or 6.6 milliamperes. Making the same calculation as before by Ohm's Law, we find the volts dropped across the first resistance are $.0066 \times 10,000$, or 66, and those dropped across the second $.0066 \times 5,000$ or 33.

Then what it comes to is that by varying one resistance you alter the volts dropped across the other. Isn't that so?

You have got it exactly. Now think of a resistance-capacity-coupled circuit. What is in the plate circuit of the valve?

A fixed resistance.

Yes; but the valve itself is a variable resistance, isn't it?

How do you mean, exactly?

If the grid goes positive more current passes from filament to plate and the internal resistance is reduced. When it goes negative the internal resistance is increased and less current passes. That is, the grid voltage variations produce the plate current changes.

I see.

Then we have in series the variable resistance of the valve and the fixed outside resistance. If the valve resistance goes up, then the voltage drop across the outside resistance is smaller; when the valve resistance goes down more volts are dropped across the outside resistance and you can find the exact amount of volts dropped across the outside resistance at any grid potential.

How is that done?

As before, by Ohm's Law. A milliammeter measures the current flowing through the resistance. Multiply this by the ohms of the resistance and the answer is the volts dropped.

Then when the valve is working you get continual voltage changes across the resistance in its plate circuit?

That is exactly what happens. These produce similar voltage changes across the coupling grid condenser and therefore upon the grid of the following valve.

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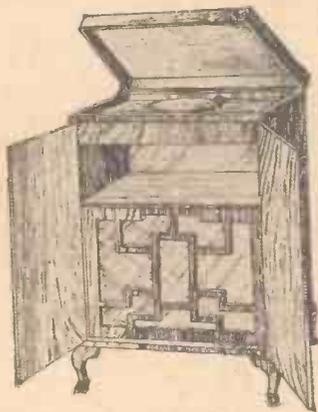
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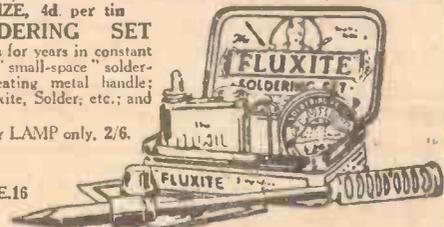
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CHOKE OR TRANSFORMER OUTPUT?

Discussion often centres on the relative advantages of the two most popular forms of output device, choke and transformer. This explanation by J. H. REYNER, B.Sc., A.M.I.E.E., will help set-builders who are now designing the output arrangements for their sets.

I OVERHEARD an animated conversation the other day between two wireless enthusiasts. One was contending that a simple choke output circuit was quite satisfactory for all ordinary purposes, while the other was all for the output transformer. For one thing, he argued, it was essential to match the loud-speaker to the output valve for the best results—that is, he added scornfully, if one really knew what decent results were!

It is, I think, significant that the question at issue was not whether an output circuit should be employed, but which of two possible forms was likely to prove the most satisfactory. We have come to accept the

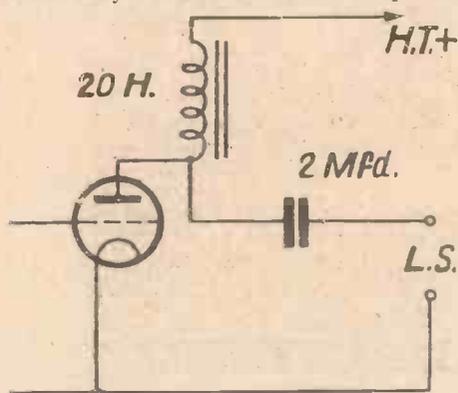


Fig. 1. A typical choke output arrangement

output circuit as a *sine qua non* in an up-to-date receiver. There are numerous reasons for this.

The first is the isolation of the loud-speaker from the set. This acts as a protection to the speaker, and also to the user, particularly in the case of a mains receiver, where it is essential to isolate the high-tension voltages in the receiver.

The second is the D.C. resistance of an output circuit is considerably less than that of a loud-speaker, so that the greatest possible percentage of the high-tension voltage available is actually applied to the anode. A 2,000-ohm speaker with a valve taking 10 milliamps will drop 20 volts, and if the H.T. battery is 120 volts, the valve will only receive 100 volts. The maximum undistorted power output from the valve will be nearly 50 per cent. greater if the full 120 volts can be supplied, and with an output circuit the voltage drop is only a few volts, so that we approach quite near the ideal in this respect.

Points in Favour

These are the general points in favour of an output transformer of some sort, and their desirability is now sufficiently appreciated to render the use of such circuits increasingly popular. It remains to discuss the two principal forms. The first of these is the choke output circuit illustrated in Fig. 1, the second being the transformer in Fig. 2. The two circuits differ appreciably in their method of action.

Consider the choke output first of all. The inductance of the choke is chosen so that it presents a high impedance to the audio-frequency currents over as great a range as possible, while the condenser should present a relatively low impedance. The audio-frequency currents leaving the anode of the output valve and arriving at the junction point, therefore, refuse to pass through the choke, passing by preference through the by-pass condenser.

The By-pass Condenser

Since the condenser will not pass direct current, the anode current is isolated from the loud-speaker which only carries the speech currents, while conversely the choke effectively prevents more than a small fraction of the speech current passing through the battery, thereby avoiding battery feedback; what is more, the speech current actually flowing through the loud-speaker is practically the same as if the loud-speaker had been placed in the anode circuit direct. For example, with the values shown in Fig. 1, the choke at 400 cycles would have an impedance of 50,000 ohms, and the 2-microfarad condenser an impedance of 200 ohms. Thus if we assume the resistance of the load to be 2,000 ohms at the same frequency, we get over 95 per cent. of the current through the load and only a small fraction through the inductance. I have indeed made numerous measurements at various frequencies on a loud-speaker both directly in the anode circuit and in a choke-output circuit.

Choke-circuit Essentials

The essentials of a choke-output circuit are a high inductance for the choke and a low impedance for the by-pass condenser. The choke should not be less than 20 henries and may be any larger value within reason provided, of course, that the choke does not saturate due to the passage of the steady anode current. The calculations, of course, must always be based on the inductance of the choke under working conditions. The by-pass condenser should be 2 microfarads at least, although in many cases 1 microfarad may be used satisfactorily. If values less than this are used, there will be a distinct loss in strength, particularly in the lower frequencies.

Let us now turn to the output transformer. This must be regarded in an entirely different manner. Here we apply a voltage across the primary winding, and we develop across the secondary a similar voltage of substantially the same magnitude, assuming the number of turns on primary and secondary to be the same (1:1 ratio). The voltage can only be transferred from primary to secondary if it is alternating in character, so that the steady anode current induces no voltage in the secondary, and is therefore isolated from the loud-speaker. On the face of it, a simple 1:1 output transformer appears to be similar, as far as results are concerned, to

a choke-output circuit. There are probably many of my readers who have tried output transformers, and have found this is not the case. In many cases a distinct drop in signal strength is noticed when using a 1:1 output transformer as compared to a choke-output.

This need not necessarily be so, but it is often found, with inadequately designed transformers, the reason being that the resistance of the winding comes into play. I explained a week or two back that the turns ratio of an intervalve transformer was not necessarily the same as its actual step-up ratio, due partly to the resistance of the winding, and the same thing happens here. The voltage which is effective in inducing the current in the secondary is less than that applied to the primary of the transformer by an amount equal to the voltage drop on the primary of the resistance. Similarly, the voltage actually delivered at secondary terminals is less than the voltage generated internally, because of a similar voltage drop produced by the resistance of the secondary. Consequently, the voltage on the secondary is always slightly less than that supplied to the primary, even though the turns on primary and secondary are exactly the same.

This is the biggest drawback to the output transformer, and failure to appreciate this point has led to the production of several

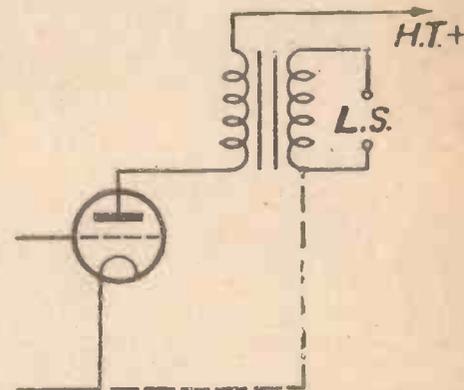


Fig. 2. A good transformer output circuit

inferior articles. The difficulty is not insurmountable, and certain transformers on the market will give practically the same signal strength as a choke-output circuit.

The great advantage of the output transformer is that the step-down ratio may be altered by taking tappings on the secondary winding, and in this way the impedance of the loud-speaker may be matched to that of the valve. It is a curious property of transformers that when they are actually in use, they behave as if the load across the secondary were actually in the anode circuit, and as if the transformer were not there. With a 1:1 ratio the equivalent primary load is exactly the same as the load across the secondary, but if we use a step-down ratio

(Continued on page 237)

Postcard Radio Literature

Baker's Moving-coil Speaker

I HAVE just received a most useful thirty-two-page book dealing with the technical details of the whole range of Baker's Selhurst moving-coil speakers. Moving-coil enthusiasts should have a copy of this, which deals with both the permanent-magnet and energised-field types.

332

For H.M.V. Radio-gramophone Owners

To hand is a folder from the Electric-Dynamic Construction Co., Ltd., describing simple D.C. to A.C. rotary converters, which enable A.C. models of the H.M.V. radio-gramophone to be operated from D.C. mains.

333

Telsen Parts

Here is the new Telsen booklet illustrating and describing all these parts which, on account of sheer technical merit, are becoming extremely popular. Transformers, condensers, valve holders, switches, coils, and dozens of other parts, useful to the home constructor, are described, and I strongly recommend every set user to write for a copy of this.

334

The Columbia 332

A good console type set is the Columbia 332, details of which are given in a new folder just to hand. This is an all-electric set and will make a special appeal to the man who wants to do away with battery bothers.

335

R. & A. Moving Coils

The R. & A. type 100 permanent-magnet moving-coil speaker produced by Reproducers and Amplifiers, Ltd., will appeal to amateurs who are out to get really good quality and who want a speaker capable of handling a large input. Full details are given in a folder just produced.

336

New Mullard Valves

Two new dual-wave rectifier valves, DW3 and DW4, have been produced by Mullard, and if you want a new valve for your rectifier, then you should get, through my free catalogue service, full details of these. The popular DW2 valve is still maintained in the range, of course.

OBSERVER

337

GET THESE CATALOGUES FREE

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard, giving the index numbers of the catalogues required (shown at the end of each paragraph), to "Postcard Radio Literature," "Amateur Wireless," 58-61 Fetter Lane, London, E.C.4. "Observer" will see that you get all the literature you desire.

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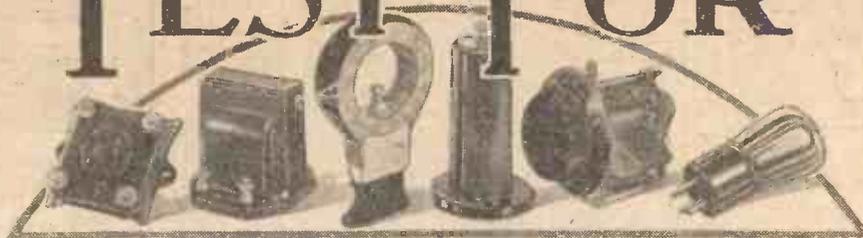
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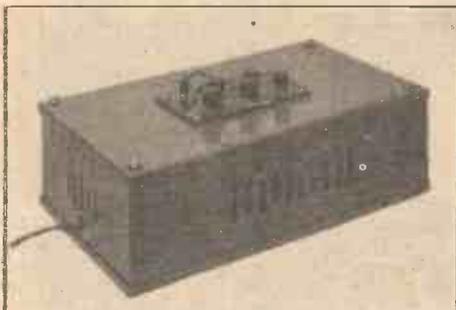


and tests of apparatus.

Conducted by J. H. REYNER, B.Sc., A.M.I.E.E.

Peerless Mains Unit

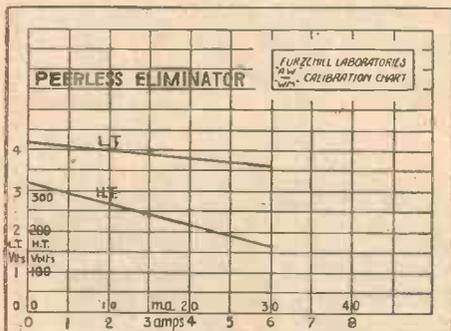
THE Peerless mains unit is a neat job housed in a green metal casing, the overall dimensions of which are 10 in. long by 6 in. wide by 3½ in. high. Mounted in the centre of the top is a small ebonite panel carrying the necessary terminals. The unit is arranged for use on 200 to 250-volt mains, the necessary adjustment



One of the range of Peerless eliminators

being made by means of tapings on the panel. Output terminals are also provided to give to 200 volts at 28 milliamperes and 4 volts at 6 amperes, a centre tap being provided for this latter. Full-wave rectification is employed, the rectifying unit being one of the well-known Westinghouse type.

A complete test was made on the unit, and the variation of voltages with load can



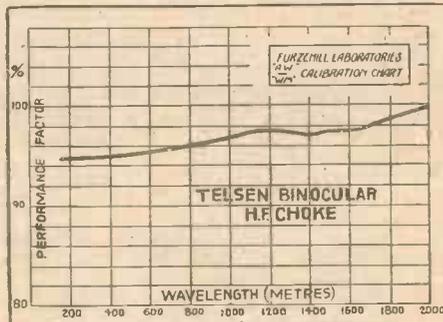
The performance of the Peerless eliminator both on the H.T. and L.T. sides is shown here

been seen from the accompanying curves. It will be noticed that the regulation on both outputs is a little high, but in actual use the performance is satisfactory. The eliminator is manufactured by the Bedford Electrical and Radio Co., Ltd., 22 Campbell Road, Bedford, and retails at £4 7s. 6d.

Telsen H.F. Choke

ANOTHER Telsen component which will meet with general approval is the binocular H.F. choke. As the name implies, this choke is wound in two sections mounted side by side and so connected as to give a restricted magnetic field and so avoid interaction with the other parts of the circuit. The choke bobbins themselves, ¾ in. in diameter and 1½ in. long, are housed in a brown bakelite moulding, the dimensions of which are ¾ in. by 1 in. by 2 in. high.

The criterion of performance in an H.F. choke is the efficiency of its choking action at different wavelengths, and a year ago we devised a test to measure this quantity directly. The impedance of the choke is measured at different wavelengths, and compared with that of a .0001 by-pass condenser. For the perfect choke the impedance would be so high that all the current would be by-passed through the condenser, and we found that a good



This curve shows the fine performance of the new Telsen binocular H.F. choke

practical choke by-passes over 95 per cent. of the current throughout the whole wavelength range.

This Telsen binocular choke falls comfortably within this class. As will be seen from the attached curve, the performance factor exceeds 95 per cent. all the time, and there is a distinct freedom from any subsidiary resonances. The minor variations in the region of 1,400 metres will cause no difficulty in practice and this choke must be considered as taking its place with the best on the market.

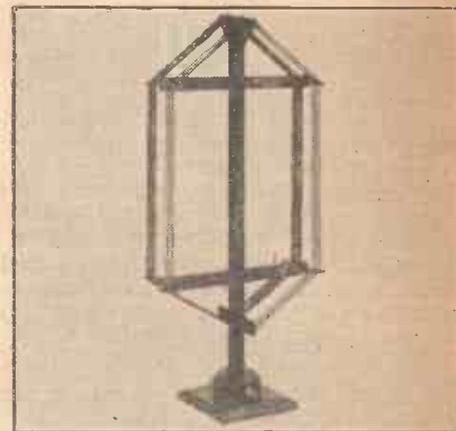
It has an inductance of 170,000 microhenries and a D.C. resistance of 750 ohms.

A Useful Frame Aerial

WITH the increasing popularity of the super-heterodyne type of receiver the design of frame aerials is receiving more

attention. With such a receiver as the popular "Century Super" a frame aerial is essential, and several new designs have been placed on the market specially for use with this receiver.

We have received this week for test one of the new Blacklea dual frame aerials. This frame is nicely made, the framework being of varnished wood with ebonite



The Blacklea frame aerial—useful for "Century Super" owners

bridge pieces to carry the windings. The frame is free to be rotated through an angle of 180 degrees, a condenser-type dial turning with the frame to indicate position. The windings are of Litzendraht wire and are arranged to give a centre tap. A push-pull switch is provided for wave-changing purposes. Tested with a "Century Super" receiver the frame proved quite satisfactory. The inductances of the windings were as follows: short waves, 165 microhenries; long waves, 2,050 microhenries, giving wave ranges with a .0005-microfarad condenser, of 235 to 550 metres, and 900 to 1,900 metres, which is satisfactory for all normal purposes.

This aerial, which is, of course, suitable for use with most types of receiver requiring a frame aerial, retails at 25s. It is marketed by the Blacklea Manufacturing Co., from whom full details can be obtained.

The broadcast of the opera *The Barber of Seville* from Salzburg on July 25 was the most widespread which has taken place to date. Apart from its relay to a number of European countries it was also transmitted by eighty-three stations working in the Columbia Broadcasting Company's net in the United States. In all, over 100 stations broadcast this performance.



A SEASONABLE end-of-the-holiday revue, entitled *Chasing the Sun*, will be given in the Regional programme on September 4 and in the National programme on September 5.

John Morel will broadcast from a London studio in the autumn a little opera entitled *Love Triumphant*, by Countess Marie Vanden Heuvel, in which the only two characters (soprano and baritone) will be played by Miriam Lic-tte and himself.

Eveline Stevenson and Gilbert Astin will be the vocalists in a programme by the Midland Studio Orchestra on August 31.

Eddie Robinson, the "Lad from Lancashire," will entertain Midland Regional listeners during a programme to be given by the Metropolitan Works Band on August 26.

Military Band music by the Band of H.M. 8th Kings Royal Irish Hussars, will be relayed from the Jephson Gardens, Leamington Spa on August 30.

Harcourt Williams' adaptation of Anthony Hope's story, "The Philosopher in the Apple Orchard," will be broadcast from Birmingham on September 1.

On August 28 a concert of an unusual nature will be given in the Leeds studio. It is called "Instrumental Variety" and the artistes taking part are The Leeds Sonorous Quartet, the Leeds and District Banjo, Mandolin, and Guitar Orchestra, and J. Lupton Whitelock.

The "Holidays in the North" series of talks is providing a number of surprises for listeners who thought they were fairly well acquainted with their own country. They will get one more surprise on August 24, when Mr. F. A. Rush will talk on "Our Continental North," and point out that many of the things we go abroad to see can be found in the North of England.

On August 25, the Pavilion Gardens Orchestra from Buxton has an ambitious programme.

The Band of H.M. Welsh Guards will be relayed from Bristol's Annual Exhibition in the Colston Hall on September 3—the opening day—from 7.30 to 8.15 p.m., and also on September 14 from 7.30 to 8 p.m.

A talk on The Monks of Mediaeval Somerset will be given for West Regional listeners by Mrs. Dorothy Howard Rowlands on September 4.

A concert by victors at the Royal National Eisteddfod of Wales, Bangor, 1931, will be given from the Cardiff Studio on September 5. Other concerts of a similar nature will be given during the autumn.

The Northern artiste giving a recital on August 24 is Kathleen Frise-Smith. Her

programme consists of works by Bach, Brahms, Chopin, and Schumann.

A medley of songs and sketches will be broadcast from the Birmingham Studios on September 2. The artistes will include Evelyn Over, Mabel France, and Godfrey Baseley, supported by the Midland Revue Orchestra and the Studio Chorus.

Students of the Birmingham and Midland Institute will give a concert from the Birmingham Studios on September 1. The violinist for the occasion is Florence Walton who will be heard in a movement from de Beriot's Seventh Concerto.

On August 23, a relay will be taken of an orchestral concert from the Hotel Majestic, St. Annes-on-the-Sea.

A Shakespearean programme of scenes from *Richard II* and *The Merry Wives of Windsor* is to be broadcast from Belfast on September 4.

Arrangements have now been completed for the autumn and winter series of International Concerts to be broadcast by Germany, Austria, Belgium, Poland, Czechoslovakia, and Hungary. The first of these will be provided by Berlin on September 20; Budapest follows on October 15; Vienna with a Lehar evening on November 7; Prague on November 26; and Brussels on December 15.

"CHOKE OR TRANSFORMER OUTPUT?"

(Continued from page 234)

the effective primary load is greater than the secondary load, being proportional to the square of the step-down ratio. For example, a transformer with a 2 : 1 step-down and a load of 1,000 ohms across the secondary, behaves as if it were a resistance of 4,000 ohms and nothing else (neglecting for the present the leakage inductance and self-capacity).

This property is exceedingly useful, because it is usually impracticable to vary the impedance of a loud-speaker to suit the valve. With an output transformer, however, it is only necessary to choose the correct step-down ratio to obtain a suitable primary impedance and extract the greatest volume of undistorted power from the valve.

With a low-resistance speaker, of course, an output transformer must be used. The speaker load may only be about 20 ohms, whereas it will require several thousand ohms to obtain anything like the normal amount of power from the valve. With a 10 : 1 ratio, the effective primary impedance would be $20 \times 10 = 2,000$ ohms.

A final advantage in favour of the output transformer is its better reproduction of transient terms.

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LONDON RADIO SUPPLY CO.
11 OAT LANE, NOBLE STREET
LONDON, E.C.2
Telephone: National 1977



Crackling Noises

SIR.—My portable set, which has in the past behaved splendidly, has now developed a crackling noise which I cannot cure. I have renewed the H.T. batteries, tried an outside speaker, and gone over all connections for a fault. I have even replaced the grid-bias battery, but the crackling still persists.

M. S. H. (Exeter).

It appears that the primary winding of one of your L.F. transformers has become broken or fractured. We suggest you replace your L.F. transformers, or have both tested through for continuity. If you have only one transformer and one R.C. coupling for your two L.F. stages, possibly the insulation of the coupling condenser in the R.C. unit may be defective. Suspect the primary winding of your transformer first, however, as the symptoms you describe point to the transformer being the culprit.—Ed.

A Re-arrangement

SIR.—I intend to build the "1931 Ether Searcher" into a gramophone cabinet which allows a panel height of 6 in. only, but a panel length of some 20 in. I want to know whether it will be quite satisfactory

to arrange the aerial series condenser and reaction condenser on each side of the ganged condensers on the panel and not beneath the ganged condensers.

K. N. (London, E.).

This re-arrangement will be quite in order, but it will be advisable to put the aerial series condenser nearest to the first coil in the set, while the reaction condenser should be placed at the other end of the panel nearest to the detector valve holder. The position of the L.T. switch is immaterial and can be placed beneath the ganged condensers or to the right of them, when facing the panel.—Ed.

Poor Amplification?

SIR.—I have a three-valve, H.F. detector, and L.F. set, in which is incorporated a gramophone amplifying arrangement. The radio reproduction is good and gives fair volume, but the gramophone side fails in regard to volume. I am using a well-known make of electric pick-up in conjunction with a volume control, and the latter is seldom used to reduce volume. Why is it that I cannot seem to get satisfactory volume from the gramophone pick-up?

J. B. (Mill Hill).

We are of the opinion that you have a very insensitive pick-up and that it does not apply sufficient voltage variations to the grid of your first valve to permit of adequate amplification.—Ed.

"1931 Ether Searcher"

SIR.—Will the "Ether Searcher" enable me to cut out interference from the London stations' transmissions and get other more distant stations?

J. B. (Edgware).

The "1931 Ether Searcher" has been tested on an outdoor aerial in North London at a distance of five miles from the Brookmans Park stations, and it was not only possible to get the two London stations' programmes clear of each other, but it was also possible to receive at least ten other stations on the speaker whilst the London stations were working. From this test it would appear reasonable to expect something in the way of other stations in the above locality when the London stations are working. We do not recommend an outdoor aerial in your case.—Ed.

A Selectivity Trouble

SIR.—I have made up one of your three-valve sets, and it certainly brings in the stations, but many stations seem to come in at the same time! I use a fairly good outdoor aerial and my earth connection is the best to be obtained.

J. S. (Ealing).

An aerial of the single-wire vertical type, not exceeding 30 ft. overall length of wire, is the maximum we would advise. Possibly an indoor aerial would be quite suitable.—Ed.

OUR LISTENING POST

By JAY COOTE

RUMOURS have been current in Continental wireless circles to the effect that a powerful broadcasting station is to be erected in the Principality of Monaco. How this erroneous information crept into the radio journals is fully explained by the fact that it emanated from a French journalist whose knowledge of the Italian language was particularly anaemic. When perusing a Milan "daily" he noticed a reference to *Monaco* in connection with a wireless transmitter and jumped to the conclusion that Monte Carlo was to be blessed with a "broadcaster." He should have known that *Monaco* is the Italian denomination for *Munich* and that the article dealt with the proposed new Bavarian high-power station.

As a matter of fact, Juan-les-Pins, although but a small studio, provides the radio programmes for the greater part of the French Riviera and has applied for permission to install something heftier in the way of radiating plant.

During the past few days I have picked up tests made by the 85-kilowatt Radio Paris building at Essarts-le-Roi, near the French capital. I do not know whether it was using its full power, but most certainly its carrier wave was a particularly noisy one, strongly reminiscent of the "Flying Scotsman" blowing off steam after its arrival at King's Cross. Signals were undoubtedly loud and modulation was far from perfect. However, these are mere trials, and no doubt by September 2, when the station is due to come on the air, many faults may have been remedied. For some time now, unfortunately, the Radio Paris broadcasts have strongly assumed the character of those offered by its *confrere* Radio Toulouse. Barring a few relays of outside performances and concerts and a number of peculiarly uninteresting talks, the transmissions mainly consist of interminable gramophone record recitals. The studio orchestra has been disbanded and, so far as I hear, until France

adopts a true licensing system with a resulting definite pecuniary benefit to the studios there is little likelihood of any improvement in the programmes.

Trieste can now be heard almost every night and its broadcasts are not suffering from any interference. You will find it on 247.7 metres, just below that little French station calling: "*Ici Nice, Cannes, Juan-les-Pins.*" Trieste does not appear to have adopted any interval signal, but it opens with a peal of bells, possibly a gramophone record. Between items the call is put out frequently and clearly: "*Eh-yah Radio Trieste,*" the name of the city being pronounced *Tre-ess-tav*. In the later hours of the evening I can now also hear Palermo, immediately below Budapest, but I receive it only at poor strength. Conditions may prove more favourable in the course of a month or so.

Reception of Vienna on 1,249 metres has been confirmed by a number of listeners in this country. These broadcasts are to be picked up only on Mondays, Wednesdays, and Saturdays when, after 8 p.m., the programme is simultaneously broadcast on both wavelengths. It is in the nature of a test, but apparently the channel is a more favourable one than 517 metres.

The Russian stations are now coming in at much better strength, and both Moscow-Komintern and Kharkov have reappeared in my log; the Trades' Unions giant has always been heard nightly without any difficulty. After midnight the U.S.S.R. transmitters are particularly active and laboriously broadcast news items for the benefit of the provincial daily newspapers. In that vast country the telegraph and telephone systems are still very inefficient and, with a view to supplying their readers with the latest information from the capital and the principal centres, the "press" in the various districts through their shorthand writers take down the *communiqués* direct from the transmitters. It is for this reason the items are read out so slowly and with such monotonous reiteration.

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BROADCAST TELEPHONY

Broadcasting Stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Kilo-Metres cycles	Station and Call Sign	Power (Kw.)	Kilo-Metres cycles	Station and Call Sign	Power (Kw.)	Kilo-Metres cycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN								
25.53 11,751	Chelmsford (G5SW)	10.0	316 950	Marseilles (PTT)	1.5	416 721	Radio Maroc (Rabat)	10.0
142 1,278	Belfast	1.2	328.0 912	Grenoble (PTT)	8.0	1,250 240	Tunis Kasbah	0.6
201.3 1,148	London Nat.	68.0	345.2 869	Strasbourg (PTT)	15.0	NORWAY		
288.5 1,010	Newcastle	1.2	367.2 817	Radio LL (Paris)	0.5	235.5 1,274	Kristianssand	0.025
288.5 1,010	Swansea	0.16	384.1 781	Radio Toulouse	8.0	240.6 1,247	Stavanger	0.025
288.5 1,010	Plymouth	0.16	447.1 671	Paris (PTT)	2.0	364 824	Trondelag	1.35
288.5 1,010	Edinburgh	0.4	1,445.7 207.5	Lyons (PTT)	2.3	368.1 815	Frederikstad	0.7
288.5 1,010	Dundee	0.16	1,725 174	Eiffel Tower	15.0	453.2 662	Porsgrund	0.8
288.5 1,010	Bournemouth	1.2	1,725 174	Radio Paris	17.0	361.9 822	Bergen	1.35
288.5 1,010	Aberdeen	1.2			85.0	592.3 506.5	Hamar	0.3
301.5 995	North National	70.0				1,083 277	Oslo	75.0
309.9 968	Cardiff	1.2	GERMANY			POLAND		
356.3 842	London Reg.	70.0	31.38 9,560	Zeesen	15.0	214.2 1,400	Warsaw (2)	1.9
376.4 797	Glasgow	1.2	217.1 1,332	Königsberg	1.7	234 1,283	Lodz	2.2
398.9 752	Midland Reg.	38.0	218.5 1,373	Flensburg	0.6	244.1 1,229	Wilno	21.0
479.2 626	North Regional	70.0	227.4 1,319	Cologne	1.7	313.8 959	Cracow	1.5
1,554.4 193	Davenport (Nat.)	35.0	227.4 1,319	Münster	0.0	335 896	Poznan	1.9
	*testing on 479.2 m. (626k.)		232.2 1,292	Aachen	0.3	381 788	Lvov	21.0
			240 1,255	Kiel	0.31	408 734	Katowice	10.0
			245.9 1,220	Nürnberg	2.3	1,411.8 212.5	Warsaw	
			253.4 1,184	Cassel	0.3			—Raszyn 158.0
			259.3 1,157	Gleitwitz	5.6	PORTUGAL		
			260.8 1,112	Leipzig	2.3	290.5 1,033	Lisbon (CTIAA)	2.0
			270.5 1,095	Bremen	0.2		also on 42.0 m.	
			283.6 1,058	Heilsberg	75.0	ROMANIA		
			283.6 1,058	Magdeburg	0.6	394 761	Bucharest	10.0
			283.6 1,058	Berlin (E)	0.6	RUSSIA		
			283.6 1,058	Stettin	0.6	427 702.5	Kharkov	25.0
			318.8 941	Dresden	0.3	720 416.6	Moscow (PTT)	20.0
			325 923	Breslau	1.7	800 375	Kiev	20.0
			360.1 833	Mühlacker	75.0	937.5	Kharkov (RV20)	25.0
			372.3 805	Hamburg	1.7	1,030 303	Leningrad	100.0
			390 770	Frankfurt	1.7	1,090 283	Tiflis	10.0
			419 776	Berlin	1.7	1,073 279.0	Kostov Don	4.0
			453.2 662	Danzig	0.6	1,103 272.6	Moscow Popoff	40.0
			472.4 635	Langenberg	17.0	1,260 235	Baku	10.0
			532.9 563	Munich	1.7	1,304 230	Moscow (Trades Unions)	105.0
			559.7 536	Kaiserslautern	1.7	1,481 202.5	Moscow (Kom)	40.0
			559.7 536	Augsburg	0.3	SPAIN		
			566 530	Hanover	0.3	255.3 1,175	Barcelona (EAJ15)	1.0
			569.3 527	Freiburg	0.3	266.6 1,125	Barcelona (EAJ13)	1.0
			1,020 185	Norddeich	10.0	349 860	Barcelona (EAJ1)	8.0
			1,634.9 183.5	Zeesen	75.0	368.1 815	Seville (EAJ9)	1.5
			2,225 119.3	Königswusterhausen	15.0	424 707	Madrid (EAJ7)	2.0
				(press)		433.2 662	San Sebastian (EAJ8)	0.6
			2,900 103.5	Königswusterhausen	15.0	505.9 593	Valencia (tests)	8.0
				(press)		SWEDEN		
			31.28 9,599	Eindhoven (PCJ)	30.0	230.3 1,304	Malmö	0.75
			293.8 1,004	Huizen	8.5	257.3 1,166	Hörby	15.0
			293.8 1,004	Radio Itzerta (The Hague)	3.0	306.9 977.2	Falun	0.65
			1,071.4 280	Scheveningen-Haven	10.0	322 932	Göteborg	15.05
			1,875 160	Hilversum	8.5	436 689	Stockholm	75.0
			550 545	Budapest	23.0	512 554	Sundsvall	15.0
			1,200 250	Reykjavik	16.0	770 389	Ostersund	0.7
			224.4 1,337	Cork (6CK)	1.5	1,229.5 244	Boden	0.75
			413 725	Dublin (3RN)	1.5	1,352 227.9	Motala	40.0
			25.4	Rome (3RO)	9.0	SWITZERLAND		
			247.7 1,211	Trieste	15.0	244.7 1,226	Basle	0.05
			296.4 1,012	Turin (Torino)	8.5	247.5 1,214	Berne	0.5
			332 905	Naples (Napoli)	1.7	403.5 743	Sottens	32.0
			441 680	Rome (Roma)	75.0	459 653	Bormuensee	75.0
			453.2 662	Bolzano (IBZ)	0.2	760 395	Geneva	1.5
			501 599	Milan (Milano)	8.5	TURKEY		
			524 572.5	Genoa (Genova)	1.5	1,204.8 249	Istanbul	5.0
			542.1 553.4	Palermo (Genova)	3.7	1,538 195	Ankara	7.0
			525 572	Riga	13.0	YUGOSLAVIA		
			1,935 155	Kaunas	7.0	307 977	Zagreb, (Agram)	0.7
			363.4 825.3	Algiers (PTT)	13.0	431.7 695	Belgrade	8.0
						574.7 523	Ljubljana	2.8

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Television—Magnin parabolic reflectors, 8/- Valves—Weco midjet-peanuts, work off one cell, 4/6; V.E. Power Amplifier 6 v. valves, 4/6; Transmitters AT40, 4/6; M.O. 250 watt., 45/- Testing Sets for High Res. and volts, THE DIXONMETER, 8s 10s. Multi-Range DIXONMETER, 2s 10s. Headphones—H.V. Sullivans Wireless Light Headphones, new, 120 ohms, 3/6; Ditto, store soiled, unboxed, 120 ohms, 2/9; New High Res. Long Range Model, 8,000 ohms, 4/3; S. G. Brown's Headphones with Headbands, 120 ohms, 7/6; Ditto, 1,500 ohms, 12/6. Field Headphones—Double Field Headphones, D.111, with all-leather Headbands and cords, L.R., 2/6; Ditto pairs without Headbands, 2/-; Single phone with cord, each, 1/4. Garrard Electric Power Units for Gramos—These are the Electric Motors with pulley and encl. adj. Resistance, with bakelite panel fitted, 12 adjustments for any mains voltage. Motor and Res. only, Our Price—Motor, 25/-; Mains Resistance, 7/6; Or the Pair, 30/-.

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The designing of apparatus or receivers cannot be undertaken.

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to proprietary receivers and designs published by contemporary journals cannot be undertaken.

Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. Queries cannot be answered by telephone or personally.

Readers ordering blueprints and requiring technical information in addition, should address a separate letter to the Query Department and conform with the rules.

In order to assist unemployed dramatic artistes the Berlin studio intends to produce a series of plays in which such actors and actresses are to appear once monthly. Other German studios have adopted the same course in respect to orchestras and independent instrumentalists out of employment.

Of five hundred applicants, only eleven were chosen by the National Broadcasting Company of America for a further audition. In the course of one year, over nine thousand would-be "broadcasters" are tested, but it is stated that not more than 3 per cent. of this number ever reach one of the studios.

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The WBZ, Springfield (Mass.) 50-kilowatt transmitter is now in daily operation on 900 kilocycles. New studios to feed this giant station are nearing completion at the Hotel Bradford, Boston.

Memories of bygone glories of the musical comedy stage will be re-awakened on September 2, when the lunch-time music from Belfast by Alex Monaghan and his Carlton Orchestra will consist of musical comedy numbers. Excerpts from *The Geisha* and *The Girl in the Train* will be given.

The Danish Government has passed a law whereby wireless receivers have been classed amongst a list of special articles which may not be offered as pledges for loans from the national pawnshops!

In order to demonstrate the advantages reaped from broadcast programmes, the Agram (Jugoslavia) station has decided to place a crystal set at the disposal of any inhabitant of that city who applies for a licence.

The new Radio Paris 85-kilowatt transmitter now testing at Essarts-le-Roi will shortly replace the existing station; it is hoped to bring it into operation on September 2 with the opening of the Radio Exhibition in the French capital.

Although Belgium possesses some eighty thousand registered listeners, it is estimated from the sale of receivers in that country that she is also blessed with another seventy thousand radio pirates!

The Norwegian authorities have established a direct short-wave telephony service with the United States. The transmitting station is situated at Jeloy, near Stavanger, the wavelengths in use being 15 metres during the day, and 30 metres during the night hours.

The Handicrafts Annual, 1932—Everyone who is interested in home handicrafts will find a wealth of information in this annual which is at once an instructional work and price list of materials and tools. Of particular interest to the wireless constructor is the large section devoted to receiver and loud-speaker cabinets which can either be made up from the rough materials or from the ready-to-assemble set of parts. The price of the annual, which is extra size and profusely illustrated, is 1s. and it may be obtained from Handicrafts Ltd., Lister Works, Weedington Road, Kentish Town, N.W.5

AT THE "PROMS"

THIS year the crowd in the "Proms" has been so far as great as ever, no matter what the programme has been. Haydn and Mozart nights start again this year, and on Tuesday Haydn's "V. London" Octet and Mozart's G Minor Symphonies were played. No greater contrast could have been chosen from the works of these two masters. Wednesday was Brahms night.

My own opinion is that the orchestra is a little better than it was for the Promenade concerts last year, and the last two movements, especially of Brahms' First Symphony, were played magnificently.

L. R. J.

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J. H. Reyner has a special article, "Rating Valves by Power Output." Mr. Reyner, also, is continuing "The Truth About Condensers." This month he is dealing with paper-dielectric and mica fixed condensers.

J. Godchaux Abrahams tells us how to recognise the Dutch stations.

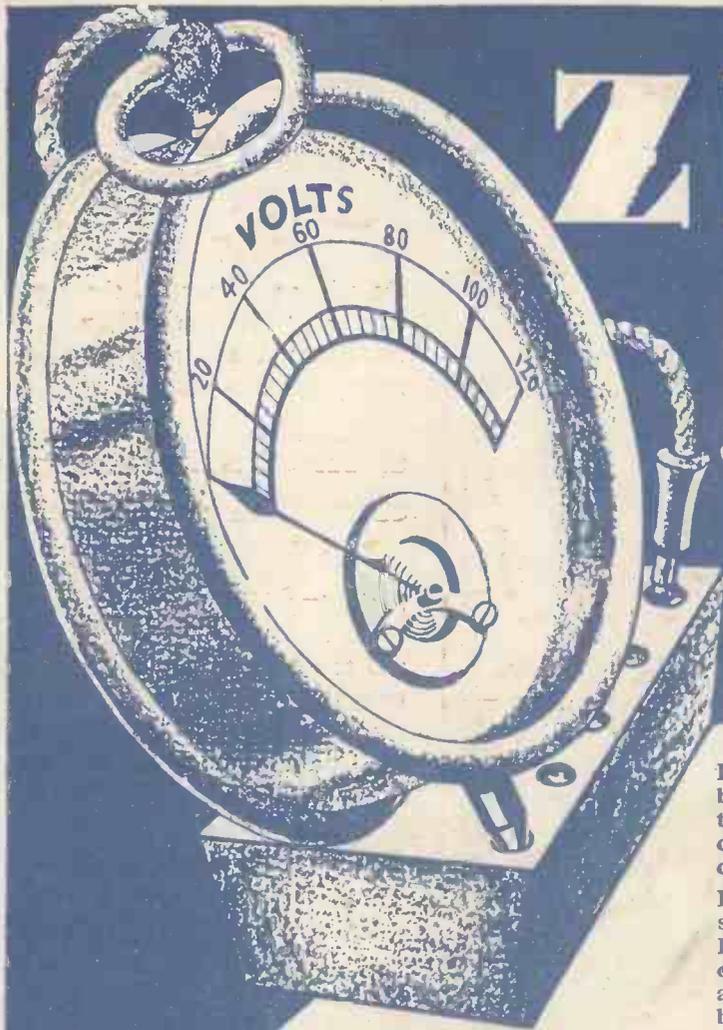
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