

HENRY HALL SPEAKING (See Page 1201)

Popular Wireless

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No. 505. Vol. XX.

INCORPORATING "WIRELESS"

February 6th, 1932.



Also in This Issue:

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By Harry Tate

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(SEE PAGE 1221)

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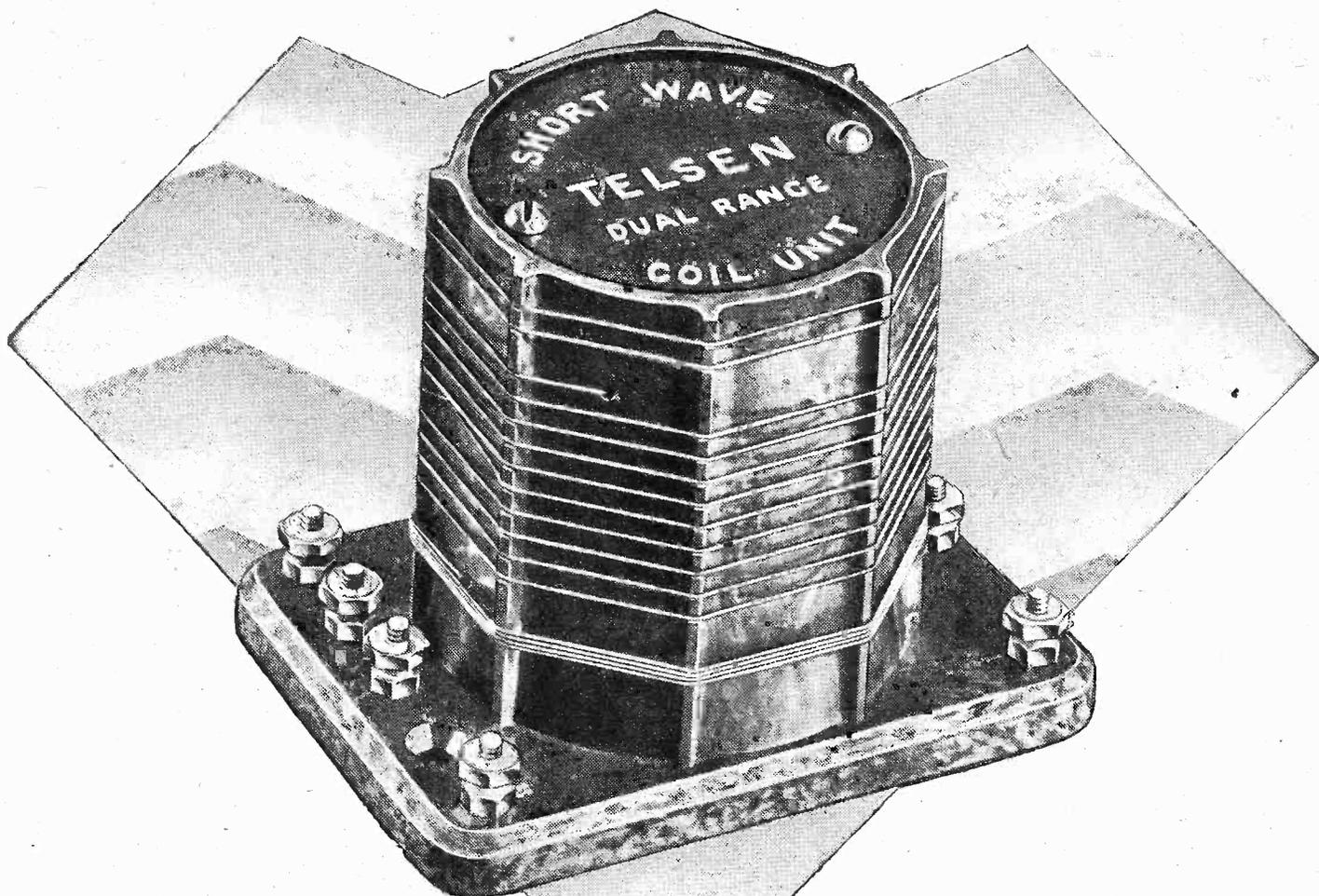
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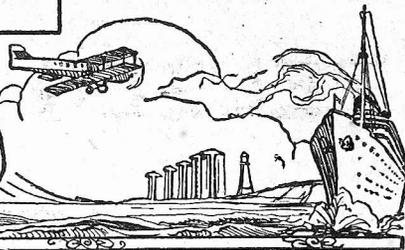
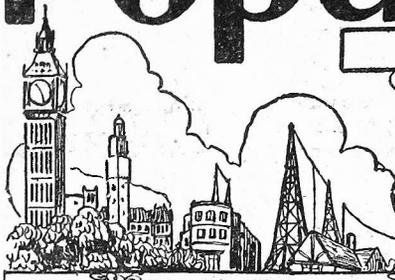
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**COSMIC!
 A STRAIGHT TIP
 FRANCE'S OFFER
 A BRIGHT IDEA**

RADIO NOTES & NEWS

**WHERE WE SCORE
 RADIO FRETWORK
 A COIL TIP
 BEAUTY NOTE**

"Cosmic."

FROM the preliminary announcements about "Cosmic" which are to be found elsewhere in this week's number, you will derive further information about the development in radio technique which has been made by "P.W.'s" technical staff, and which I have briefly referred to in the two previous issues. You ought to follow this matter closely; I regard it as really important and feel sure it will cause a flutter, not only in amateur coteries, but also elsewhere.

A Straight Tip.

NATURALLY, I must leave the proud and happy originators of "Cosmic" to tell you the full story. I do say, however—most emphatically—the "stranger" is not a "hash-up" of old ideas and devices, but is a new circuit designed to operate on a triple band (short, medium and long waves), in a cheaper, simpler, and better way than has been done up to now. It is expected to give an impetus to home construction. If you have never made a set, begin with one which embodies the "Cosmic" circuit. You couldn't make a better start than that, anyhow.

France Makes An Offer.

HERE is something which may attract "fans" who are students of French, and followers of the charming M. Stéphan. Mr. Louis Feurtey, Assistant Technical Editor of "Radio-Rail," Paris, asks whether any "P.W." reader would care to exchange copies of "P.W." for copies of "France-Radio" or "Le Haut-Parleur," each week. I would recommend the latter. Those interested should write to Mr. Feurtey, at Radio, Rue de la Gare, Montchanin, S.L., France. (I wonder what he'll do if 97 of you fellows close with his offer!)

British Radio Institution.

THIS Institution, founded in 1929, caters for all who take an interest in radio work, its principal object being to set up a standard of proficiency by means

of an Associate Examination. It is not a profit-making concern, all officers acting in honorary capacities. You can obtain a brochure containing full information about this Institution, its work, and particulars of membership, from the Secretary, Mr. D. H. Irving, 15, Alexandra Place, Redland, Bristol.

Ariel's Latest Complaint.

THIS time my complaint is that in order to get the week's programmes we have to buy a hotch-potch of light (very light!) literature (save the mark!), explanatory paragraphs compiled from Grove's Dictionary of Music, the Encyclopædia Britannica, etc., well-edited

B.B.C. Prowess.

IN spite of my regular minor "grouses" my admiration for the B.B.C. remains undiminished. When you consider that during 1931 they had to provide 67,686 hours of broadcasting—and did it jolly well, taking it by and large—and that the engineers were so efficient that the percentage of breakdown time for the year was only 0.03 hour—well, in the language of Hollywood—you gotta hand it to 'em! If only they would stick to regular broadcasting and not go flitting about after talk centres, school radio, adult education, and all the side winds worked up by specialists who harbour bees in their bonnets! As to that pronunciation ramp—it's like their cheek!

A Bright Idea.

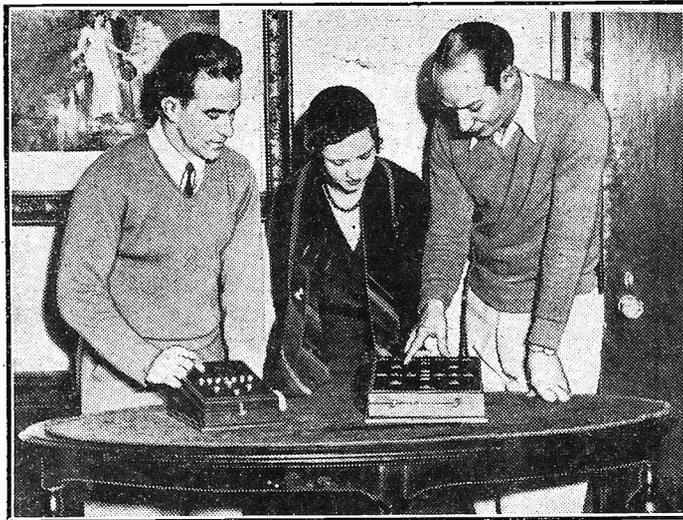
I GIVE full marks to whoever thought of the B.B.C.'s new "feature" which begins on February 6th; I refer to the weekly criticism from the studio of the vaudeville programmes given during the week. Of course, the secret of the success of this new life-brightener is to get the right critics, and as the names of P. G. Wodehouse and Ashley Sterne are mentioned it looks to me as though we are about to be present at the birth of a "high spot." However, "them as lives longest," etc.!

Honours for British Scientists.

THE Institution of Electrical Engineers has awarded the coveted Faraday Medal to Sir Oliver Lodge. I am sure all "P.W." readers will join me in congratulating our Scientific Adviser upon this new and deserved honour. The American Institute of Radio Engineers has honoured Dr. E. V. Appleton, Wheatstone Professor of Physics at King's College, London, by electing him to a Vice-Presidency. Dr. Appleton is known internationally for his researches into the "Heaviside Layer," and its effects on wireless signals and he has the gift of Lodge and Fleming in that he can explain difficult subjects to the lay mind with perfect clarity.

(Continued on next page.)

HOW HE "SQUARES" HIS ACCOUNT



On the right is Ted Husing, the famous American sports radio announcer. He is explaining to the girl friend how, with the apparatus shown, he and his assistant follow the ball from point to point during a hot game, the assistant operating binoculars and one end of the system, while Ted tells the world from the other end. Not long ago Ted got so excited over a Harvard game that he called somebody's play "putrid"—since when he has been barred from the Harvard stadium!

letters from listeners, pen-and-ink sketches, and lots of advertisements (oh, rather!). The whole forming a very valuable property which neither life nor death nor T.N.T. can separate from the B.B.C. Yet all we need is a plain statement of what the programmes are to be; price one penny, and less trouble in finding "what's on at 7.15 p.m."

NOTES—NEWS—AND INTERVIEWS (Continued)

The English Accent.

THIS has been much in the limelight lately, since Mr. Culbertson, the gentleman who plays so many cards, said a few very poignant words on the matter.



I have now to report, with surprise and regret, that T. S. (Saskatchewan) has sent me a couple of sketches by "Bairnsfather" which make fun of the English accent—the "silly ass"

accent. T.S. says that he does not long for an English announcer's accent. Let him get this straight—the English are the salt of the earth! What they say and how they say it are as nothing compared with what they *do*. He must have been listening to Dean Inge—who has the most affected English accent ever put over the ether! Come, T. S. (*Regina*), don't be influenced by black and white sketches when the *facts* are so plain.

Where We Score.

BY this time it is safe to say that the American relay of last month has satisfied the majority of those who heard it that our programmes want some beating! An "All-Star" programme—and it was not nearly so enjoyable as the best of the B.B.C.'s "Vaudeville" evenings. The transmission has won, and deserves, the highest praise, and it is generally agreed by the Press that they can teach us something in the technique of presentation. Nevertheless, I suppose we must admit that national tastes differ. Anyhow, they gave us of their best so I hope that this interchange of programmes with America will be a frequent occurrence.

Radio Fretwork.

MY recent S.O.S. for a cure for the fretwork craze has elicited a timely reply from C. S. P. (Wembley)—the fellow who sent me the lemon! He recommends



that I give young "Ariel" a good chunk of Mühlacker and tell him to cut the London Regional out of it! 'Sawfully cute idea! But the snag is that this young chap of mine has not the necessary

command of language wherewith to grease the saw that will do that.

Meantime the average daily output is one toothbrush rack and one photo-frame. We look like a stall at a bazaar!

Handcuffs in Argentina.

AN important radio weekly published in the Argentine, where there is a keen and artistic body of listeners, constructors and, as the Spaniards would say, "the sea" of amateur transmitters, is voicing a general complaint about the

quality of the programmes broadcast there. They appear to be suffering from too many gramophone records, tangees and foxtrots, and I can well believe that Buenos Aires, the artistic centre of the most advanced South American republic, will not let this state of affairs continue. Out there they say that broadcasting is in the grip of the handcuffs, and has not improved since it was first introduced.

The International Short-Wave Radio League.

ALF. MANN, o' Middlesbro', tells me that some of the fellows who wrote for copies of the League's official publication enclosed half-penny stamps instead of penny ones, and so had to be passed.

K. C. (Totton, Hants) says that he sent

SHORT WAVES.

HEARD AT THE LOCAL RADIO STORE.

"Would you mind calling round and looking at that new wireless set I bought from here? I seem to be always getting Whipsnade."—"Punch."

"Wireless set, handsome walnut cabinet, illuminative accumulators," runs an advertisement in the local paper.

This must be one of those "Brighter Broadcasting" receivers.

During the production of a recent elaborate wireless play, when most of the B.B.C. studios were being utilised for various "effects," etc., an official came across an aged "extra" standing in a large box of gravel, holding a bunch of chains in his hand. The official asked him what he was doing.

"Please sir," was the sad reply, "I'm the Bulgarian Army."

"This most excellent canopy, the air, look you, this brave overhanging firmament, this majestical roof fretted with golden fire—why it appears no other thing to me than a foul and pestilent congregation of vapours."—Hamlet.

A good many wireless fans in our district think the same—only they don't express it quite so well.

FOR THIS, THANKS.

"While so many people are grumbling at the quality of the wireless programmes, I am pleased to point out in defence of the B.B.C. that recently there was a bagpipe recital in Inverness, and it was not broadcast."—"Sunday Pictorial."

the money for his annual subscription about December 15th, but up to January 7th had received no reply, in spite of his reminder, about December 30th. Now, Mr. Mann, no doubt you can ask Southport to explain this. I shall be glad to know the explanation. (Rest of K. C.'s nice letter passed to W. L. S. for attention.)

A Coil Tip.

THIS comes from A. W. G. (London, E.C.), whose letter has given all concerned great pleasure, and who I hope is by now out of hospital and in good health. He points out that the ends of coil windings are brought out about eight inches for connection within the set, and suggests that a few extra inches be allowed, so that a part of the wire can be made into a short spiral of, say, a number of turns wound round a pencil and slipped off. This spiral will then

give a safety "play" against the undue tightening of a terminal and consequent snapping of a lead, or, if the soldered joint should break, the spiral furnishes a little more wire for a new joint instead of the wire being found too short.

Beauty Note.

AS a set-off against all those technical matters I permit myself to recount to you a note, which I caught in the net when I was going through the provincial papers. A Huddersfield "service" engineer received the following telephone message from a lady set owner.



"Please send a man round to my home at the earliest possible moment as my dial has slipped." Can it be that the enterprising fellow was doing "face lifting" as a side line, and this was the unexpected result?

More British Success.

HAVING chortled over the success which has attended British manufacturers in regard to the supply of parts for the new Prague broadcasting station, I am penetrated to the marrow to hear from Ferranti's that they, also, are represented by reason of their having supplied a number of smoothing chokes to that station. Good! Anyone else? There's still magic in the words "British Made."

Years ago a great Spanish industrialist said to me, "Your English she manufacture finest; *bud*, she was not zo sheeps like de Aleman."

I don't think that "sheepness" is everything. But—

Radio Catches the 'Bus.

MY sad experience has been that to catch a London 'bus one needs to be equipped with iron nerves, springy heels, beefy shoulders, and a non-sense of chivalry—for the little lady clerks swarm round the "stops" in their thousands!

An interesting application of "broadcasting" has appeared at the Eastern Counties 'bus terminus at Thorpe Station, Norwich, where the controller announces over a "mike" the time and place of departure of the various services. All the public have to do is to line up and listen.

I wish that all the porters on our railway could be pensioned off and replaced by B.B.C. announcers and loudspeakers. "Shorlabrollybillioly," say the porters! No prizes for correct solutions, but I expect you know the place!



ARIEL.

HENRY HALL SPEAKING



A few words to "P.W." readers from Jack Payne's successor.

"HULLO, everybody! I am very happy to be able to meet you in this way. Here's to our friendship. I hope you will like my band—when I have one, that is. At present there is neither band nor instruments nor music, merely myself. Such a strange situation is a wonderful compliment, particularly when it comes from such a high authority as the B.B.C. I hope I justify the confidence they have placed in me.

Smallest Band to Broadcast.

The band you have been hearing for the past eighteen months from Gleneagles, Manchester and Liverpool is my Gleneagles Hotel Band, and is the smallest one ever to come to the microphone, comprising only six people. Dance music has brought me good fortune, since it has lifted me from the bottom of the ladder to the top in nine years.

And yet, by all the accepted superstitions, I ought to have experienced the worst of bad luck, for my original contract with the London, Midland and Scottish Railway was signed on Friday the Thirteenth of December, 1922!

And, worse still, my contract with the B.B.C. begins on March the Thirteenth. But, to tell the truth, I am wondering whether the number thirteen is not lucky for me instead of unlucky, as it is for most people.

I suppose the majority of listeners are under the impression that I have been attached to one hotel. Actually this is not the state of affairs at all really. The London, Midland and Scottish Railway owns hotels from one end of its line to the other, and it has been my job to provide the dance music for all of them.

Knowing People's Likes.

The number of bands I have had under my control in this way has varied from fourteen to thirty-three, and, of course, I have played in practically every county in England and Scotland.

I am hoping that this experience will stand me in good stead in the studio, because it has brought me into contact with so many different kinds of people and taught me what they like and what they dislike—at least, I hope it has.

I cannot help wondering to myself what a peculiar world it is that we live in. Here am I, soon to play to the largest audience

on the earth, and only nine years ago I set out to seek my fortune, not as so many do, towards London, but away from it! For I am a Londoner. I am a pianist and orchestrator, and could see no opening in London, so I turned my footsteps to the north.

Dancing was then becoming more and more popular, and I was fortunate enough to be the one to supply the band which opened the Gleneagles Hotel in 1924.

This band, I might add, was the second ever to broadcast, the first being the Savoy Orpheans. As time went on more and more hotels installed dance bands, and gradually I became more of an organiser than just a conductor.

Henry Hall has long been a favourite with listeners, but no one could have foreseen that he was soon to become Jack Payne's successor. Immediately the news of his appointment became known "Popular Wireless" obtained an exclusive interview with him, and here he tells you all about himself and his plans.

I am afraid I shall miss the variety which this life has provided me with. I thought at first that my signatory tune, "Come Ye Back to Bonnie Scotland," would have to be scrapped. Fortunately, it will not, and those listeners who like it will still be able to hear it when my band is on the air.

That Signatory Tune.

I should have been very sorry to have given this number up, not because I wrote it, but because it was one of those curious freaks that somehow draw one's affection irresistibly. You see, it was written as a fox-trot and is a fox-trot, but you cannot beat fox-trot time to it, that is two beats to the bar.

The next time that you hear it try for yourself, and you will find as I found, that you have to give it waltz time, that is three beats. Of course, a song having such a peculiarity should have been a failure, but it was not, and that is why I have grown to like it so much.

The change-over will be a terrible rush, as I shall have to spend some considerable time leaving things in order in the L.M.S. hotels as well as getting my new B.B.C. dance band together.

Within less than a month of coming to London I shall be on the air, and for most of the time I shall be playing somewhere in the Midlands or the North at night and travelling down to London by "sleeper" in order to be able to attend to things there during the day.

Orchestrating the Numbers.

In the brief time at my disposal I must not only select and engage the instrumentalists, but also rehearse them. Then there are the tunes to be heard and selected and orchestrated. I wonder how many listeners know how long it takes to orchestrate a dance number?

Not less than eight hours, and I must have at least a hundred and fifty ready before I can start broadcasting. Perhaps such a figure rather startles some listeners, but I can assure them that before very long I shall want many times that number in order to be ready for any emergency.

My policy will be tunefulness. Those who listen to my band now will know what I mean. Naturally I shall have a somewhat larger band and be in a position to use greater volume where it is required than I am now. But

I cannot tolerate numbers which are nothing more than a long series of horrible noises.

Personally, I think that dance band conductors who play this kind of thing are very ill-advised to do so, for it brings discredit on the whole of dance music.

It turns lots of people against it who might otherwise be enthusiastic followers, and it enables critics to accuse us of debasing our art; it gives them just what they are looking for, a stick to beat us with.

There are quite enough tuneful numbers for any band to make up a good programme without have to play dreadful cacophonies.

Rhythm but Not Noise.

Naturally, if people are to dance to a tune it must have rhythm, and the rhythm must be sufficiently pronounced for everyone to catch its infection, but this does not necessitate the series of grunts and groans which can sometimes be heard in a ballroom.

I do not know whether it was my tunefulness that caused it or not, but one dear old lady in Manchester confused my band with the Hallé Orchestra, which is conducted, of course, by Sir Hamilton Harty.

(Continued on page 1232.)

THE winter of 1931-32 will go down to wireless history as one of the best that we have ever had for long-distance reception. There have been few nights when a big selection of stations could not be received at full loudspeaker strength; in fact, with hardly an exception, conditions have been uniformly first-rate.

There have, too, been outstanding nights during which the reception of foreign stations has been nothing short of phenomenal. One of these occurred on January 17th, and I hope that many of my readers were fortunate enough to be indulging in wireless trips abroad at the time.

A "Ham's" Paradise!

I don't ever remember a night on which conditions were better. Interference was at a minimum, and on even a modest set stations were coming in at full blast at every tick of the tuning dials.

I mentioned recently that American medium-wave stations were worth trying for just now. They most certainly are.

On a recent night I switched on shortly after twelve o'clock and found several of them as easy to tune in as the more powerful Europeans had been earlier in the evening. Using a standard four-valve set with a couple of screen-grid stages, I started searching upwards from zero with the merest whiff of reaction. W P G, W T A M

ALTHOUGH I have not received sufficient logs to be able to judge our Competition at the time of writing this, it appears to have been a success, and—more important still—to have started a revival in "conditions"! I did not have time myself to do much listening during the twenty-four hours, but when I did, distant signals always appeared to be coming over very well.

If you can possess yourselves in patience until a later issue of "P.W." reaches you, you will find the summary of reports sent in, and the names of the winners in both classes.

Plenty of "D.X."

"L. H." (Essex) reports that in spite of bad conditions he is receiving plenty in the way of D.X. on his "S.G. Four," including quite regular programmes from Nairobi (V Q 7 L O). He mentions, incidentally, that a slow-motion dial on the reaction condenser justifies its existence by simplifying tuning quite a lot.

Once more, may I please assure those of you who keep writing to me about my single-valver that it is in the hands of the Editor now, and will appear before very long? Thank you!

The set has been specially made for "P.W." and is not quite a replica of my own, which is hardly suitable for covering the whole of the short-wave range. It (I

STATIONS WORTH HEARING

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

and W B Z were found straightaway with the set miles off the point of oscillation.

There was no need for fine tuning. The stations were so much there that they just came in as one moved the dials at an average searching speed.

Others very nearly as good are W I O D, W T I C and W A B C. I should mention, by the way, that my reception of these and other American stations was carried out on an indoor aerial.

On this side of the Atlantic the number of stations that can be received is enormous. One or two rather interesting curiosities have been observed lately, and these may be worth mentioning.

Variable Reception.

Huizen is varying in strength rather more than he has done for a long time, and I was surprised one afternoon to find him quite a feeble transmission. Warsaw has also had ups and downs such as one does not expect from his giant transmitter.

You can always find him and be sure of obtaining good volume from your loudspeaker, but on certain days he may be not

quite up to the mark. Budapest is a medium-wave station which shows similar irregularities. On six recent consecutive nights his record in my log has been: moderate, fair, very good, good, very good, poor.

I will be rash enough to mention certain stations that

have shown no variation night after night for weeks, even though my doing so will probably result in reports from readers that they find them "all over the place." Here they are, anyhow. Radio-Paris, Kalundborg, Prague, Rome, Frankfurt, Toulouse, Hamburg, Breslau, Hilversum, Heilsberg.

Those Wave-Length Wanderers!

There are a good many others that almost come into the same category, but I have left them out because they have shown just an occasional lapse.

One or two stations show signs of wave-length wandering, which is rather a pity. This kind of thing inevitably results in mutual interference.

One station makes a slight alteration in his wave-length; to escape a heterodyne his next-door neighbour does the same. And so the movement passes on, affecting station after station and causing something like chaos.

What the U.I.R. urgently requires is an apparatus which will give the control engineer a hefty electric shock every time his station moves off its allotted wave.

SHORT-WAVE NOTES



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

By W. L. S.

mean my own) is designed chiefly for amateur-band work.

Our "publicity glutton," friend "M. S.", of Harlow, has succeeded in finding Y V Q, the Venezuelan station, and is mildly annoyed to read that someone else forestalled him. Not satisfied with the Competition that has just finished, he wants one for "H.A.C." folk only.

Such Wonderful Receivers!

That wouldn't be fair, "M. S." All H.A.C. people have got such wonderful receivers that every one of them would be bound to hear all the stations working, and there would be no result. "Writ sarcastic," as a certain essayist used to say.

"W. W." (Exeter) reports hearing a station (probably an amateur) announcing

the time as 0045 when our time was 1445. From this he deduces that said station was in Australia, and wants to know who he was.

Well, "W. W.", there are some thousands of amateurs! I cannot possibly take a guess at who it was unless you heard the call-sign. But as you say you think it was on about 28 metres, I should think it was the Sydney broadcasting station.

"Man-Made Static."

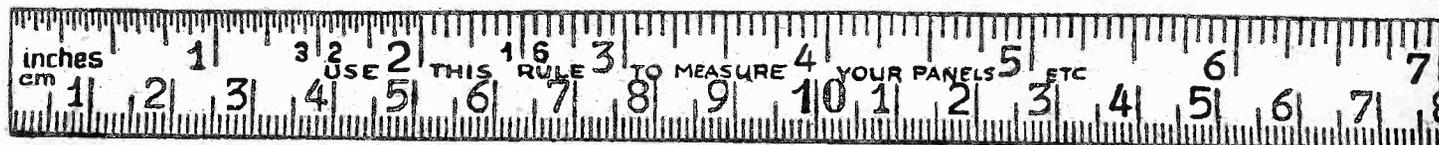
At all events, I have never heard an Australian amateur on telephony in my life, although I must have heard a couple of hundred of them using Morse.

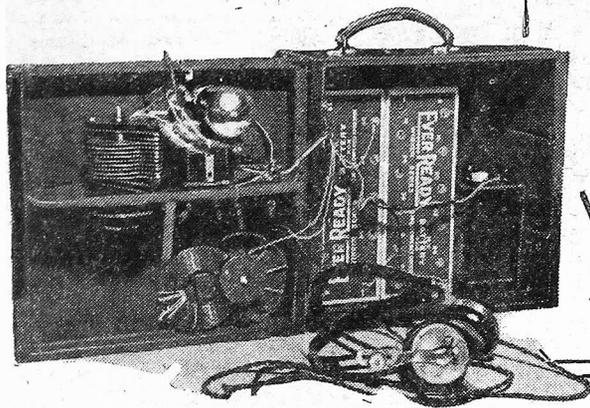
"P. A. V." (St. Leonards) writes a plaintive letter, chiefly on the subject of "man-made static." He has acquired several earfuls of this since he became an enthusiast for the short waves and the long distances.

Every time a trolley-bus passes he logs "a miniature thunderstorm," and cars with high-revving engines are a delusion and a snare, he thinks. As if all this were not enough of a trial, he has a neighbour who repairs and tests *magnetos*!

That is a jolly one, "P. A. V." You have my heartfelt sympathy. My neighbour with the electric bed-warmer and a perpetual taste for slumber is bad enough.

Notwithstanding all these disadvantages he sends in a very fine log, which just shows that patience is a virtue.





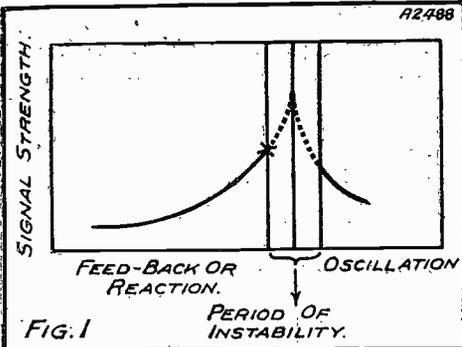
A SHORT-WAVE "ARMSTRONG" FOR THE EXPERIMENTER

ONE of the most difficult problems the wireless experimenter has had to face is the amplification of short-wave signals. The fact that high-frequency amplification is often of little help on short waves proves a rather unpleasant set-back to the enthusiast.

Unique Advantages.

Many reasons have been put forward for this inability of high-frequency amplification to turn out the goods on short waves, the most prominent being that the inherent capacities of the H.F. valve circuits fritter away these tiny input voltages. Be that as it may, it should be noted that these short-wave impulses have the undisputed reputation of travelling enormous distances in comparison with the longer waves.

MAKING THE MOST OF IT



In an ordinary single-valve, working in its most sensitive condition with straightforward reaction, there is an area of instability near the point where oscillation commences. Because of this area of instability it is impossible to make the most of this reaction effect, as the set "spills over" before the boosting action attains its maximum.

There is a definite limit to the amount of low-frequency amplification that can be employed in any set which is used for long-range working. For earphone work one additional note-magnifying valve is about the limit if one has any regard for one's ears!

One stage of note-magnification, moreover, does not provide a very great advance in signal strength, and so it is here that the single-valve short-wave "Armstrong" scores. The circuit employed has the pleasantness in working characteristic of the simple one-valve set—yet the enormous advantages of this arrangement over some multi-valve sets are acknowledged by everyone who has done any experimenting with it.

An "Armstrong" set is even easier to

Readers whose radio experiences go back to the early days of broadcasting will no doubt remember the Armstrong super-regenerative circuit. In this extremely interesting article our contributor describes an up-to-date version of this famous hook-up which he has adapted for short-wave reception with very gratifying results.
By IAN MUNRO.

handle than a straight one-valver on short waves—and, apart from the great magnification of signals, the freedom from capacity effects would be almost sufficient recommendation in itself.

Armstrong's Idea.

The common experience of everyone who uses a wireless set is that when reaction is increased in order to "boost" up a signal, the valve bursts into oscillation before apparently the loudest signal is obtained. The valve in an ordinary detector circuit is working in its most sensitive state, not when reaction can be obtained in a smooth manner, but when the oscillation is not under complete control.

"Overlap" or "ploppy reaction" are terms applied to this effect. Most sets, however, are adjusted to eliminate any "ploppy" reaction, and are so working at a disadvantage as regards sensitiveness and volume.

Between the non-oscillation and the pure oscillation there is an area which is uncontrollable and it would seem that if reaction could be advanced by microscopically small stages up to the oscillation point—and held there—a very loud signal could be obtained. This is roughly explained in the diagram in Fig. 1.

What Major Armstrong accomplished as far back as 1923 was to cut out this period of instability and allow reaction to be increased without the valve falling over into oscillation until reaction had done more than its ordinary duty, as it were. Fig. 2 illustrates this effect.

Enormous Power.

The point X (at which the valve commences to oscillate) is considerably delayed in Fig. 2, so that a very much greater amount of amplification can be accomplished by reaction alone in this circuit. This is the secret of the great amplification in the "Armstrong." It is simply extra reaction.

In a well-constructed "Armstrong" set the degree of amplification is such that most

signals are too loud for phones. Weak signals are amplified to a greater extent than strong, so that there is a more or less definite level for all signals—not excluding atmospherics, electric machines in general, and, if one is unfortunate enough to live near them, tramway cars.

However, when a set brings in all these extraneous items it is a healthy sign.

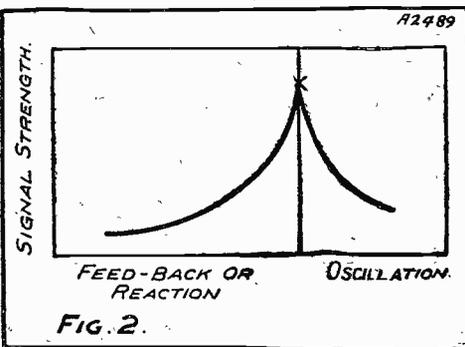
The outcome of my experiments with "Armstrong" on short waves is represented in Fig. 3 in diagram form, and below it is a photograph of the set made up as a portable. A small power valve is used which will not easily overload when used with high high-tension volts.

Throttle Reaction.

Such a valve will work equally well, of course, with the normal and lower H.T. voltages. The reaction is the now common "throttle" arrangement—condenser C_5 being .00015 mfd. The tuning condenser C_2 in this set is .0003 mfd. A smaller one would be better—though excellent results are got on this set even with this large condenser at maximum.

The grid condenser C_1 is .0003 mfd., with leak of somewhat less resistance than for

"THE LAST OUNCE"



In the Armstrong circuit the area of instability which in an ordinary set is encountered near the point of oscillation, is wiped out altogether. The result is that reaction can be increased to a much greater extent and "the last ounce" of amplification extracted from the receiver. (The point marked X in the diagram is where oscillation commences.)

ordinary use. (Note that this condenser is used as a bridge between the grid leg of the valve holder and the tuning condenser.)

It should be observed that not all valves function satisfactorily when connected to the low-tension supply as illustrated, and it may be necessary to reverse the L.T. connections so as to give a slightly negative grid bias instead of positive. Rectification

(Continued on next page.)

A SHORT-WAVE "ARMSTRONG"

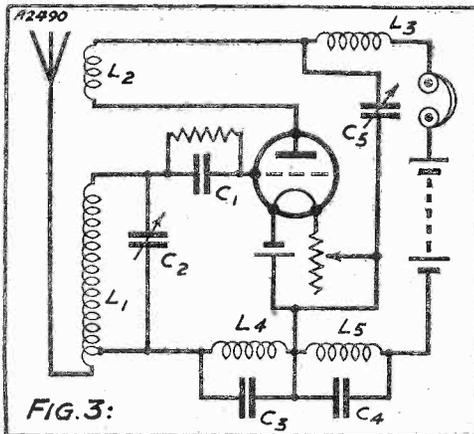
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is nearly always better when it is possible to connect the grid of the valve to L.T. +.

A fine adjustment filament resistance is necessary as the valve is not run at full temperature under all conditions.

One photograph (right), shows the set ready for operating. In order to close up the set the valve is removed and put into its containing carton, which is placed in the

THE MODIFIED CIRCUIT

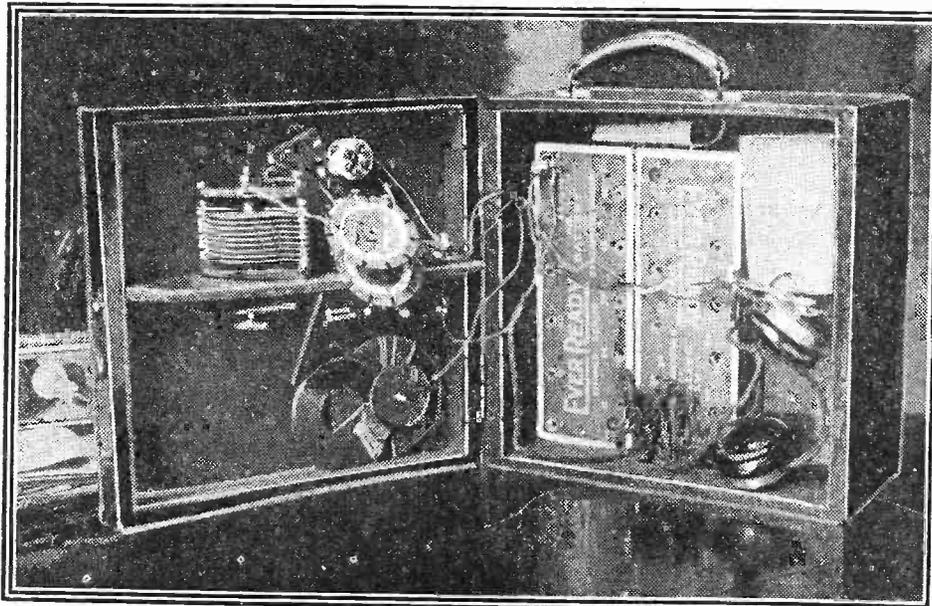


The modified short-wave Armstrong circuit used in the portable set described in this article. In many respects it resembles an ordinary regenerative single valver, but the main difference is the inclusion of the pair of quenching coils L₄, L₅, and condensers C₃, C₄, upon which the receiver depends for its extreme sensitiveness.

space above the low-tension battery. The headbands of the phones are brought together and 'phones placed in front of the low-tension battery; the set should now close without any difficulty.

The vital element in the "Armstrong" circuit is what is called the "quenching" arrangement—in the circuit diagram marked

IT RECEIVES AMERICAN STATIONS REGULARLY



A photograph of the finished set, mounted up in portable form. The pair of quenching coils can be seen mounted in the lower part of the cabinet lid, with the grid and reaction coils suspended directly above them. For convenience, the valve is removed from its holder when carrying the set about, and its carton is shown tucked away behind the headphones.

L₂, C₃ and L₃, C₄. This is composed of two large coils at the appropriate coupling (explained later in this article) and a fixed condenser across each of these coils.

The set is comprised of two variable condensers, a valve holder, a filament rheostat, grid condenser (including leak), "quenching" coils and their associated fixed condensers. These are the fixed or built-in components, which are arranged as close together as possible in order to obviate long leads.

Direct Coil-Wiring.

It will be observed in the illustration that there are no extraneous terminals. There are also no leads whatever carrying H.F.

Wire leads are taken from the appropriate parts of the components through an eye-hole screw from batteries and 'phones. The shelf or bracket on which the components are mounted is made of dry wood, which is an excellent insulator for short-wave work.

The two large quenching coils (L₄ and L₅) should have approximately 1,500 turns apiece. The fixed condensers C₃ and C₄ should be .001-mfd. each. These coils should not be fixed in position till later, but left lying in front of the set though connected up.

The form in which these large coils are wound or bought is not vitally important, but they should be reasonably compact or they take up too much room.

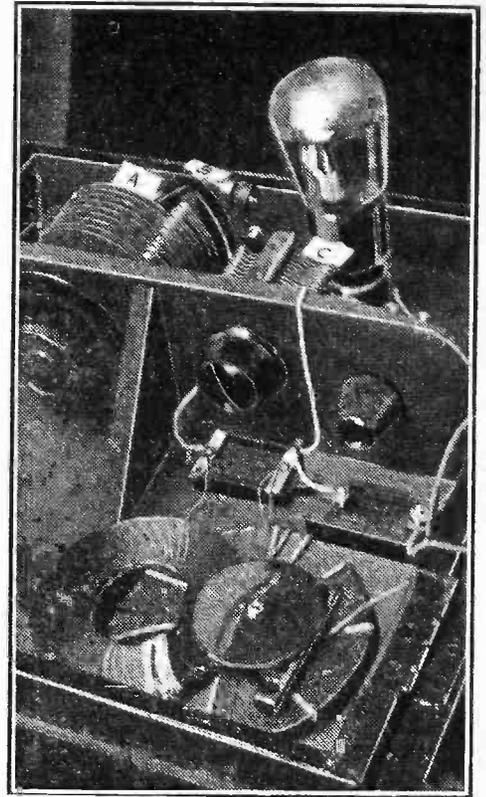
The set described is used chiefly on the 20-40-metre wave-band. Though it has functioned down to 12 metres and up to 400 metres, it will be found most useful—for experimenting and broadcast reception purposes—to concentrate on this wave-band, as most of the transmissions of interest lie here; certainly for anyone trying out the set for the first time this is the most encouraging region.

No Earth Needed.

Quite a number of first-rate broadcasting stations are here, including several Americans regularly received on this particular set.

It will be noted in the circuit diagram

QUENCHING COILS



A "close-up" of the quenching coils, showing the method of mounting them. Two other components are also clearly recognisable in the view, (A) the tuning condenser, and (C) the reaction condenser. The small knob to the right of the latter is the filament rheostat.

(Fig. 3) that no earth connection is indicated. One may be tried either attached to the low-tension battery or to the "earth" side of the tuning condenser (C₂). It is not always an easy matter when using the set as a portable to find a satisfactory earth at hand, and it is more conducive to good results to get accustomed to the operation of the set in the way which it is always intended to be used—i.e. preferably without an earth.

To work one time with an earth connection and the next time without means time wasted getting the new "hang" of the set each time. It may be mentioned, however, that stations which come in near the maximum of the tuning condenser are usually improved by an earth connection.

About the Coils.

The better plan, of course, is to have several coils at hand, so that if a station near the maximum of the condenser is particularly wanted a larger coil should be used in order to substitute inductance for capacity.

The tuning inductance L₁, for 20-40 metres, should have 8 turns of No. 20 or 22 S.W.G. on a 2½-in. "basket" former, and having a tapping two turns from the end. Connect as shown in Fig. 3.

The aerial may be of stranded or similar wire of any length up to 50 ft. About a 12-ft. length of lighting flex makes a very good aerial—and if this can be kept vertical throughout its length so much the better.

Excellent results are got without any aerial whatever: this depending on the conditions at the time. Rome and Zeesen are received with perfect clarity and volume in the centre of a large N.E. coast town

(Continued on next page.)

A SHORT-WAVE ARMSTRONG

(Continued from previous page.)

with this set, using no aerial or earth whatever.

W 2 X A F (New York) and W 3 X A L (Bound Brook, N.J.) are also received often under similar conditions.

Preliminary Adjustments.

The reaction coil L_2 , for 20-40 metres, should have 10-12 turns, using the same size of former and thickness of wire as for L_1 . These two coils, which are basket-wound, should be fixed together at the distance which is found by trial to give the best results. Quarter to half an inch should be tried.

Having got the set together, the batteries connected up, and the ear-phones on one's

whistle is called—must be finally adjusted under reception conditions. So again we replace H.T. lead and switch on the filament.

The quenching arrangement should be left alone for the present and attention given to tuning in a station as in an ordinary set. Starting at the bottom of the tuning condenser dial, apply reaction by increasing condenser C_2 . With a slight increase of this a harsh hissing should be heard which denotes approach to the oscillation point.

If on further increase of the reaction condenser this "noisiness" is not manifest, make sure that the reaction coil is the right way round: try it reversed.

When things are all well and the set produces the right noise to order, advance the tuning condenser and follow up with the reaction so as to keep the hissing noise in the offing. Unless the number of turns in the tuning coil is wrong, there should have been heard quite a number of Morse stations by this time.

When one strikes speech or music the

species of hoarse roar that for obvious reasons it is advisable not to cultivate.

So when everything is O.K. the set is found to be working like an ordinary one-valver—plus great increase of signal strength and minus instability.

Plenty of Stations!

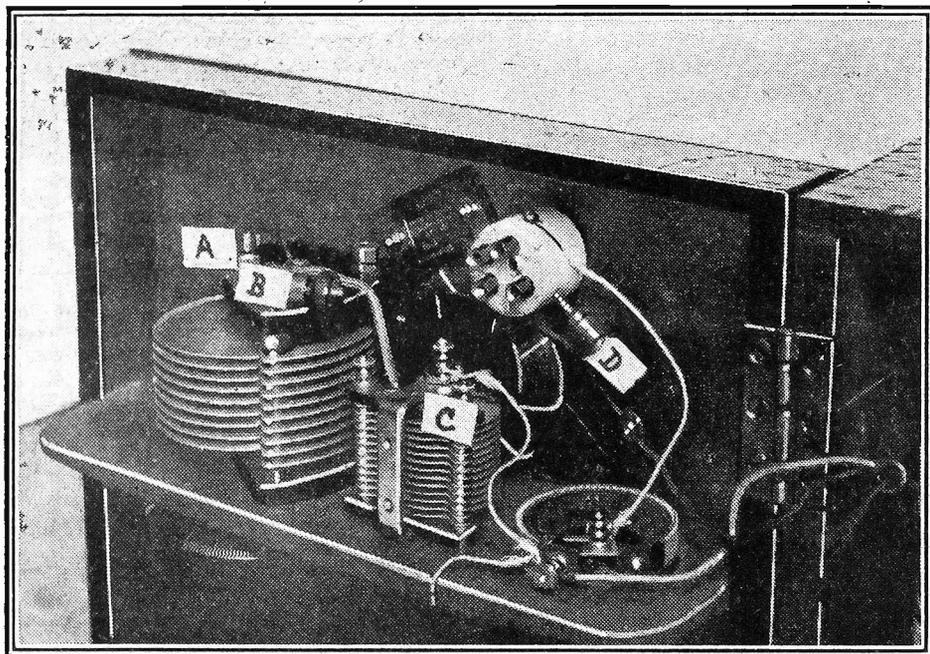
The range covered by this set when the ether is quiet—and all good tramway cars and motor buses have gone to rest—is quite encouraging. Three or four American broadcasts may be relied on, as also Rome, while the German station Zeesen is good up to about 9 o'clock in the evening; after that there is often heterodyne interference as between the three stations—Zeesen, W 2 X A F (Schenectady, N.Y.) and W 1 X A Z (Springfield, Mass.).

On several occasions I have picked up the Sydney (Australia) broadcast, while the Vatican transmissions are amongst the best to be got. Moscow is always strong.

Over and above these regular transmissions one is able to pick up all sorts of interesting things on these short waves, such as Marconi speaking from his yacht "Elettra" (about 27 metres, I think).

Personally I have not attempted much below 14 metres on the "Armstrong," but am experimenting on these lines at present.

AN INTERESTING SET FOR THE ENTHUSIAST



One of the most outstanding features in the construction of this interesting set is the absence of long leads carrying H.F. currents. Both the grid and reaction coils are connected direct to their respective components. The points being marked A, B and C, D respectively.

ears. the filament should be switched on. If the connections are all in order one should hear a faint high-pitched whistle in the 'phones. If not, the large coils which are lying in front of the set should be moved slowly one over the other. At a certain degree of coupling this whistle will have started.

Keep advancing the coupling in the same direction and the whistle will be heard to get much higher-pitched and fainter. A further advance in the coupling will produce a "plop" in the 'phones and entire disappearance of whistle or squeak. Note this position of coupling.

Switch off filament again, disconnect a lead of the H.T. battery and fix the large coils up at approximately correct coupling in such a manner as shown in the photo. A piece of ebonite or dry wood with a hole in the centre and a screw-nail is all that is required to accomplish this.

Before screwing up tightly, however, the "quenching" frequency—as this faint

reaction should be increased till the signal is as loud as comfortable, and then the tuning and reaction controls should be left alone in the meantime.

The speech or music should be carefully scrutinised for a few moments. If the high-pitched whistle is also heard at too great an intensity the quenching coils require attention.

The Correct Setting.

Advance one of these as before so as to raise the pitch of the whistle into the squeak region. Now advance the reaction condenser, and it will be found that the set has more tendency to burst into oscillation with the familiar "plop."

The correct adjustment has been found when the set will just perceptibly "plop" into oscillation and C.W. can be clearly received. If this "quenching" is not far enough advanced oscillation will not follow, however far the reaction condenser is increased; all that will happen will be a

AMERICAN S.G. VALVES

A Reader's Experience.

The Editor, POPULAR WIRELESS.

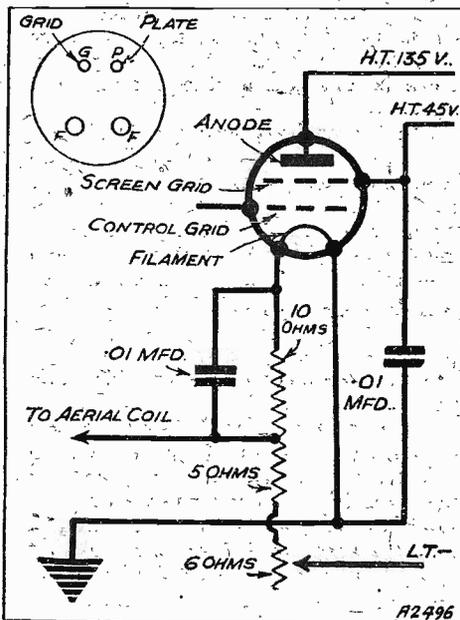
Dear Sir,—I noticed in the "P.W." of December 12th a reader asking about the connections for an American S.G. valve. As I am acquainted with these valves, may I be permitted to give some information which may be of some service?

These valves are of the "6-volt" type, but the filament legs are easily distinguished as they are thicker than the other two, which are plate and screen-grid. One point must be noticed, and that is the voltage on the filament is only 3.3 volts, a 15-ohm tapped resistance being used in the negative L.T. lead. The screen-grid voltage is not more than 45 and the plate 135 (recommended).

You may pass this on for what it is worth if it will help W. D., of Barking, at all.

Yours truly,
J. C. TURNER.
ss. "Newton,"
C/o Hunter's Quay P.O.,
Dunoon, Argyll.

THE CONNECTIONS



This is the diagram of connections kindly supplied by Mr. Turner (see above.)



THE H.M.V. TABLE RADIO GRAMOPHONE MODEL 501

For some time we have had on test one of the smallest radio-gramophones ever produced in this country—the H.M.V. table model 501. Below is a description of the instrument and the circuit it incorporates.

By K. D. ROGERS.

WHAT does the term "radio-gram" conjure up before you? A radio set "with provision for a pick-up" or a massive piece of furniture incorporating somewhat elaborate radio-cum-electric gramophone mechanism, and costing something like £40-£50?

If that is the picture presented by your imagination, and based, of course, on your memory, this brief article describing one of the latest radio-gramophones will make interesting reading.

How it Started.

It is, perhaps, only logical that a concern like The Gramophone Company, known all over the world for the design and production of acoustic gramophones, of all sizes and prices, should apply something of the same trend of design to the more modern combined electrical record reproducer and radio set.

Not that I want in any way to imply that the H.M.V. radio-gramophones are merely electrical models of the acoustic reproducers. They are in quite a different class.

What I do mean is that following on its previous successes in the acoustic world, with its large console machines, its table grands and lastly its portables, the Gramophone Company has rightly followed precedent, and after the production of one or two electrical giants has tackled the design of something very much smaller.

The large H.M.V. radio-gramophones are not excessively large, nor are they over priced; they are excellent value for money, and can be obtained on the hire-purchase system.

But not everybody wants a full-blown cabinet radio-gram, and so very wisely the H.M.V. engineers put their heads together and said, "We'll do a table model; something after the style of our old acoustic table gramophone." And they have. Here it is—the Model 501, illustrated in the photographs on this page.

S.G., Det. and Pen.

It is commendably small, but this in no way means loss of efficiency; as a matter of fact, its performance is better than any other similarly priced radio-gram we have tested, irrespective of size. Its dimensions have obviously been cut down with a view to meeting present-day housing conditions, and for the benefit of flat users.

So that you may see at a glance the specification of the instrument—which costs 29 guineas—here it is in tabulated form. The instrument incorporates a three-valve circuit, employing screened-grid, detector,

and pentode output, and is available for either A.C. or D.C. mains.

It is contained, including moving-coil speaker, in a cabinet that goes easily on a small side-table.

Band-pass tuning is employed, giving exceptionally fine selectivity, while its S.G. and pentode ensure plenty of punch and programmes.

A mains aerial device is incorporated so that no outdoor, or even indoor, aerial need be erected.

One control switch enables the set to be switched on and off, and "long," "medium" or "gramophone" to be used at will.

The circuit employed is quite straightforward, the pick-up switch being arranged

pass and intervalve coils. A trimmer is provided for sharpening up the tuning, and is of great assistance when tuning-in distant stations. It operates as a series-aerial condenser, and so affects the aerial load, and therefore the ganging accuracy of the band-pass unit.

Plenty of Power.

"Extra-loudspeaker" sockets are provided at the back of the instrument so that extension leads to loudspeakers other than that in the machine itself may be used, if desired.

I have had one of these instruments on test for some considerable time and can honestly say that it is right in the front rank of modern receiver design.

To give a log of stations received, and to name a distance over which the music can be heard are useless methods of supplying an idea of what the set will do on radio or gramophone. But, given reasonably good reception conditions you will hear far more stations than you will require, and you will get in the instrument a reserve of power that will provide far greater volume than you will normally desire.

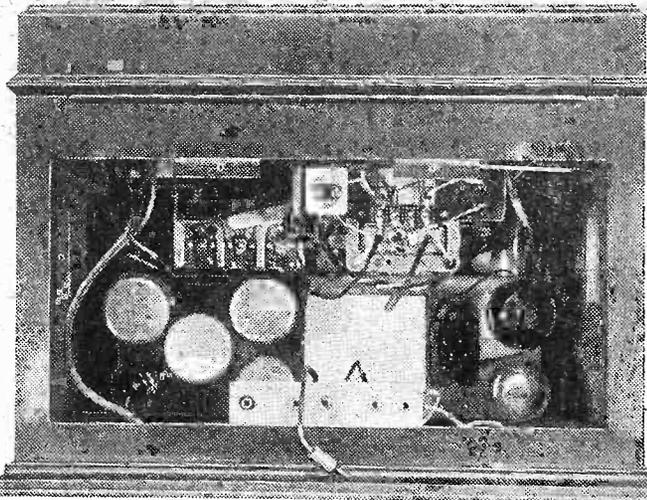
The motor, a disc-driven induction motor in the case of the A.C. set, deserves special mention. It is perfect. And there is no vestige of hum or

mechanical vibration when the motor is operating. As a matter of fact, the machine is completely hum free (or mine was), except when in use on mains aerial, when a certain amount of hum was noticeable. Not bad going when you consider that the mains on which the receiver was tried were decidedly "dirty."

Real Value.

In conclusion, I can honestly say that the H.M.V. table radio-gramophone Model 501 is unique value, and, bearing in mind the work that is behind it and the perfect servicing that is arranged to follow (should it be necessary), it is bound to give every satisfaction.

THE SECRETS REVEALED



In the heading photograph we show the H.M.V. Table Radio-Gramophone in use, and above is an illustration giving you a glimpse of the inside, with its screened coils and compact layout. It is housed in a walnut cabinet, and we need give no other praise of its finish than to say it is of H.M.V. standard.

to place the pick-up in the grid circuit of the detector and, at the same time, to "dis" the cathode circuit of the S.G. valve, so that no radio shall break through.

A volume limiting resistance is used in series with the pick-up volume control, which is ganged with the radio control (a screening-grid potentiometer device), so that bad overloading by heavy passages on the record cannot take place.

Shunt-fed transformer coupling between the detector and pentode valve is employed so that good volume and pure reproduction are obtained. The screened-grid valve is choke coupled to the tuned grid of the detector, and one ganged, three-section variable condenser tunes the band-

CAPT. ECKERSLEY'S QUERY CORNER



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

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

The Value of the Grid Condenser.

H. G. (Falmouth).—"I should be glad to know the effect of using different values of grid condenser for the condenser in a normal leaky grid detector. So far as I can determine by experiment, alterations between about .001 mfd. and .0001 mfd. make no noticeable difference to results."

The condenser in a leaky grid detector arrangement exists to form a path for the high-frequency current into the grid circuit. But the condenser, if too large, would shunt the low-frequency variations of potential on the grid to earth.

So this condenser must not be too small or too big. I should say that there were actual changes going on which do affect the result if you vary the condenser as 10/1, but if you cannot appreciate these changes they must be of a second order magnitude.

Really, of course, it's not only the value of the condenser alone which determines performance; there's the grid leak as well.

Does it Distort?

R. J. W. (Hornsey).—"When I was studying for my P.M.G. certificate, I remember being taught that when two circuits were coupled together and an E.M.F. of frequency f was applied to the primary, the currents in the primary and secondary were at first very complicated. Two other frequencies, f_1 and f_2 . I was told, were generated, and these combined with the original frequency to produce exceedingly complex oscillations. Would not this circumstance indicate that a band-pass filter must cause distortion? After all, modulation is only a specialised form of starting and stopping the carrier-frequency, so that a modulated carrier must be 'mutilated' by a band-pass aerial tuner."

No; there is no reason to suppose that there is any serious distortion. A tuner, whether band-pass (silly name—all tuned circuits pass bands of frequencies more or less) or peak tune device, changes the high-frequency currents in two forms (a) amplitude, (b) phase.

We all know there is some amplitude distortion when we try to receive a 10 k.c. band width and have to chop at 5 k.c. (say). This is ordinary distortion, and we know if we include everything up to 5,000 the cutting off of the rest leaves a worth-while result. As to (b), phase distortion, suppose we did get 90 per cent. phase change, what is this in milliseconds at a frequency of a million?

I leave you to work it out—it's one-quarter of a millionth of a second; isn't it?

Or is there a π to come in? Never mind, it's negligible, as you will see.

Home-made Coils.

C. M. (Colchester).—"I have recently been trying to wind some tuning coils on cylindrical formers. I find that all tables and formulas on the subject require the ratio of length to diameter of the finished coil to be decided upon before the table or formula can be used.

"Is there anything to guide one in the choice of this essential ratio? For instance, should the coil be the same length as the diameter of the coil?"

second (medium-wave broadcast range), and the resistance is lower as the wire is thicker or the wire is more spaced (as the former is bigger).

In fact take a "square" coil, make it as big as possible with as fat a wire as possible. This forms an efficient coil. But remember a cascade of bad resistance divided by inductance (R over L) coils, each tuned, is better than one very efficient coil, assuming you are designing a broadcasting receiver.

Decoupling Difficulties.

R. B. (Norwich).—"I intend to construct a three-stage R.C. coupled L.F. amplifier, which will derive its anode volts from the 230-volt D.C. mains.

"The matter of L.F. stability is giving me some apprehension, as I do not wish to 'decouple' by means of resistances. I propose, therefore, to arrange the eliminator circuit so that a smoothing choke and condenser is associated with each anode circuit. Will such an arrangement be successful in preventing L.F. instability while smoothing the anode supply to the valves?"

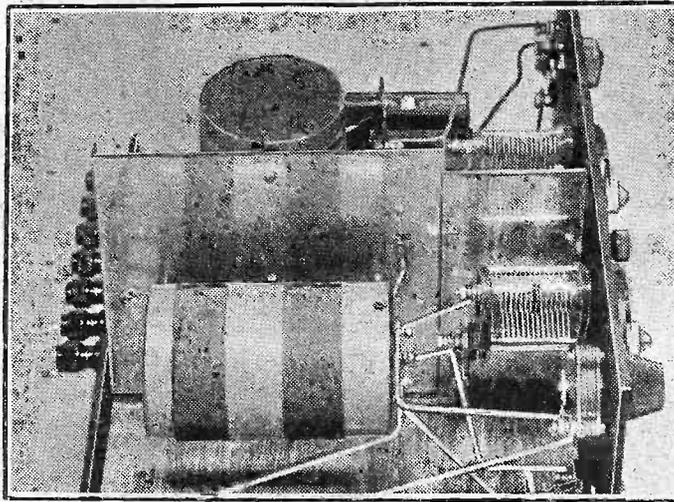
Well, I've tried it with a fairly high lift amplifier, and I gave

it up! I may have been stupid or too hurried or too impatient, but I found the amplifier more stable without the decouplers.

The great trouble is that amplifiers when they motor-boat are oscillating at a very low frequency. Suppose it's 1 cycle a second. Suppose 2,000 ohms decoupling is required—then the inductance has to be 333 henries. And it's got to carry a lot of current, maybe.

Then, again, the condensers of several microfarads connected effectively across these chokes produce tuned circuits, behaving, consequently, very indiscreetly at 50 cycles, maybe. Why not get the electric people to put you in 460 volts, and use resistances both for dropping volts and decoupling? If they will, you will do much better!

TUNING-COIL CONSIDERATIONS



The size and shape of tuning coils make a big difference to the results obtained, especially when they are used preceding the valve. This illustration shows the tuner in the "P.W." Eckersley Two, which was described in our last week's issue.

The design of inductance coils is terribly complex. The best ratio length to breadth is dependent upon spacing of winding. In general practice you will not go far wrong in making the square coil, where diameter of winding equals length of winding.

The whole point is to get the minimum value for the ratio resistance divided by inductance. You have to use solid wire for frequencies above about 500,000 a

ONLY IN "P.W."

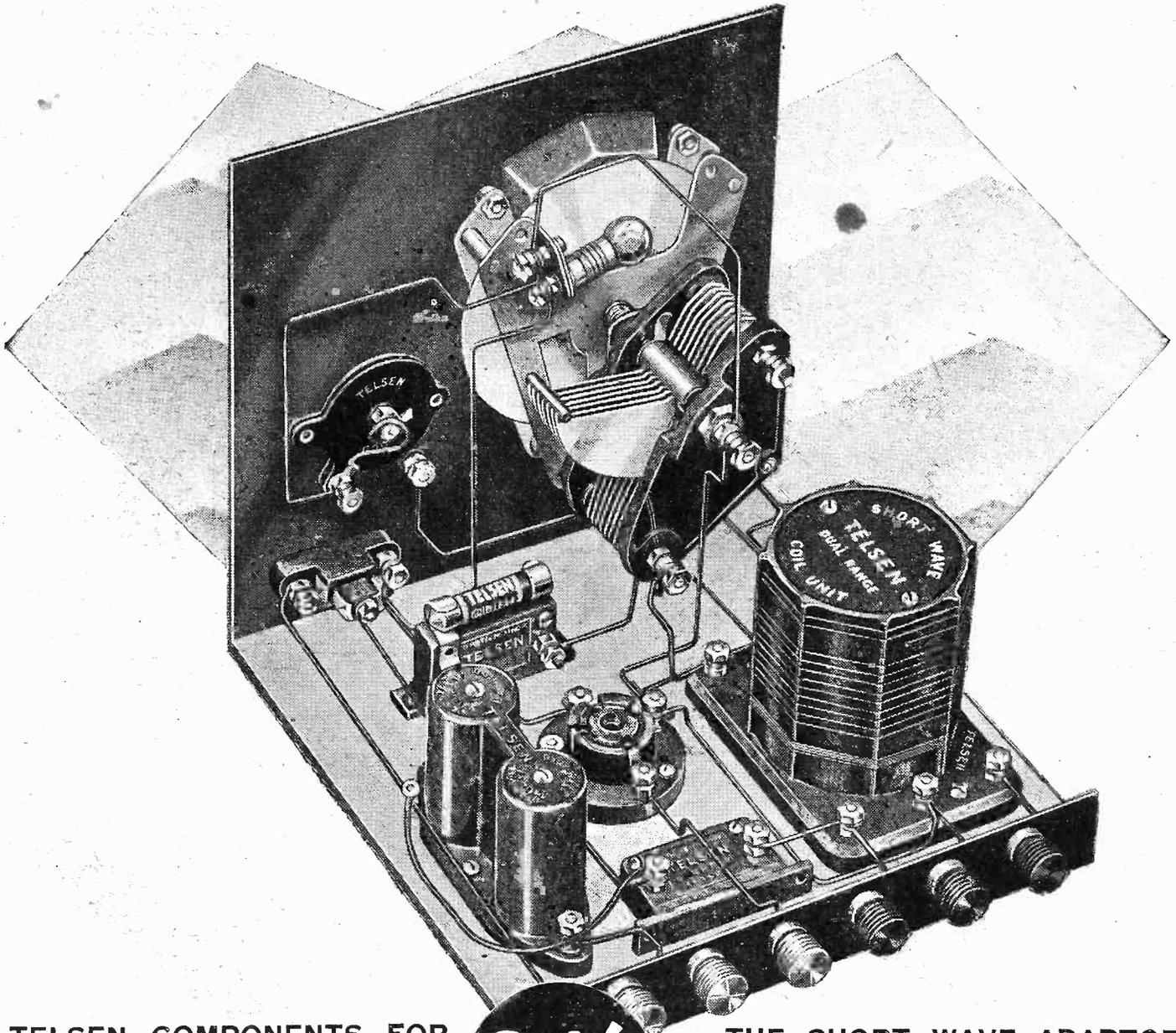
can you read Capt. Eckersley's replies to listeners' own problems.

AND REMEMBER—

Captain Eckersley's technical articles appear only in

"POPULAR WIRELESS" and "MODERN WIRELESS"

TELSEN SHORT WAVE ADAPTOR



TELSEN COMPONENTS FOR

24⁹

THE SHORT WAVE ADAPTOR

AMERICA

YOUR NEXT DOOR NEIGHBOUR

AUSTRALIA

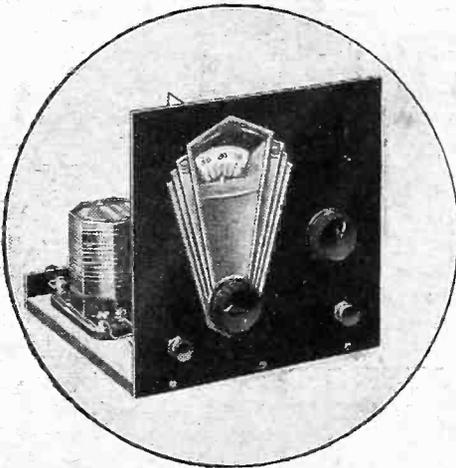
ROUND THE CORNER

Telsen, after many years of patient and expert research, now puts the keen constructor in command of the Short Waves—without altering his present receiver. The Telsen Short Wave Adaptor enables an ordinary receiver to reach America, Australia, Africa, Russia, the Far East, etc., etc.—it can be constructed in an hour with a pair of pliers and a screwdriver. No coil changing—no controls inside the set. The greatest development yet in the history of Short Wave reception.

THE TELSEN SHORT WAVE COMPONENTS YOU NEED

	s.	d.
1 Valve Holder	6	0
1 .0001 Mica Condenser	6	0
1 .001 Mica Condenser	6	0
1 Grid Leak, 2-meg.	9	0
1 Short Wave Coil Unit	4	6
1 .00025 Logarithmic Variable Condenser	4	6
1 .0001 Reaction Condenser	2	0
2 Two-Point Switches	2	0
1 Binocular H.F. Choke	5	0
1 Illuminated Disc Drive	4	6
	24	9

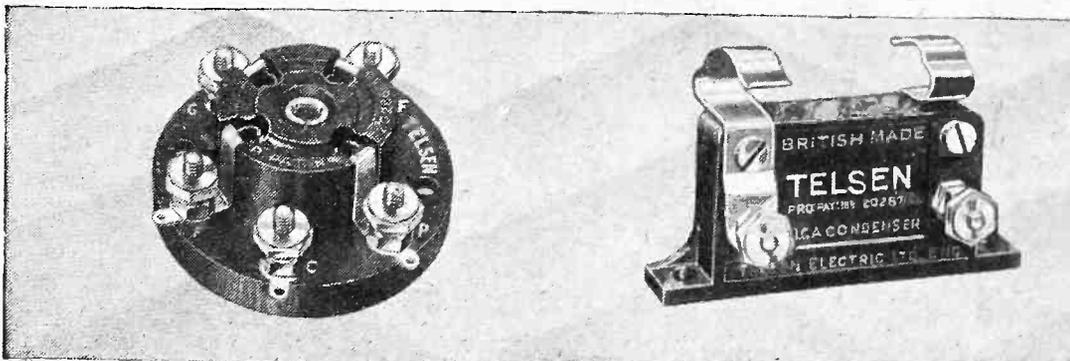
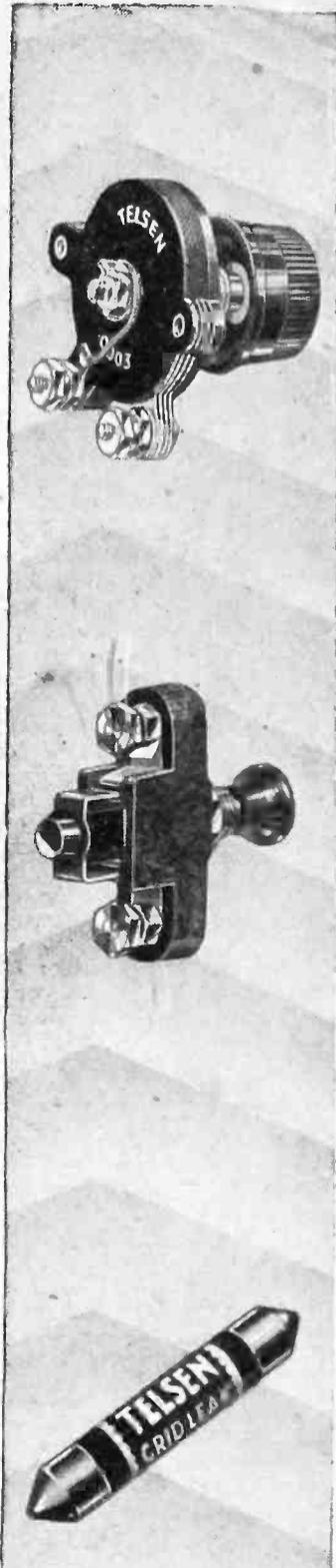
Panel 7x7 ins.
Baseboard 7x7 ins.



Full wiring chart, building and operating instructions are included in the new issue of the Telsen Radiomag, price 3d. at your dealer's, or, if you have any difficulty in obtaining a copy, write direct enclosing 4d. in stamps to "Radiomag," Telsen Electric Co. Ltd. Aston, Birmingham.

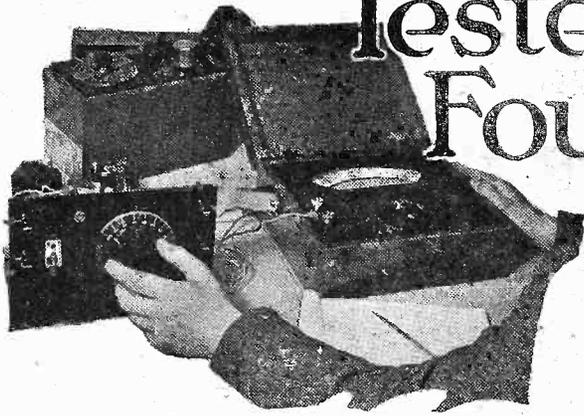
TELSEN

SHORT WAVE ADAPTOR



FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



AN INVALUABLE BOOK.

THE "Practical Electricians' Pocket Book" covers every department of electrical theory and practice.

With some entirely new sections, and many of the older ones thoroughly revised, the 1932 edition just published has been brought right up to date.

Radio, of course, has a prominent place. Various types of circuits are described and there is a very useful glossary of radio terms. The rules of the Institution of Electrical Engineers governing the installation of wireless apparatus are also fully explained.

In another chapter, the construction, uses and maintenance of batteries are dealt with.

Altogether there are over 600 pages in this valuable little book, which is published by "Electrical Trading" Technical Book Department, 93, Long Acre, London, W.C.2, price 2s. 10d., post free.

LAYING THE "HUM" BOGEY.

If mains current were absolutely pure, mains units and sets would be very much cheaper than they are now. But, unfortunately, the best of electric power mains supplies is of an irregular nature, and "smoothing," particularly for H.T., is essential.

The most important component used for smoothing is the L.F. choke, and this figures, generally in duplicate or triplicate, in all mains sets and units.

Its name is a misnomer or, at least, is somewhat misleading, and it cannot, as is commonly believed, act as a complete barrier to all current fluctuations, while providing an easy path for the main body of the current after the surface ripples have been entirely skimmed off, as it were.

The most an ordinary L.F. choke can do is to offer a comparatively high "resistance" to current variations of a low-frequency nature. And the amount of "resistance" it offers will depend mainly upon its inductance and the frequency of the current variations. The greater the inductance and the higher the fluctuation frequency, the greater the "resistance."

A 25-henry L.F. choke will offer what

corresponds more or less with a resistance of some 15,000 ohms to a current fluctuation of 100-cycles frequency.

But what about that mains interference which is due to current variations of a very high frequency? It is often present, and generally makes itself most troublesome when the set is tuned-in on the lower dial readings.

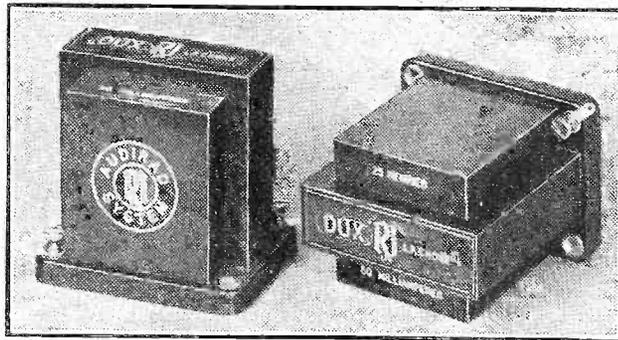
Say it has a frequency of 300 metres. Theoretical calculation will show that a choke of 25 henries should offer a "resistance" equivalent to about 150 million ohms. Actually, it would do so only if it were the perfect choke and had no self-capacity.

But, in the ordinary way, in achieving an inductance of 25 henries and a reasonable current-carrying capacity in a component of compact construction, a considerable degree of self-capacity is inevitable. And this self-capacity provides an easy alternative path to high-frequency currents.

No mere re-spacing of a section of the winding, as is the universal practice in H.F. chokes, will solve the problem, because of the close magnetic linkage that must exist between that and the other parts of the choke.

On the face of it, then, it would seem that the only way to achieve an effective reduction of both L.F. and H.F. current variations would be to use a mains H.F. choke in series with a mains L.F. smoothing choke.

A "UNIVERSAL" SMOOTHING CHOKE



The R. I. Dux L.F. choke is designed in accordance with what is known as the "Audirad" system and can smooth mains irregularities of a high as well as a low-frequency nature.

At least, that was the case until the new R. I. Dux smoothing choke came along. This choke, which has a 25 henry, 50 milli-ampere rating, is constructed in accordance with an invention known as the "Audirad" system, and though it is actually smaller than most ordinary smoothing chokes, it is able to act as both an L.F. and an H.F. choke.

Looking at the neat little article, it is very hard to believe this possible, but the constructor who purchases a Dux "Audirad"

can test its properties in a spectacular manner.

Disconnect the earth-lead from a set and tune the set in to the local station. Now disconnect the aerial, too, and re-tune and note how much can be picked up, if anything, directly on the coils and leads of the set. Then connect an ordinary L.F. smoothing choke in series with the set's aerial terminal and the aerial itself, keeping the lead between the choke and the set as short as possible.

The reception will be unimpaired, thus proving fairly convincingly that the H.F. currents induced in the aerial are treating the choke merely as a fixed condenser owing to its comparatively high self-capacity.

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

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

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

Replace the L.F. choke by a good H.F. choke, and the reception will fall to the "no aerial" level, however much you re-tune—thus illustrating the effectiveness of this kind of choke at high frequencies. Finally, replace the H.F. choke by the R. I. Dux "Audirad," and you will find this as effective as the H.F. choke!

This is not a strictly scientific experiment, but it is a pretty one, and gives a practical proof that the R. I. "Audirad" is no mere stunt.

You would naturally expect a revolutionary combination of "sympathetic functions," like the R. I. Dux "Audirad" smoothing choke, to be a somewhat bulky and rather expensive item. I have said it is smaller than most ordinary chokes, and when I go on to say that it costs only 8s. 9d., you will gather that R. I. have made a notable contribution to the science and economics of radio.

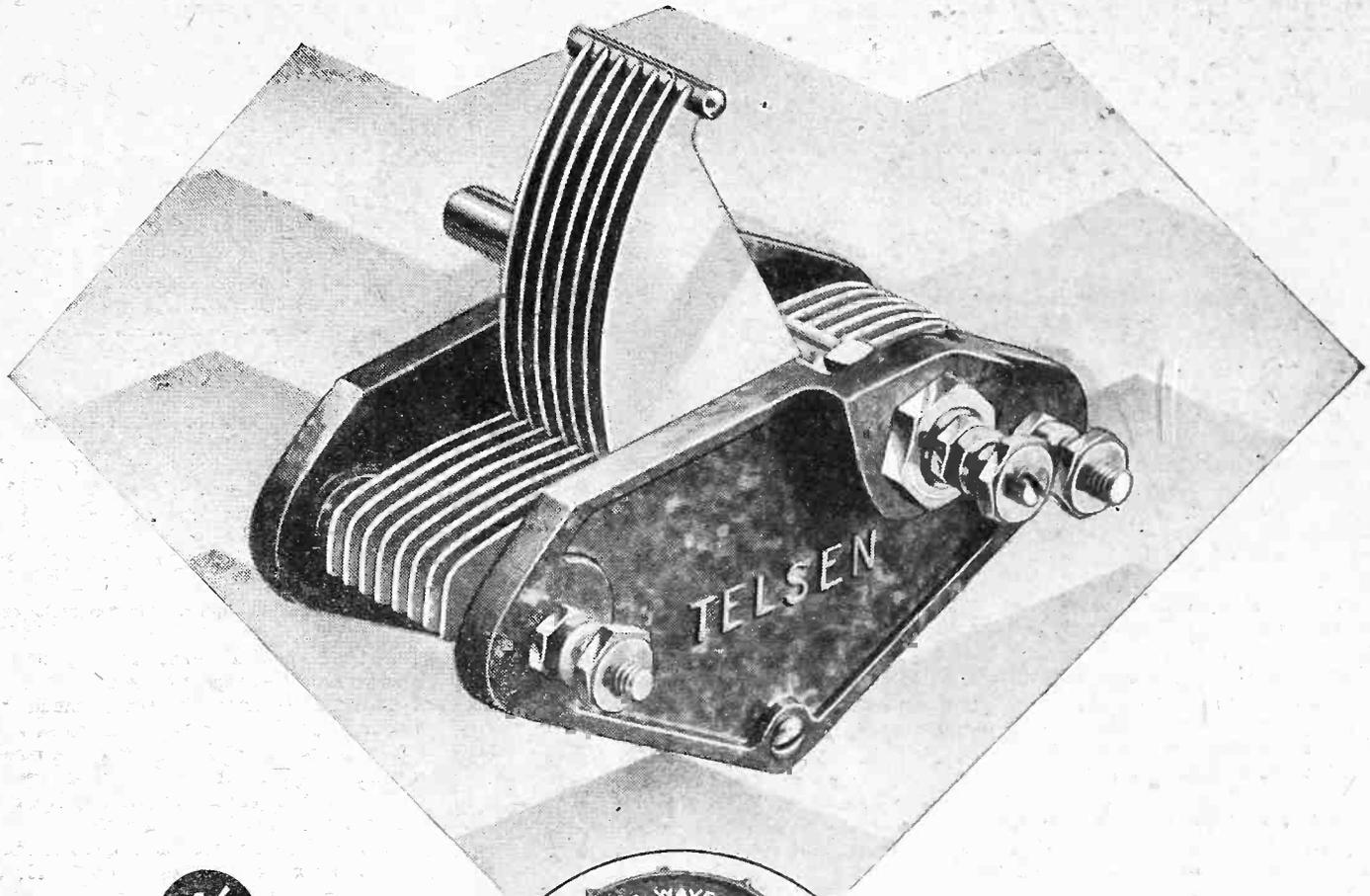
For smoothing purposes in mains units and sets, as an output choke, or for scientific interstage decoupling, the R. I. Dux "Audirad" must, by virtue of its original qualities plus competitive price, attain very great popularity.

"ATHCO" L.F. TRANSFORMERS.

Messrs. A. T. Harrison and Co., of Bermondsey, recently sent me samples of their new 5 to 1 and 3 to 1 L.F. transformers. I have carefully tested them and, judged purely in terms of a reasonably low price level, I find them to be quite good components. They are contained in very well moulded cases and are compact and neat in appearance.

If they are also inexpensive—these "Athco" transformers should merit the constructor's attention.

TELSEN ·00025 VARIABLE CONDENSER

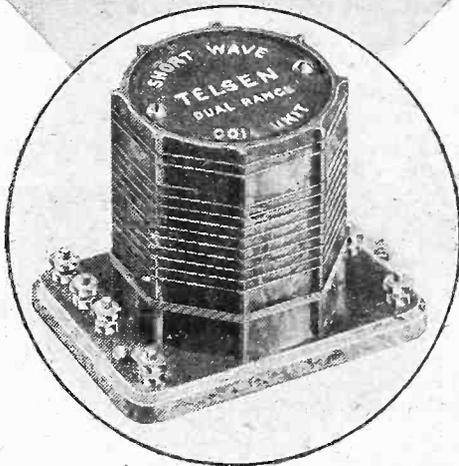


46

PRECISION . . .

The Telsen ·00025 Variable Condenser is specially designed for short wave work. The frame is sturdy—braced by three solid pillars: the vanes are clamped at three points—distortion is impossible: the rotor is built into a rigid unit and the vanes are held at the ends—backlash and end play is avoided.

Telsen Logarithmic Variable Condenser in capacities ·0005, ·00035, ·00025. Price 4/6.



The Telsen Short Wave Coil adds the Short Waves without coil changing.

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FAKING NOISES AT BROADCASTING HOUSE



Our Special Correspondent is taken over the suite of studios devoted to the Productions Department at Broadcasting House, and tells how realistic effects can be "faked" in musical and other radio programmes.

"EFFECTS, please!" I said to the commissioner of Broadcasting House, and forthwith was transported to the sixth floor, where, in the company of one of the men of the Effects Department, I wandered around the corridor to studio 6D.

"Do you remember," said my guide, "our old effects studio outside studio No. 2 in the basement of Savoy Hill?"

Having nearly fallen in the huge wooden water-bath there, while listening to an even louder than usual effects record of gunfire, I replied feelingly!

Plenty of Space.

"There's more room in our new headquarters," said the effects man. We entered the studio, and immediately his point was proved. Studio 6D is one of the double-deckers taking up the sixth and seventh floors of Broadcasting House, and it is one of those which I saw in the rough plaster stage many months ago.

Just why they have taken up a double-decker studio for effects only I do not know, but it seems obvious that the Productions Department sees a big feature for artificial noises in Broadcasting House programmes.

A great deal of the apparatus was being installed at the time of my visit and we made a hurried inspection, my guide pointing out additions which would be made as time went on.

"One reason for having a double height studio," he said, "is that we need the echo. The small single-decker studios on this floor, such as the gramophone studio next door, are too 'flat' acoustically speaking."

Getting "Floor" Effects.

He showed me, first, the duct at one extreme corner of the room, along which all the microphone cables pass, and where the lines come in from the control-room and the dramatic control panel to the effects studio.

Then he pointed out how, in order to get special floor effects the room had in one corner a concrete floor, and in another a wooden floor. A heavy carpet covered another section.

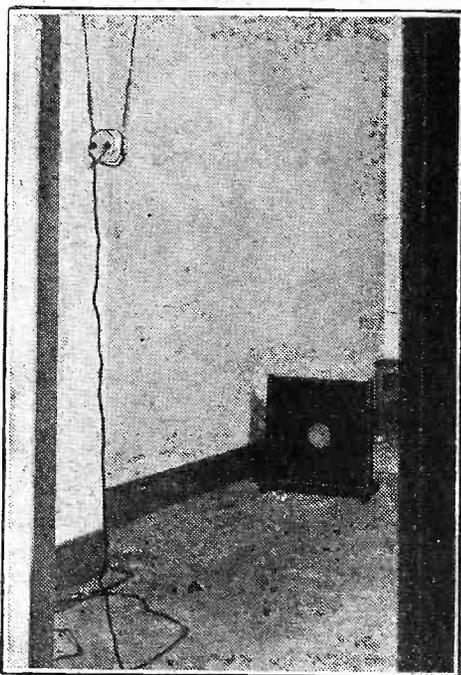
There is a big table with a rotating top in the centre of the room and this carried what appeared to be boxes of litter, but which, when unwrapped, will be hand-made effects apparatus.

There will be a strip of carpet leading down to the wind machine, that good old

background to plays in which there is a storm scene. On the concrete and wooden floors respectively there are two benches which will carry new apparatus for making effects by electrical means, and a new gadget which was produced in Savoy Hill for making railway noise is in another corner.

A drum rack, a barrel organ, thunder sheet and water tank are also part of the quaint furniture in this room.

IN THE ECHO ROOM



The B.B.C. can add as much echo as it wishes to any studio performance by means of the echo room shown here. It is a bleak and bare apartment, so a speaker's voice, coming from the loudspeaker, "rings" as from a sound-box. The echo-room microphone picks this up, and adds it to the original transmission in any desired degree, the balance between the two microphones being under the control of the engineer in charge.

A new addition is a collection of compressed air gadgets, hooters and fog horns. These are not fixed yet and the effects men are now experimenting with various heights.

A published plan of the effects studio gives the height of this group of apparatus as about 6 ft. 9 in. above the floor, in order to get the right amount of echo, but this can be varied.

As the equipment in this main effects studio is not completed we went through

into the ante-room where there are the gramophones: This is studio 6E.

A semi-circular bench carries six gramophone turntables and an instrument board with switches and fader controls. There is, I understand, to be a second bank of six gramophone turntables, in addition to the twin gramophone consoles in the two new studios.

"Twelve Gramophones!"

The gramophone in studio 6E will be used only for making effects noises, while those in the announcers' studios will be for filling in time between programme gaps. With twelve gramophones for their exclusive use the effects fakers ought to be able to make a useful amount of noise! They had only three turntables at Savoy Hill, and even with these they succeeded in setting a standard for radio noise producers!

The gramophone consoles in the news studios are fitted with a special device which illuminates the needle point at a distance of about 3 ft.

Special high candle-power bulbs send a pencil of light on to the needle point, and as the electrical apparatus is so far away from the magnetic system of the pick-up there should be no interference. This same apparatus may be used for the effects gramophones.

All the studios in the effects department are fitted with a rather novel microphone mounting, so that the "mikes" can be pulled out in any direction and remain automatically balanced without any further adjustment.

Studio 6D is not the only effects room. Studio 7D, which is on the floor above, and is only a single decker, will later on be fitted out with noise-producing apparatus. We climbed up the stairs to the seventh floor, but found that the new gear had not yet been installed.

All Connected by 'Phone.

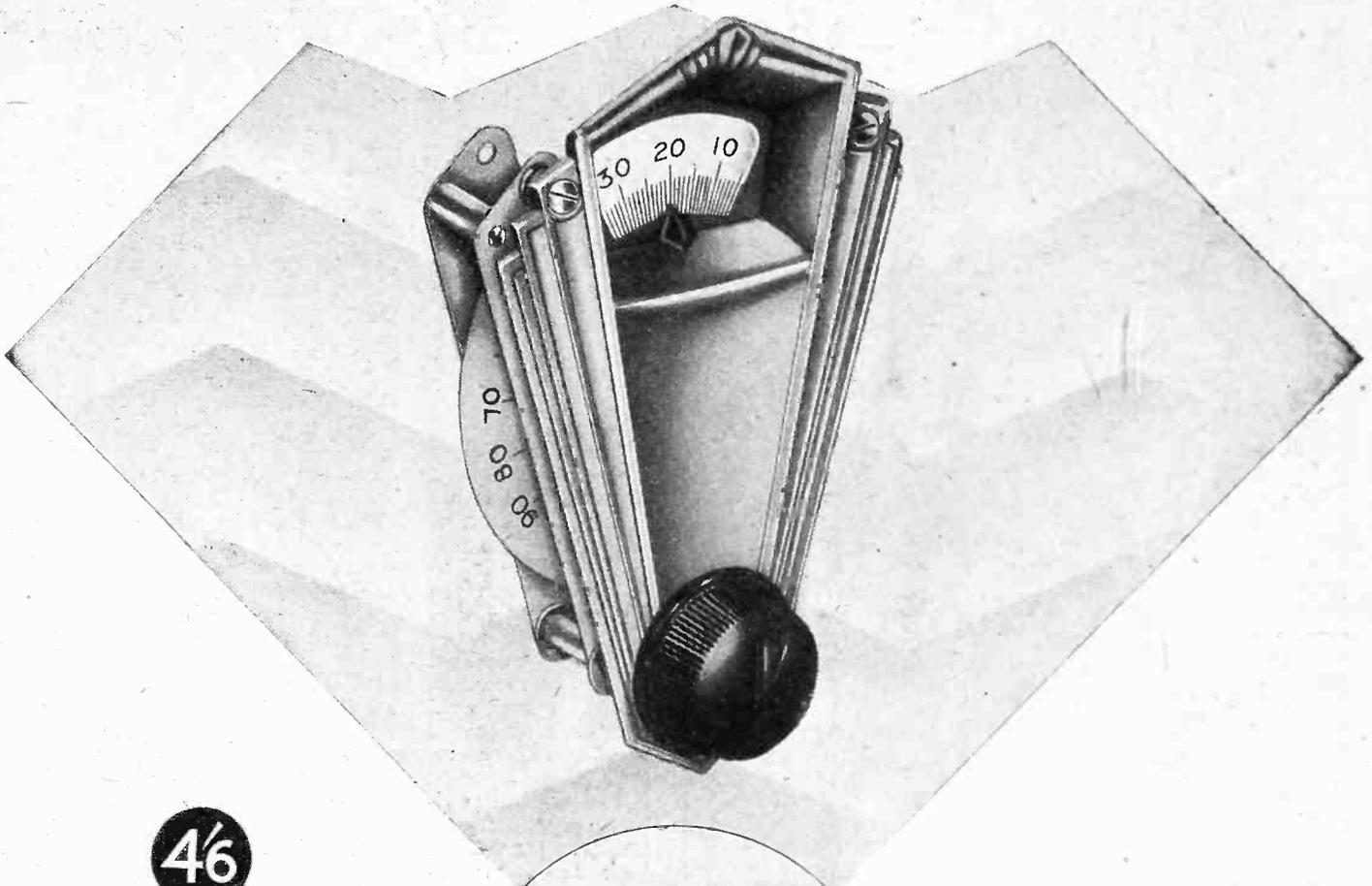
There is another gramophone studio, too, on the seventh floor, immediately below the 6E studio.

'Phone communication between all three is possible, but the operators do not really need to know when to come in with each gramophone set, because the man in the dramatic control-room on the eighth floor can switch-in to any studio and control the effects.

This dramatic control studio, which is outside the big military-band room at the top of Broadcasting House, can control ten studios at a time—far more than are ever likely to be used in any one programme.

(Continued on page 1214.)

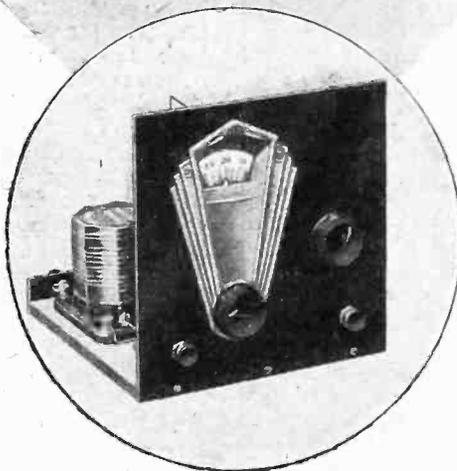
TELSEN ILLUMINATED DRIVE



4/6

TELSEN ILLUMINATED DISC DRIVE

Fitted with a handsome oxydised silver escutcheon of modern design, this drive incorporates an improved movement, which gives an exceptionally smooth action with no possibility of slip. The gear ratio of approximately 5-1 and the bold and well proportioned figures make for delightfully easy tuning, and as the dial rotates over the full circle, all types of condensers are catered for. The dial may be illuminated by means of an ordinary flashlamp bulb. Price 4/6.



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FAKING NOISES AT BROADCASTING HOUSE

(Continued from page 1212.)

"All the studios connected with musical comedy and radio plays are on the sixth and seventh floors," said my guide, and we went down in the lift again to the ground floor of studio 16 and then along the corridor, outside the studio well, to the 6A studio, which is to be used for musical comedy programmes.

I asked what the distinction might be between musical comedy and vaudeville, and was told that ordinary vaudeville turns requiring few effects would be done in the basement vaudeville studios B and BA. Vaudeville programmes requiring a lot of effects will be done in the 6A studio, so that the producer will not be far from the gramophone room.

A Fine Studio.

I noticed that the decoration of the effects studio is rather striking and my guide told me that the scheme had been planned by Mr. Wells Coates, B.Sc., Ph.D. The effects studio scheme is a little on the futuristic side and is certainly a change from the effects-cum-lumber room of Savoy Hill, which started out as a listening cabinet to No. 2 studio and which, little by little, was filled up with hooters, gramophone records, microphones and other noise-producing miscellanea.

"By altering the microphone positions

in studio 6D," said my guide, "we can get a fairly long period echo. The man in the dramatic control-room upstairs can switch us on to an echo room, if he wants a still longer echo. In this way the boom of the big drum, which imitates heavy gunfire, seems to vibrate for nearly ten seconds."

"What about the little door which you used to carry up to the studio where a radio play was going on at Savoy Hill?" I asked.

"Exclusively for Slamming!"

"You mean the little door which was slammed, instead of banging the studio door," said the effects man. "That was all very well, but the door and its framework were so small that there was always a chance of somebody kicking the thing over in the hurry to get to the microphone. A special door has been built in to the corner of studio 6E, and the microphone in the effects room will pick up the noise of this being slammed."

"That door is exclusively for slamming!"

DOES YOUR AERIAL FEEL THE COLD?

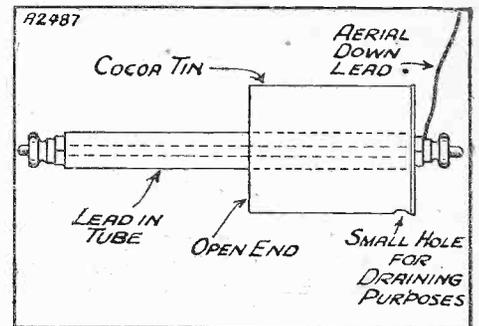
IT is an actual fact that of all the various component parts that go to make up a wireless installation, the aerial is the one that suffers from the cold more than any other.

When I refer to "cold," I mean the type of weather that is seasonable now, with plenty of hard frosts and abundant snow. Frost and snow seem to have a peculiar affinity for such things as aerial insulators. And, needless to say, it does not assist them to perform their duties as insulators.

Only the other morning I was trying to tune-in Radio Paris for his 8 a.m. time signal (very useful, by the way, when the household clock fails!), when I noticed that his strength was very much below par. Something induced me to look-out of the window (it may have been instinct), and I was astonished to see what, to all intents and purposes, appeared to be a thickish rope up aloft, where the aerial should have been.

At first I thought someone had been playing a practical joke, but investigation soon showed that the aerial wire was there all right, and so was something else—a

KEEPING IT DRY



A good idea for the lead-in, described in the accompanying article.

thick coating of frost, right from one end of the wire to the other, completely covering the small egg insulators, and giving the whole the appearance of a long rope.

With no little difficulty I lowered the aerial, cleaned the insulators, and removed the frost from the wire. The aerial was then hoisted into position again, and on returning to the wireless set everything was normal once more.

This little incident should clearly show the importance of looking after your aerial through the winter months. That is if you want maximum efficiency from the set.

Large Insulators.

Always make a point of using good big insulators, and the more the merrier! In frosty weather or when there is snow about, an occasional shake on the aerial halyards often does wonders in keeping the wires and insulators free from encumbrances.

Another part of the aerial equipment that deserves attention in wintry weather is the lead-in tube.

It is surprising that these are not protected more; there they are, all open to the weather, and in many cases simply consisting of a piece of ebonite tube, with a length of brass rod passing completely through it.

A good example of a well-protected lead-in insulator is to be seen on almost any ship equipped with wireless. If the same principle were followed in ordinary broadcast gear our aerial systems would be much more efficient.

With the ordinary type of ebonite tube lead-in a tremendous improvement can be made by fitting a small hood over it for protection.

An excellent method is to make a small hole in the bottom of a cocoa or similar tin, and fix it under the end terminal of the lead-in tube before tightening it up on the aerial down-lead.

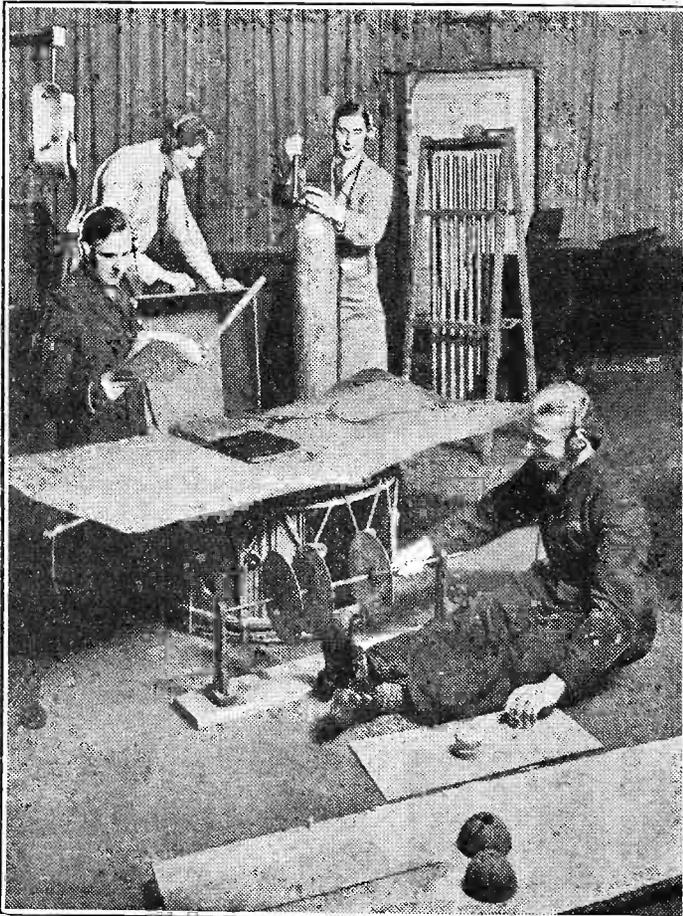
Proper Protection.

The accompanying diagram will give the idea clearly, and it will readily be seen that rain, hail or snow as it will, the part of the tube inside the tin will always be dry. Some of the large commercial and broadcasting stations, with high aerials, are so troubled with ice and snow on the insulators and wires that they have special arrangements whereby they can, before commencing transmission, send a powerful current through the system and so clear all the ice away.

So next time your set seems to be a bit "off colour," don't condemn it until you've made sure that your aerial is above reproach.

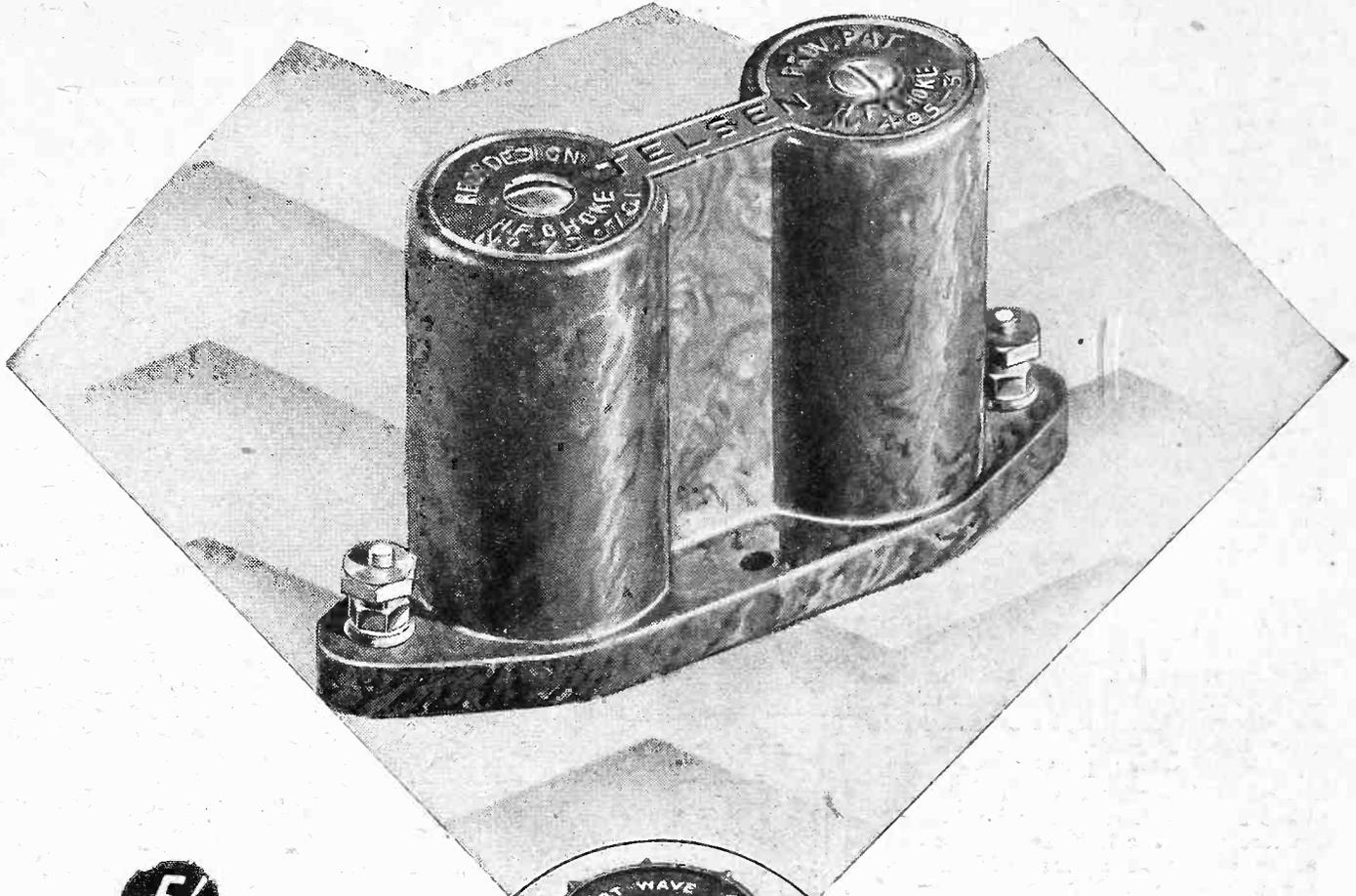
F. B.

HOW THEY GOT THOSE LIFE-LIKE EFFECTS



Engineers in an "effects" studio, with the equipment with which they duplicate any noise you wish—an aeroplane starting up, a train coming in, a howling gale, or a cross-country gallop!

TELSEN BINOCULAR CHOKE

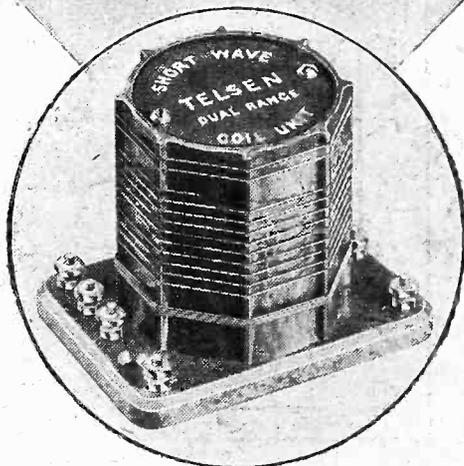


5/-

TELSEN BINOCULAR H.F. CHOKE

It is the function of an H.F. Choke to present the highest possible impedance to H.F. currents at all wavelengths. Particularly does this apply to the popular tuned-grid arrangement of screen-grid amplification, where the performance of the whole set is limited by the value of the impedance in the anode circuit of the screen-grid valve. It is equally important that this high efficiency should be maintained over the whole broadcast band.

Telsen Binocular H.F. Choke. Price 5/-



The Telsen Short Wave Coil adds the Short Waves without coil changing.

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HOME-RECORDER SWITCHING



ANYONE who is experimentally minded—and what radio enthusiast isn't?—will find great attractions in a home-recording outfit. And that, quite apart from the "fun" which can be had with records made by oneself, whether from the radio or from a microphone.

Mention of a microphone reminds me that many are "put off" home-recording because it seems far too expensive. But you can use your cone speaker as the microphone if you have a powerful set, and if you are contemplating buying a gramophone pick-up, you need not do so if you buy a recording outfit, for the actual recorder serves this purpose as well.

A Real Time-Saver.

But all that by the way; what I really want to write about is the bother, whether a loudspeaker is used as the "mike" or not, of changing over all the necessary connections each time you want to go from recording to playing. At first, before the original novelty wears off, you won't mind, but later on you will find some switching scheme highly desirable.

And the simpler it is the better. So I have devised a scheme which will work with a double-pole change-over switch, or if a tone control is to be switched in and out as well, with a three-pole change-over switch.

The circuit of the arrangement is given in the diagram, and for the time being we will suppose that your loudspeaker is to be used as microphone. The two valves shown are merely for the purpose of showing how the arrangement fits in with the circuit of the receiver.

The first valve V_1 is the detector, or first amplifier for pick-up work, and the set's pick-up terminals are shown wired up direct to the valve in the usual way. If a transformer is used for pick-up input, it will come between the pick-up terminals and the V_1 valve, and slight differences in the connections will be necessary, but I shall deal with those later.

Components Required.

The second valve V_2 is the power or output valve of the set, and an ordinary output filter circuit is shown. A filter circuit is a necessity for the scheme so that one side of the loudspeaker can go direct to L.T. negative.

Apart from the loudspeaker and recorder "pick-up" the components required are a three-pole change-over switch, a 1-mcg. volume control, a fixed condenser, and a variable resistance, and a $1\frac{1}{2}$ -volt G.B. cell.

An ingenious switching scheme for use with home-recording apparatus, which enables a "play-back" to be made immediately after recording without having to change round any wires.

By A. S. CLARK.

If desired, all of these can be made up into a compact little unit with four terminals for joining up to the loudspeaker and pick-up terminals of the set. The values given for the fixed condenser and variable resistance will generally be O.K.

But their values are not critical and depend largely on the resistance of the recorder-pick-up, and the amount of high stuff you wish to cut out when reproducing. So try any components you have on hand before buying fresh ones. A potentiometer with only two terminals in use will be ideal for the resistance.

If you trace out the circuit you will see that one side of both the recorder and

side which does not go to the grid-bias cell of the unit) is joined up to grid-bias plus.

Let us trace the circuit out in the two positions of the switch. First we will have it over to "record."

The loudspeaker is now the "mike" and you will see that its "unearthed" end goes to the high potential side of the volume control. The slider of this should be put to maximum unless you find the sensitivity of the speaker wants cutting down a bit.

Ready for Recording.

The high potential end of the recorder now goes to the set's output and the remaining section of the switch does nothing. Having made a record, put the switch over the other way and you are immediately ready to play it back!

The loudspeaker is now connected to its usual terminals and the recorder-pick-up is across the volume control. The tone control has now come into circuit and is shunted across this pick-up where it will be very helpful in removing scratch from home-made records and for controlling the tone of professional records. Of course, once the best setting for a certain purpose is found, it can be left adjusted.

Volume is controlled with the potentiometer in the usual way. In the circuit-diagram the radio-gram switching of the set is omitted, as it works in the normal manner.

No Snags.

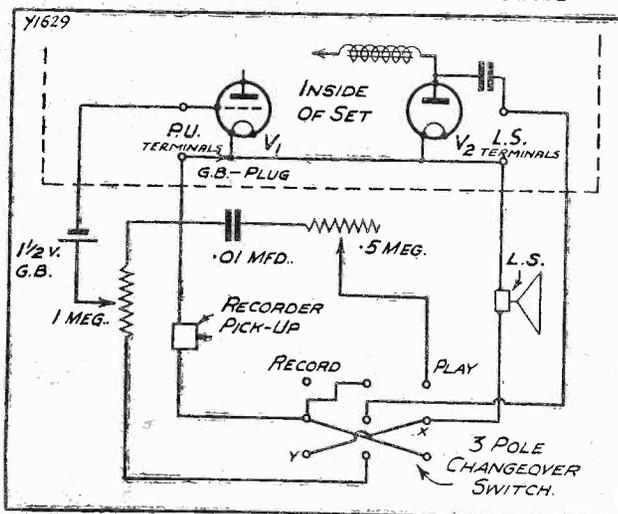
To make records of radio, just put the radio-gram switch on to "radio," and the other over to "record." For all reproducing of records and work with the "mike," the radio-gram switch on the set is, of course, left on "gram."

If you don't want the tone control part, use a D.P.D.T. switch and leave out the fixed condenser and variable

resistance and the connections thereto. And if you use a proper microphone, proceed as follows.

Don't join the switch contacts X and Y together, but take Y to one side of the secondary of the microphone transformer, and the other side of it to L.T. negative. Then carry on just as already described, but, of course, speaking into the microphone and not the loudspeaker!

MAKE UP A SEPARATE UNIT



Here are the simple connections. All the components outside the dotted line can be incorporated in a special unit external to the set. The scheme is suitable for recording radio items as well as for record-making via a "mike."

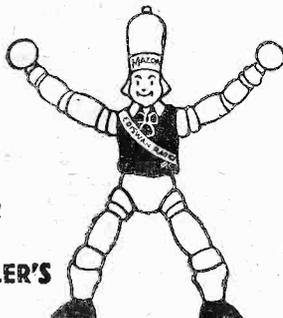
loudspeaker are connected direct to L.T.—. To obtain this effect the G.B.— pick-up plug in the set must be joined up with grid-bias plus, the bias being supplied by the cell on the unit.

This, however, will not apply if a transformer input is used. In such a case the pick-up bias plug should be left in its normal position, but you must see that one side of the transformer primary (the

2 VOLT MAZDA MASTERPIECES

TYPE	PRICE
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★ H.2	8/6
HL.210	8/6
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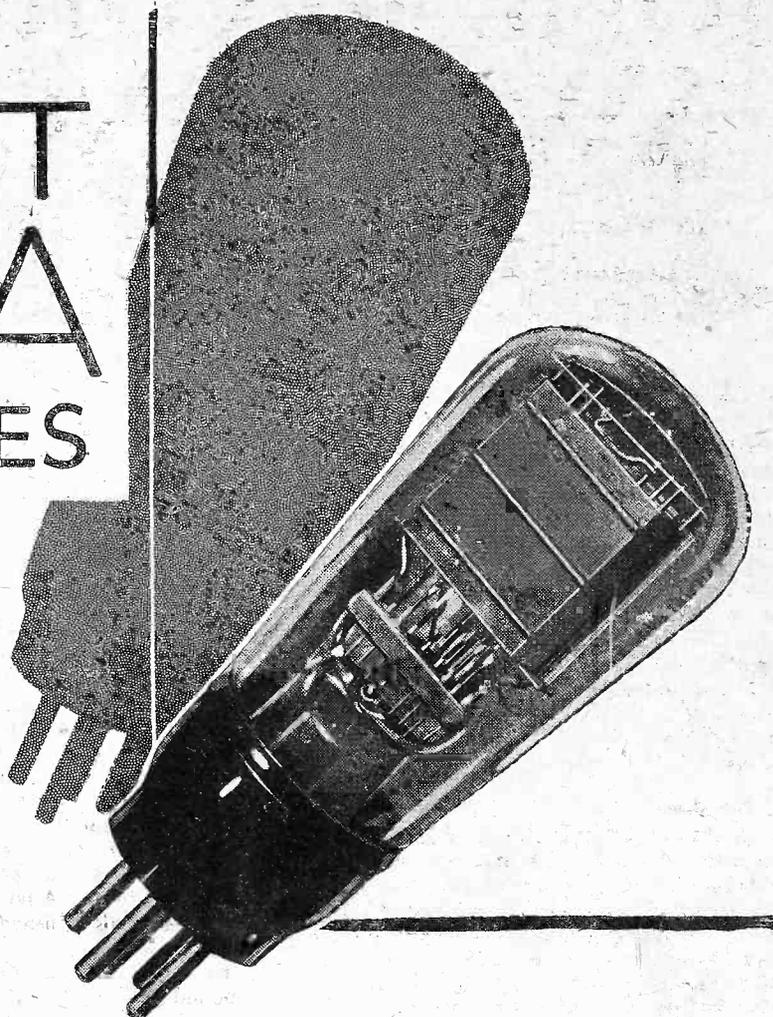
THE AMAZING

MAZDA PEN. 220

Characteristics:

Filament Voltage - 2.0 volts; Anode Current (Max) - 12 mA
 Filament Current - 0.2 amps; Screen Voltage (Max) - 150 volts
 Anode Voltage (Max) - 150 volts; Mutual Conductance - 2.5mA/V
 At $E_s = 100$; $E_s = 100$; $E_g = 0$.

PRICE 20/=



Never, in the history of 2-volt valves, has there been such an amazing range as this—so much evidence of brilliant engineering—so many valves with outstanding characteristics. Instance the Pen. 220; a pentode valve which at once presents the solution to the output stage problem in portable sets, giving an extraordinary large output for a combined screen and anode current of under 5 mA. It is a valve for which dry battery users have long waited.

Being typical of all Mazda valves, it is outstanding in its efficiency. Mazda 2-volt valves, both metallised and clear bulb types, are sold by all good radio dealers. Mazda valves are 100% British made and designed by British engineers.

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THE HUROR OF THE B.B.C.

By O.H.M.

THE CONCERT BUSINESS CHAOS

MR. WHITLEY ACTIVE—TELEVISION DEVELOPMENTS—
FOREIGN ADVERTISEMENTS—THE AUDITION BAN, Etc.

IT seems the B.B.C. has already been engaged in the various negotiations for control of the business of the late Lionel Powell, the famous impresario. Sir Thomas Beecham, with influential financial backing, has also made strenuous efforts in the same direction, but he has had to face strong opposition from various quarters. H.M.V. and the B.B.C. have both nibbled, and at least two independent syndicates are interested. The position of the B.B.C. would seem to be rather difficult, as there appears to be differences of opinion in the Corporation as to whom they should give their backing.

Mr. Whitley Active.

Mr. Whitley, the Chairman of the B.B.C., has become much more active recently. Staff see him about the building daily, and it is believed he is finding his time fully occupied with his job of work. It is quite apparent also that relations between Mr. Whitley and Sir John Reith, the Director-General, are most cordial, and they are in close touch with one another on all matters of policy.

Television Developments.

Extension of television broadcasts by the Baird process will be announced shortly. The new arrangements probably will include four half-hour programmes organised and radiated by the B.B.C. independently of the Baird Company. I understand that technical opinion both at Savoy Hill and in Long Acre looks to ultra-short waves as the future right venue for television signals.

Staff Changes.

There are again persistent rumours of still more important staff changes at the B.B.C. These are said to be largely the result of the careful survey which has been made by Mr. Harold Brown, the new Governor.

Foreign Advertisements.

It is the subject of some comment in political and advertising circles that the B.B.C. continues to accept advertisements of foreign products for publication in its journals. The subject was raised some time ago by Sir Henry Page Croft, who is understood to be so dissatisfied with the reply of the B.B.C. that he is likely to raise the matter in Parliament at an early opportunity.

The Audition Ban.

The six-months ban on auditions was no doubt necessary in view of the accumulation of no less than 2,000 names of artistes eligible for the microphone. It does, however, convey bitter disappointment, particularly to the brightest products of the musical colleges.

A suggestion is being made that the B.B.C. might resume auditions to secure likely talent for public performance as well as for the microphone. It is also pointed out that this suspension might well be the cause of missing some really great artists.

Mr. MacDonald and General Hertzog.

Early in February, morning listeners to the National programme will hear an interesting broadcast in the form of a conversation between Mr. Ramsay MacDonald and General Hertzog, when they inaugurate the new Post Office radio-telephone service between Great Britain and South Africa. Mr. MacDonald will be speaking from his room in Downing Street, and General Hertzog from Cape Town, and the broadcast will take place at 10.45 a.m. G.M.T. It will be recalled that a similar broadcast took place two years ago, when Mr. MacDonald spoke to Mr. Scullin on the occasion of the

opening of the radio-telephone service between Great Britain and Australia.

"Irish Bulbul."

Mary O'Farrell and Denis O'Neill are taking part in Gordon MacDonnell's production, "Irish Bulbul," which is being revived for National and London Regional listeners on Monday and Tuesday, February 5th and 9th respectively. It should be a first-class show of Hibernian songs, linked by Hibernian dialogue. Wednesday, February 10th, brings another light programme—a vaudeville entertainment—for Regional listeners, in which, I hear, is a sketch entitled "At the Bar," by Edgar B. Street. The sketch will be played by Ronald Purdell and F. George Ide. Alexander and Moore, Marie Blanche, Dennis Arundell, Marceline D'Alroy, Vernon Lee and the Carlyle cousins are also in this programme.

Piano Humour.

The seventh of the series of "Reminiscences of Piano Humour," devised by Tom Clare has a place in the National programme on Saturday, February 13th. Tom Clare, Norman Long and Nelson Jackson, three of the leading exponents of this type of entertainment, are taking part, and with them, but doing their own "acts," are Leonard Henry, Joubert Lyons, Terence McGovern, Henri Morton, Dora Gregory, and Haver and Lee.

"A Tabloid."

How the wish of a young playwright, who, for the purposes of his work, would like to know the feelings of one murdered, is fulfilled—fortunately without any disastrous consequences—is the plot of an original playlet by Arthur Eckersley, entitled "A Tabloid," which Charles Brewer is producing for Midland Regional listeners on Monday, Feb. 15th.



THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

Mr. S. P. B. Mais.

I HAVE said before how I like Mr. S. P. B. Mais' talks. Yes, I like them more and more every time I hear him. I envy him his eyes, or is it his imagination?

I ask this question because I know (or, at least, I thought I knew) the Lincolnshire Fen country on which he lavished so many adjectives recently. I know Boston and Spalding, but I have never seen in them what Mr. Mais has. It is probably a case of "Eyes and no Eyes."

I was hoping that, in his discourse on Fen Churches, he would mention Toft Church, a remarkable church near Wainfleet, rich in historical association but, when I last saw it just after the War, in a deplorable state of repair. The churchyard resembled a hay field just before harvest time, there was a *crack* in the *sky*, there were several holes in the roof, I remember, and the floor-boards of the

pews in the aisles came up and hit you in the face as you entered.

It is probably this recollection that made me feel that Mr. Mais' words regarding Lincolnshire's prosperity didn't ring true.

I also know the Rector of Crowland Abbey; he lives only for the Abbey, and loves to talk about it. I can imagine his meeting with Mr. Mais, and wonder who enjoyed the other more!

"Guilty."

Aren't you getting a wee bit tired of "Guilty"? A victim of every kind of musical instrument, it is going the way of all haunting melodies. Soon, it will be as dead as mutton.

They couldn't even keep it out of "Rope." Though masquerading in France under the name of *Coupable*, it is being no less mercilessly done to death there. The life of a

(Continued on page 1234.)

MAKING A SINGLE DIAL SUPER

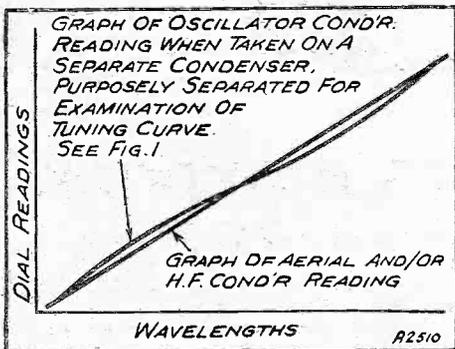


AMONG the many technical problems connected with modern receivers probably the ganging of tuning condensers on one common spindle for the super-het is the most interesting. It would not be incorrect to state that a single-dial super-het is also one which offers the greatest difficulty to the designer because, unlike the straight H.F. amplifier, where the tuned circuits are identical and ganging is a matter of repetition, the "tracking" of the moving vanes on the various sections of the ganged condenser on a super-het call for complicated calculations and considerable experiment.

For the Constructor.

The essence of this short article is not to prove how difficult the design may become, but how simply the single-dial super-het

COMPARING THE CURVES



The curves of this diagram show the slight differences between a tuning condenser and the oscillator condenser of one single-knob super-het, in which the oscillator and tuning condenser are in step at the top and bottom readings.

can be built by the constructor, particularly where the ganging arrangements have been worked out for him.

For purposes of comparison, let us first examine any typical commercial or home constructor design incorporating two S.G. H.F. stages, with band-pass or plain aerial tuning and tuned grid or H.F. transformer couplings and, of course, having a three or four-section ganged condenser.

Matching of Coils.

The coils will invariably be completely screened in metal cans and have identical physical constructions. They will also be accurately matched by the makers on both

The next step in the development of the super-heterodyne is the perfecting of single-knob control, and in this introductory article, which deals with single-dial supers for home construction, we describe our own work in developing this ideal arrangement.

their medium and long-wave sections, at least to within 1 to 2 per cent of each other.

"Matching" is achieved by measuring and collecting coils together having nearly similar inductance values and not by turn numbers, since equal turn numbers do not necessarily produce identical inductances, owing to variations in the thickness of the insulating covering, minute variations in the diameter of the wire and so on.

Accurately "matched" tuning condensers are equally important where maximum sensitivity and selectivity are required over the whole of the condenser scale. Minimum capacity trimmers will be fitted to compensate for the varying small capacities set up between the associated wires and components external to the condensers and coils, and to enable accurate tuning to be achieved at the bottom end of the scale.

Split Vanes.

With certain high-class ganged condensers the end moving vanes on each condenser section are split in addition to allow for maximum capacity trimming, usually a much more difficult business. These split vanes are, of course, bent in or out during adjustments under operating conditions at the top end of the tuning scale.

It will be seen that under the conditions mentioned above a very high degree of efficiency can be expected, and, owing to the tuning characteristics of each circuit, ganging can be maintained over each wave-band. Of course, certain precautions have to be taken, say, in the aerial circuit, where

the added capacity of the aerial system is likely to throw the first tuned circuit out of balance with the remainder.

In this case, however, the designer invariably makes it a practice to insert a pre-set condenser of small capacity in series with the aerial lead, and eventually employs it as a trimmer instead of the one already fitted to the first section of the ganged unit. It will be noted that this pre-set condenser can be adjusted on the particular aerial to which the set is attached.

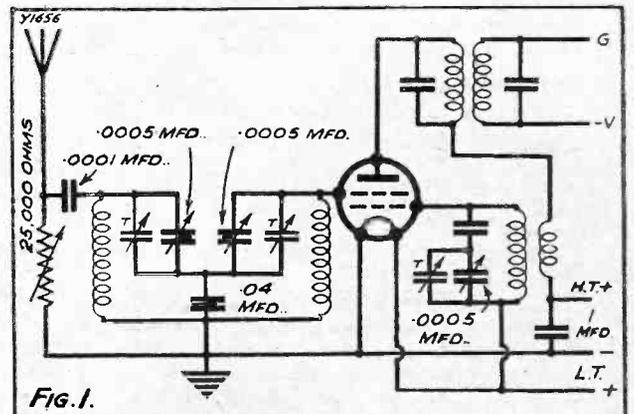
Oscillator-Tuning Differences.

"What has this to do with super-hets.?" you may ask, and, naturally, there seems no connection with the subject under discussion. Yet a little careful consideration will show the above notes apply in their entirety to the single-dial super-het because, with the exception of the oscillator circuit, the other tuned circuits obey exactly the same laws as those governing normal receivers.

As it is not possible to discuss the operation of a super-het here, let it be sufficient to remind the reader that the aerial (and H.F. if incorporated) tuning circuit must tune exactly to the station it is desired to receive.

The oscillator circuit, however, has to be

AN INTERESTING SCHEME



In this arrangement a fixed condenser is connected in series with the oscillator condenser, which has the effect of altering the apparent capacity in the circuit. There are, of course, small trimming capacities across all the condensers.

tuned to a frequency which is so many kilocycles "off-tune" with the aerial circuit, the difference in the two frequencies being called the "difference" frequency, which corresponds exactly to the frequency chosen for the I.F. band filters.

Taking the London Regional as an example, which has a frequency of 843 kc. (Continued on next page.)

MAKING A SINGLE DIAL SUPER

(Continued from previous page.)

the oscillator circuit must be tuned to 959 kc. when the intermediate frequency of the band filters is 116 kc. On the other hand, the oscillator can be made to function at its alternative setting at -116 kc., which in this case would be $843 - 116 = 727$ kc.

In practice the oscillator is often tuned to a higher frequency than the fundamental, as, in terms of metres, the wavelengths covered by the oscillator coil are then lower than the other tuned circuits, and consequently the windings on the oscillator coil can be made smaller.

Whether the higher or lower oscillator setting is chosen is, however, immaterial to our discussion, because in either case the windings on the oscillator coil are quite different from the others. To keep to strict facts, though, we will assume the inductances of the grid windings on the oscillator are below those of the aerial coils, and that the tuning condenser across them is one of the sections of the ganged unit.

How the Dials Differ.

It can be proved both in theory and practice that if the oscillator-tuned circuit is arranged to come into tune with the other circuits towards the middle of the condenser scale, it will be some 10 degrees or so out at each end of the scale, in one case being, say, 10 degrees higher, and in the opposite end of the scale 10 degrees lower.

If the circuits are originally ganged to have the same dial reading at the top end of the scale, the error can be as much as 30 degrees at the bottom end, since it becomes proportionately greater the lower the setting.

Owing to the lower inductance of the oscillator grid winding, the tuning condenser across it no longer obeys the same law as the remainder, despite its similarity. Nevertheless, it is not only because of the

A SUCCESSFUL CIRCUIT FOR TWO-BAND WORKING

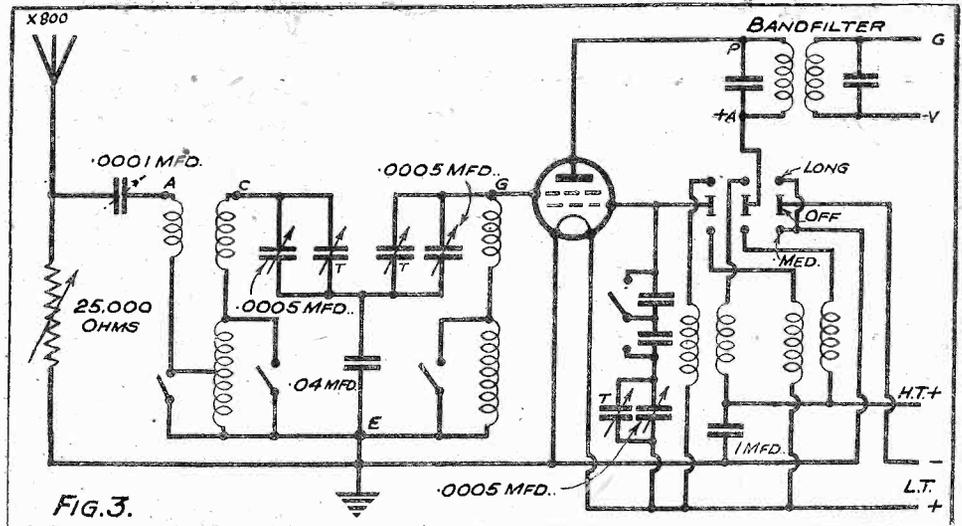


FIG. 3.

To obtain a balance on both long and medium waves two entirely separate fixed condensers are required in the oscillator circuit. Both condensers are connected in series and a switch arranged to short-circuit one or the other at will.

lower inductance of the oscillator coil that the condenser becomes mismatched, as it must be remembered it is across a circuit which is 116 kc. (taking this as the intermediate frequency) off-tune from those tuned to the fundamental, and this kilocycle separation remains constant throughout the scale.

But 116 kc. separation at the bottom end of the scale is vastly different from a similar separation at the top end, owing to the numerical values of kilocycles becoming less as the wavelength is increased. There are many ways in which correct relative "tracking" of the moving vanes of the tuning condensers can be achieved, the most simple, unfortunately, not being within the scope of the constructor.

Specially Shaped Vanes.

A condenser having fixed and moving vanes of special shape is obviously the most simple, as the only factor would then be the inductance of the oscillator coil, which would have to bear a certain relation to the other coils.

From many points of view, the condenser

manufacturer can hardly be called upon to produce such a model, as the shape of the vanes would depend on the frequency of the I.F. band filters, which are not at present standardised in all makes, and, additionally, on the inductances of the oscillator coils as well as the circuit arrangements.

At least one set maker in course of production is utilising a special condenser wired as in Fig. 4. One section of the

THE "SPLIT" CONDENSER

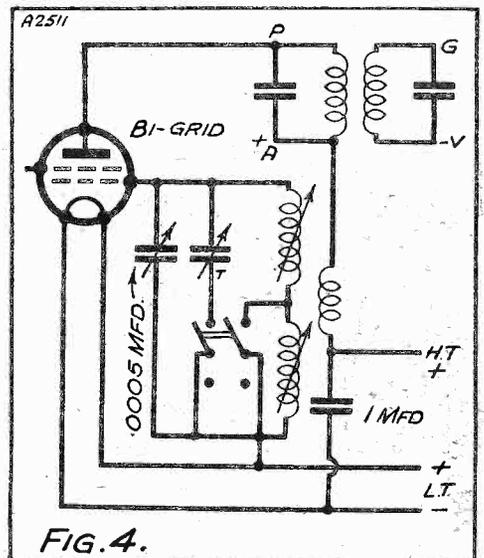


FIG. 4.

In this circuit a special oscillator condenser is used for obtaining accurate ganging on medium and long waves. The main condenser is employed for tuning on long waves, but on medium waves, where a higher capacity is required, an extra set of plates is brought into circuit.

condenser, which is split in two, is connected across the high-wave oscillator grid winding, a second section being automatically connected in parallel for medium-wave reception; more capacity being used on the latter wave-band than on the long.

Fig. 1 is likely to prove of greater interest to the set constructor, as it does not call for special condensers. An examination of the circuit will show that it is practically identical with the "P.W." "Super-Quad,"

(Continued on page 1236.)

GIVING IT THE "YANKEE" TOUCH

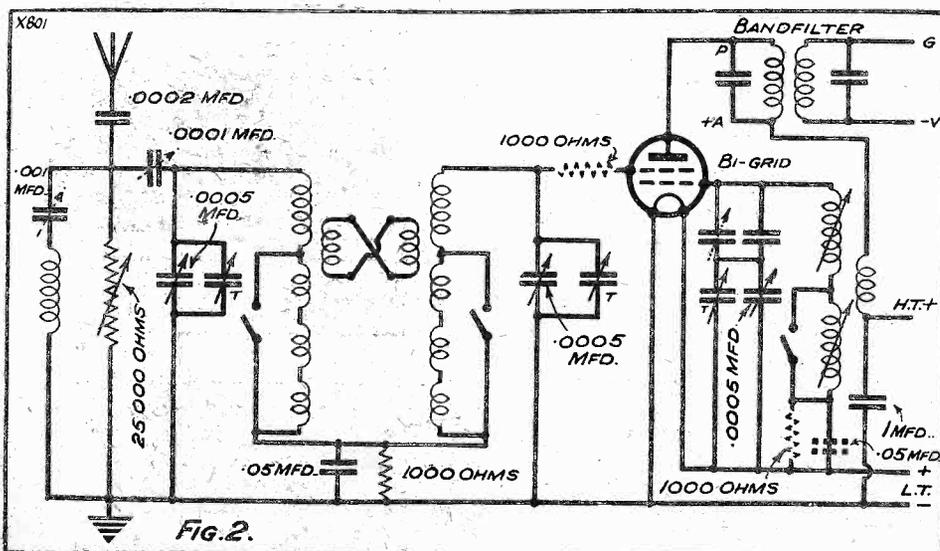


FIG. 2.

Originally used in a popular American single-dial super, this circuit is capable of very accurate ganging for medium-band working. Although there is bound to be a slight error, it is not sufficient to affect the sensitivity of the set, especially when employing band-pass tuning in the aerial circuit.

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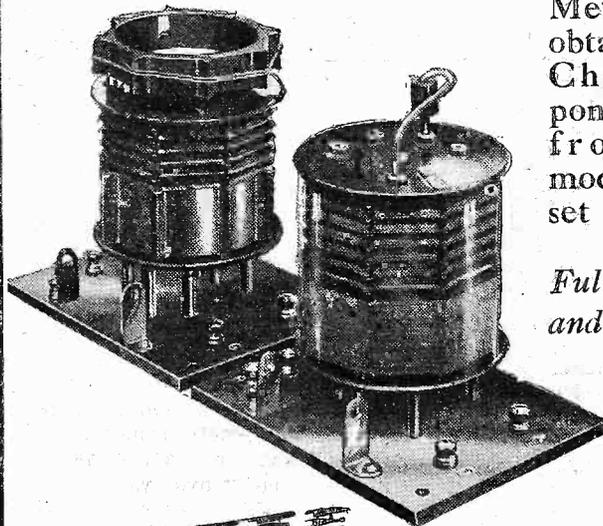
	s.	d.
1 Panel, drilled and fitted with brackets	4	6
1 Baseboard	1	8
2 Slow-motion dials, complete with escutcheon plates and fixing screws	5	0
1 Push-pull on-off switch	1	10
1 Wave-change switch	1	6
1 .00045-mfd. variable tuning condenser	6	6
1 .00025-mfd. solid dielectric reaction condenser, with bracket, extension rod, and insulating coupler for connecting up to slow-motion dial	6	0
3 Valve holders	1	6
1 E.F. transformer	1	6
1 100,000-ohms anode resistance and holder	1	0
1 2-meg. grid leak	1	0
1 1-meg. grid leak	1	0
1 Grid leak holder	1	0
1 Coil holder with wooden strips to act as supporting spacers	5	6
1 .0015-mfd. fixed condenser, tag type	1	4
1 10,000-ohm link resistance	1	0
2 Connection strips with various leads eyeletted thereto	1	0
1 Radio-gram switch	1	2
1 Set of 7 flex leads fitted with plugs	2	6
6 Spare plugs for external connections	1	0
1 Packet of fixing screws	2	0
1 Set Meteor "Jifflix" for wiring	2	0
1 Meteor dual-range high-selectivity coil	10	6
1 Meteor short-wave coil with special adjustable aerial coupling coil	7	6

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S.T. 300. Is introduced by an expert in the design of receivers that can be successfully constructed at home.

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My WIRELESS GUYED

By Harry Tate.



WITH WHICH IS INCORPORATED THE SELLING OF A CAR

An amusing contribution from the famous British comedian whose broadcast sketches have been so conspicuously successful.

TO one of my nimbleness of mind, the indolence of the British wireless listener is an astounding thing. As a nation, I fear we are in danger of losing our love of inquiry, our traditional desire to poke our noses into other people's business (which, you will remember, laid the foundations of our great and glorious Empire).

The art of wireless listening has been reduced to fastening one's feet to the mantelpiece, and pinning one's ears back for the fun (if any) to commence. Or, alternatively, falling asleep.

Good Advice.

Yet I am loath to believe the British wireless listener is inherently lazy. Perhaps it is fairer to suggest he is indolent merely because he lacks a friend and guide. At any rate, I have been working feverishly for some months past on a small wireless compendium, a handbook wherein are explained those technical terms so baffling to the uninitiated listener.

I am convinced that this, my Wireless "Guyed," will point the way to a broader and more satisfactory understanding of wireless than has hitherto been possible. With commendable enterprise, this magazine has purchased (at unbelievable cost) the first publication rights, although the film rights, novelette rights, comic strip and wastepaper rights are strictly reserved by me.

(Oh, by the way, does anyone want to buy a car? A dinky little thing with five wheels, and one stuck on a stick, technically known as the

steering wheel, somewhere about the middle. Strictly speaking, it has nothing to do with wireless, but I thought I might as well mention it whilst the Editor wasn't looking. Price? Well, what do you say to fifty golden sovereigns?)

Now I can see you are all impatient about this Wireless Guyed. Let's shoot ahead.

The First Aerial.

AERIAL. So called because it is hung in the air. Consists of a chunk of wire slung between a pole and a house. Or a house and a pole; it depends on which end of the garden you happen to be. Invented by William Shakespeare during a Tempest, this being the first recorded attempt to broadcast the song of the nightingale.

Aerial poles have a habit of falling down on fruit trees, prize rose bushes, and glass houses. When sawn up make excellent firewood. Aerials are occasionally useful in

conjunction with a wireless set, but more often used as washing lines, and roosting places for sparrows.

BROADCAST. An affliction of the eye caused by staring speechless at a wireless set which refuses to work.

CONDENSER. A series of revolving plates from which the wireless waves, once trapped, can never escape. Must not be confused with the condensers of Switzerland, who are men connected with the milk-canning business.

(Incidentally, if anyone would like that car of mine, going at the ridiculously price of twenty-five pounds, I might add that each of the four mudguards is entirely detachable. Prospective purchasers will be dealt with in strict rotation).

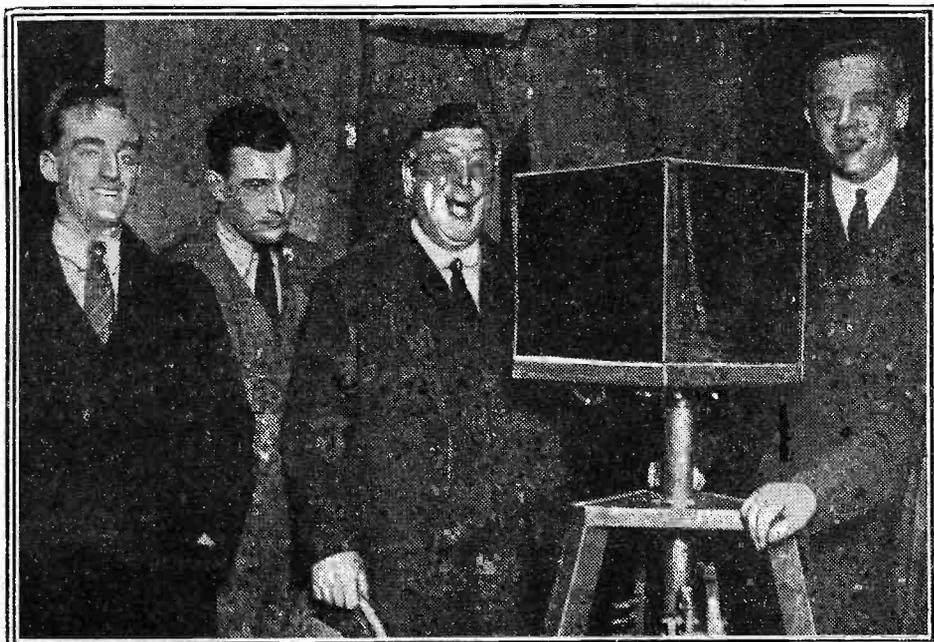
Very Peculiar!

ELECTRICITY. A peculiar force which often runs up and down poles, but is found at its strongest in the human elbow which should be hit by some blunt instrument like a mallet or a mantelpiece. Sometimes found in eels, thunderstorms and lamps. Once it gets into a wireless set it is apt to prove troublesome, often causing the loud-speaker to work.

HETERODYNE. See any good wireless guyed for this.

JAM. A sticky substance found around the mouths of small children. The old-fashioned idea of using jam to stick the parts of a wireless set together is now dying out as it caused a condition known amongst

AN EARLY BROADCAST FROM MARCONI HOUSE



This photograph was taken several years ago, and shows Harry Tate and his company amusing listeners from one of the studios at Marconi House. He is one of the few original broadcast artists who still successfully entertain the public, for he is just as popular to-day as he was at the start of his broadcasting career.

(Continued on next page.)

MY WIRELESS GUYED.

(Continued from previous page.)

experts as jamming. This meant you could hear a man speaking in English, French, German, and the Morse-code language at once, thereby causing you to use a tongue spoken by retired colonels, golfers, and other barbaric peoples.

LOUDSPEAKER. Not necessarily a mother-in-law, but that part of a wireless set which makes a lot of noise. Very often the reason why men leave home. Is particularly nauseating when heard through the walls of a suburban house. The best treatment in case of obstinacy is with a hatchet.

MOTOR-CAR. In passing, I would like

to force it into a corner with a red-hot poker, holding the hot end away from the body.

TATE. A very funny twentieth-century comedian.

(It has come to my knowledge that the above gentleman is willing to dispose of his car for the ludicrous figure of five pounds. The brasswork is in excellent condition, and driving gloves and goggles are included.)

The Bi-Valve.

VALVE. An electric lamp which doesn't light. An oyster, or bivalve, must not be confused with a two-valve set, being of an entirely different shape.

WIRELESS. Anything with wires—such as a wireless set.

ZEBRA. Is a black and white horse having no connection with wireless, but which conveniently finishes off the alphabet.

(P.S.—If any person would care to call on me and take away my car I will give

in ten days' trial. The same applies to the London National (261.6 metres). In fact, I have had to tune in Stuttgart to make sure he was working. I have had a friend in to hear this set, and he has a super-het., and says this set is quite as selective as his.

The bugbear of the medium waves in this district has been up to now a set to get stations without jamming from others at the same time, and I must say the results from this set are *marvellous*. I should be glad for you to use this testimony in any way you care to do so, and pass the good news of *quality, volume, interference-free wireless* on to any of your readers.

Thanking you for a first-rate wireless set, and the best of wishes for 1932.

I am, sir,

Yours faithfully,
E. G. LOCKYER.

Eastbourne, Sussex.

GREAT "COMET" SUCCESS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to express my appreciation of your POPULAR WIRELESS sets, and in particular the "Comet" Three, which I made up some months ago. I am using a pentode valve in the output stage instead of a power or super power, and an H.F. choke in place of the spaghetti resistance, which I found rather noisy, otherwise it is exactly as you specify, including the refinements. The tone and volume of the set are really magnificent, and up to the present I have logged exactly 60 stations besides a few others which I have not yet identified, and all on the loudspeaker (as I never use 'phones), not just at a whisper, but all at sufficient volume to be heard comfortably in each of the rooms. These stations include one or two American stations, and as I am within three miles of the Boumemouth Transmitter, I think this proves the "Comet" to be extremely selective and sensitive. This may not be a record, but your readers may be interested to hear that I get no interference whatever from my local station, and so am signing myself a very satisfied user of the "Comet" Three.

Yours faithfully,

R. RUFF.

Poolc, Dorset.

A LONDON RADIO CLASS IN PROGRESS



Students at the Northern Polytechnic probing into the secrets of radio. These classes have proved a great boon to keen traders who wish to give the best service they possibly can to their customers.

to mention that I am willing to dispose of my own car for the almost laughable sum of ten pounds. Down hill it is very speedy, and the Klaxon horn is in fine voice. From the southern (or rear) aspect it has the appearance of a portable wireless set.

PEST. Favourite name for your neighbour's wireless set. Exterminate at the first available opportunity. (See under "Loudspeaker.")

More Definitions.

SAVOY. May refer to a hotel, a theatre, a sausage, or the home of wireless broadcasting. Named by Gilbert Sullivan, one time Mikado of Japan.

SOLDER. A member of the King's Army, or, alternatively, a very hot substance found in wireless sets, and causing a disease known as atmospherics. The only successful way of combating the condition is

them, free of all charge, the film rights, novelette rights, comic strip and waste-paper rights of this, my WIRELESS GUYED.)

WHAT READERS SAY ABOUT— THE ECKERSLEY THREE— THE "COMET."

The Editor, POPULAR WIRELESS.

Dear Sir,—Having constructed Capt. Eckersley's "three" about ten days ago, and having given the same a thorough test, I am forwarding you my report. I have identified forty stations with good volume on loudspeaker, and many more not identified.

As you will see from the address I am in a good position for receiving a great deal of interference from the congested state of the ether. However, I may say I have never once had a trace of Stuttgart on the London Regional programme (356 metres)—i.e.

ACID-PROOF PAINTS

Some Reliable Recipes.

ACID-PROOF paint is invaluable—at least, so we often think after accidentally spilling the contents of an accumulator over the internals of an expensive cabinet—but small quantities of a dependable mixture cannot be purchased cheaply or easily. A reliable concoction, however, can be made at home for a few coppers, and if applied to accumulator carriers, cabinet shelves, and so on, will be found to resist any "misplaced" acid.

Two recipes are given, the first being the stronger, thus likely to wear longer, but both have been tested and found satisfactory.

Take 6 parts of resin, 1 part of dried red ochre, $\frac{1}{2}$ part of calcined plaster of paris, and $\frac{1}{2}$ part of linseed oil. Melt, stirring thoroughly, over a small flame.

For Resisting Rot.

This, now a reliable acid-proof cement, can be thinned to paint consistency with oil or varnish. The latter being recommended on account of its quick drying.

Any paint dryer may be added (but is not necessary), if varnish is not available. A further alternative is to await the natural process of evaporation and absorption, a tedious process where a liberal quantity of oil is used.

The second recipe is as follows: Make a solution of silicate of soda, and concentrate with powdered glass.

It is not advisable to mix more than the required quantities. Failing this a perfectly airtight container must be used. Incidentally, both mixtures should be thinned out to prevent "dead" drying in storage.

W. W.



BRITISH MAKERS introduce standardisation into dry battery manufacture . . .

A dry battery is a collection of small cells. Like a company of soldiers it operates most successfully when each individual is equally strong, equally efficient and equally energetic. That is why the FULLER machine-made and tested 'Super' Battery is proving its superiority under all conditions in the field of wireless. The FULLER cells are standardised by machinery. Each part, each detail, each ingredient is identical in every cell, no matter how many are turned out. Each step in construction is automatically correct. Result—a perfect dry battery. A battery, too, which is British-made. The perfection of the Fuller 'Super' emphasises the benefit of **Buying British.**

Fuller H.T. Dry Batteries are obtainable in all types and sizes, 60-120 volts, prices ranging from 5/3 to 15/3. Also Portable, Triple and Grid Bias Batteries and a full range for Torches, Flashlamps, Cycle Lamps and Electric Bells. Write for list D3.

FULLER
'SUPER' DRY BATTERY
EMISSION UP TO 20 MILLIAMPS

Full List of other types and sizes with names of Local depots on application to
FULLER ACCUMULATOR CO. (1926) LTD., Chadwell Heath, Essex.
Telephone: Seven Kings 1200. Telegrams: Fuller, Chadwell Heath.
Contractors to British and Overseas Government Departments, Railways, etc

ANOTHER "P.W." TRIUMPH!

Next week the readers of "Popular Wireless" will make acquaintance with the most remarkable set of the year—

The "COSMIC"

It embodies an entirely new circuit for world-wide reception, and covers all the broadcasting wave-lengths without changing coils!

The Set you hoped for! It's here at last

SPECIAL FEATURES

- LONG WAVES
- MEDIUM WAVES
- SHORT WAVES
- NO COIL-CHANGING
- ENORMOUS VOLUME
- EASY TO MAKE
- WORLD-WIDE RANGE
- ASTOUNDING SIMPLICITY
- NO SOLDERING
- REAL QUALITY

and every reader will be presented with a

FULL-SIZE BLUE PRINT

FREE!

DON'T MISS THIS!

FREE!

ORDER NOW

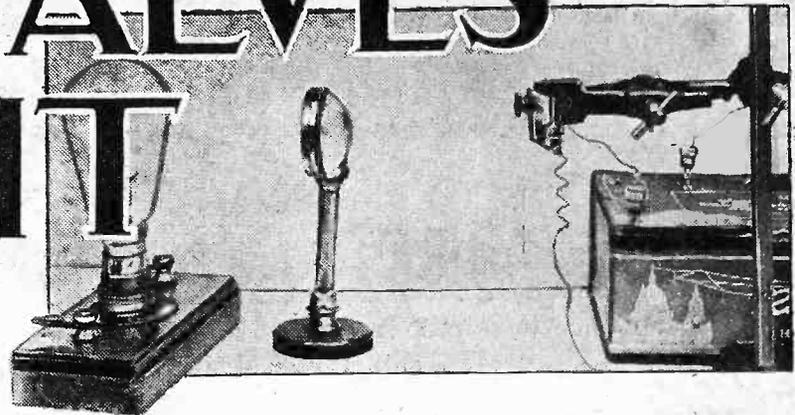
NEXT WEEK'S

POPULAR WIRELESS

USUAL PRICE. THREEPENCE. OUT NEXT THURSDAY.

WHY VALVES GO OUT

Some new light on an exasperating trouble.
By J. F. CORRIGAN, M.Sc., A.I.C.



THE modern radio valve, embodying as it does so many vast improvements on its predecessor, is a long-lived article in the majority of instances, and it shows practically no inclination to "go out" upon the slightest provocation, like the earlier valves used to do.

Yet, sooner or later, every valve "goes dead" and refuses to function any longer. In ninety-nine cases out of every hundred, its owner is perfectly correct when he ascribes the cause of the valve's decay to filament trouble.

But there the matter ends. The valve is referred to as having been "burnt out," and it is cast aside and forgotten as speedily as possible.

Not Really "Burnt Out."

In most cases it is really quite incorrect to speak of the valve's filament having been burnt out. Naturally, if, by some accident, the full force of the set's H.T. finds its way across the filament circuit, the slender life-line of the valve will certainly become burnt out.

In fact, in such an instance, a sort of miniature electrical explosion will take place, the filament—or most of it, at any rate—being disintegrated and volatilised in an instant of time.

In passing, perhaps it may be of interest to note that the study, by means of high-speed synchronous photography, of these filament explosions which are set up under the influence of heavy currents has proved very fruitful in adding to our knowledge of the physical constants of filaments.

By means of such experiments, technicians have been able to determine where the weak places in a valve filament lie, and thus, by altering the shape and disposition of the filament, they have made it less susceptible to overheating effects.

It Just Goes "Dead"!

All that, of course, is by the way, because there is no gainsaying the fact that if you try to apply 60 or 100 volts to any self-respecting filament, things will turn out rather unhappily for the latter.

In all ordinary cases, a valve goes "dead" quite suddenly. It may have been functioning perfectly well on one evening, then, when you go to switch on the set the following day you find that something has gone wrong, the "something" proving, on investigation, to be a dud valve.

Obviously, in all such cases filament disease (so one might put it) is the trouble. But the reason? In most instances it is a mystery.

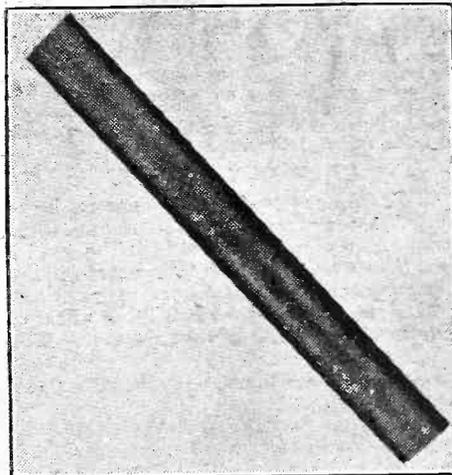
Here, however, are the causes which, working together, slowly but surely tend to

bring about any filament's final dissolution. Looked at with the naked eye, or even under a strong hand lens, a new valve filament appears to be perfectly uniform in cross-section or diameter throughout its length. Even under a microscope, the filament looks pretty even in thickness.

Uneven Wear The Cause.

Generally, however, if you closely examine the whole length of a new filament under a microscope, you will discern places in which the filament is thinner. There may only be one such place. There may be many such places, and even in a valve whose filament, by some good chance, is perfectly uniform in thickness throughout its entire length there will be some disturbance

IMMENSELY MAGNIFIED



A new Tungsten valve filament as seen through a microscope. Note its fine crystalline nature.

of this uniformity of cross-section at the point of attachment of the filament to its electrodes.

Now such a filament really begins its working life under a disadvantage. When it has areas of smaller diameter than its average diameter, it is obvious, after reflection, that these areas will heat up more than the rest of the filament. The electronic emission will be rather greater in consequence. Thus the filament will wear more at its thin places than it will at others.

If the filament wore evenly all along its length it would last for a very long period of time without breaking, but the fact that the filament possesses places of smaller diameter than the rest gives rise to an uneven heating at these areas; and as the

rate of thinning of these places increases, so, too, does the extent of their over-heating.

In this manner you get a sort of cumulative snowball effect. The state of affairs at the thinned places of the valve filament does not become worse evenly and gradually. It becomes worse, so to speak, by leaps and bounds, until ultimately the filament gives way at its weakened spot.

This fracture of the filament may, of course, take place while the filament is hot; but, more generally, the heated filament holds itself together, and the fracture takes place either after it has cooled down or when it is newly heated up by the current. Hence, for these reasons, a valve which was working quite satisfactorily on a previous evening may, on switching on, be found to be quite "dead" the following day.

The other cause which works a filament's final downfall is one which scientists have found easier to overcome to a very great extent.

Suppose, by way of explanation, you have a thin rod of copper and a rod of cast-iron of equal diameter. You then bring both these rods down with a heavy blow on to a hard surface. Generally, the copper rod will remain intact, but the cast-iron rod will be broken in two.

A Parallel Case.

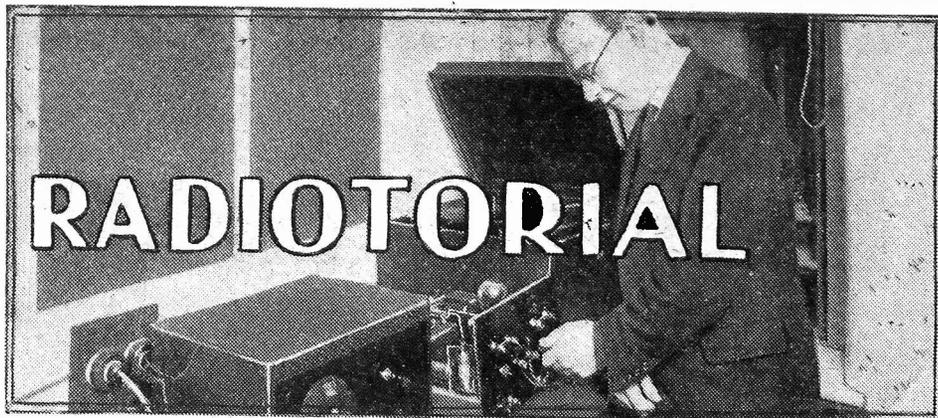
Now saw off a piece of the copper rod and compare its cross-section with that of the rod of cast-iron. The cast-iron rod will be found to be crystalline in section, giving an appearance of the rod being composed of innumerable tiny crystals, which, incidentally, represents the real state of affairs.

On the other hand, the copper rod's cross-section will have a much finer and smoother appearance. It will be far less crystalline than the cast-iron.

All metals are crystalline in structure, but a metal which is coarsely crystalline has very much less mechanical strength than a finely-grained metal. Consequently, as in the instance of the coarsely-crystalline cast-iron quoted above, it will be much more susceptible to breakage under the influence of mechanical strains, stresses, and shocks than the other.

Now the tungsten metal which forms the basis of all valve filaments is rather crystalline, to begin with. Worse, however, is the fact that during the life of the valve the filament metal gradually increases in crystalline nature. Therefore, it decreases

(Continued on page 1240.)



RADIOTORIAL

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

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

WAS IT THE PLUG ?

"DISAPPOINTED" (Salford).—"For over a month we have had a D.C. eliminator in use and going perfect, but in my absence and during some foolery in the children's holiday this got moved for the first time, and has been placed in a cupboard until I came home to-day. As soon as I had finished a bite to eat I connected up again, but not a sound.

"My wife said she is sure no harm could have been done, as she took it off herself and put it straight in a cupboard, where it has not been touched. I write to you in hope of some suggestion to help, as it is hard luck to lose it like this."

You really need some knowledgeable neighbour or friend who has had experience of mains units to look it over for you, for it is probable that only some

IS YOUR SET GOING WELL ?

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

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service. Full details, including scale of charges, can be obtained direct from the Technical Query Dept., "POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

minor defect is causing the trouble. In fact we rather think that all that may have happened is that you have inserted the plug in the mains the wrong way round!

If you still have the instructions for the mains unit, read these carefully again; or if you have not kept a copy get the dealer to tell you exactly how it should be joined up, for the probability is that there is only some little matter where you have gone wrong.

And look over all the leads and terminals to make sure that nothing is a drift or faulty, as the flex connection may have come off inside the plug or some little simple matter of this kind, which could be put right in two minutes.

MAKING THE P.J.3.

W. E. (Nuneaton).—"I want to make up another P.J.3. coil, but I have lost the details which were given in 'P.W.' Can you repeat the dimensions, wires and numbers of turns for primary, etc.?"

"The bare details will be enough, as I am quite accustomed to coil winding; but do not know the correct number of turns, etc."

The P.J.3 is wound on a 2-in. diameter former, which is 3 in. long. The wire used is No. 30 D.S.C., and all the winding is done in the same direction.

As you know, the three separate windings are all placed on the tube itself, commencing with the primary, which is 30 turns, tapped at No. 10 and No. 20 from the beginning, which should be marked A. The end of this coil is marked X, and a space of 1/8 in. should be left between it and the grid winding.

The grid winding consists of 64 turns, the beginning of which is marked with G and the end with Y. Leave another space between the end of this and the reaction winding, this time of a 1/4 in.

For the reaction put on 34 turns, marking the beginning Z and the ending R. If you remember to wind in the same direction these particulars should be quite sufficient to make a perfect coil.

THAT NEW LICENCE.

G. P. (Glasgow).—"As a regular reader of 'P.W.' I would be very glad if you could answer a question, which, although more of a legal than a technical nature, involves wireless apparatus, and would settle an argument.

"Indeed, it is only through being aware of your unbiased attitude towards the B.B.C., the Post Office and the listener generally that I consider you are the best qualified to settle the argument.

"Recently, following some of the programmes which emanated from the local transmitter, friend No. 1 announced that, so disgusted with the programmes was he, he had no intention of renewing his licence, which expires quite shortly. Possibly, if there was any improvement in the quality and type of programme when the new transmitters at Falkirk get going he would consider taking out another licence, but in the meantime he intended to use his receiver for the purpose of playing his gramophone records electrically.

ONE POINT OF VIEW.

"This procedure, he contended, he was quite entitled to do without sanction from the Post Office, by virtue of the fact that the wireless set is his property to do with as he pleases, having been bought and paid for by him, provided he does not use it for the purpose of receiving wireless programmes. He doesn't grudge the licence fee, but his point is that as the type of programmes he receives bears no resemblance to the type he expected to receive from a Scottish station he is not compelled to pay for something he doesn't want.

"Well, friend No. 2 retorted that if friend No. 1 did such a thing he was doing an illegal action, and if it became known he would be liable to punishment and have his set confiscated. Friend No. 3, was not quite so drastic, but at the same time maintained that friend No. 1 could be compelled to mutilate the 'innards' of his set so as to render it useless for reception.

"But this, friend No. 1 says, he would refuse to do, as the receiver is his property and he may decide to take out a licence again any time, but, in the meantime he can use it as an ornament or whatever he chooses.

"Personally, I am inclined to agree with friend No. 1, as his attitude is more of a protest and is not meanness. I believe it is quite an interesting point, and would be extremely grateful if you could settle it."

The P.M.G. licence "authorises the holder to establish a wireless station for the purpose of receiving wireless signals." The 10/- fee is paid partly to the P.M.G. because he has monopoly rights over the ether, and partly to the B.B.C. for providing broadcast programmes.

If a wireless set is maintained in such a condition that it can receive wireless signals—i.e. if it is attached to an aerial (frame or otherwise), then the P.M.G. would succeed if he prosecuted the owner (under the Wireless Telegraphy Acts 1904-1926) for not having a licence.

Apart from possible patent royalties, there is no licence necessary for reproducing gramophone records electrically.

In the case you quote no demand for a P.M.G. licence could succeed providing the high-frequency and detector portion of the apparatus was completely dismantled, so that only an L.F. amplifier remained.

In the absence of "radio" components such an amplifier could be employed for reproducing gramophone records without the user being liable to take out a wireless receiving licence.

DECOUPLING A PENTODE AND DETECTOR.

R. P. P. (Aston, Birmingham).—"I recently had the opportunity of acquiring the loan of a detector and pentode (A.C. valves), which the owner had made up out of curiosity to try this type of valve.

"It is a perfectly straightforward arrangement of detector, L.F., with usual reaction, and works very well indeed except for a tendency to instability when used from a mains unit H.T. There is no instability when used with dry battery H.T.

"It seemed to me that the set ought to have had plenty of decoupling, and when I suggested this I was given the opportunity to try it

(Continued on page 1230.)

TECHNICAL TWISTERS

No. 99. BEAT NOTES.

CAN YOU FILL IN THE MISSING LETTERS ?

If a current of a given frequency is superimposed on another current of a different frequency, they interact and produce . . . other frequencies.

The two original frequencies can still be detected, but another frequency, which is the . . . between them is also present.

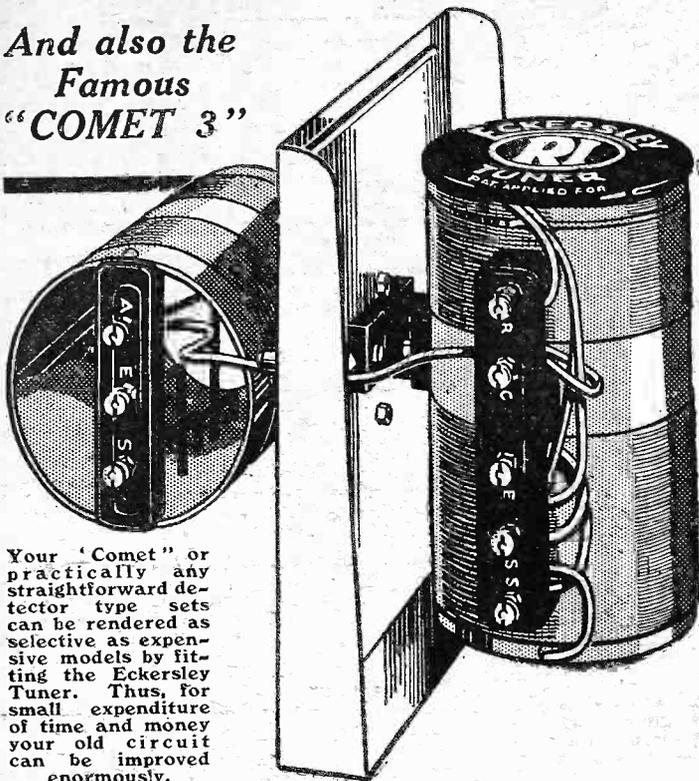
Similarly, a frequency corresponding to the . . . of the two frequencies can be detected.

It is this property of combining two frequencies to produce other frequencies that is the basis of the . . . class of receiver.

Last week's missing words (in order) were: Greater, High-frequency, low-frequency, Filtering).

Specified for the 'P.W.' ECKERSLEY '2' and '3'

And also the
Famous
"COMET 3"



IMPROVED AND PERFECTED ECKERSLEY TUNER

With the Eckersley '3' and '2' the Laboratory Tested R.I. Eckersley Tuner will give you surest satisfaction.

It is the model embodying improvements that make it definitely superior in constructional detail and finish. A fact that is important to remember is that R.I. were the first manufacturers to produce Capt. Eckersley's invention which was entrusted to them as the most reputable Radio firm for its development.

Secure these advantages by insisting on **15/6**
R.I.—the cost is no more.

List No. BY30. Provisional Patent No. 29404/22-10-31. Size: 6 1/2 x 7 ins. x 7 1/2 ins. Ask for technical details and diagrams.

Your "Comet" or practically any straightforward detector type sets can be rendered as selective as expensive models by fitting the Eckersley Tuner. Thus, for small expenditure of time and money your old circuit can be improved enormously.



QUAD-ASTATIC H.F. CHOKE

A most reliable H.F. Choke, specified for the Eckersley '3' and '2' on account of its exceptionally good results. It functions efficiently over the entire broadcasting wavelengths and gives freedom from resonant losses and blind spots, whilst its special astatic winding prohibits H.F. interference with adjacent components. It is particularly useful as a parallel feed choke. List No. FY2.

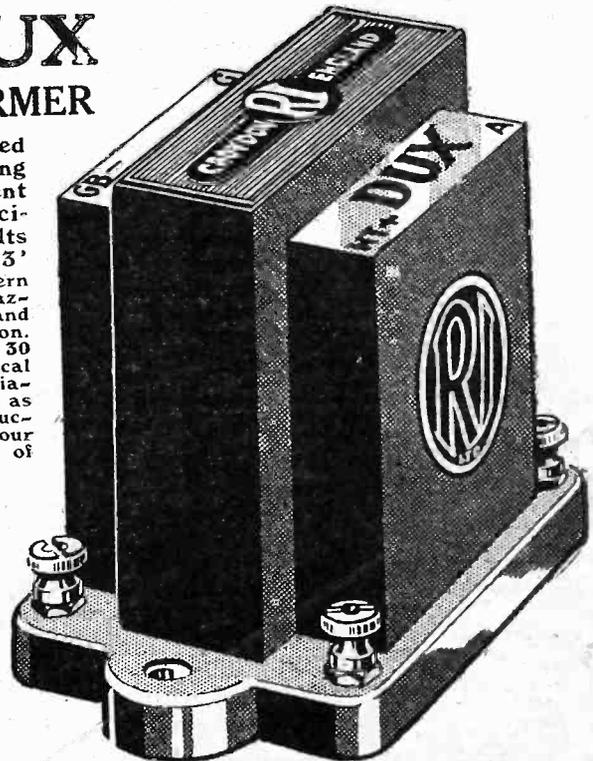
3/6



DUX TRANSFORMER

The Lowest Priced Transformer giving consistent, efficient performance. Specified for best results in the Eckersley '3' and '2' and all modern circuits. It gives amazingly powerful and uniform amplification. Its inductance is 50 henries. Full technical information and diagrams are available as with all R.I. productions. Ask us or your dealer for a copy of the "DUX" leaflet. List No. DY29 Ratio 1:3 1/2 (standard) or 1:4 1/2 (auto-connection) Size: 3 1/2 x 2 x 2 1/2 high.

6/9



ASK FOR THE LATEST R.I. CATALOGUE
It is the finest Radio Component Reference published. Ask your dealer or us for a copy.

They Never Disappoint!

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1228.)

for myself. I was proposing to use a 20,000-ohm resistance in series with the primary of the low-frequency transformer and a 1-mfd. condenser going from this to cathode.

Do you think that while I am putting this in I might as well insert further decoupling for the screen of the pentode, which at present goes to a tapping on H.T. battery, or intermediate plug on the mains unit?"

This class of circuit needs careful decoupling, so you are certainly doing the right thing in supplying it, as the symptoms would indicate that all that is wrong with the set is insufficient decoupling. The values quoted by you appear to be O.K., and in addition to the detector alterations you should provide a decoupling resistance, etc., for the "screen," if you want to be on the safe side.

Probably the value for this will not be found very critical, as if the set now works fairly well on batteries the provision of further decoupling will have removed

or shunting condensers, or else by using a 30-ohm potentiometer slider for the connection to heater instead of a centre-tapping on the heater transformer.

WHAT STATION WAS THAT?

L. L. (Conway).—"What is the name of the French station immediately below Dublin's wavelength?" On several occasions I have heard this station, sometimes using a deep-toned gong as an interval signal. It does not always appear to use French, but I have heard this language distinctly, just below the Dublin reading and just above Midland Regional."

There are only two stations between Dublin and the Midland Regional, the one next to Dublin being Katowice, Poland, and the other being Radio-Suisse-Romande, Switzerland. The Swiss station usually announces itself as "Radio-Suisse-Romande" and invariably uses the French language.

The Katowice station (Poland) usually speaks in Polish, but *sometimes* in French.

We are inclined to think it was the Polish station that you heard, as the gong in question would correspond with the interval signal of that station. Actually it was not a gong, but an anvil, and the striking of about eight or nine blows on this frequently introduces the programme after an interval, and

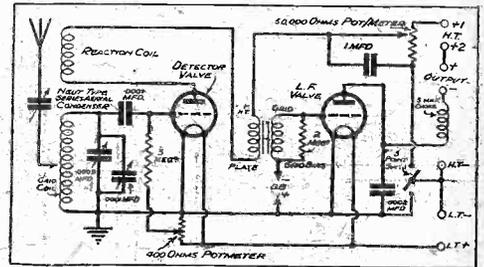
in other countries, being broadcast, with short comments in French, that it was the Katowice station you were listening to.

CUTTING OUT AN H.F. VALVE.

H. L. (Nr. Glossop).—"My set is the good old 'Magic' Four, described in the April 19th, 1930, 'P.W.' And although it is supposed

MISSING LINKS, No. 27

A TWO-VALVER FOR SHORT WAVES.



This is the two-valve circuit given last week, with the addition of the missing "component" which, it will be seen, was a 3-point switch for disconnecting the potentiometer and switching off simultaneously.

"P.W." PANEL, No. 57, SMOOTHING.

The need for smoothing circuits does not arise with battery-operated receivers, as battery-current is steady and free from "ripple" or surges.

Current taken from a mains supply is not smooth and ripple-free, but is invariably accompanied by irregularities which result in loud humming and other noises.

Such irregularities can be overcome and "smoothed out" by passing the current through filter circuits, which offer enormous impedance to varying current whilst passing steady current easily.

Smoothing circuits consist of chokes (both high and low frequency) and condensers.

most of its tendency to instability. However, a fairly high resistance, say 5,000 ohms, could be tried between H.T. + and the screen, the screen side of this being shunted to earth by a large fixed condenser of, say, 1 mfd. or more.

We should expect that the set will then prove perfectly O.K., but if a little residual hum from the mains is still there this could possibly be removed by juggling a little with the values of the resistances

indicates to listeners the industrial nature of the district in which the station is situated.

If you wish to be quite sure we should advise you to listen about 11 p.m. on a Friday evening, when Katowice generally speaks in French to listeners abroad, answering their letters by microphone. The Radio-Suisse-Romande station has generally closed before that time, and consequently you would be quite sure if you heard English addresses, or addresses

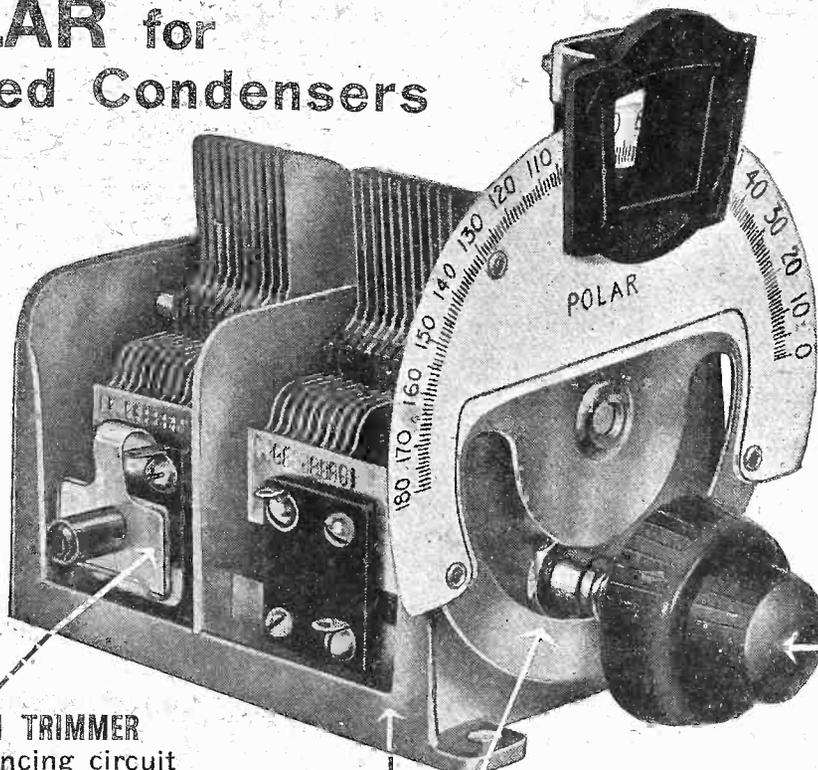
to be old-fashioned now, it is going too well to make me seriously think about a new one.

The North Regional is about twenty miles from here, and as most of my listening is done to this station I do not really need the H.F. stage.

Yet I do not want to cut it out altogether, because now I have become accustomed to foreign programmes as well, I should hate to do without them. But I have wondered whether it would be possible to easily change

(Continued on page 1232.)

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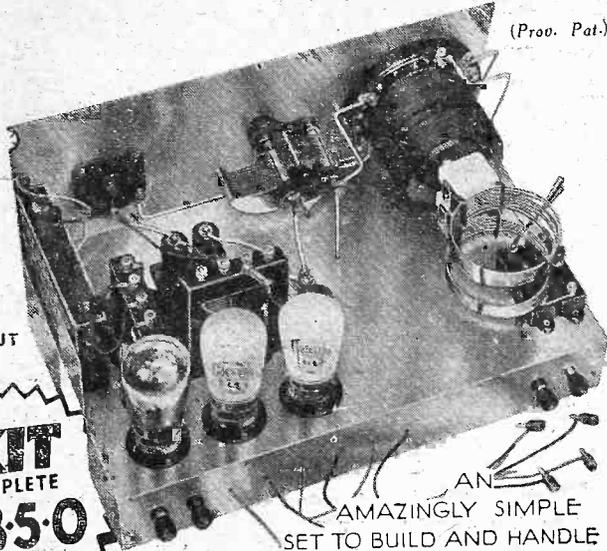
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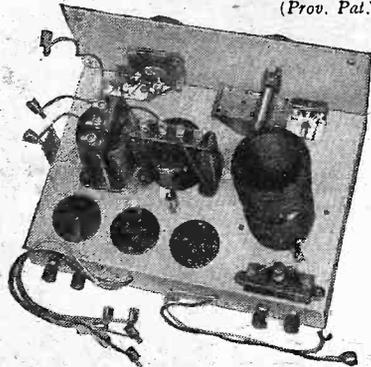
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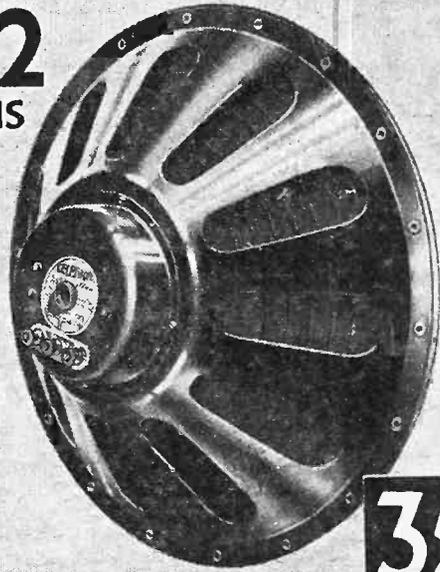
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1230.)

the set to a 'local station' set by using only the detector and two L.F. stages.

"At present I have to keep the volume control well down on North Regional, and as I am using H.T. batteries it seems a pity that I should be using juice for the first valve which is helping to make the set too strong. It seems to be the fashion nowadays not to cut out an H.F. valve, but I wonder whether it could not be done in this case, so I should be very glad if you could suggest something that would enable me to make an easy change over from four to three valves."

In the circumstances we think you would be doing the right thing in arranging to cut out the first valve. It would involve only a simple alteration to the set, and you could change over from one arrangement to the other in just a moment or so.

What we suggest is that you arrange an on-off switch in the filament lead of the first S.G. valve, which would put this out of action when using detector and two L.F. only.

The Easy Alterations.

In order to change over to three valves you must tap in your aerial to the grid circuit of the detector valve, and this can easily be done by arranging a second terminal on the baseboard close to the H.T. + 1 terminal.

Insert an on-off switch on the panel just underneath the first .0005-mfd. condenser. Undo the lead on the nearest filament terminal of the first valve holder, and take this to one side of the switch, the other side of the switch then being joined to that filament terminal, so that the same circuit is completed through the switch.

Thus when the switch is "on" you have exactly the same circuit as before. When it is "off" there is no L.T. current going through the valve.

About half way between the screen and L2 coil holder fix on the terminal strip a second aerial terminal which we will call A2. Join this by means of a flex lead to a crocodile clip or some other convenient means of making a connection to the tapping on the coil.

All that you have to do to change the set over from a four-valver to a three-valver, cutting out the S.G. valve, is to switch off the filament by means of the new filament switch, and change over the aerial lead from the original aerial terminal to aerial terminal No. 2.

This can be left permanently connected to that tapping on the coil which gives sufficient selectivity and sensitivity for your purpose, and you will then be using this as the aerial feed to a detector and two L.F. set. Reaction and other controls will remain exactly as before, except, of course, that you will not need to tune on the first condenser C1.

To return to four valves, simply pull out the filament switch and transfer the aerial back to the first terminal. You should effect quite a considerable saving of dry-battery H.T. in this way.

HENRY HALL SPEAKING

(Continued from page 1201.)

She wrote me a perfectly lovely letter of appreciation, towards the end of which she said, "But I must say that I much prefer the tunes you play on Friday night to those you play on Thursday night."

At first this sentence completely baffled me, as I knew very well that she could only have heard me on the wireless on the Friday, and I could not see what she meant by saying that I had broadcast on the Thursday as well.

A Queer Confusion.

At length, however, I tumbled to it. Sir Hamilton Harty and his Hallé Orchestra had been relayed on the Thursday, and she had confused the word Hallé with my name Hall. This was a huge joke among my friends for some weeks.

I am afraid we were all tickled to death at the thought of Sir Hamilton Harty being a dance band conductor controlled by Henry Hall! But I am not so sure

that he would have seen anything funny in it.

I am looking forward to my new work with the B.B.C. with no small amount of pleasure. Naturally, it is painful to have to sever connections with the hotels I have been playing in so long now, and to have to bid farewell to the London, Midland and Scottish Railway.

My relations with everyone have been ideally happy, and although I am elated at the thought of the new audience which awaits me I am nevertheless downright sorry to have to resign my old job. If I find the same happiness in the future as I have experienced during the last nine years I shall be more than satisfied.

That First Broadcast.

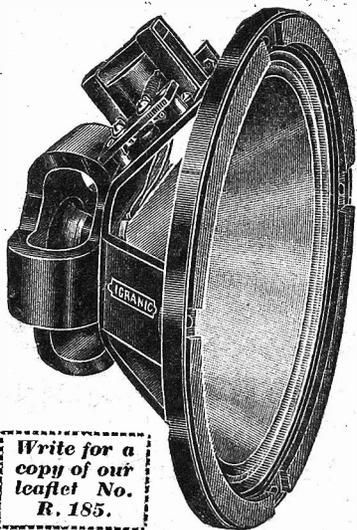
The thought of my first broadcast is already giving me "nerves." It is so absolutely essential that my band should please listeners from the very beginning that I am haunted by the thought of that first number.

I hope listeners will be good enough to give me their kind indulgence for a little while, until I have settled down. Perhaps some know what "nerves" are. If they do I am sure they will be sympathetic.

I can assure everyone that no pains will be spared to provide the very best that dance music can show. So far as it lies in me to do so I shall see to it that every number I play is first and foremost a tune. That, in a word, will be my policy, and I hope very much that I shall be able to carry it out in such a way as to give you all the pleasure you expect from a B.B.C. Dance Band.

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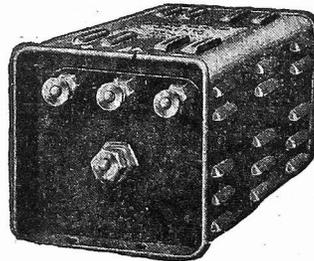
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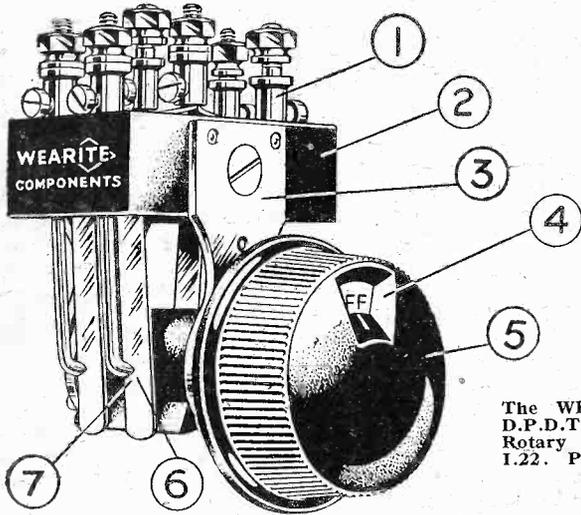
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THE LISTENER'S NOTEBOOK

(Continued from page 1218.)

great hit is lamentably short, even though it is gay!

Al Jolson's Feat.

The recent mention of Al Jolson in Mr. John Watt's "Theme Songs" programme reminds me of a marvellous feat of his which I once witnessed, and which I feel ought to be placed on record. It happened during the War—in 1918 to be precise—at a New York theatre.

The occasion was the last performance of a show in which Al Jolson was starring and which had had a very long run. Making his appearance on the stage about five minutes after the rise of the curtain (i.e. about 8.5 p.m.), Al, who was immensely popular, even then, sang his song, and, in response to the insistent demands of the hysterical audience, continued singing till about midnight!

At least, I believe he did; I didn't stay till the finish for I had had quite enough of Al Jolson by 10 o'clock!

His repertoire consisted chiefly of songs of the "Sonny Boy" order, so you can guess the dust was pretty well laid by the time the curtain fell. Never have I witnessed such a pathetic spectacle as was to be seen in the auditorium.

The show, of course, didn't get beyond Al Jolson's first appearance at 8.5 p.m.; at least, it promised not to when I left at 10 p.m.

Those Thrillers.

"If through youth, sensitiveness, or infirmity, you do not feel inclined to listen,

switch off." This, apparently, was the B.B.C.'s reply to all the comment and criticism about the inclusion of "Rope" in a National programme broadcast. "Switch off!"

Yes, and I think they would have added, had they dared, "And cut the cackle, too." At any rate, that's how it struck me at the time. If this is so, then I admire the B.B.C.'s boldness, and am glad to see this indication of a resolve to be bolder in controversy than they have been.

matter how well it is acted. "Rope's" cast was admirable, I thought, but one wanted to see the artistes. Heart-rending shrieks, noises off, sitting in a darkened room even, may help to produce a thrill, but it's a poor thrill at its best.

Radio's Influence.

Evidence of wireless influence is everywhere apparent. Even the butcher-boy can't escape it. I was amused to hear one the other day whistling a Chopin Polonaise.

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TO EVERY READER

ORDER NEXT WEEK'S "P.W." NOW

I didn't switch off, however. I steeled myself for the ordeal. But I was disappointed, because "Rope" didn't thrill me in the least; though it interested me immensely.

At the moment I can't see how any radio thriller will ever thrill anyone, no

There is no doubt that we are all getting a much wider sense of music; but alas! the day has gone when mother's rendering of "Home Sweet Home" on the piano entertained us, or gave us the first itch to be a player, also. We find the alternative programme from Savoy Hill much easier!



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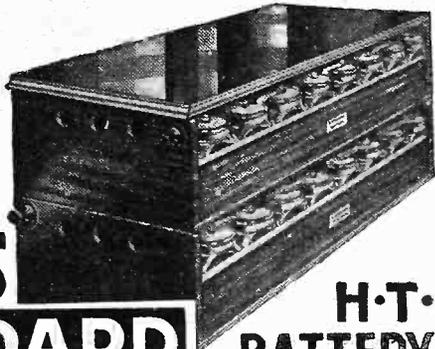
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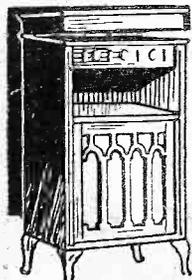
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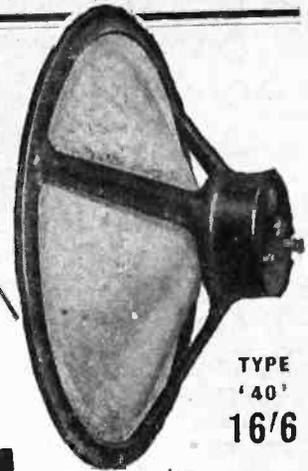
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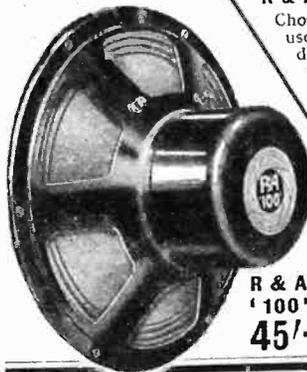
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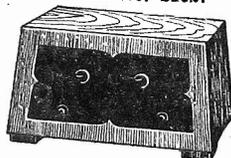
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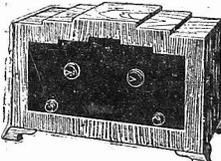
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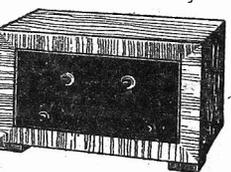


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MAKING A SINGLE-DIAL SUPER

(Continued from page 1220.)

which included a bi-grid valve as a combined first detector-oscillator.

The tuned circuits have been simplified by the omission of the switching and a fixed condenser is shown in series with the oscillator tuning condenser. Strange as it may seem, this fixed capacity alters the "law" of the variable capacity, as well as reducing its effective capacity. Is this latter effect desirable?

Oscillator Wave-Bands.

Assuming the set is to tune between 200 and 600 metres (1,500 to 500 kc.), and allowing for a plus 116 kc. oscillator setting, the oscillator has to tune between 1,616 and 616 kc. in order to cover the same wave-band. In metres 1,616 kc. represents 185 metres and 616 kc. equals 487 metres.

Thus, while the aerial tuning has to cover 600-200=400 metres, the oscillator will require to tune over 487-185=302 metres, proving beyond question that the tuning capacity across the oscillator need not be so large in order to cover the same band of frequencies.

Further calculations for the high wave-band show an even more interesting result. If the set is to tune between 900 and 2,000 metres (333 to 150 kc.), the oscillator must tune between 449 and 266 kc. The aerial circuit must tune over 2,000-900=1,100 metres and the oscillator over 1,127-668=459 metres.

Comparing these results with those obtained for the medium wave-band, it will be noted the wave ranges to be covered by the oscillator, computed on a percentage basis, show that the capacity of the oscillator condenser on the long wave-band can be considerably less than on the medium waves.

The circuit Fig. 4 now becomes feasible, but from the constructor's point of view it would only be necessary to substitute the fixed condenser in Fig. 1 by one of a lower value when tuning over the long waves.

An American Scheme.

A modified scheme of connections is shown in Fig. 3, and includes a switch with two fixed condensers which can be short-circuited alternatively.

Another oscillator tuning arrangement is shown in Fig. 2, and is more in accordance with American practice. It was first used to the writer's knowledge in the original Majestic single-wave-band super-het. The scheme allows for maximum and minimum trimming, and is undoubtedly capable of very accurate adjustment, at least over the medium wave-band.

With a single fixed capacity in series with a variable one (and trimmer), as in Fig. 1, the tuning curve will be somewhat similar to the graph illustrated. Although complete accuracy is only obtained at roughly three points, yet the error even at the "widest" part is not sufficient to cause an appreciable lack of sensitivity, especially where a band-pass filter comprises the aerial tuning system. By making the inductances of the oscillator grid coils slightly variable in themselves, on the variometer principle, even greater accuracy is possible.

Readers may be certain that any single-dial Super-hets, which may make their appearance in this journal in the near future will include oscillator devices which combine all the desirable features mentioned.

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TECHNICAL NOTES

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

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

Judging Quality.

It is curious how our ideas of quality and volume are dependent upon one another.

What I mean is that the quality of reproduction at a fairly low volume may be quite satisfactory, but if the volume is considerably increased the quality seems to be all wrong, even though accurate tests show it to be unaltered.

I think this has something to do with our ideas of the "naturalness" of sounds. To my mind, there is always something unnatural and even objectionable about an enormously magnified voice coming out of a loudspeaker (as sometimes happens in the talking pictures, for instance) when in point of fact it might be possible to show by curves that the quality was quite good. Quality as indicated by scientific tests, and quality as judged by the ear often mean very different things.

Of course, this is all on the assumption that the quality really remains the same when the volume is increased. In point of fact, as we all know perfectly well, a large increase in volume is almost invariably accompanied, unless special precautions are taken, by a serious falling-off in quality.

Perhaps it may even be that we have grown accustomed to associate bad quality with very intense magnification, so that we half-unconsciously assume the quality to be bad when the volume is very loud.

Tone Controls.

It is for reasons of this kind that tone and volume controls often work wonders so far as getting pleasing results from the set concerned. Sometimes if you have a very sharply tuned radio-frequency circuit you will get a loss in quality, but this can often be overcome by suitable arrangements in the low frequency and detector circuits.

G.B. with S.G.

Referring to screen-grid valves, many people do not appreciate that a little grid bias can often be used with good results. For instance, I came across a case a short time ago in which a screen-grid valve was used, this being of rather low impedance, so that it was carrying a somewhat heavy high-tension current when the normal H.T. and screen-grid voltages were applied.

It is not a bad plan to try the effect of grid bias (usually only a very small amount is required) with a screen-grid valve if you have any reason to think that the anode current is too heavy or that the valve is not entirely suitable for the conditions.

The Earth Connection.

As for the earth connection, it goes without saying that this is most important, not only with the screen-grid but with any other type of receiver. It is really extraordinary how often one finds people struggling with

(Continued on next page.)

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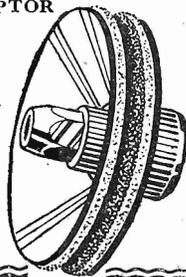
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TECHNICAL NOTES

(Continued from previous page.)

sets and going to a lot of trouble and often expense to bring in all kinds of refinements, when in fact all their efforts are knocked on the head by a poor earth.

I came across two such cases during the Christmas holidays. In one case it was a four-valve battery-operated set which had been working excellently only fairly recently. Of course, the first thing I found was that the batteries were all wrong, but having got this and certain other points right, it was still impossible to get the set working properly.

I then found that if I took hold of the earth terminal the set immediately behaved itself—at any rate, much better than before. To cut the story short, the alleged earth connection was no more an earth connection than my hand was; or, to be strictly accurate it was not nearly as good an earth connection as my hand was.

On running a short wire to a neighbouring gas pipe, if you please (I know you will tell me I should have chosen a water pipe, but this would have meant a run of about 20 yards of outside wire), and using this as

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an earth, the set was at once brought up to proper condition—greatly to the delight of the owner.

Sound Units.

Several readers have asked me at different times what is the meaning of the term "decibel." Well, it is a term used for the unit of loudness in sound. It is generally used in connection with telephone practice, and is derived from the name of Graham Bell, who, as you know, was the inventor—or, at any rate, one of the inventors—of the telephone.

The unit as defined is the "bel," but for ordinary practical purposes the "decibel" is employed, which has a value of one-tenth of a bel. To give you an idea of the meaning of the decibel in terms of ordinary sounds to which one is accustomed, I should say that the difference in loudness between what you might call average speech and very loud speech is about 20 decibels, whilst the difference between average speech and a mere whisper is about 40 decibels.

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(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

inch or so from your ear, this would sound very loud indeed. Well, it has been shown that the difference between this loudness at the ear and the smallest volume which can be detected is about 100 decibels or 10 bels.

Incidentally, it is interesting to note that if two sounds are heard alternately, the average ear cannot detect with certainty a difference in the loudness of the two sounds unless the difference amounts to at least 1 decibel.

Of course, this depends very much, like most other matters in connection with sounds, upon the particular properties of the ear, and therefore the distinguishing power varies a good deal with different individuals.

Voltage Tappings.

Sometimes, when an H.T. mains unit is employed, it becomes necessary to cut down the output voltage in cases where this is too much for the valve. Cases of this sort do not arise very often, it is true; in fact, the reverse is usually the case.

However, if an external resistance is used in conjunction with the output of the unit, it is very important to connect a fairly large capacity fixed condenser, not less than 2 microfarads, between the negative terminal of the unit and the end of the extra resistance which is nearest to the valve; that is, the end of the resistance remote from the unit.

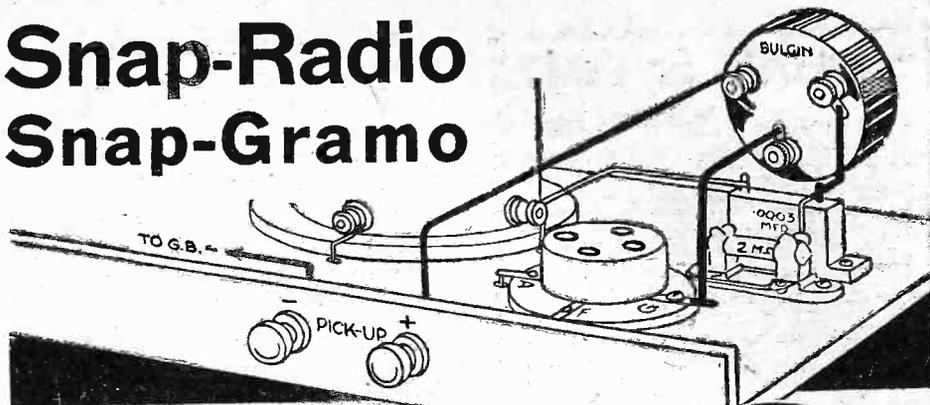
As a matter of fact, it is a very common practice to sub-divide the voltage of the unit so as to get the voltages for the various tappings, by means of a series of resistances inside the unit. Generally the highest voltage is required for the output stage, and the subsidiary voltages are got by tapping off from the maximum voltage (inside the unit, of course) through the various resistances.

Potential Gradient.

It is a very simple matter—in fact, it is simply a question of Ohm's Law—to determine the value of the resistance

(Continued on next page.)

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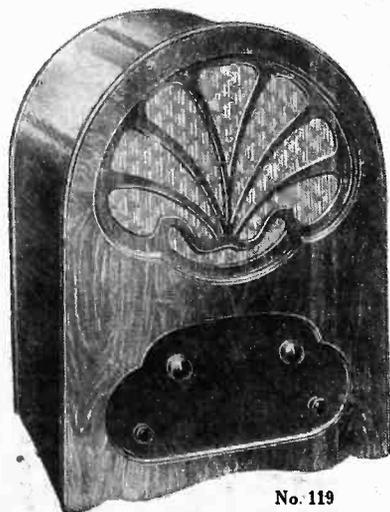
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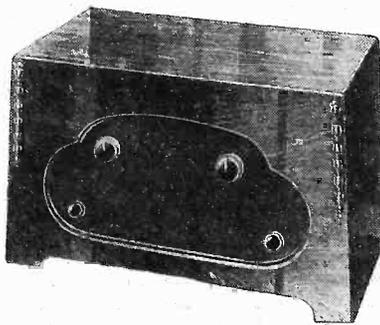
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TECHNICAL NOTES

(Continued from previous page.)

required if we know the value of the output
voltage when passing a certain current.

For instance, suppose the maximum
voltage is 200 volts, and for a particular
tapping we want 120 volts when passing
4 milliamps. Ohm's Law shows us that
80 volts (the difference between 200 volts
and 120 volts) will be dropped at 4 milli-
amps by a resistance of 20,000 ohms.

I ought, perhaps, to make it clear that
if there is nothing connected to the sub-
sidiary tappings, these will all have a
potential equal to that of the highest
tapping; it is only when something is
connected to them, and current drawn from
them, that their voltage drops.

And with a fixed resistance in series with
each tapping, it follows, also by Ohm's
Law, that the amount of voltage drop in
the resistance will depend upon the
current drawn from the tapping. So if your
second highest voltage tapping is rated at
120 volts, 4 milliamps, and you are drawing
only 3 milliamps from it, its voltage will
naturally be appreciably higher.

Effect of Internal Resistance.

This is a point which should be carefully
borne in mind with a mains unit, and one
which is often overlooked. With any unit
having an appreciable internal resistance
(and the tappings have, as you will see
from the above, quite a large internal
resistance) the voltage and current strength
of the output must necessarily be de-
pendent one upon the other.

This is in marked distinction to a high-
tension accumulator battery, where the
voltage output is within limits virtually
independent of the current output owing,
of course, to the low internal resistance.

Sometimes the voltages for the sub-
sidiary tappings in a mains unit are derived
not by the use of a direct series resistance
to each tapping, but by a potentiometer
which is shunted, inside the unit, across
the main conductors.

Each subsidiary tapping goes to a point
of the potentiometer. People often think
that the potentiometer method is entirely
different in principle from the series-
resistance method, but in the conditions
obtaining in the ordinary H.T. unit this is
not really the case.

The Potentiometer Method.

Theoretically, a potentiometer, as its
name implies, is a resistance which acts as
a "potential gradient," so that by using
a slider at different points you can pick off
different potentials.

This assumes, however, that the current
which is picked off by the slider is negligible
in comparison with the current flowing in
the potentiometer. If it were not, it would
seriously upset the supposed electrical
conditions in the potentiometer itself.

Now, in practice, under the working
conditions of the mains unit, the current
taken off from the potentiometer is, at
least, of the same order as the total current
flowing in the potentiometer, so that really
it is a sort of cross between a true potio-
meter and a series-resistance arrangement.

Before leaving the point, I want to
emphasise again the importance of large-
capacity condensers shunted across from
each of the tappings to the negative lead.

WHY VALVES GO OUT

(Continued from page 1227.)

slowly but surely in mechanical strength.
The filament becomes brittle, and in this
condition it gradually gets more and more
susceptible to mechanical shock, and also
to the local strain set up by sudden heating
and slight overrunning. Hence, when any
of these conditions crop up, the brittle
filament gives way, thus rendering the
valve useless.

Difficult Problems.

This slow increase in brittleness takes
place concurrently with the development
of unequal areas of cross-section in the
filament. Careful drawing of the filament
wire in the first place has very greatly
minimised the production of filaments
with serious inequalities in diameter, but
up to the present this potential source of
filament trouble has not completely been
eliminated.

And, finally, as regards the second cause
of a filament's demise, it is to be noted
that many firms have patents relating
to the addition of certain substances to
the filament metal which have the effect
of retarding its slow increase in crystalline
nature.

These twin problems of filament physics
are not yet completely conquered; but,
nevertheless, the modern radio valve
filament is, in many respects, a model of
perfection, considering the many great
difficulties which are inherent in its com-
mercial production and manufacture.

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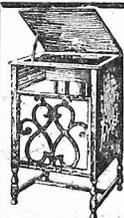
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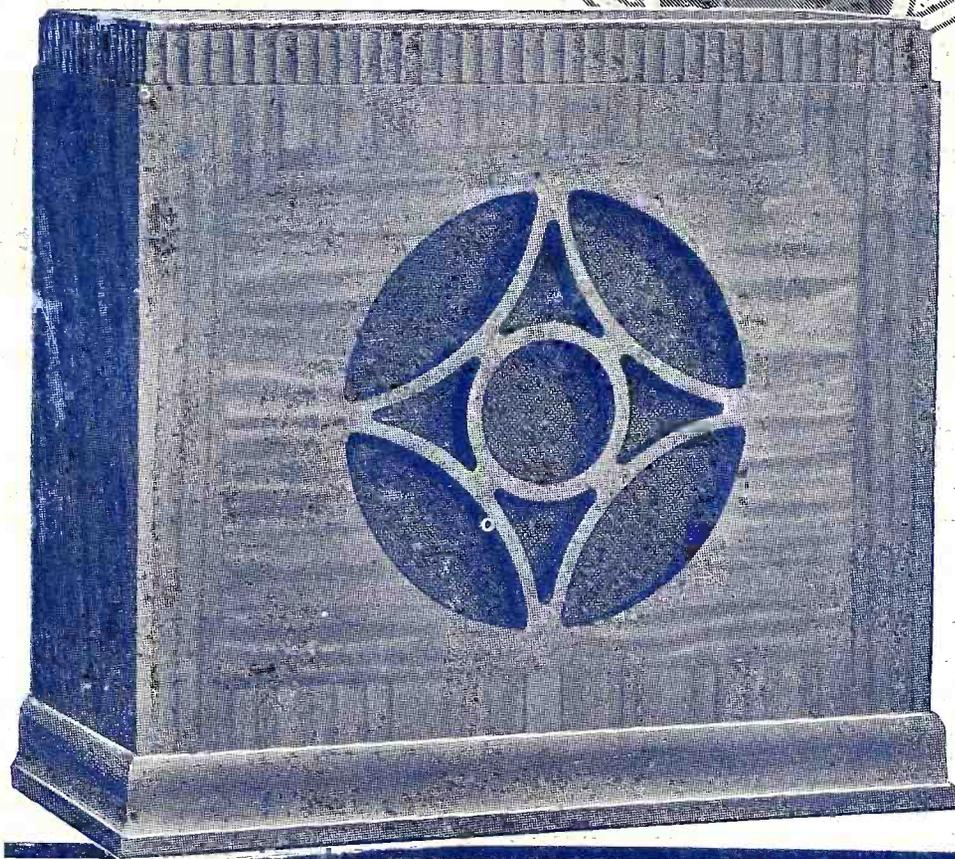
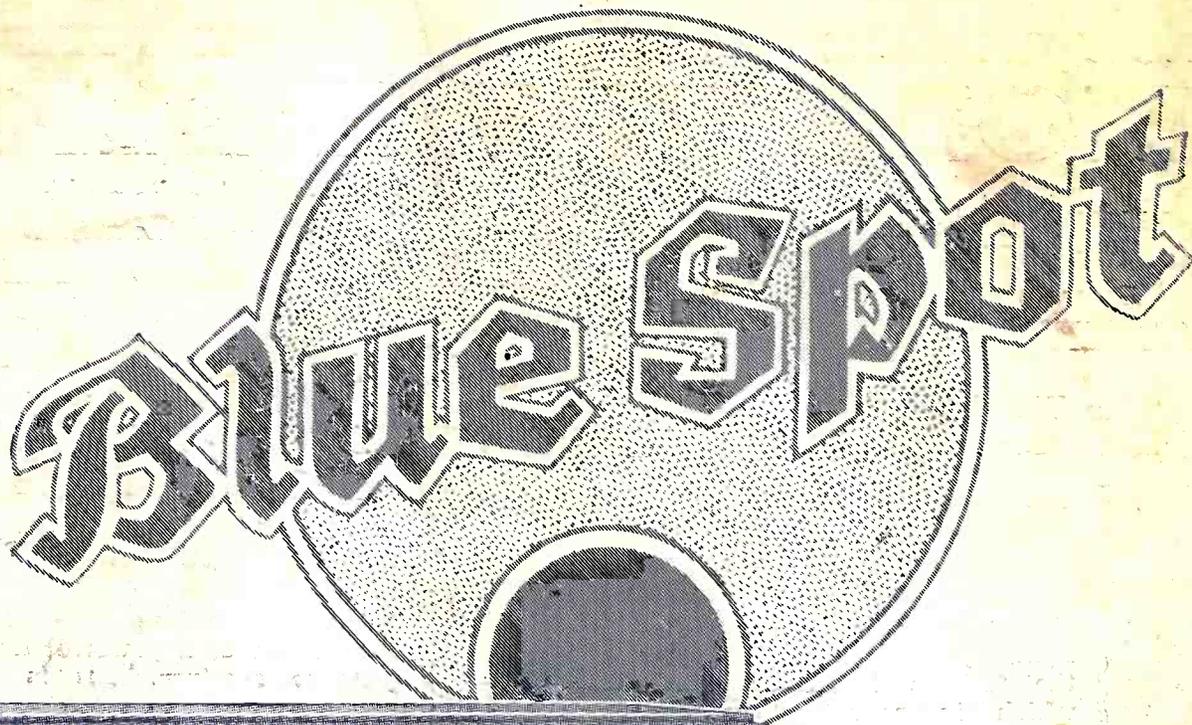
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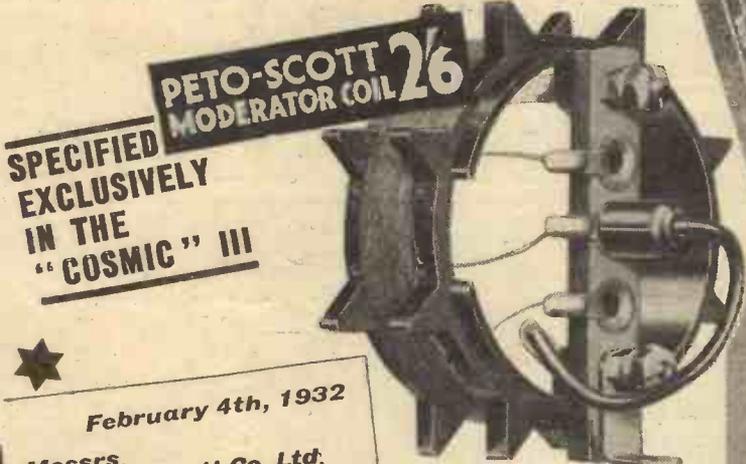
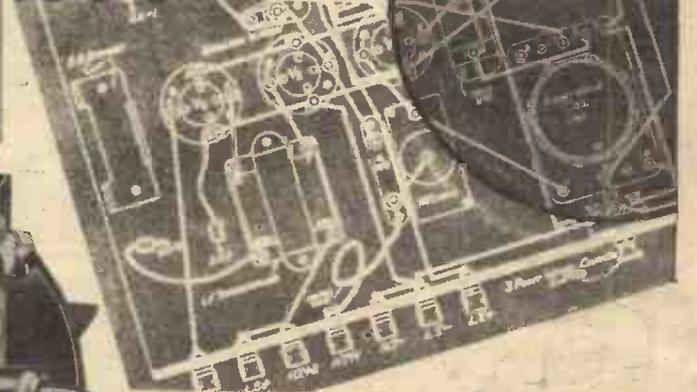
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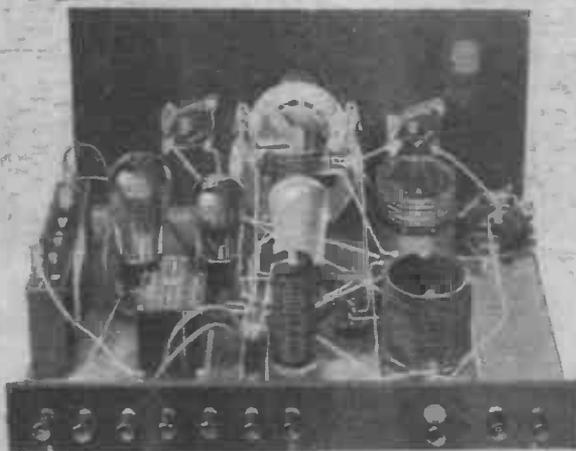
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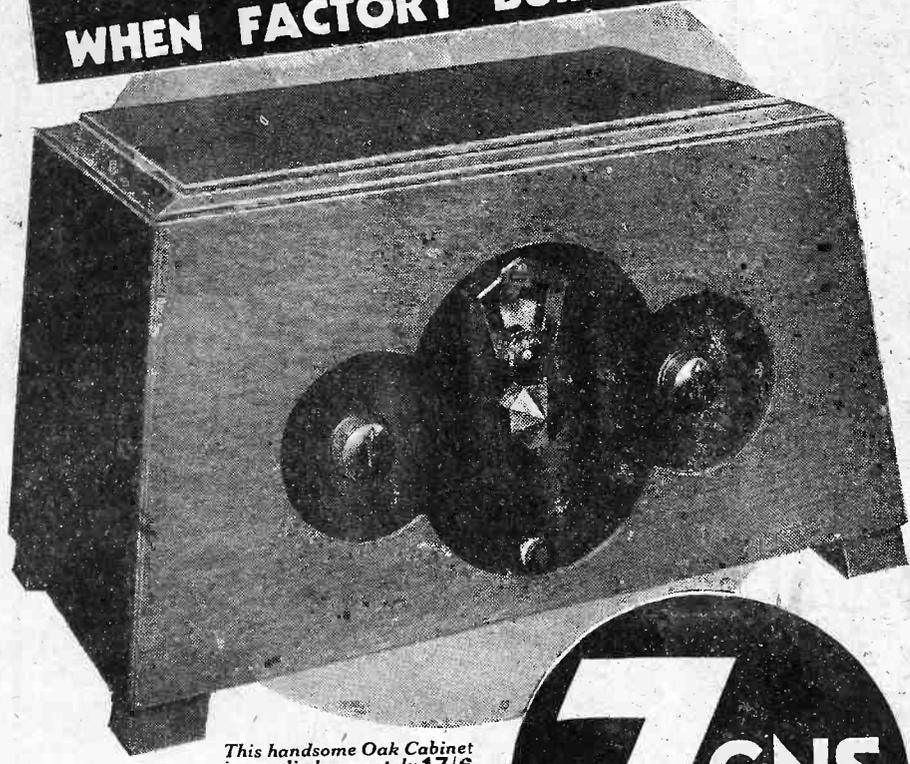
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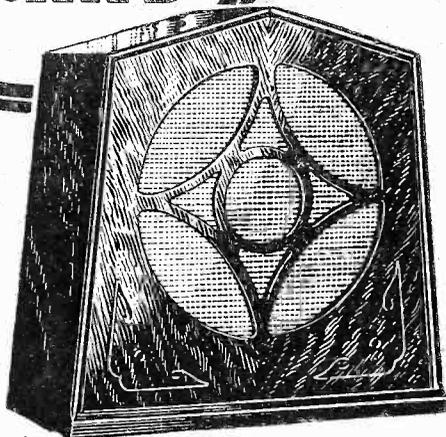
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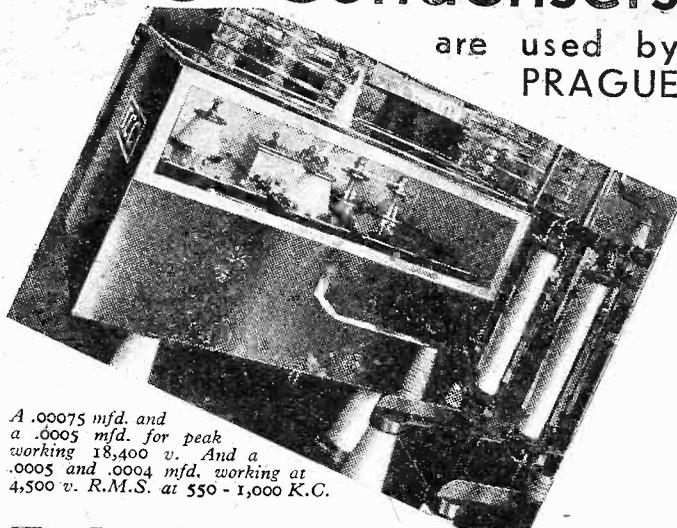
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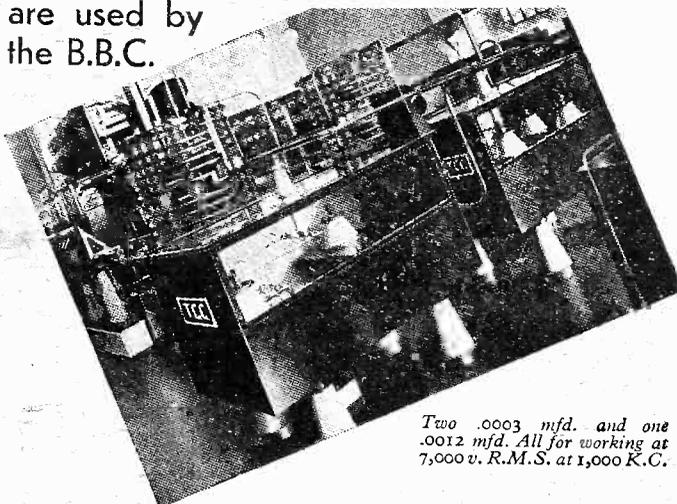
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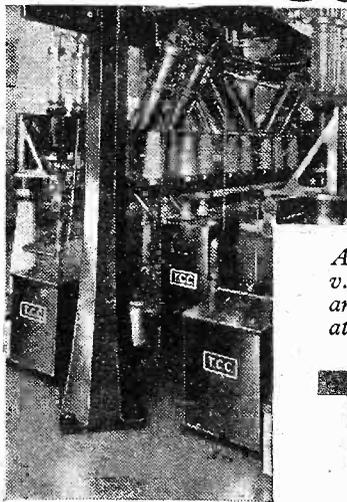
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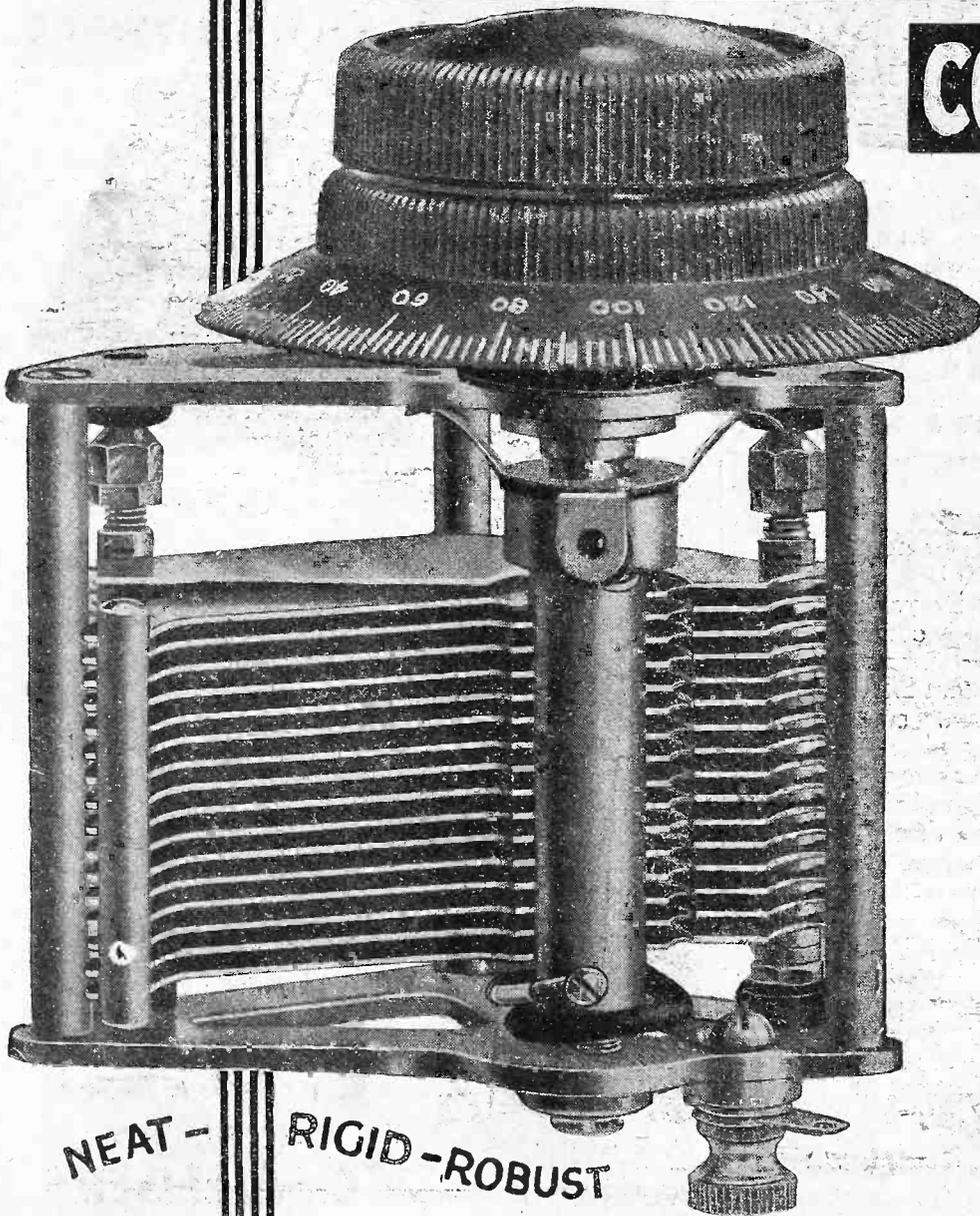
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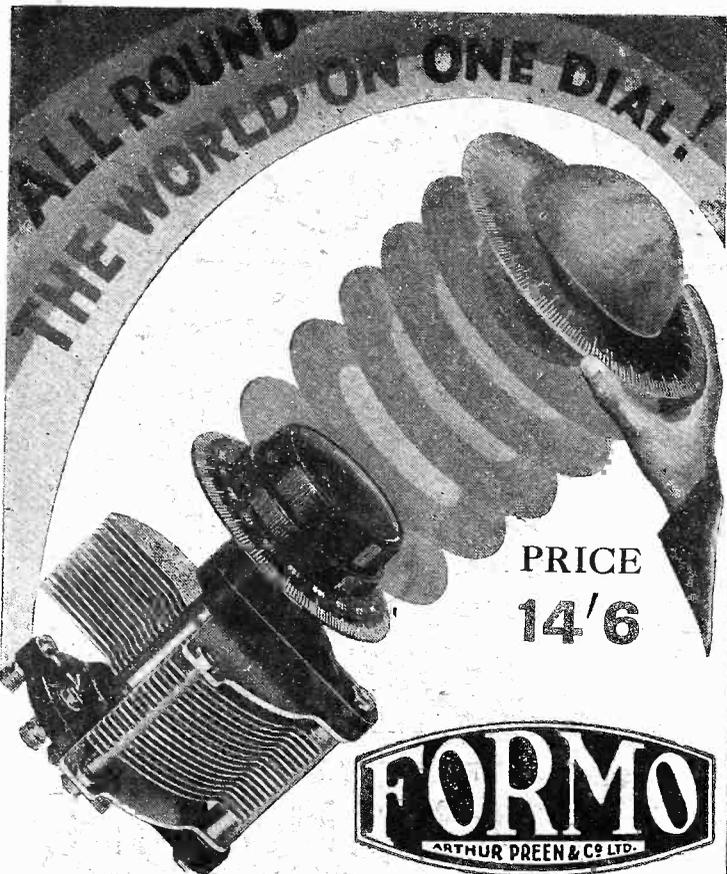
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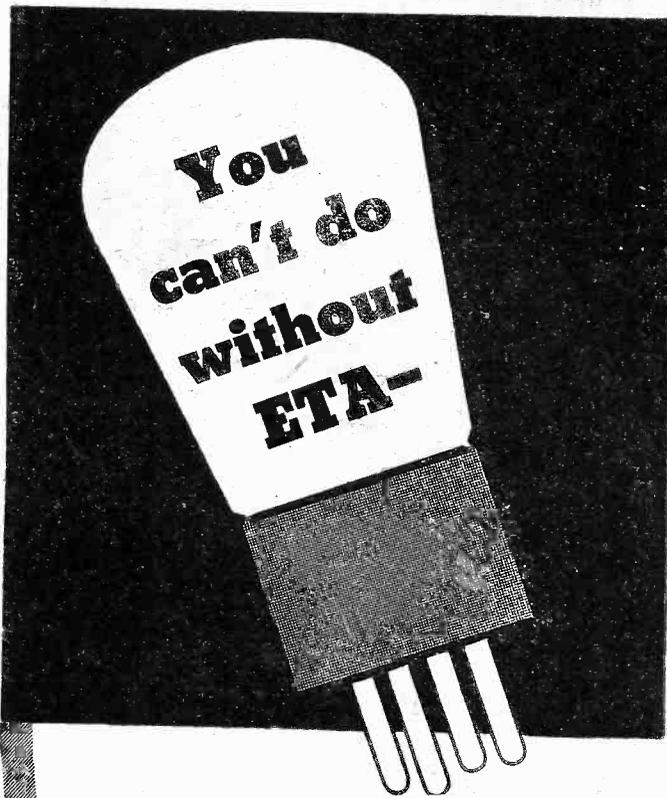
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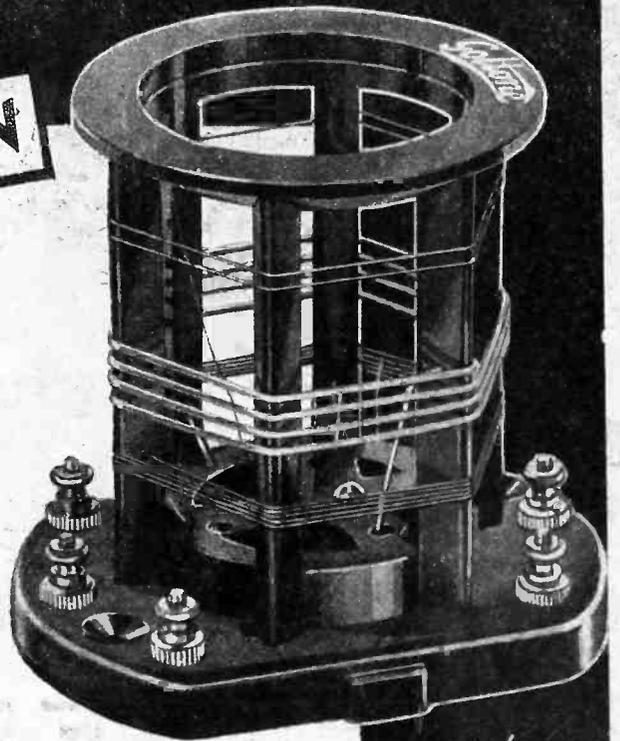
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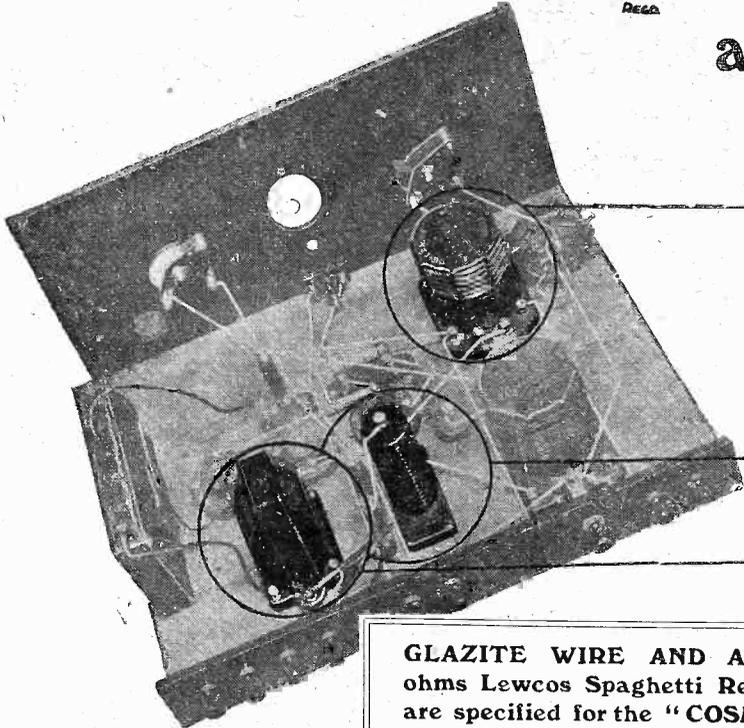
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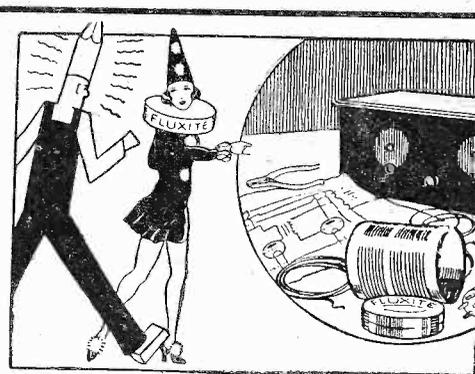
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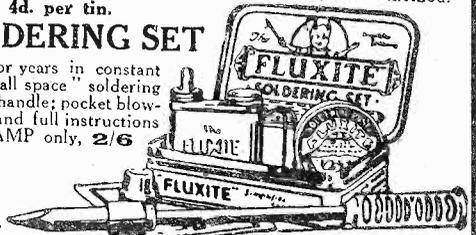
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KIT "A" Specially prepared with Matched Components, less Valves and Cabinet. **5/10** DOWN

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1 Wavemaster '0001-mfd. Differential Reaction Condenser with black knob	2	0	0
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1 N.T.S. H.F. Choke (Binocular)	2	6	0
2 Ready Rad 3-point switches	3	0	0
1 Wavemaster '00015-mfd. Differential Condenser	2	0	0
1 Panel 16" x 7" x 3/8" ready drilled	4	0	0
1 Standard Screen 10" x 6" with notches filed as specification	2	0	0
1 Terminal Strip 16" x 1 1/2" x 7/8" ready drilled	1	3	0
1 Baseboard 16" x 10" fitted with 10" x 7" copper foil	2	3	0
2 Ormond '0005 Condensers (Type 426) with Slow Motion Dials	12	0	0
1 pair S.T. 300 Coils with two supporting pillars special S.T. 300 winding and terminal connections	10	0	0
1 Graham Farish '0001-mfd. condenser	6	0	0
1 Graham Farish 1-meg. Grid Leak with terminals	10	0	0
1 Graham Farish H.F. Reaction Choke	2	0	0
1 Lewcos Spaghetti Resistance 20,000 ohms	1	6	0
1 R.I. Dux Transformer	6	9	0
2 Lotus Valve Holders	1	0	0
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1 N.T.S. push-pull three-point switch	1	3
1 Wavemaster '0003-mfd. reaction condenser	2	6
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1 Cydon '0005-mfd. Extenser	16	6
1 N.T.S. dual-range coil-unit	5	0
1 N.T.S. short-wave coil unit	4	0
1 Peto-Scott Moderator coil	2	6
1 Graham Farish '0003-mfd. fixed condenser	6	0
1 Graham Farish 01-mfd. fixed condenser	1	6
1 Graham Farish grid-leak holder	6	9
1 Graham Farish 2-meg. grid leak	6	0
1 Graham Farish grid-leak holder	10	0
1 Graham Farish 1-meg. grid leak	1	6
3 Valve holders	3	6
1 Peto-Scott H.T. choke	6	9
1 R.I. "Dux" L.F. transformer	1	6
1 Lewcos 100,000-ohm Spaghetti resistance	2	3
9 Clix engraved-type terminals	2	3
1 Grid-bias battery clip	6	0

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1 Panel, 14 ins. x 7 ins. (ready drilled)	4	0
1 Cabinet for above, with baseboard 10 ins. deep	17	6
1 Terminal strip, 14 ins. x 2 ins.	1	3

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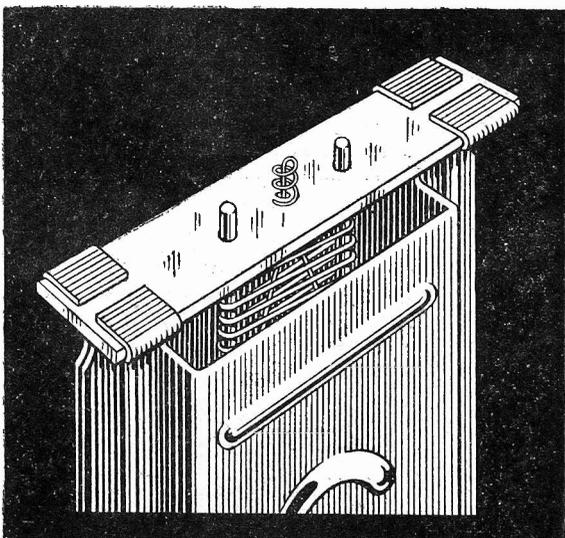
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Price **8/6**



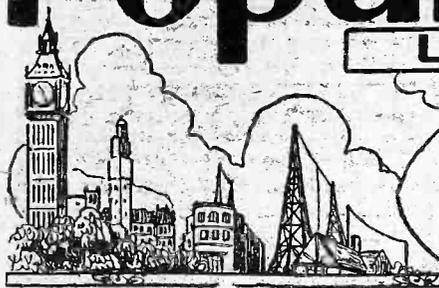
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THE COSSOR 210 H.F.

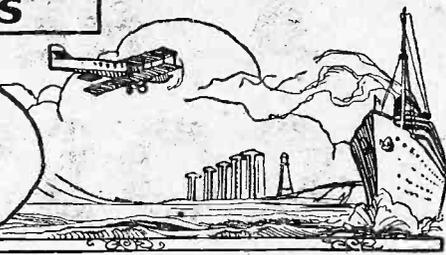
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**THE NEXT SHOW
 THAT FLASH
 THE OLD TIMER
 A SUPER CENSUS**

RADIO NOTES & NEWS

**"GIVE ME A JOB!"
 GONE ASTRAY
 HIS HUNCH
 SPAIN AGAIN**

This Year's Radio Show.

THE dates which have been fixed provisionally for this year's National Radio Exhibition, which is to be held at Olympia, London, are from Friday, August 19th to Saturday, August 27th.

I understand that according to the tenancy agreement the show must be held between August 15th and September 4th, but it is none the less a great pity that it has to be slap in the middle of the holiday season, for it is the most popular exhibition of the year, barring the Ideal Home Exhibition.

Thanks for an Effort.

THE Editor desires me to say something nice to E. H. (Warrington), who submitted a short article and sketch which, though admirable, cannot win a place in "P.W." for reasons which His Nibs finds good.

E. H. can take it from me that those reasons are quite sound, for no Editor this side of Bedlam rejects matter he can use, unless the writer wants "best seller" rates! Well, E. H., don't take it to heart. You ought to see my private pile of MSS which have "come back"!

"In Search of Television."

I HAVE been "sitting" on a number of letters from fellows who are sniffing after television. Why doesn't "P.W." publish full constructional details, etc., and so forth. Thank goodness Mr. Dowding's article in No. 504 lets me out.

But I can recommend a medium-strong solution of boracic acid as an excellent eye-lotion—for the moral of which please consult the aforementioned article. Having been associated with radio from very early days, I am not spending any money on television just yet. I shall wait till the darned outfit costs about £10—and I hope by that time I shall be able to see my grandchildren's sweethearts!

That Flash!

THIS phenomenon—the flash which is sometimes to be observed when valve bulbs are suddenly smashed—bids fair to rival the "Magic" Three and certain other sets for top place in the post-bag, for we have had dozens of letters concerning it.

Almost the only regular correspondents who have not contributed are Alf. Mann and the bloke with the iron bedstead.

As a matter of fact, if the flash is found to be a source of annoyance the trouble can be overcome by tying a copy of "P.W." to the base of a brewer's drayman and making the fellow sit heavily upon the valve which is to be broken. No flash will then be seen.

A QUEEN OF RADIO



She is Miss Jane Carpenter, of Hot Springs, Arkansas, and, after a keen contest, she beat all other claimants and was selected as "Queen" of the Chicago Radio Show.

A Versatile Reader.

THANKS are due to W. N. E. (Appledore) for his interesting letter, including an extract from his log book of about eight years ago describing the B.B.C.'s first attempt to exchange greetings with the U.S.A. I am passing it to Capt. Eckersley.

W. N. E. is the most versatile reader who has ever written to me, for, besides being a qualified chemist, he is a successful amateur biologist, astronomer, microphotographer, radio worker, music composer, singer, and water-colourist.

Thirty years ago he made the apparatus needed for repeating Hertz's experiments with electromagnetic waves.

Chat by an Old Timer.

W. N. E.'s letter babbles along very pleasantly. Eight years ago his set was a two-unit four-valver; it cost 33 guineas, and the valves were 6-volt B.E.'s, each taking about 0.7 ampere. He has since become a S.W. enthusiast, and has our "Night Flight" Three plus an S.G. stage, which he thinks runs the latest models pretty close.

He says that if anyone thinks that an S.G. stage is of little use in a short-wave set there is another thought overdue, for he can secure a big increase in signal strength, and wonders whether it is because he uses a big variable condenser (0005 mfd.). I really believe I envy W. N. E.; he must be a very happy man—if only to live in Appledore and be a chemist!

Welsh Society Note

ALWAYS glad to try and help a radio club. Mr. E. E. Hewins, 303, Grand Avenue, Ely, Cardiff, Secretary of the Ely Gramo-Radio Society, would like to hear from radio men in his district; view, membership.

This is not one of those societies dead from the neck up, but a go-ahead affair with enthusiasm in its boiler. If you have never belonged to a good radio club you can have no idea of what fun and utility it can be. I hope to hear that Ely goes ahead, Mr. Hewins.

The B.B.C. Super Census.

I DO not share the indignation which some people and papers are displaying in connection with the questionnaire which the B.B.C. is inviting us to answer. Firstly, we need not write for the necessary form unless we wish to do so. Secondly, I do not see why the public should not be asked to do something for science, which

(Continued on next page.)

"ARIEL'S" RUNNING COMMENTARY ON RADIO (Continued)

has done so much for all of us—even giving us radio.

Perhaps it would have been better had the B.B.C. limited its cooperation to the use of its ether time and to announcements in its official organ, leaving all pecuniary expenditure to the London School of Economics. But I suggest that we ought to be a bit above imagining that broadcasting was instituted mainly for the purveyance of vaudeville and football commentaries. After all—we are grown up!

"Give Me a Job!"

LET the joy bells ring! For from Jan. to leafy June the school kids are to have just one long feast of "talks," thanks to the cranks. Here are a few of



the luscious items, picked at random: "Merchants on the Road," "Stoats and Weasels," "Posture and Fatigue," "The Tale of the Taxes," "In der Sprechstunde des Rechtsanwalts," "Fungoid Diseases,"

"Chalking and Liming," "Scottish Herrings," "Life on a Peat-bog."

Imaginary conversation:

Boy: "Give me a job."

Employer: "What can you do?"

Boy: "Tell you all about stoats, chalk, fungi, and herrings."

If I were dictator I'd stop this cruel time-wasting and have the youngsters put their minds to work on subjects which would arm them to compete in the labour market.

Broadcasting Gone Astray.

THIS would make a subject for pretty debate; but one can't debate with the B.B.C., which is a dictator. I am well aware that education is much more



than the three R's plus a smattering of French, Latin, and a few ideas about chemistry and physics. Most of one's education is received long after schooldays! Nevertheless, competition for jobs is so keen now, and

will be so much harder later on, that school curricula should be framed with the object of fitting the young for the battle for bread and automobiles, not for instructing them in the ways of the cockroach and the eel.

Faith in a "Hunch."

THE most interesting point about Marconi's latest revelations concerning his epoch-making experiment in 1901, when he managed to send radio signals across the Atlantic, is that he not only flew in the face of some of the principal mathematicians, who said that "it couldn't be done," but that his company risked some £50,000 on the venture—all on the strength of his "hunch" that the radio waves would follow the curvature of the

earth and not flip off at a tangent. You can't be a pioneer without vision and pluck.

Law versus Radio.

ANOTHER incident, which is amusing when considered in retrospect, but which must have been tragic at the time, was the action of the Anglo-American Telegraph Company, which, so one gathers, had some sort of monopolistic concession for transoceanic telegraphy; I suppose its cable landed in Newfoundland.

Well, Marconi introduced long-distance radio to the world on December 12th, 1901. On December 16th, 1901, the Anglo-American threatened him with legal proceedings if he did not stop his operations. This caused his demonstration to the Governor of Newfoundland to be abandoned.

That was the young man who is now loaded with honours and has conquered the whole world with his radio.

SHORT WAVES.

AT LAST.

"The fact that owing to the travelling detector thousands of wireless licences have been taken out, suggests some of the users have tuned in the still small voice of conscience." —"Birmingham Daily Mail."

"A 'comb' for unlicensed wireless listeners will take place in Southampton and surrounding districts," we read in the "Hampshire Chronicle."

That ought to make many pirates tear their hair.

ADVICE TO RADIO WIDOWS.

A woman in Toledo, U.S.A., recently applied for a divorce from her husband because he spent his spare time on the radio set, but the judge advised her to get a set of her own and beat him at it.

If this sort of thing goes on, husbands will soon be wanting their old "loudspeakers" back again.

Disgruntled Announcer (closing down for the last time after dismissal): "Listen, Everybody. I hope you all have a perfectly ghastly night. I repeat—a perfectly ghastly night." —"Humorist."

AND NOW TELEVISION.

Did you find it rather galling—Almost, one might say, alarming—(If perhaps your maid had gone And left the wireless-switch turned on) When a voice, abrupt but charming, Broke the silence: "London Calling"?

Now, if she repeats that blunder, Shall we be surprised, I wonder (When we're in a bath, or cooking), By the whisper: "London Looking"?

"Punch."

The Foundations of Society.

FOLLOWING my erstwhile remarks upon the "fruitiness" of Mr. Harold Nicolson's voice—A. J. Alan with a cold, no less!—the "Spectator" has given hospitality to letters concerning that same noise. One lady detests it. Well, I can imagine that a lady of narrow experience might well do so. "Jean Forbes of Callendar" (Heaven preserve us!) speaks of his "delightful deprecating drawl," the talks being above her head. Why should they be? They are quite elementary—once you know his gang and their mannerisms.

He Stoops to Conquer.

THE fact is, Mr. Nicolson is an aristocrat who has taken the right turning. He is doing, and has done, things which would cause his ancestors to revolve

within their narrow cells. He has relinquished high circles and made good in Fleet Street and the great open spaces where the rate is so much "per thousand words" and where men are writers. But he has brought along with him his "well off" voice.

To succeed, he will have to temper that with a little humanity. That's all there is in it! His talks on literature were worth much fine gold.

An Upsetting Day.

JOHN MOREL is by way of being the perfect film hero: When he was appearing in Milan, in "Carmen," a fellow singer became ill and had to be replaced. On returning to his hotel after the show Mr. Morel heard groans coming from the adjacent room, and, dashing in, he was able to save the sick singer from completing the slitting of her



fair throat with a pocket-knife, which she was engaged in doing because she was so upset at being unable to take her part.

Then, blow me if Mr. Morel didn't go straight out and find the place on fire! He knocked up the entire human contents of the hotel, the fire was located and extinguished—and so to bye-bye. In spite of all that, I'll bet he had to pay the ten per cent tip on his bill!

Wireless for the Blind.

AMAZING! This universal pity for the blind! I recently noted that the Fund still lacked a certain amount to enable it to carry out its primary object of equipping the whole blind population of this country with radio sets. The need has been met, following Viscount Spowden's appeal, for contributions from 16,500 people have been received since that was delivered, donations ranging from a 1d. stamp to a £100 note having been sent in from contributors who include three pensioners whose combined age totals 217, and three mites, the eldest of which is 3½ years old. Blind persons also have contributed.

Spain Again.

HAVE you noticed how well the Spanish stations have been getting over of late? Years ago we used to look on Madrid as one of our best friends, but later so many good new stations cropped up that somehow Spain went right out of the radio picture. Then they "revolted," and of course that revolution was the finishing touch.



Now I notice Madrid, Barcelona, and the rest of them state their case with that verve and volubility, which the visitor expects when he is offered tickets for the bull-fight!

ARIEL.



By G. V. DOWDING, Associate I.E.E.

A brief survey of the technical foundations of "P.W.'s" latest wonder set. In a concise, lucid manner you are shown exactly what happens during the operation of the receiver, and how it immediately adapts itself to the best conditions on each of three wave-bands without resort to complicated switching.

THE indisputable originality of the "Cosmic" Circuit forms an excellent illustration of the truth of that well-known saying "Necessity is the Mother of Invention."

We decided that we wanted a set which would do this and that, and then proceeded to try and evolve a circuit which would enable the desired results to be obtained. At first it seemed practically impossible, but after much thought and experimenting we finally managed to lay down the foundations.

Then followed a period of intensive development during which snag after snag was ironed out until, finally, the loose ends were caught up and the final polishing given.

Looking at the neatly drawn diagrams which accompany this article; you may find it very hard to credit that we spent some hundreds of hours in mere "paper-work" and that similar or even longer periods of time were devoted to active research to make possible the instrument these diagrams theoretically represent.

Simplicity.

In some of its earlier stages the circuit was even more original in its ideas than it is now, but those ideas just failed to do all one thought they would do! And at practically every earlier stage there was greater complication—the present simplicity is a quality which itself is due to the incorporation of novelties!

In short, the "Cosmic" is the complete antithesis

of such a circuit as the once famous "Filadyne." Some of you will still no doubt remember the "Filadyne." It would work only with certain definite valves of the period, but it gave excellent results and created considerable interest. But it owed its origin to a sudden brain-wave during a deliberate attempt to break away from conventional practice.

Practical Achievements.

But, I repeat, the "Cosmic" Circuit is a carefully planned electrical structure whose originality is really incidental. It is important that you should thoroughly grasp this vital fact, because the practical achievement of the "Cosmic" lies in what it does more than in what it is.

To make this point absolutely clear I

will give you an analogy. Take the very first aeroplane. From the ordinary fellow's point of view, what was the more vitally interesting, that something new in science had been accomplished—i.e. the first principles of aero-dynamics laid down—or the amazing fact that man had at last conquered the air?

Inasmuch as even to-day aero-dynamics are something of a mystery to most of us, the answer is quite obvious!

Reverting to the "Cosmic" again I will tell you why we are so extremely anxious that you should regard the originality of its circuit only as a matter of secondary importance. It is so that no suspicion should arise in your mind that the whole scheme is "raw" or "half-baked" for, you know, it is sound common sense to

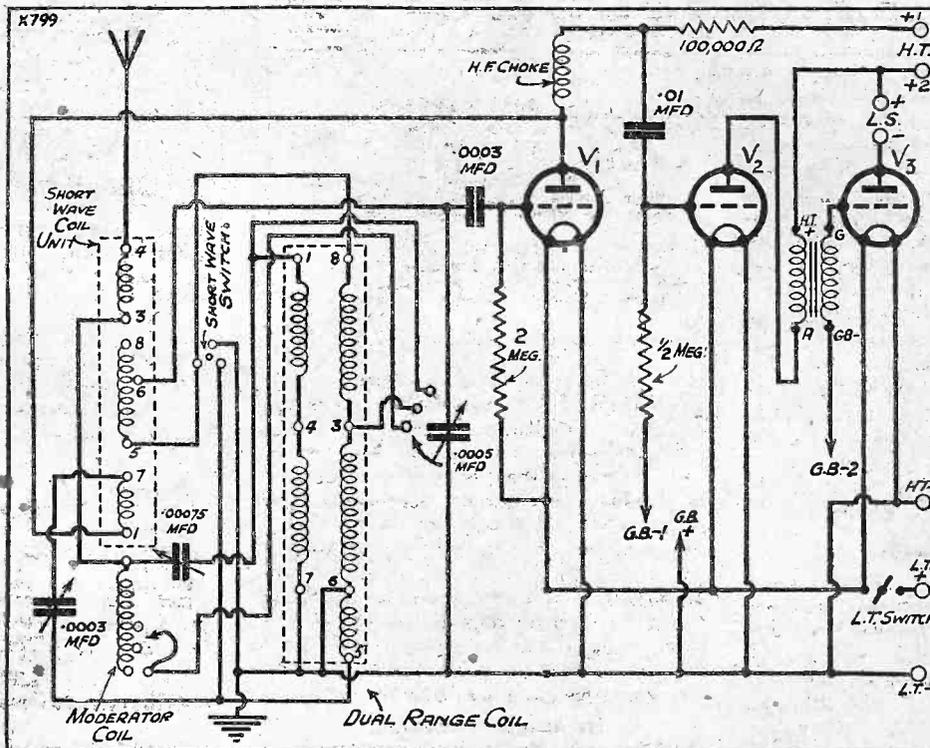
regard all new things with some suspicion.

But as it so happens, the "Cosmic" is new only to the public. During the past few months we have built up numerous models, and these have been sent all over the country. Some of our trade friends have had models in their possessions for weeks on end, and an index of their enthusiasm is afforded by the unprecedented trade support that is being given to the "Cosmic."

No Risks.

So you see you are taking no risks in embarking upon the "Cosmic" way! In passing, I must not forget to add that we invited criticism from the above-mentioned trade friends, with the result that

A COMBINATION OF COMPLETELY NEW FEATURES



You will find it interesting to compare the complete circuit with the three small diagrams which appear on the following pages, for these show you exactly what happens at the change-over from wave-band to wave-band, and how high efficiency is maintained throughout without complicated switching.

(Continued on next page.)

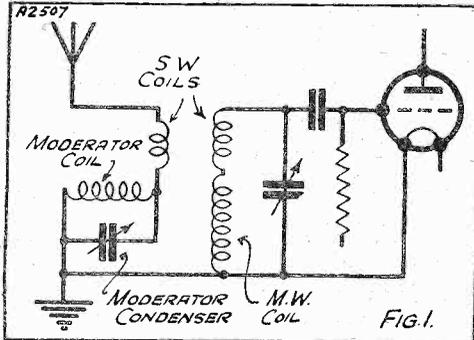
THE "COSMIC" CIRCUIT

(Continued from previous page.)

credit must be given to them for some goodly proportion of the final and perfect "Cosmic."

I expect you will know by now what the "Cosmic" is, and does; in a nutshell, it is an "all-wave" three-valver capable of tuning-in the American and Australian short-wave broadcasters as well as the medium and long-wavers of Europe. It is inexpensive and almost too simple in assembly to be true!

MEDIUM WAVES



There is a loose inductive coupling through the short-wave coils, and the moderator condenser serves to tune the aerial circuit so that maximum efficiency at any particular wave-length is possible, as opposed to the losses usually associated with "aperiodic" aerial circuits.

The full theoretical circuit diagram may at first sight appear rather complicated, but it isn't really, because all those coils which are shown by nine separate spirals are grouped into three straightforward coil units.

There is a dual-wave coil which operates in conjunction with an Extenser to give switchless tuning through both medium

and long waves. A second unit carries the short-wave windings and these immediately come into operation the moment a simple push-pull switch is operated.

Finally, there is a coil known as the Moderator which functions in combination with a small variable condenser; it is small, but it does vitally effective work.

Enormous Volume.

When the Extenser is being rotated through its 0-100 dial readings for medium-wave tuning, the moderator condenser assumes a parallel connection—see Fig. 1. And it is possible to tune the aerial circuit instead of leaving it aperiodic as is usually done. The increase in volume that results is enormous, and comparative tests against conventional practice are most enlightening!

The coupling between the aerial and grid circuits is through the short-wave coils—just the right degree of coupling for maximum volume and greatest selectivity.

When the Extenser is rotated through its 0-200 dial readings the following circuit changes are quite automatically effected.

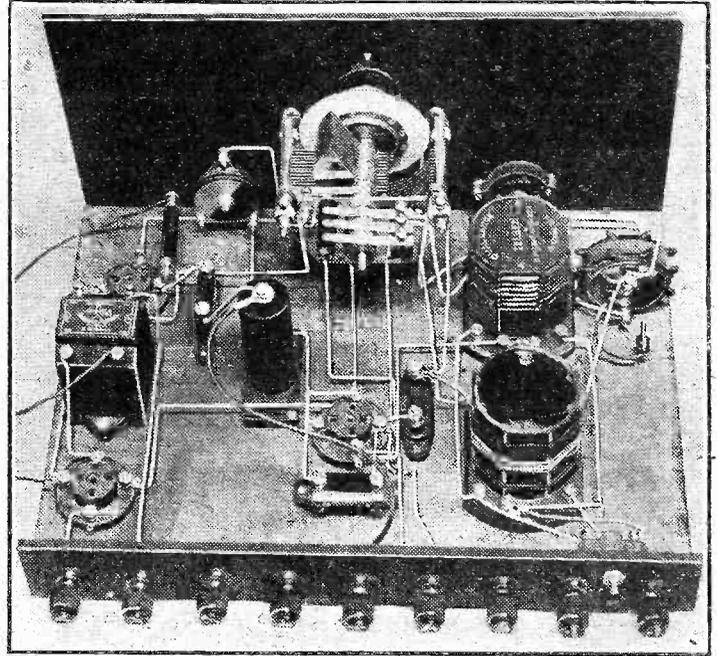
The moderator coil goes out of circuit, the moderator condenser is joined in series with the aerial, an aerial long-wave coupling coil comes into operation, and the grid circuit is loaded with the required extra

inductance. And all this happens without the casual operator of the set knowing anything at all about it!

You will see the skeleton of the new circuit conditions in Fig. 2—there has been some slight change from Fig. 1, hasn't there?

The moderator condenser now acts purely

THE RESULTS OF RESEARCH



This was the first practical model of the "Cosmic" to be built up, although, of course, it was preceded by numerous "bench hook-ups."

and simply as an aerial coupling condenser, and enables you to adjust for selectivity and power just to your liking in accordance with your own local conditions.

The Moderator.

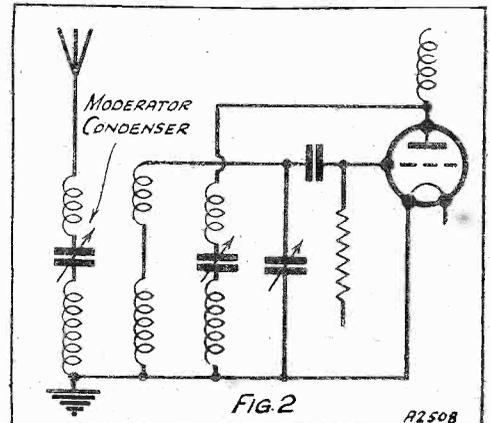
You will now appreciate the fact that the word "moderator" is not a spot of "pseudo science" created for mere effect, but that it had to be invented of necessity, as there is no existing word which is applicable.

A SCIENTIFIC TEST FOR SENSITIVITY



Mr. Dowding testing the "Cosmic" Three, with a valve voltmeter, for sensitivity and selectivity.

LONG WAVES



The aerial coupling provided by the short-wave coils is augmented for the long waves, and at the same time, and also quite automatically, the moderator condenser adopts a series position for regulating selectivity.

It is true that the practical effect of adjusting the "moderator condenser" is similar on both medium and long waves, but it is not identical, and, anyway, its electrical duties are quite different.

It is even more different on short waves.

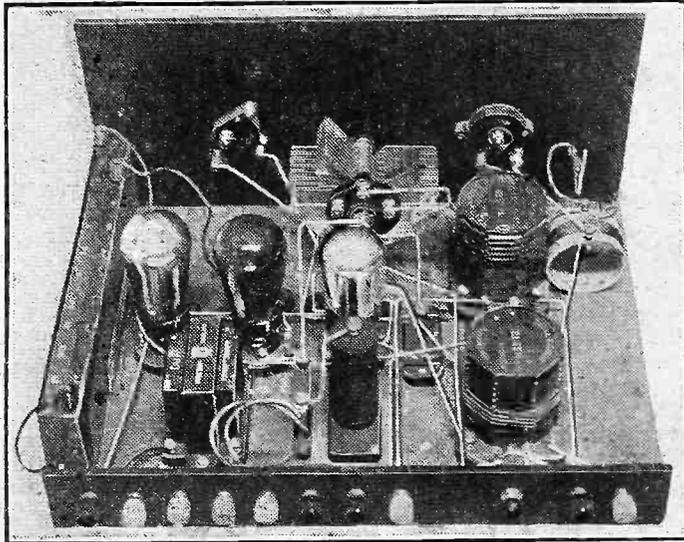
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THE "COSMIC" CIRCUIT

(Continued from previous page.)

Here it functions in a small degree as an eliminator of dead-spots and an aid to reaction. (We consider this "moderator" one of our greatest "Cosmic" triumphs, for it pulls its weight on all three wave-bands.)

THE REFINING PROCESS CONTINUES



A further step in the development of the "Cosmic" is illustrated by this photo. In addition to a refinement of the layout, certain further slight circuit alterations have been made. The final model is, of course, that one described in detail in other pages of this issue.

When that simple little push-pull switch at the back of the "Cosmic" set is operated the outfit at once becomes a short-waver, and the new set of circuit conditions depicted in Fig. 3 obtains.

It should be noted that *all* those coils which figure in the medium and long-wave broadcasting are completely cut out of circuit by the effective expedient of being simultaneously shorted to earth. And as they are also well separated physically they cannot unfavourably affect the short-wave coils. In brief, the set becomes an *efficient* collector of the high-frequency radio wave energy.

Hand-capacity Eliminated.

The reaction condenser is so arranged that its moving vanes are earthed, and that means an absence of hand-capacity effects. This is another feature that is in the nature of a triumph.

The moderator condenser operates as a series capacity of very limited effectiveness, and so adjusts for aerial coupling conditions.

There is no wave-change on the short-wavers but there is a circuit alteration all the same. However, better results are generally given on the 0-200 extension dial readings.

And that completes the tuning arrangements. You must agree that I have indulged in no unnecessary "padding," and yet it has taken me many hundreds of words merely to sketch the bare skeleton of this part of the circuit! And yet it is quite simple. You see, we have "boiled things down."

And why shouldn't we? If one little .0005-mfd. condenser, for example, can be made to do three jobs merely by altering its connections, why shouldn't it do these

things? It was certainly a sticky problem to effect the alterations without introducing weird and wonderful switches with dozens of terminals and leads to complicate the wiring and reduce the set's efficiency, but it was a problem which, fortunately, we were able to solve.

You could quite easily add more parts and wires to the circuit, but there would actually be efficiency-loss rather than gain and the final circuit as you see it is complication scientifically reduced to simplicity plus effectiveness.

Leaving the detector stage we have two stages of low-frequency amplification, and these can quickly be dealt with, for they are perfectly conventional.

No Comparison at all.

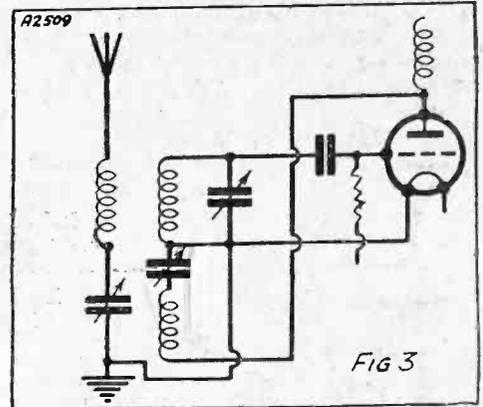
The first L.F. valve is resistance-coupled, and the second transformer-coupled. We chose this grouping, for it makes both for greater stability and inexpensiveness. And there is adequate amplification for first-class loudspeaker results.

The last thing you must do is to compare the "Cosmic" Circuit with any ordinary Det., 2 L.F. with resistance and transformer L.F. couplings. In the ordinary way, so much valuable volume is thrown away in aperiodic aerial circuits plus loose aerial couplings in order to achieve something approaching the measure of selectivity demanded by modern ether conditions, that

many constructors are quite unaware of the potentialities of a three-valver of new design such as the "Cosmic," where every fraction of a volt that can be developed by bringing the aerial system into sympathy with the ether vibrations of the required station is available if you want it.

If you are a Londoner you will know how badly the North Regional comes over in many districts of the metropolis during the

SHORT WAVES



The circuit associated with the tuning resolves itself into these working elements when the little short-wave switch is operated, and, as you see, the reaction condenser takes up the ideal position for minimising hand-capacity.

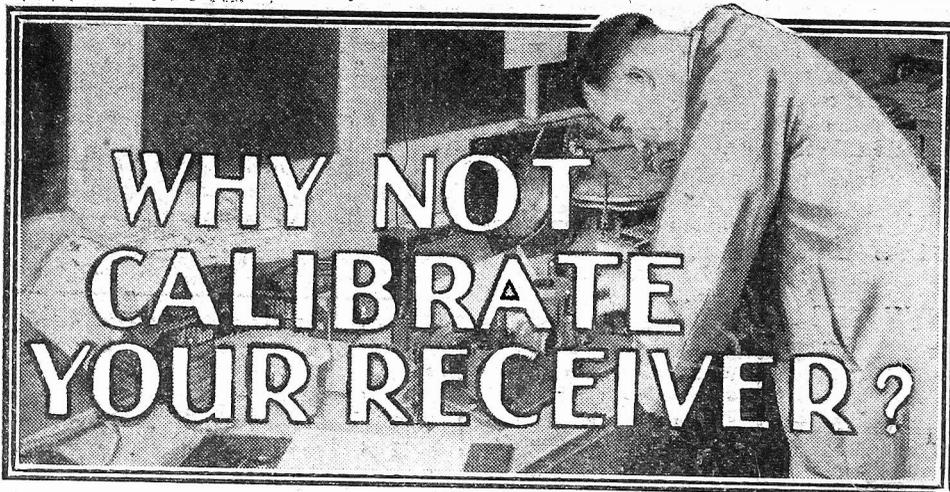
daytime. And yet it has *full* programme value on the "Cosmic" at Tallis House. You get it really loudly on the loudspeaker without pressing reaction to its limits! Trade friends who have witnessed demonstrations were openly amazed at the robustness of reception from this and other distant stations using such simple apparatus.

But, as I have said elsewhere, we were determined that whatever the "Cosmic" might do in the way of short-wave feats of reception, we were determined that it *must* be a first-class instrument for ordinary broadcast reception; and it is.

SHORT-WAVE TESTS BY AN EXPERT



Mr. G. T. Kelsey, originator of the short-wave adaptor idea which has been adopted in every country in the world, designed the short-wave section of the "Cosmic," and is here seen testing one of the intermediate models.



Here are some authentic details of short-wave stations on whose wave-lengths you can rely for purposes of calibrating your receiver, and also some general hints on the subject of set calibration.

By W. L. S.

IN my recent article called "Short-Wave Signposts," I described some simple methods whereby short-wave enthusiasts who had "lost their way" could easily find it again.

As a result of a week-end's work I find that calibration of the actual receiver you use is not at all difficult, and it is certainly worth the little time and trouble involved.

For "Non-Short-Wavers" as Well!

If, after looking at the initials at the head of this article, any "non-short-wave" readers are still reading on, it may pay them to continue, since they can do a lot with their broadcast receivers that is quite worth while, on practically the same lines.

To deal with short waves, however, I will be more explicit. Whatever set you are using, it is probable that you cover at least a range of 15 to 60 metres. With most commercial varieties of short-wave coils you will be covering 15 to 30 metres on one coil, and 30 to 60 on another. If this be the case, your lot is easy. On the upper coil there are several broadcast stations that I have checked up on, whose wave-lengths can really be relied upon. I suggest that you start off with Moscow, on 50 metres.

He can readily be identified by the length of his talks, the variety of languages spoken, and a slight "bubble" in the transmission. On my own receiver, with a 100-division dial, he is found on 68 degrees. Now if you listen late at night—unless conditions are very poor—you cannot fail to find W 3 X L, Bound Brook, New Jersey. He is on 46.7 metres, and is generally about the strongest American station to be heard.

Plotting the "Points."

Having located the dial readings for these two (on my set W 3 X L comes on 62 degrees), you will probably be able to find W 8 X K (Pittsburg) in between them. His wave is 48.86 metres, and he occupies the mark of 66 degrees with me. These readings are obtained with a .0001 tuning condenser, and should give you some rough idea of the space you may expect between the stations. If your dial has a 180-degree scale, multiply my readings by nine and divide by five.

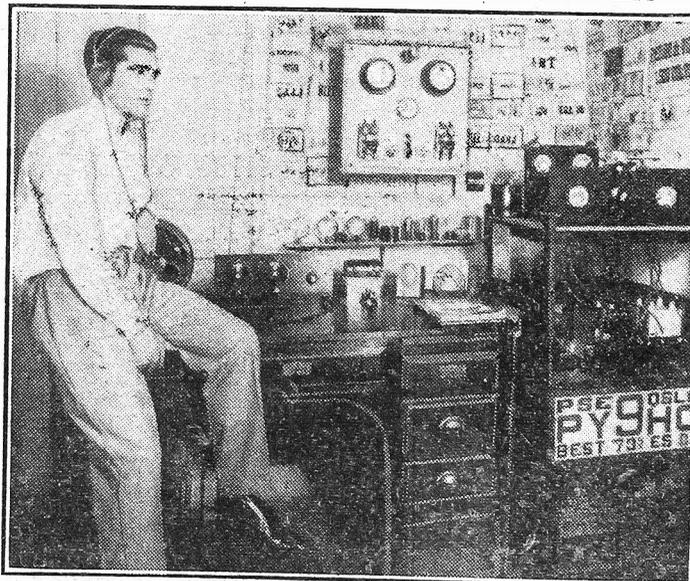
Down towards the bottom of the dial, using the same coil, you ought to find some of the 31-metre stations. Among those I have logged and found correct are: O X Y

(Skamlebaek), on 31.51 metres—18 degrees; W 2 X A F (Schenectady), on 31.48 metres—17 degrees; V K 2 M E (Sydney), on 31.28 metres—15.5 degrees.

The curve, when you have started plotting points from these stations, will be rather devoid of "spots" in the middle, but you should be able to identify amateur transmissions in the 41 to 42-metre-band, which will give you an idea.

If you can read Morse your lot will be much easier. Good "landmark" stations in the 40-metre region are D H E (Nauen)—40.96 metres; U O K (Vienna)—40.6; and F Y A (Pontoise)—40.38 metres.

A SOUTH AMERICAN SHORT-WAVER



A general view of the Brazilian short-wave station, PY9HC, and its successful operator. Note the particularly neat arrangement of the apparatus, which in itself is conducive to good results.

All these three may generally be caught sending slow V's or "ABC" with frequent repetitions of their call-signs. Above 50 metres I am afraid you will have to trust to luck, but if you receive Morse stations and send me a card, via "P.W.", I will try to give you the exact wave-lengths.

Turning now to the smaller coil, we find calibration an easier matter. The obvious station to start on is one in the 25-metre group. For some readers the best will be our own G 5 S W, on 25.53 metres. For

others (G 5 S W not being audible everywhere) Rome will be the man. His wave is 25.4.

Purely for your guidance, I may say that the readings on my particular set are; G 5 S W, 56 degrees; Rome, 55 degrees. Higher up, if your coil will get there, you may find the same 30-metre stations that you have already logged on your larger coil. If that is the case, you will have a nice curve for the one we are dealing with now.

Going down from Rome, you will probably identify amateurs in their band of 20.8 to 21.4 metres. Further down still you should find (if you listen before about 6.30 p.m.) W 2 X A D (Schenectady) on 19.56. Immediately above him is the French station at Pontoise, on 19.68. I find the readings for these two are 17 and 18 degrees respectively. Lower down still is Bandoeng (Java), famous for his Tuesday afternoon concerts, on 15.93 metres. He may, when you read this, have dropped that wave in favour of his other berth on 32 metres odd.

The Value of Accuracy.

If you are fortunate enough to "bag" all the above stations, or most of them, you will probably be surprised at the beautifully regular curves you can draw on squared paper.

I have calibrated my own set in kilocycles, and have a list of commercial C.W. stations with their frequencies. If I hear an unknown man, look up his frequency from my curve, and check in the official list, I can guarantee not to be more than 20 kc. out. And that, in the 20-metre region, represents, I believe, about .03 of a metre!

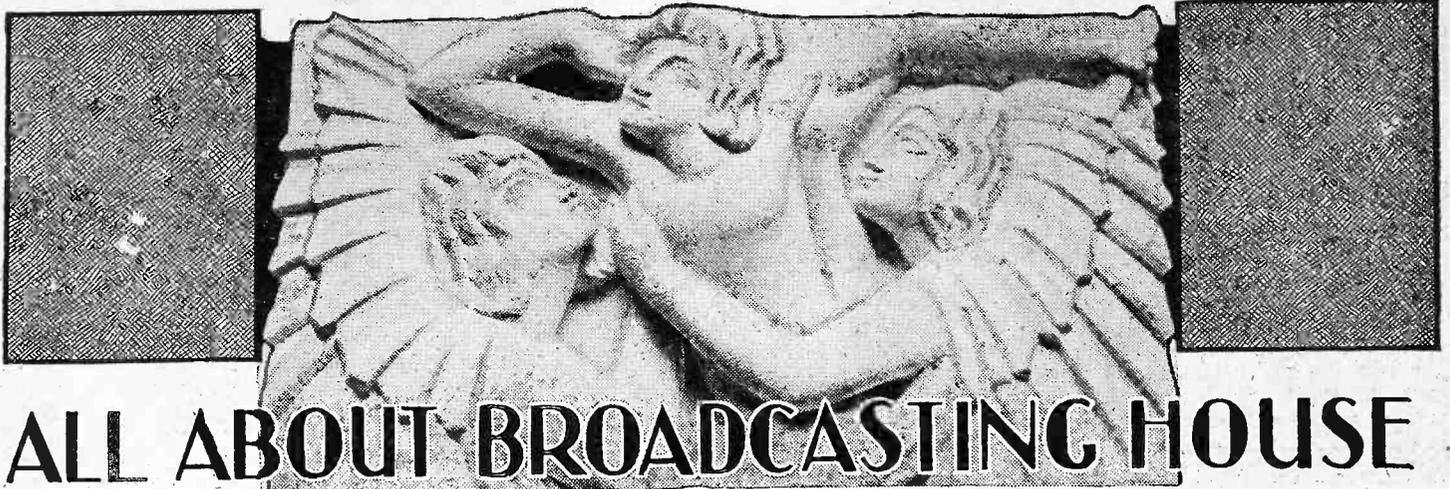
Now for an important point. If you

intend to calibrate your set you must *not* have anything "floppy" about it. Your aerial coupling, for instance, must either be fixed or arranged so that it may be set in a known position. You should always use the same H.T. and L.T. voltages, so that the setting of your reaction condenser will not vary from day to day.

A Useful List.

"Swinging-coil" reaction is taboo unless you are very careful to take all readings when the set is "just" on the oscillation point. I am not trying to state that really accurate calibration is possible to the ordinary man, but it can be done sufficiently well to serve its purpose.

Here are some reliable stations that are nearly always transmitting on C.W., for the benefit of the Morse readers. I am giving their frequencies as well as their wave-lengths. W K Q, 16,000 kc., 18.75 metres. W A Z, 14,920, 20.11 metres. W Q P, 13,900, 21.58 metres. D H A, 11,440, 26.22 metres. D G U, 9,650, 31.1 metres. W E T, 9,470, 31.68 metres. F L E, 7,980, 37.59 metres. W E E, 6,920, 43.35 metres. D G K, 6,680, 44.91 metres. H R B, 6,005, 49.95 metres. W Q N, 5,505, 54.5 metres.



ALL ABOUT BROADCASTING HOUSE

*By the Chief Engineer of the B.B.C. Mr Noel Ashbridge
B.Sc. Lond. AM.I.C.E.*

ON September 28th, 1931, the first detachment of the B.B.C. headquarters staff—to the number of about 150—moved into the new building at Portland Place. Except for a certain amount of painting and decorating, the offices are complete, but some months must elapse before the studios, and the apparatus associated with them, are ready to take over the full load of the double programme service.

Descriptions and diagrams of the general arrangement of the building, showing how the studios are arranged in the central "tower," surrounded by a kind of outer coating of offices, have already appeared in various publications. It is intended, therefore, in this article to describe the technical arrangements which are being made for the actual production and controlling of the programmes.

There are altogether 22 studios of various sizes, ranging from the concert hall, which measures 100 ft. by 45 ft. by 30 ft. high (approximately), to the news studios, which measure 11 ft. by 8 ft. by 8 ft. 6 in. high.

Those Twenty-Two Studios.

The first question which will probably occur to the reader who already has some knowledge of our work is why there are so many studios in the new building, since alternative programmes have been produced for the last two years, using only ten studios? The answer is a simple one, namely, that the two programmes would have been better produced had more and better studios been available.

In fact, for the last year or so the studio accommodation at Savoy Hill has definitely limited programme activity, particularly from the point of view of rehearsals. It is not always realised that far more time is taken up in rehearsing a programme than in actually broadcasting it.

In the vast majority of cases these rehearsals must be done in a studio using the complete studio equipment, that is to say, the microphone and control apparatus which goes with it. Again, very often it is essential to use the same studio for the rehearsal as will be used on the "night,"

An exclusive article in which a great deal of real "inside information" about our broadcasters' new home is interestingly given.

or else one which is exactly similar. This accounts for the 22 studios, which at first sight seems a large number.

Perhaps the best way to describe the electrical equipment which is used for the actual production of a programme is to

begin with a typical studio and trace out what happens "electrically" while a programme is being rehearsed or broadcast. First of all we come to the microphones, and of these there will be a mixture of two main types, namely the well-known carbon granule and the condenser.

Blending the Microphones.

Both carbon and condenser microphones have their own advantages and disadvantages, and we have come to the conclusion that the best policy is to use both. In the case of most of the principal studios there will, in fact, be a choice of microphones, and the more suitable will be chosen, according to the type of programme to be transmitted.

All condenser microphones deliver far less electrical energy than the Reisz carbon type, and for this reason it is practically essential to raise the level of the output before attempting to transmit it any appreciable distance.

Otherwise any slight traces of induction picked up en route would be amplified in the control-room along with the music, and there would be too great a ratio between the unwanted noises and the wanted noises, i.e. the programme.

Therefore, each condenser microphone is provided with an additional amplifier, which raises the level of the music but not the spurious noises. Usually it is contained within the microphone-mounting itself.

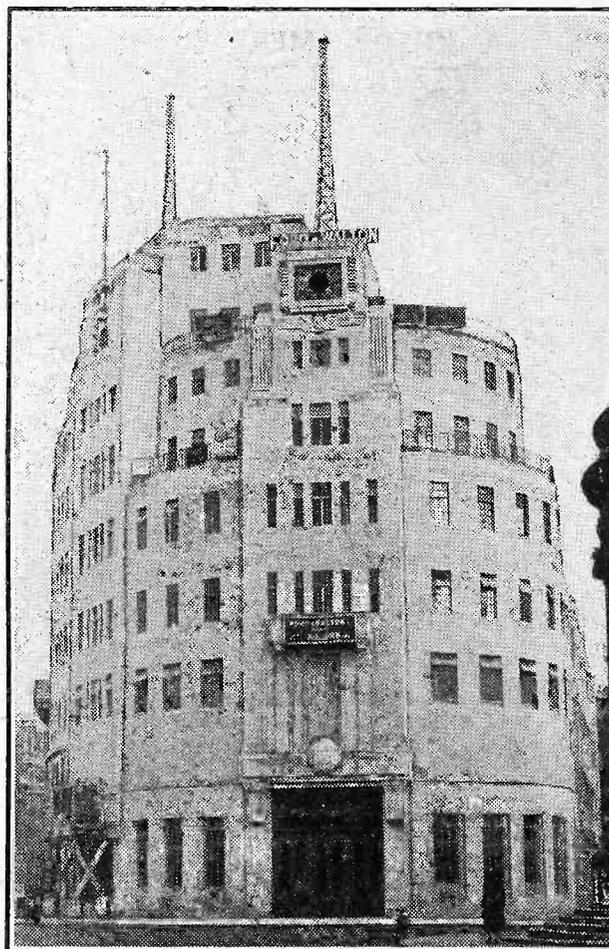
The Light Signals.

In our case it is adjusted to raise the level so that it shall be the same as that given by the Reisz microphone without an amplifier. This gets over the difficulty just referred to and allows the rest of the amplifying chain to be standard for both types.

Of course, in addition to the microphones, each studio is fitted with the usual system of coloured lights for signalling, similar to those at Savoy Hill. That is to say, there is the red light which indicates that the microphone is "energised," and that a programme is being broadcast.

(Continued on next page.)

THE B.B.C.'S NEW HEADQUARTERS



A recent photo of Broadcasting House. Many of its offices are already occupied.

ALL ABOUT BROADCASTING HOUSE

(Continued from previous page.)

The blue light, to indicate that a rehearsal is in progress. A green light for giving cues, and a white light for silently calling the announcer to the telephone.

Adjoining each of the larger studios there are two rooms; one of these is called the Listening Room, and is equipped with a loudspeaker, and a telephone communicating with the control-room. This room is used by the producer or the announcer, to check what is going out, and to balance the performers, that is to say, to fix their positions in relation to each other and to the microphone.

Balancing the Artistes !

It is very desirable to do this by listening to a loudspeaker, and not by headphones. Unfortunately, at Savoy Hill, it is not possible to balance artistes in the studio by means of a loudspeaker without, in most cases, going to a room some distance away

switch gear to enable announcements to be made without the necessity of going into the studio.

There are many advantages in announcing in a separate room, and it has been done at Savoy Hill for the past few years, but most of the Silence Rooms at Savoy Hill are too small, and indifferent quality results, unless the announcer is very skilful in choosing his precise distance from the microphone, and suitably pitching his voice.

Like a Large "L."

The music currents leave the studio by means of plain lead-covered twin cable. This was chosen after careful tests had been carried out to make sure that the lead covering provided sufficient electrical screening.

It was found to compare favourably in this respect with other methods of running cable, and has the additional advantage that it is very convenient to handle when a large number of leads have to be run in one duct.

Cables carrying programme currents are in separate ducts from those carrying currents to signal lamps, etc., in order to minimise the possibility of induction. There is, of course, particular risk of in-

Again, the architectural arrangement of the building made this position more convenient. Although all the apparatus is contained in one large "L" shaped room, electrically it is divided into two sections, a transmission section and a rehearsal section.

There are several advantages in this arrangement; it prevents the risk of the constant switching associated with rehearsals from interfering with the transmitted programme; it allows the staff to concentrate on the transmissions, free from interruptions, and permits the use of simpler apparatus for the control of rehearsals than is necessary for a transmission.

There are six switching and controlling positions in the transmission section and eight for rehearsals, from which it can be inferred that there are usually more rehearsals, auditions, etc., in progress than transmissions.

Sixty-Five Amplifiers.

In addition, there are monitoring positions for the Supervisory Engineer, and "simultaneous broadcast" switching positions for controlling the trunk lines to the various transmitters all over the country. All the switching, monitoring and S.B. positions are in the form of control desks, fitted with the necessary keys, meters, etc., resembling, to some extent, the control desks in large high-tension power stations.

All the apparatus not associated with the switching positions, that is to say, the amplifiers of which there are altogether 65—line terminating apparatus, check receivers, etc., are mounted on vertical racks stretching in a long line almost the whole length of the room. Mounted on these racks, also, is the testing apparatus for the "outside broadcast" and "simultaneous broadcast" Post Office lines.

It would be impossible to describe all the switching operations in detail without writing a long series of articles which would probably be found tedious by most people, but there is one main feature in which the new control apparatus differs fundamentally from that at Savoy Hill, which is, perhaps, of general interest.

At Savoy Hill practically all switching is direct, by means of plugs and jacks or keys, but at Broadcasting House all switching of music circuits will be remotely controlled by relays operated by keys, which are mounted on the control desks.

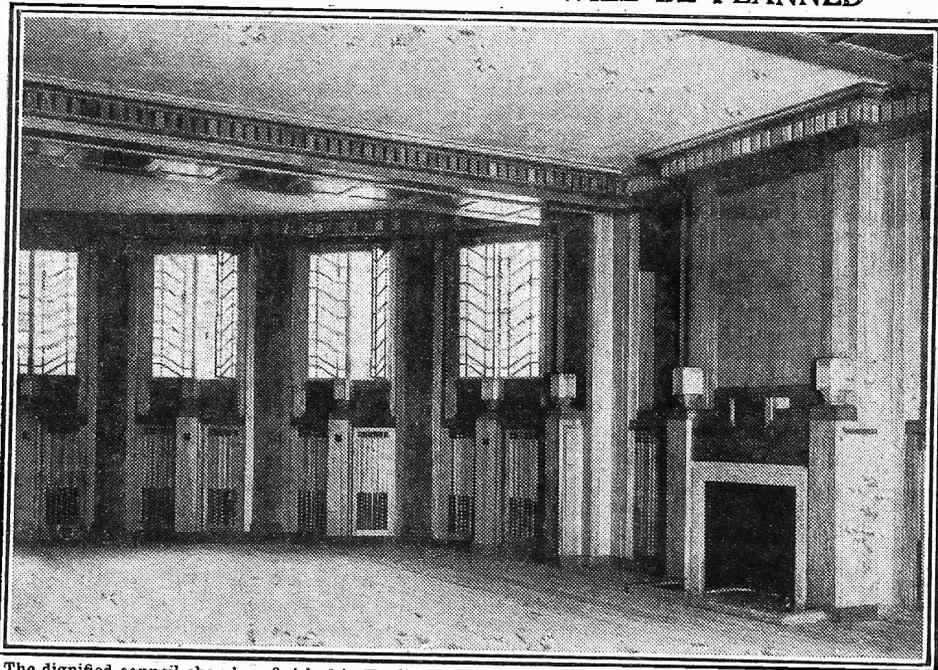
Some Switching.

Thus, all programme wiring is concerned with the racks only, and it is not brought up to the confined space behind the control desks. This was found necessary mainly to avoid crosstalk; since the amount of wiring has been greatly increased by the greater number of studios, and the better switching facilities which are provided.

At Savoy Hill there are far less studios concerned, and in any case the arrangement there has not been found ideal for the greatly increased programme activity which exists to-day. Moreover, the new control-room includes better switching arrangements, allowing greater facilities to be given to the Programme staff during the production of complicated items.

It would have been possible to carry this idea further, and to design the switching on an automatic or semi-automatic principle, using selector apparatus, after the manner of an automatic telephone exchange, but simpler methods were preferred.

WHERE POINTS OF POLICY WILL BE PLANNED



The dignified council chamber, finished in English oak panelling, where the governors will meet in conference.

—a most inconvenient arrangement, but unavoidable owing to lack of space.

All loudspeakers are fitted with a local amplifier, the input to which comes from the control room at headphone strength.

This arrangement is very simple and convenient, and prevents the ever-present danger of crosstalk as a result of having cables running round the building carrying music currents at a high level of strength.

The Silence Rooms.

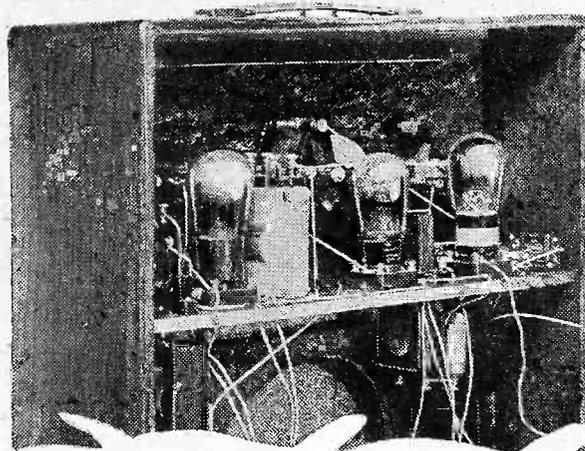
The other room associated with the studio is called the Silence Room, although this is not a particularly apt title. It arose originally from the fact that at Savoy Hill silence cabinets were used similar to those for telephoning in a noisy room.

At Broadcasting House, however, these cabinets have been replaced by small rooms containing a microphone and the necessary

duction from signal light and buzzer circuits owing to the sudden interruptions of the current.

The control-room, or amplifier room, as it is sometimes called, is almost entirely different in general plan from that at Savoy Hill, which was installed about seven years ago. All microphone amplifiers, "B" or variable gain amplifiers and line amplifiers, are contained, together with the switching and monitoring apparatus, in one large room, about 90 ft. long, situated on the eighth floor, that is to say, at the top of the building.

It was placed here rather than in a more central position to keep it as far as possible from the electric motors, transformers, switch gear, etc., associated with the ventilating, power and boiler plant, most of which is accommodated on the basement and sub-basement floors.



ADAPTING YOUR PORTABLE

BY D. J. H. T. ROBERTS

How to extend the reception range of a portable set by adding an outside aerial, the employment of external batteries and other useful hints concerning the indoor use of portable sets.

MANY of us get into the habit of regarding the portable set as a receiver only suited to summer outdoor use; for indoor use we have a more standard type of receiver, generally with aerial and earth, and with a generous supply of H.T. and L.T. power. It does not perhaps occur to us that the portable can perfectly well be adapted for indoor use during the winter months, and that the modifications necessary to convert it into an excellent indoor receiver are comparatively slight.

If your portable set is true to its name it will contain the H.T. and L.T. batteries tucked away inside the cabinet, and as these are the principal items of weight in the set it follows that the portable receiver has to

receivers during the past two or three years have been made possible mainly by the introduction of highly efficient H.F. and L.F. amplifying valves; in particular, of course, I refer to the screened-grid for H.F. amplification and the pentode for the output side. Many portable sets make use of a circuit embodying simply an H.F. screened-grid amplifier, a detector, and a pentode output valve; and for a three-valve set this arrangement gives overall results which would have been considered impossible not more than five years ago.

Considerations of Batteries.

At the same time, efficient though the portable may be, we have to consider that the merit of the set is the performance which it gives *having regard to the limitations* imposed upon the size, weight, and available power. When it comes to an indoor receiver, where these considerations are of minor importance, we are naturally able to get better *actual* results, although possibly the relative efficiency of the indoor receiver may be less than that of the portable.

In making arrangements to press the portable into service as an indoor receiver, the first consideration is to substitute adequate L.T. and H.T. supply for the very limited supply which is provided by the internal batteries of the set itself. This can be done by removing the batteries from the portable cabinet and running the leads to a row of terminals on an ebonite terminal strip secured to the cabinet itself.

Use of a Mains Unit.

The terminals should, of course, be clearly marked, and all you have to do is to connect your external low-tension battery to the L.T. terminals on the strip and your H.T. battery (or unit) to the H.T. terminals, when the set will be supplied with power from the external source precisely as it was formerly from the internal source. Incidentally, it is worth while to consider providing one or two extra tapings for the H.T. on your terminal strip, so that you can supply the proper voltage to the screening grid, the detector, and the power valve or valves.

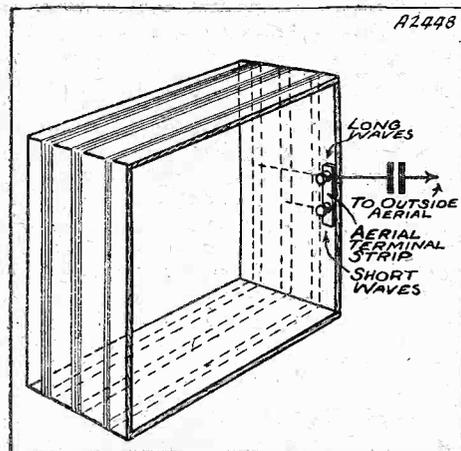
A further advantage of the use of an external H.T. source is that you can now supply a higher voltage, say 150 volts or 180 volts, whereas previously you were probably limited to, say 100 volts.

Extra H.T.

The extra H.T. voltage which you can now use will in itself probably put up the efficiency of the receiver noticeably. Of course, if the circuit was not previously arranged for separate voltages to the different stages it will be necessary to make a slight modification of the connections inside; if you do not want to interfere with the circuit arrangements, however, you may be content to use the same voltage of high tension as before, but from a battery of greater capacity or from a mains unit.

In passing, I should mention that you will probably find it unnecessary to supply a fresh grid-bias battery, as the grid-bias battery in the receiver will most likely do all that you require. If, however, you are going in for considerably increased H.T.

ADDING AN AERIAL



When making provision for connecting an outside aerial, it may be necessary to provide separate terminals for long and short waves; also, a series condenser is desirable.

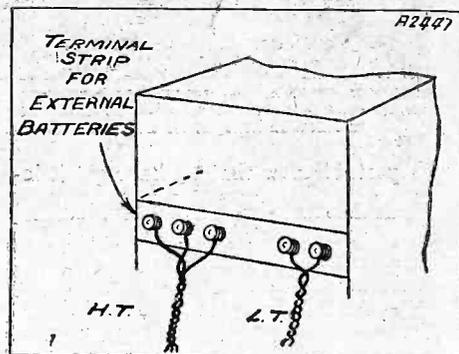
be designed for strict economy in current if we are to secure the all-important economy of weight and bulk.

If the Portable is Put Away.

Now, if you put away your portable set during the winter months it is certain that the high-tension batteries will be useless when you come to get out the set next season, and it is ten to one that the low-tension accumulator will be ruined by neglect unless you have the foresight to remove it from the cabinet and keep it in use for some other purpose.

The great improvements in portable

USING SEPARATE BATTERIES



Showing how a terminal strip can be fixed to the outside of the receiver carrying the extra battery terminals.

voltages, then it is wise to fit also a grid-bias battery giving a higher voltage.

Now I would like to say a word or two about the use of a mains unit for supplying the H.T. instead of a battery. If the unit is an A.C. one, you should try to keep this well away from the set, as the circuit of the portable receiver might pick up the hum of the A.C. mains.

If the supply is D.C. and assuming that the D.C. ripple is not very pronounced, the danger of interference is much less, and I know of many cases where a portable set has been modified in this way and the D.C. unit has successfully been included in the cabinet. It is a good plan, however,

(Continued on next page.)

ADAPTING YOUR PORTABLE

(Continued from previous page.)

to enclose the unit totally in a metal case, if it is not already so enclosed.

As regards the low-tension supply, it may be that the accumulator battery of the portable set will serve the purpose, particularly if you have means for charging this from time to time. This is important, because the L.T. battery of the portable will be of small capacity and so will want charging fairly frequently.

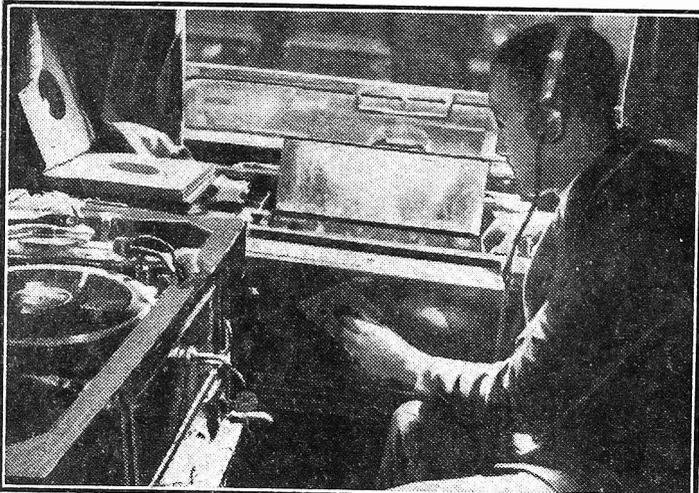
Adding Aerial and Earth.

Having satisfactorily settled the question of substituting a generous power supply for the restricted supply previously contained within the cabinet, we come to the question of aerial and earth arrangements, because here again we can probably effect an important improvement in the efficiency

You will see that the two or three windings of the aerial form a coil which is magnetically coupled to the frame aerial inside. A neater way of arranging the coupling is to wind the extra turn upon the frame itself. I should perhaps mention that if you couple the external aerial to the frame aerial in this way you will destroy the directional properties of the receiver, because the external aerial has not directional properties like the frame aerial of the set, and it is the external aerial which is now taking charge of the situation.

At first sight you might think this was a disadvantage, but if you consider it for a moment you will see that it is in some ways actually an advantage. It is true that you lose the directional property as an aid to selectivity, but on the other hand, when using the portable in a room you are quite likely to find that the setting for direction involves the front of the instrument being turned in some impossible position where you can't get at it. So you see that by the use of the extra aerial you are free to place the set in any position in the room and in any direction that you may wish.

TRAIN RADIO IN GERMANY



An engineer operating the receiver on a radio-equipped train in Germany. A special compartment is set aside for the installation which enables passengers to listen on headphones while the train is speeding along.

of the portable now that we have got it indoors.

The provision of an earth is a comparatively simple matter and all you have to do is to connect an earthed lead to the negative wiring of the H.T. or L.T. circuit. I should say in passing that this simple arrangement of earth connection is possible in the majority of portable circuits, although not in all.

Two or Three Turns of Wire.

There are certain portable sets using what one may call a type of reflex circuit in which the connecting of an earth lead in this way would cause the set to become unstable.

The adding of an external aerial to the receiver requires a little consideration, and you may use either a loose coupling or a direct coupling. The loose coupling arrangement may be carried out in its simplest form by bringing a lead from the aerial and winding it two or three times round the outside of the cabinet of the portable and then carrying it on to earth, the winding outside the cabinet being, of course, as near as possible in proximity to the frame aerial inside the cabinet.

Directly-Coupled.

If the extra aerial is direct coupled, you should include a fixed or semi-fixed condenser of fairly low capacity, generally about .0003 mfd. or less. It will be necessary to find the best position for this direct coupling, and you can do this by means of a fine point, such as a needle connected by a flexible wire to one side of the condenser just mentioned above (the other side of the condenser being connected to the extra aerial and the low-tension wiring of the set being connected to earth), the needle being used to prod the

frame aerial of the set at different points.

The needle must be inserted into the frame aerial and the hand removed whilst each test is being made. When the best position is found, the extra aerial is soldered to the frame aerial at this point. If separate windings are used on the frame aerial for two ranges of wavelengths, it will be necessary to have two tappings and two leads so that the requisite parts of each of the two frame aerial windings may be used alternately.

A final point is that if a loudspeaker is contained in the portable set, this is probably of a very light construction, and so you may get better results by providing for the connection of an external speaker instead.

CRYSTAL-SET SELECTIVITY

SOME PRACTICAL HINTS.

It is a mistake to suppose that crystal sets cannot be made much more selective without rewiring, for there are several easy methods of doing this.

A wave-trap placed between the aerial and aerial terminal is one way of improving crystal-set selectivity, whilst another method is to use a capacity-coupled aerial tuning circuit.

It is useless to couple an extra circuit for selectivity to a crystal set's tuned circuit by means of a large fixed condenser, as such a coupling capacity has to be quite low.

Failing a neutrodyne type condenser, a 6-in. or so length of good quality flexible wire may be employed for selective capacity coupling. (One of the twin wires acts as one side of the condenser and the other wire acts as the other, and, of course, these two must not be in metallic contact at their free ends.)

THOSE WOBBLY VALVES

A reader passes on a useful tip about repairing valves with loose bulbs.

A VALVE TIP.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue of "P.W." I notice "Charlie" (Headingley) refers to a defect in one of his valves, namely, that the glass bulb and base have lost their grip of each other and the bulb now wobbles. If you consider the following information worth while perhaps you will convey it to him (and others so placed) through the medium of your esteemed publication.

A defect of this kind which came under my notice recently was treated in the manner outlined below with complete success:

Clean the line of contact round the bulb and base with a cloth moistened with warm water. Next squeeze a train of Seccotine along this path and, if necessary, press it in the junction with a pointed quill or match. Leave for a day or two to dry.

If this simple operation is carried out with care a first-class repair will result and, possibly, save the price of a new valve.

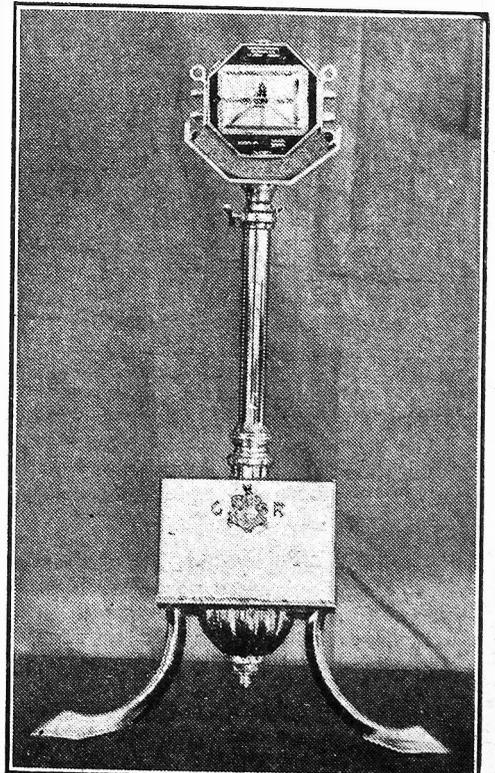
Good luck to "P.W.," my favourite weekly.

Yours sincerely,

W. H. CLARK.

Lancaster.

THE ROYAL MICROPHONE



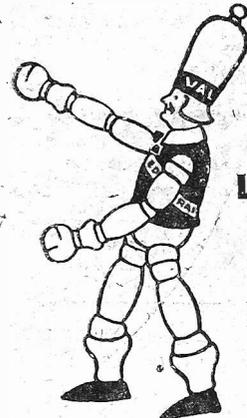
This is the microphone and stand which is now used when the King broadcasts. It is made of gold and silver.

REASONS WHY YOU SHOULD USE MAZDA INDIRECTLY HEATED RECTIFIERS



MAZDA INDIRECTLY HEATED RECTIFIERS

TYPE	PRICE
Full wave	
UU.30/250 - - -	12/6
UU.2 - - - - -	15/-
UU.60/250 - - -	15/-



LOOK FOR "EDDY" IN YOUR DEALER'S WINDOW

If you are using rectifying valves in your A.C. mains receiver there is a definite advantage to be gained by using **Mazda indirectly heated Rectifying Valves.** You are safeguarding the condensers, chokes and valves of your receiver. When you switch on an ordinary rectifying valve, operating temperature is reached considerably before that of the receiving valves. A surge is caused and damage is frequently done.

Mazda indirectly heated Rectifiers heat up with the receiving valves, and so afford you absolute protection. Mazda valves are 100% British made and designed by British engineers.

THE AMAZING

MAZDA THE BRITISH VALVES

THE EDISON SWAN ELECTRIC CO. LTD.
RADIO DIVISION:
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EDISWAN RADIO

PERFECT PAIR WAY
TO PERFECT RADIO



SPECIFIED
for the
COSMIC III

Wander plugs in the PERTRIX H.T.? PERTRIX L.T. connected up all right? Then switch on. You never realised radio could be so good, did you? That's the best of getting the Perfect Pair—they work in perfect harmony with each other and with your set, giving you just Perfect Radio. And they last longer, too . . . infinitely longer.

Made by BRITANNIA BATTERIES, Limited
at Redditch who also make:

Batteries for Central Stations • Batteries for Country House Lighting • Emergency and Stand-by Lighting Batteries for Theatres, Cinemas, Hospitals, etc. • Batteries for the Starting and Lighting, and Lighting and Ignition of Motor Cars, Motor Cycles, Buses and Coaches • Batteries for Electric Vehicles, Trucks, Locomotives, Ships and Yachts • The only Nickel-Iron Alkaline Battery on sale in Britain that is entirely made in this country.

PERTRIX
SUPER LIFE
DRY BATTERIES
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THE PERFECT PAIR FOR PERFECT RADIO

Advert. of BRITANNIA BATTERIES LTD., 233, Shaftesbury Avenue, London, W.C.2
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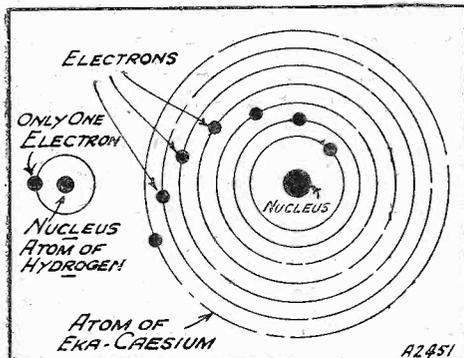
ANY new discovery in physics is of interest to the wireless community because wireless has now become such an important branch of physical science. The report, therefore, that Dr. Papish, of Cornell University, has discovered a new element has caused some excitement, for it is always possible that some such discovery may lead to one of those sudden and startling advances which have been such a feature of applied science during the last few decades.

The Fundamental Substances.

The elements, to speak of them in a strictly scientific manner, are the foundation stones of the universe, from them were built the earth, the moon, and stars, and possibly all life; they are the fundamental substances of existence which defy further analysis.

It is generally believed that there are ninety-two of these elements altogether.

ALL BASED ON ELECTRONS



Elements differ from one another in the number of electrons they have and hold, but each is a little universe of its own with central "sun," and "planet" (hydrogen) or system of "planets."

but this is by no means certain, and there may be more. Each element is different from its fellow. For instance, hydrogen is known as Element No. 1. This is because an atom of hydrogen has one electron revolving or oscillating (we do not quite know which) round a central nucleus.

Element No. 2, which is helium, has two electrons in motion round its central nucleus, and Element No. 3, lithium, has three electrons, and so on up to Element

Science is continually providing us with new wonders, and here is an account of a new element, "Number 87," which has great possibilities.

By G. H. DALY.

No. 92, uranium, which is the heaviest atom of all, and which has a large number of electrons revolving round a very complex nucleus.

The newly discovered element is known as No. 87, and it has been named eka-caesium, and will have eighty-seven electrons inside one atom of it, if the theory is correct. This new element may be said to be of special interest because the element just below it—i.e. No. 86—is the gas radon, and the element immediately above it, No. 88, is radium. Both of these elements are radio-active—that is to say, they both throw off electrons of their own free will, so it follows that eka-caesium must also radiate electrons voluntarily.

Radiation of Electrons.

In wireless we are always on the look-out for anything which will radiate electrons easily, because the throwing off of electrons by a hot valve filament has brought wireless communication to its present high position amongst applied sciences. But, unfortunately, before the valve filament will throw off electrons it has to be heated by a battery.

Yet, if we could find a powerful and cheap element which radiates a sufficient quantity of electrons of its own free will, then no battery would be required to heat the valve filament, and we should be able to use a battery-less set. Radium is too rare and expensive, radon is a gas; so that, maybe, eka-caesium will help us in this direction. Other radio-active substances do not for the most part throw off sufficient electrons to enable enough current to pass from the filament to the plate.

It is too early yet to say anything about eka-caesium, as almost nothing is known about it except its bare existence, but one never knows, and very startling developments have arisen from what at the time appeared to be unimportant discoveries—wireless itself, for instance.

Then, again, if we are ever going to discover an everlasting battery it will be radio-activity which will make this possible, and it will be just our luck if the radio-active discovery which makes possible the battery-less valve also provides us with an everlasting battery. In science things happen like that.

The next step, of course, is to create wireless waves without the aid of any outside electrical power such as steam- or water-driven dynamos and generators. This could easily be accomplished by a powerful radio-active substance or a combination of radio-active substances, and if this is possible, some day we may have wireless waves of this description. But we might go on for ever where the possibilities of radio-activity are concerned, hence the excitement when a new radio-active element is discovered, and if eka-caesium merely helps us to create even better valve filaments, then its discovery has not been in vain, from the wireless point of view.

PRAISE FOR THE "CLEAR CUT."

A Reader's Report.

The Editor, POPULAR WIRELESS.
Dear Sir,—I feel I must write and express my opinion on your "Clear-Cut Cone" speaker, the construction of which was published in "P.W." some time ago. The speech on the "C.C." speaker is better than any cone speaker which I have heard—quite clear and crisp and without the usual "boom" which is so common with most cone speakers. The clear speech and such good music reproduction is no doubt assisted by the "Pop-Vox" set which I use (my latest "P.W." set, from the only journal in my opinion to turn out first-class sets). Whether the double cone makes the difference I cannot say, but when compared with other home-made cone speakers, the volume on the "Clear-Cut" is from 25 per cent to 50 per cent louder.

My cabinet is home-made, 18 in. by 16 in., and the front baffle 1 in. thick 13-ply, and I find that the thick wood improves the tone. The front is then covered with a cut-out fret.

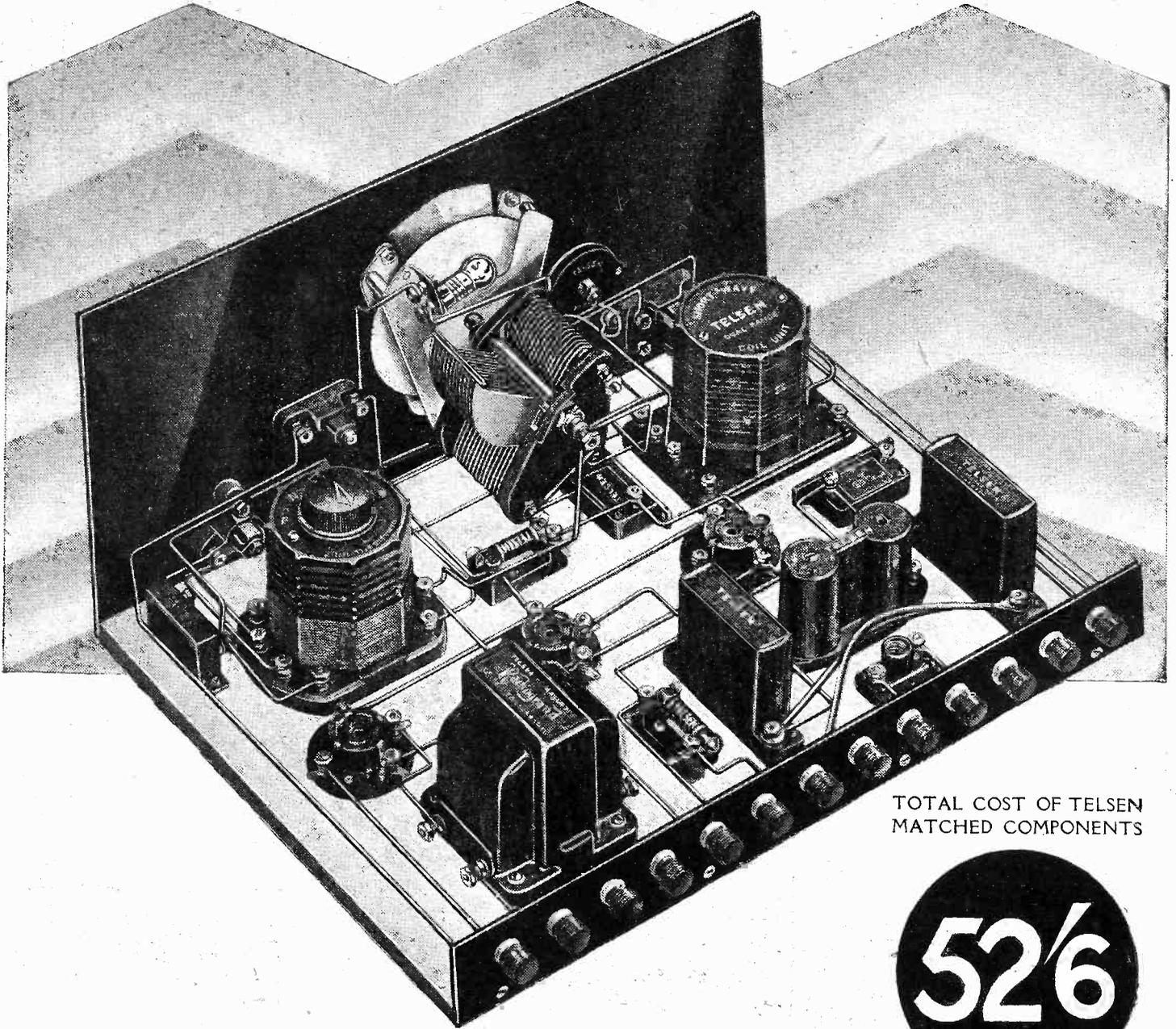
It is only fair that I should mention that the unit used is the Ormond, and I don't think I could get any better results from a unit costing three or four times the amount.

When the price is compared with others, I think both you and the Ormond Engineering Co. are worthy of congratulation. My speaker has cost me 15s. complete.

Yours sincerely,
H. R. PRESS.

Grimsby, Lincs.

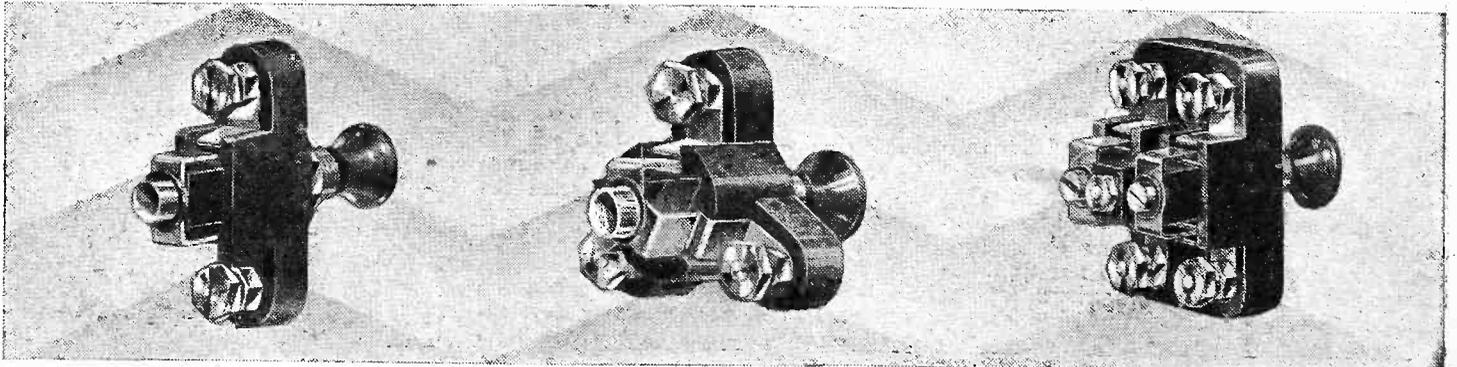
TELSEN TRIPLE THREE



TOTAL COST OF TELSEN
MATCHED COMPONENTS

52¹/₆

SHORT, MEDIUM, AND LONG WAVE RECEPTION

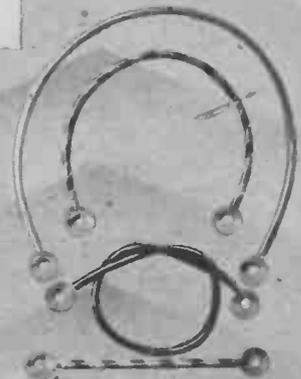
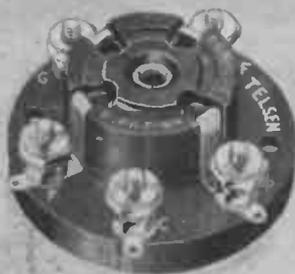
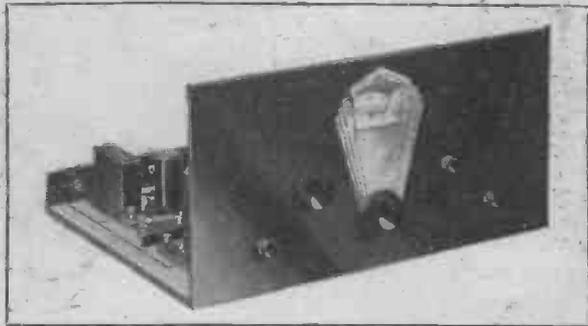


TELSEN

TRIPLE THREE RECEIVER LIST OF COMPONENTS

	s.	d.
3 Valve Holders	1	6
1 .0001-mfd. Mica Condenser		6
1 .0003-mfd. Mica Condenser		6
1 .001-mfd. Mica Condenser		6
1 Grid Leak, 2 meg.		9
1 Grid Leak, 1 meg.		9
2 Grid Leak Holders	1	0
1 Aerial Coil with Selectivity Adjustment	7	6
1 Dual Range S.W. Coil Unit	4	6
1 .0005-mfd. Logarithmic Variable Condenser	4	6
1 .0003-mfd. Reaction Condenser	2	0
1 2-point Switch	1	0
1 3-point Switch	1	3
1 4-point Switch	1	6
1 Radiogrand Transformer	8	6
1 50,000-ohm Spaghetti Resistance	1	6
1 25,000-ohm Spaghetti Resistance	1	0
1 .01-mfd. Mansbridge Condenser	1	6
1 1-mfd. Mansbridge Condenser	2	3
1 Binocular H.F. Choke	5	0
1 Fuse Holder		6
1 Illuminated Disc Drive	4	6
	52	6

Full wiring chart, building and operating instructions are included in the new issue of the Telsen Radiomag. price 3d. at your dealer's, or, if you have any difficulty in obtaining a copy, write direct enclosing 4d. in stamps to "Radiomag," Telsen Electric Company, Limited, Aston, Birmingham.



NOTES FROM THE NORTH

The latest news about reception conditions and programme amenities in the North and also some comments on recent events and future progress.

Contributed by **OUR SPECIAL CORRESPONDENT.**

SINCE the North Regional station was opened last summer, increases of power by Continental stations have seriously reduced the area in which really first-class reception may be obtained. A friend in the Isle of Man, which is 100 miles from Moorside Edge, tells me that a receiver with band-pass tuning will generally cope with the trouble on North Regional, but North National is badly jammed.

There are a large number of people whose receivers fail to separate North Regional and Prague. Similar trouble exists in North Wales, Durham, and other outlying parts of the North Region.

The Scottish Regional.

We await improved conditions with but faint hope. In the meantime, test transmissions have started from Falkirk, and one cannot ignore the effect which will be produced later in this year when two more high-power transmissions commence from the Scottish Regional station. The present tests from Falkirk are conducted by the B.B.C. 500-watt mobile transmitter, which radiates an unmodulated signal and is experimenting with different aerial designs.

Television tests on the London-Moorside Edgo land-line have also been continuing, but considerable technical difficulties have yet to be overcome. There is no immediate prospect of television from the North Regional station, but the project is by no means ruled out.

Activity on the Northern front during February and March seems to be mainly notable for extensions of the B.B.C.'s entrenchments in Yorkshire. Such performers as the Arthur Kaye Orchestra at Huddersfield (which has over 100 members), and the orchestra and organ of the New Victoria Cinema, Bradford, have been brought on the air, the cinema taking its place as a weekly midday feature in the London, North and Midland Regional programmes, where it has displaced the Trocadero Orchestra. Here are some other Yorkshire events:

February 26th (Friday).—Concert by Huddersfield Choral Society, from Town Hall, Huddersfield.

March 2nd (Wednesday).—Leeds Choral Union in a concert version of "Carmen."

March 5th (Saturday).—Leeds Symphony Orchestra.

March 12th (Saturday).—Holme Valley Male Voice Choir, from Town Hall, Huddersfield.

Outside Broadcasts.

Another link between the B.B.C. and Yorkshire is forged by the appointment of Dr. Bairstow, organist of York Minster, as a member of the B.B.C.'s Music Advisory Committee.

The fortnight season by the Covent Garden Opera Co. at Halifax from February 22nd to March 25th will not include any broadcasting, however.

I understand that this is due to the fact that the company goes on to Manchester afterwards and the B.B.C. preferred to wait

for the Manchester visit, as the handling of an outside broadcast is simpler from a Manchester theatre than from Halifax. The relay will be a part of "Faust," and will be given on March 10th from the North Regional and London Regional transmitters.

The frequency of outside broadcasts at the beginning of the year seemed to cut down studio activity in the North Region. Some of the O.B.'s were most elaborate. Eleven microphones were used for the broadcast of pantomime from the Palace Theatre, Manchester, and nine for that from the Theatre Royal, Leeds.

Friendly Rivalry.

What the North Region can do when it concentrates its efforts in the studios was shown by the success of the programme in commemoration of the birth of Lewis Carroll which, alone among B.B.C. stations, North Regional gave to its listeners.

The regular fortnightly studio concerts by the Yorkshire Mummies and the Lancashire Mummies cannot be credited to the B.B.C., as both these concert parties are organised by outside producers.

The rivalry of these two parties bids fair

in the North Regional armour, and it is significant that although auditions for vocalists and instrumentalists at the Manchester, Newcastle and Leeds studios were suspended for three months from February 1st, this ban does not apply to bands, choirs, and artistes seeking engagements in revue, variety, and dramatic programmes. There are plenty of vocalists and instrumentalists of good class.

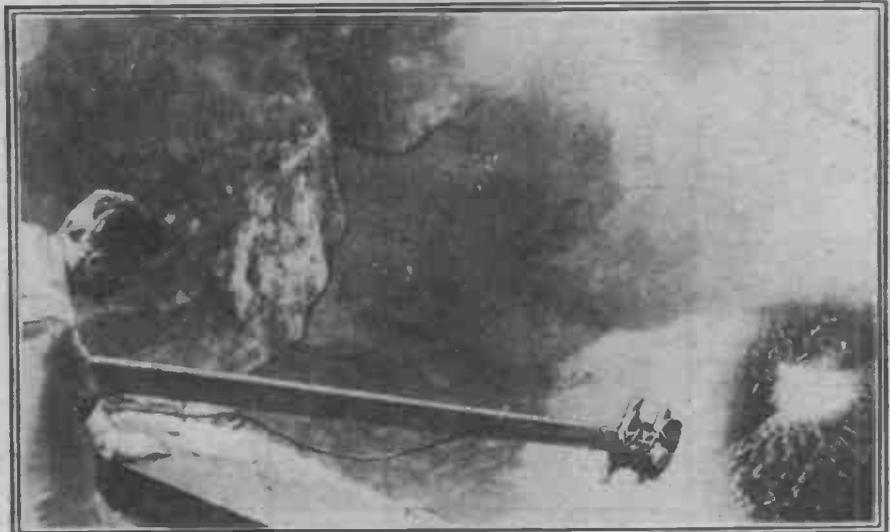
The New Leeds Studios.

The B.B.C. lists are overcrowded. Bands and choirs in Yorkshire are being engaged in readiness for use after the opening of the new Leeds studios, which will be able to accommodate these large combinations, but poor progress has been made with the alterations, and it seems certain that the studios will not be ready for opening in March.

In both the North of England and Scotland there is a tendency for the B.B.C. to go to the man-in-the-street (and to the shepherd from his hills) for radio programme material. North Regional has an excellent series of talks called "We Northerners," in which a Yorkshire miner, a Lakeland sheep farmer, and other workers came to the microphone and told us about their day's work.

The B.B.C. in Scotland has followed the same idea—a country carrier was heard in the Burns' Night programme, and the feature called "In the Highlands, in the Country Places," on February 13th, included a conversation between a shepherd (the genuine article) and a farmer (also genuine). There is no doubt that as a change from the

THE LATEST IN OUTSIDE BROADCASTS



A microphone tied to the end of a long post was used to pick up the noise of a volcano in eruption, for broadcasting via United States stations.

to be one of the most advantageous occurrences in Northern broadcasting, and the pitting of one organisation against another might well be copied by the B.B.C. in other departments of the programmes.

One hopes during the spring and summer to see both outside broadcasting and studio programmes developed on equally determined lines by the North Regional staff. An interesting possibility is the broadcasting during the summer of the Eastbourne Municipal Orchestra, which has been engaged to play at Harrogate. Nothing has been decided, but this is under consideration.

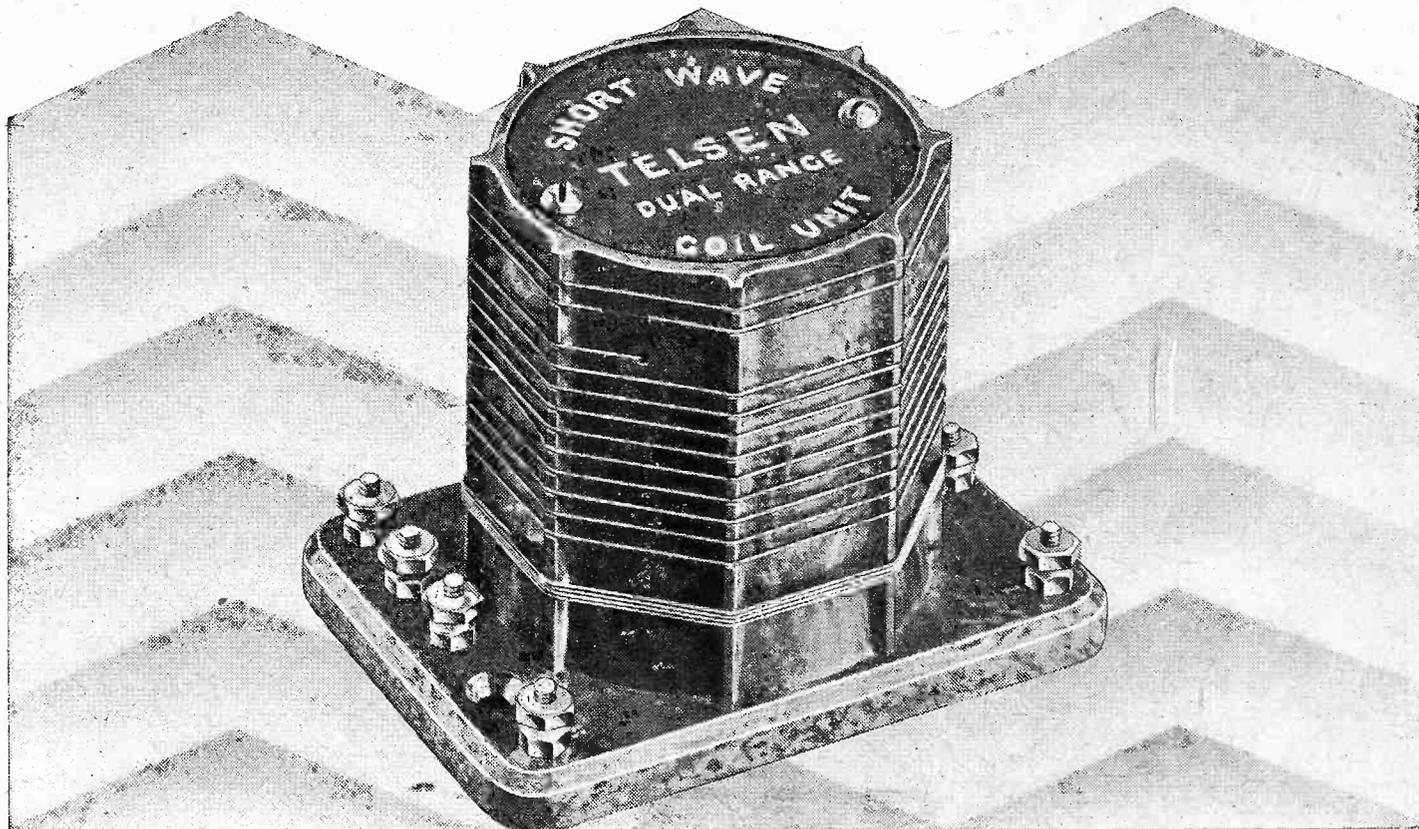
Vaudeville continues to be a weak point

Oxford, Cambridge and Cockney accent which almost monopolises the National programme, Northern listeners appreciate the sound of their own dialects in the Regional programmes.

The "We Northerners" talks from Manchester are being followed by a series on "Housing Problems of the Industrial North" given by experts.

The new City Hall, in erection at Sheffield, is being wired for broadcasting, and a B.B.C. engineer from Manchester was invited to inspect the arrangements. That the architects of such a building should take the possibility of future broadcasts into serious consideration is significant.

TELSEN SHORT-WAVE COIL



TELSEN COMBINED DUAL-RANGE SHORT-WAVE COIL UNIT

The Telsen Combined Dual-range Short-wave Coil Unit for the first time brings the construction of short-wave receivers into line with the simplicity of modern practice. When tuned by a .00025 condenser a wave range of 20 to 75 metres can be covered by the operation of a switch as in ordinary broadcast practice. No coil changing is necessary and no other coils are required, as the unit incorporates windings for aerial, tuning, and reaction circuits. The coil is also suitable for use with sets covering all wave-bands with a .0005 tuning condenser. In this case the dual-range feature is not employed.

WAVE RANGE OF 20-75 METRES

In the Telsen Short-Wave Coil advertisement in last week's "Popular Wireless" it was inadvertently stated that the Telsen Short-wave Coil covered a wave range of 220-75 metres. This should have read 20-75 metres.

The Telsen Short-wave Coil adds the Short Waves without coil changing

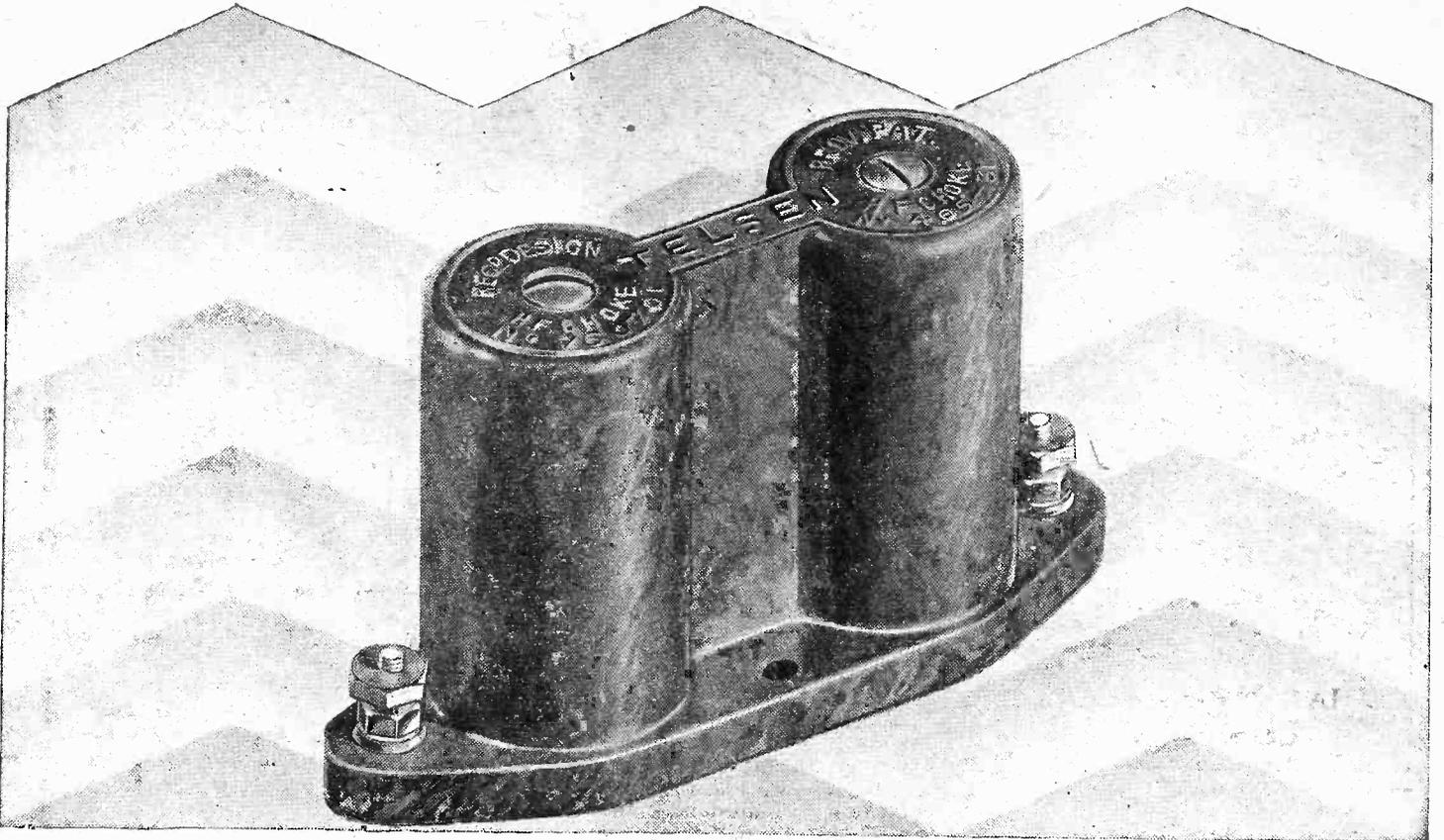


Specified for The Telsen "Triple" 3. See pages 1264, 1265.

TELSEN

**100% ALL-BRITISH
SHORT-WAVE COMPONENTS**

TELSEN BINOCULAR CHOKE



TELSEN BINOCULAR H.F. CHOKE

The Telsen Binocular H.F. Choke is efficient on all wavelengths down to 20 metres, thus enabling the short-wave band as well as the medium- and long-wave broadcast bands to be worked with the same H.F. Choke. Whatever the circuit or waveband the Telsen Binocular H.F. Choke is the safe choice for highest efficiency.

Telsen Binocular H.F. Choke - Price 5/-

5/-

*Specified for The Telsen Triple 3.
See pages 1264-1265.*

The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN

**100% ALL-BRITISH
SHORT-WAVE COMPONENTS**

CAPT. ECKERSLEY'S QUERY CORNER



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

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

Using Two H.F. Stages on the Short Waves.

L. E. S. (Manningtree).—"I have for some time been experimenting with an H.F. detector and two L.F. short-wave receiver. Encouraged by the excellent results I obtained, I tried a further stage of H.F. amplification, and now find that I am unable to receive short-wave stations as well as I did before.

"A friend tells me that two H.F. stages are very unsatisfactory on these short wavelengths, and that I cannot expect to get any amplification at all. Will you please tell me whether this is true?"

No; there's no fundamental reason at all why you shouldn't have three or four

which is used to couple the aerial to the grid end of the first tuning coil, makes a considerable difference to signal strength and selectivity."

A very pretty question. May I without seeming to be patronising congratulate the questioner—he has obviously thought very wisely and well.

Let's draw the two circuits a bit diagrammatically, pull them to pieces and see what they mean. I think we may say that each can be represented as I show them. (1) is the aerial circuit; (2) the same redrawn; (3) the valve circuit, and (4) valve circuit redrawn.

Now it can be shown that the aerial circuit is in fact a series resonant circuit. R_a is relatively small and C_a resonates with L which is made to "look big" by the connection of C in parallel. The impedance of the whole combination from the input to C_a to earth is small. This doesn't matter, because the aerial has a low internal impedance, and can work into a low external impedance.

The volts over L are much greater than E , the applied volts. But the valve circuit is different, because the valve looks like a generative of very high internal impedances which prevents the series resonance effect taking place.

Thus, C_v merely becomes a (vertically) added impedance in series with R_v , and does not act to alter or to create a resonant circuit with an apparently increased L . It would have to be very small indeed to compare with R_v , and even if it was, the effects it produced would not be important.

It's a bit difficult to do anything but write down the explanation as I see it. I fear it's a little complex and doesn't submit to a very simple analysis, and one clear to these without a basic knowledge of A.C.

But once more, congratulations to the questioner who spotted it!

Non-Inductive Condensers.

N. K. L. (Leeds).—"Recently I have noticed a number of adverts recommending the use of non-inductive fixed condensers in H.F. decoupling circuits. I am some-

what curious to know in what manner the use of this type of condenser is preferable to the normal paper type condenser, as surely the amount of inductive properties possessed by condensers of the latter type is very small."

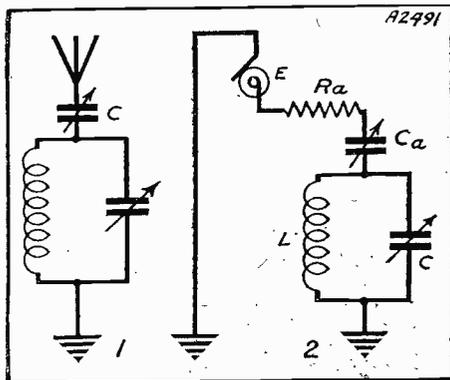
No; that's just it, it isn't small! After all, you are dealing with such high frequencies that a few turns of wire represent a substantial impedance. After all, 20 microhenries, about one-tenth of the inductance of a medium-wave coil, has an impedance of over 100 ohms at a frequency of a million (wave-length, 300 metres).

Then, again, there is the possibility that a paper condenser may introduce serious losses, and so spuriously increase its impedance; you may decouple H.F. by putting a rejector path which is of thousands of ohms, but if the acceptor path is hundreds of ohms even, you don't get true decoupling. And decoupling has got to be pretty thorough when you are dealing with very "high lift" valves.

Decoupling Resistances.

B. N. (Claygate).—"In a receiver which I intend building in the near future I should like to incorporate decoupling devices in

THAT SERIES AERIAL CONDENSER



To the left (1) is a common aerial circuit arrangement, and beside it (2) the equivalent circuit by which its behaviour can best be understood.

or five or six high-frequency magnifications, using very short waves. But it's by no means easy to get stability.

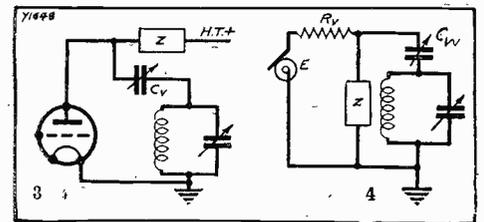
You could not use resistance or choke, or any aperiodic units, in the chain. Each coupling unit would have to be resonant in some way.

Thus I should look into the question of stability mostly, and be sure you are not trying to get an aperiodic coupling when a tuned coupling is essential.

Have You Noticed This?

U. K. B. (Cardiff).—"I have recently noticed that altering the value of the condenser which is used to couple the anode of an H.F. valve and the grid end of the following coil in a tuned grid parallel-feed circuit makes no noticeable difference to performance. I am at a loss to understand this, as altering the value of a condenser,

COUPLING CONDENSERS



This sketch illustrates the interesting question raised by U. K. B. (Cardiff) to which Capt. Eckersley replies on this page.

the H.T. leads to each of the two S.G. valves. I notice that generally resistances of fairly low value are used for this purpose, but as I have several good H.F. chokes on hand I should like to know whether these could be used."

I prefer resistances for several reasons. They have a constant value over the range of frequencies, they do not tend to introduce retro-action by stray couplings, they will not resonate with their own self-capacity, nor have they large self-capacity if properly designed—all of which nasty things may happen with air core chokes. On the whole, and because you cannot guarantee immunity from these troubles, use resistance and forswear reactance.

ONLY IN "P.W."

can you read Capt. Eckersley's replies to listeners' own problems.

AND REMEMBER—

Captain Eckersley's technical articles appear only in

"POPULAR WIRELESS" and "MODERN WIRELESS"

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



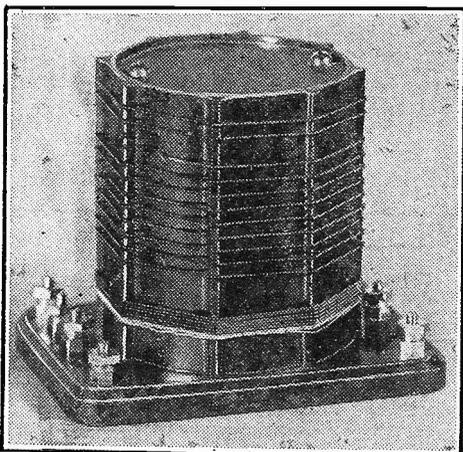
THE TELSEN SHORT-WAVE COIL.

ONE of the first firms to produce a short-wave coil especially for the "Cosmic" Three was Messrs. Telsen, Ltd., whose enterprise in keeping abreast of developments in home-constructor radio will have been evident to every "P.W." reader.

But this is, of course, sound business acumen, for the home-constructor army is an ever-growing one. And now that another definite lead is registered over the "commercial" set, the men who "roll their own" will be joined by tens of thousands of recruits.

"You know," said a prominent trade personality to me the other day, "the old saying 'What the constructor does to-day the set-maker does one year hence' is as true in 1932 as ever it was."

TELSEN "COSMIC" COIL



The Telsen short-wave coil which was primarily designed especially for the "P.W." "Cosmic" Three set.

And it certainly is. At the present moment the commercial set covers two broadcast wave-bands; the "P.W." "Cosmic" Three now makes it possible for the home-constructor inexpensively to assemble a THREE-BAND instrument of unprecedented simplicity and effectiveness.

The inevitable result will be a horde of "commercial" sets for "all-wave" reception in the lists and catalogues of 1933. That isn't a prophecy of the pier-head variety, but scientific prediction!

But to return to the Telsen "Cosmic" Short-Wave Coil which I have been asked to test and report upon. As to the testing, well that has been unusually severe for the simple reason that a Telsen Short-

Wave coil figures in our finished model of the "Cosmic" Three.

Readers will therefore not require me to emphasise the fact that we find the Telsen Short-Wave coil perfectly satisfactory!

I should mention before I close that it is very well made, and mechanically is as good as it is electrically.

It should be noted that Messrs. Telsen have made a slight departure from our original specification to enable them to use the coil for other purposes.

This in no way interferes with its operation in the "Cosmic"—quite the reverse, in fact!

A FINE MAINS UNIT.

I wonder how many radio enthusiasts having A.C. mains fully realise their good fortune? Not only does a mains supply of H.T. and L.T. reduce maintenance to an almost negligible degree, but it is almost fantastically inexpensive.

Using dry batteries and an accumulator which has to be periodically re-charged, it may cost about three pounds per annum to keep the loudspeaker of a three-valve set going for approximately three hours a day.

But taking advantage of A.C. mains with electricity at 3d. per unit, you could do the same for the comparatively minute cost of two shillings and sixpence—one twenty-fourth of the above-mentioned sum!

That is if you used, for example, the Ekco K.25 A.C. mains unit. This attractive device is a combined H.T. and trickle-charging unit and here is, in brief, its specification.

It employs a metal rectifier and gives up to 25 milliamperes H.T. current. There are two voltage tappings giving 50/80 and 120/150 volts respectively.

A special feature of this new Ekco unit is that each tapping is adjustable in accordance with a simple High, Medium and Low scheme, so that individual receivers can be suited to their best advantage.

The trickle-charging provides for 2, 4 or 6 volts at a $\frac{1}{2}$ -ampere current rating.

And the price of the K.25 is £5 7s. 6d., which, in all the circumstances, appears to me to be very reasonable indeed.

The unit is constructed on approved "safety-first" lines and you can see at a glance that it is the result of knowledgeable craftsmanship.

On test we found the K.25 right up to Ekco standard, which, as readers will know, is a high one. The outputs were O.K., and the smoothing of a high-grade character.

The K.25 is a unit all A.C. mains users desirous of H.T. of an order coming within the above specification would be well-advised to give serious consideration.

A DESCRIPTIVE LEAFLET.

The leaflet describing the Celestion P.P.M. Loudspeakers is particularly well

produced and brings out the "selling" points of these instruments in a most effective manner. It should prove of considerable interest to both dealers and customers.

WATMEL CIRCUIT SHEETS.

These are designed to assist retailers by providing a representative selection of circuits together with all relevant technical data, emphasis being laid upon those Watmel components which are suitable for the various arrangements.

FERRANTI PRICE REDUCTIONS.

Ferranti, Ltd., announce considerable price reductions in all their standard wire-wound resistances in consequence of the

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

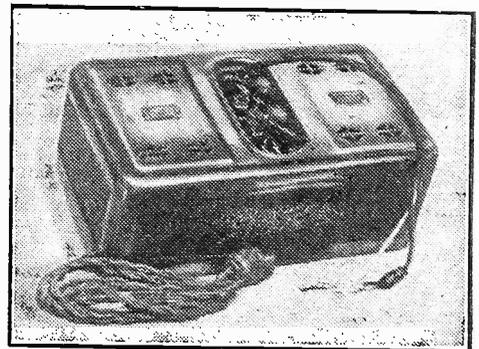
We should like to point out that we prefer to receive production samples picked from stock, and that we cannot in any circumstances undertake to return them, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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

lower cost of certain raw materials and the introduction of special new plant. In future all these resistances will be sold at one standard price, namely 3s. each without holder, and 4s. each with holder.

Constructors should note that Ferranti, Ltd., are producing a constructor's A.C. Mains Band-Pass Screened-Grid Three set which is to be sold in the form of a complete kit, although individual parts will also be available.

A FINE MAINS UNIT

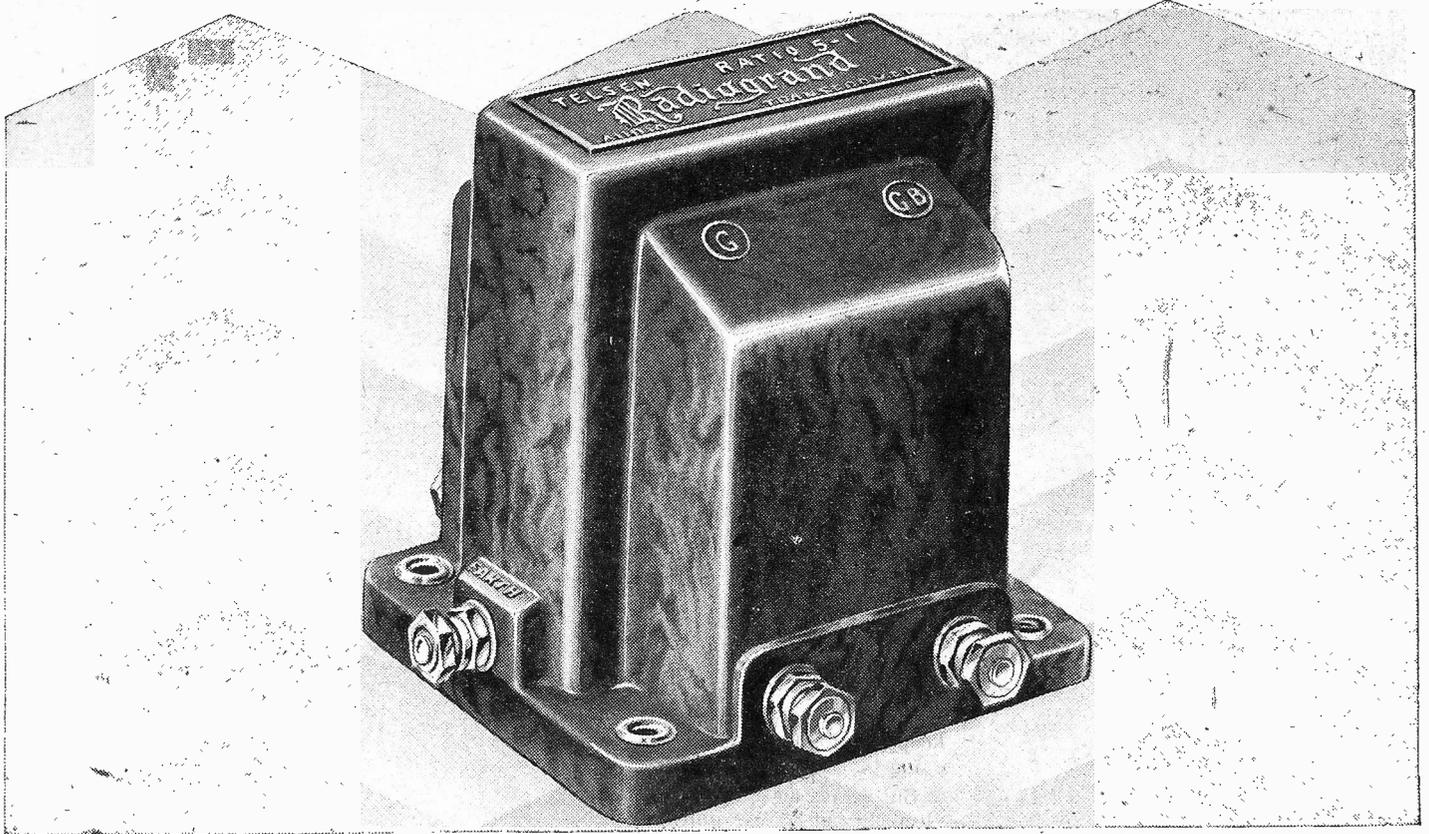


The Ekco K.25 is a combined H.T. and trickle-charging unit for A.C. Mains.

RADIO CABINETS, LTD.

I learn that this enterprising Walsall concern, which makes cabinets for Telsen and other well-known sets, is progressing by leaps and bounds. It started only three years ago as a one-man business but grew apace. Although it now has a large factory, a search is in progress for a site to accommodate even more extensive works and further modern plant. It is, indeed, most refreshing to hear of such booming business.

TELSEN RADIOGRAND TRANSFORMER



TELSEN L.F. TRANSFORMERS

Telsen Transformers have achieved fame in the radio world on account of the high standard of their quality and performance. Designed and built on the soundest engineering principles, these robust, full-size Transformers will give not only efficient but enduring service.

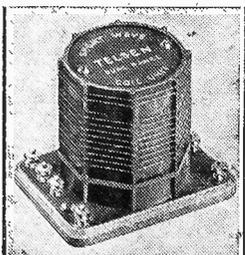
L.F. TRANSFORMERS

- "Ace" Transformer, ratios 3-1, 5-1 - Price 5/6
- "Radiogrand" Transformer, ratios 3-1, 5-1 - Price 8/6
- "Radiogrand" 7-1 Transformer - - Price 12/6
- "Radiogrand" 1.75-1 Transformer - - Price 12/6



*Specified for the Telsen Triple 3.
See pages 1264 and 1265.*

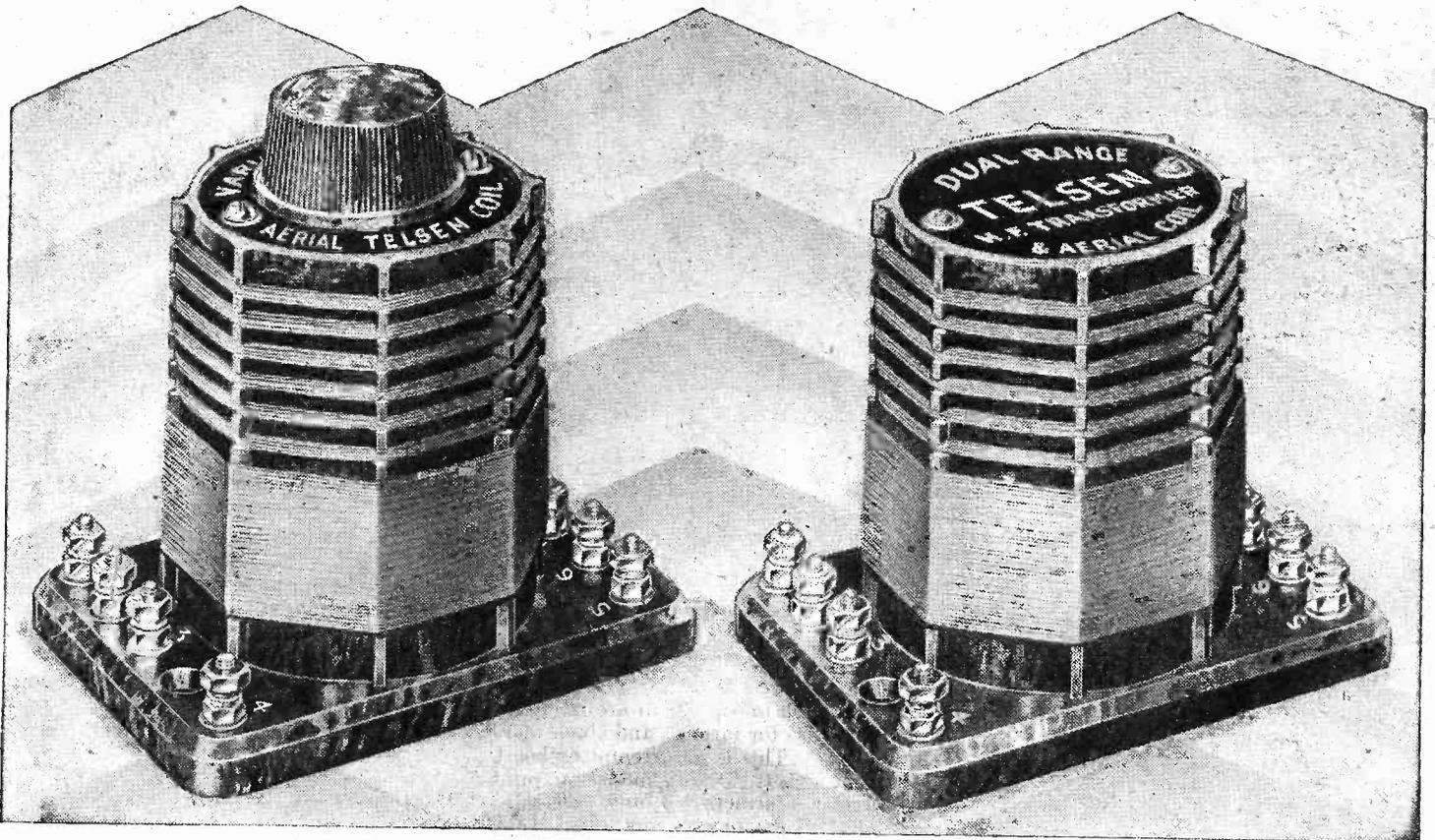
The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN

100% ALL-BRITISH SHORT-WAVE COMPONENTS

TELSEN AERIAL COILS



SELECTIVITY . . .

TELSEN DUAL RANGE AERIAL COIL

Specified for the Telsens Triple 3. See pages 1264, 1265. This incorporates a variable selectivity device. Aerial coupling is reduced to the degree demanded by local conditions—local station interference is simply and efficiently avoided. Independent primary and secondary windings make it suitable for any position in the circuit. Wave-changing is simplicity itself—by a switch mounted on the panel. Price 7/6

H.F. TRANSFORMER & AERIAL COIL

is primarily designed for H.F. amplification in conjunction with screen-grid valves. It is arranged so that it can be connected as a tuned-grid or tuned-anode coil, or as an H.F. transformer. It also makes a highly-efficient aerial coil where the adjustable selectivity feature is not required. A reaction winding is incorporated. Price 5/6

7/6
5/6

The Telsens Short-wave Coil adds the Short Waves without coil changing



TELSEN

100% ALL-BRITISH SHORT-WAVE COMPONENTS



ON THE OTHER SIDE

A TALK WITH A RUSSIAN LISTENER

With this article commences an original and important new series designed authentically to describe radio conditions in other countries. You will be given first-hand information from listeners of various nationalities concerning their "home" radio and what they themselves think of it—which is a vastly different thing from the superficial descriptions of the usual outside observer.

WHEN I came back from Berlin, one of the first radio men I met in London was a Russian friend of mine, a Smolensk manufacturer in rather a big way, who was over here studying tariffs for business—and wireless for pleasure!

He had been over here for three months, so I had no need to tell him about the B.B.C. Instead, I asked him about Russia.

"Why are there so many stations?" I asked.

"Stantziya?" he echoed. "There aren't many, really. In the early days there were one or two private broadcasting stations, but expense rather than Soviet law compelled them to shut down.

Controlled by the Soviet.

"Now, let me tell you, the Soviet Union runs all the stations, and even the new Trades Union station is indirectly under the control of the Soviet. There is a very—what you say?—highbrow department known as the Kommissariat of Posts and Telegraphs. It is much more military than your British Post Office ever knew how to be.

"At the beginning of the Soviet Union it took charge of all the means of communication in Russia; and Radio naturally came under this heading.

"Then the Soviet expressed the desire for broadcasting to put out educational stuff, and propaganda, and the Posts and Telegraphs authorities realised that they would have to hire out broadcasting to other interests.

"That's where we came in. The Trades Unions in each centre were asked to make up their programmes. A telephone link was provided between each studio and the transmitter. Once upon a time the old P.T.T. 720-metres station was the only one available.

"If you could realise how much education is needed by some of our peasants you would realise that there was a big excuse for our Trades Unions stations using 165 kilowatts to cover an immense area."

"But you don't have much music?" I asked.

"As a matter of fact, Soviet propaganda, news and lectures, make up practically the

whole of the daily programme. What little music there is, is given very much on the lines of your Foundations of Music series, some of which I have heard from the B.B.C. There is always something educational behind it, you see."

"And news, I suppose?"

"Little International News."

"Broadcast news is not, in our country, what you know it to be. There are extensive weather reports for farmers and stock market bulletins. This is an attempt to boost up agriculture in the Union, and in the country, where the farmers are only half educated and where newspapers often take days to arrive at their destination, you see what a boon it is to get these reports from the Moscow market centre.

English talks to which a good many British listeners tune on the long waves."

"But we think you have too many stations," I suggested.

"It is probably true," he said. "that, including all the relays, especially the relays in the Vladivostok area, there are forty-eight stations actually working. Some of these are so low-powered, though, that they could hardly be heard in England; and many of the smaller ones will be put on a common wave-length during the next seven or eight months."

Many Radio Journals.

"What are all these Russian wireless papers about?" I inquired. "We sometimes get them over here—full of quaint pictures."

"The so-called wireless papers are, as you will see if you can understand Russian, mostly programme sheets with additional articles on education. That is why there are so many wireless journals. They almost take the place of newspapers in country districts.

"There is one big wireless paper called (in English) 'The Pioneer.' That is a programme sheet and a reprint of talks on Communist problems. There is a special radio paper for farmers, too. In that there are market reports and agricultural hints.

"These papers get most of their material from Moscow. In many cases some of the sheets are printed in Moscow and sent down to the Regional centres where the programme material is inserted.

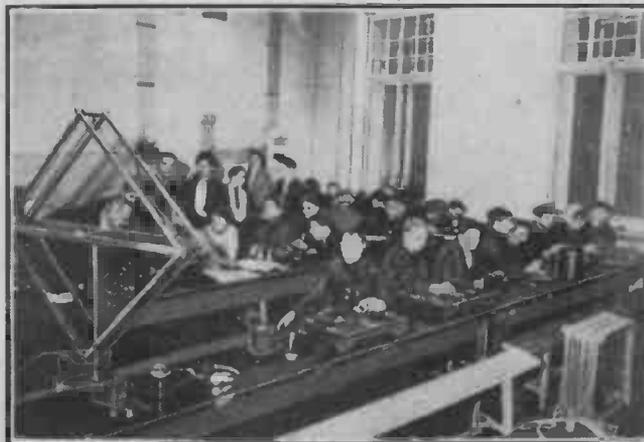
"So important are these papers to the people that the newspapers often have to copy some of the talks and hints given in the wireless journals, and these latter are more important than newspapers; the farmers are beginning to realise that the news in their newspapers is not only censored, but 'canned.'"

"Your stations shut early," I remarked.

"As a matter of fact stations do not shut

(Continued on next page.)

TEACHING RADIO IN MOSCOW



Radio plays an important part in the life of the Russian people, especially in the case of those who live away from the cities. Evening classes and listening posts are organised at all the large centres, and this photograph shows a group of students at work in one of the schools.

"News is composed of 90 per cent of news about trade. There is little international news, for the country people do not want it.

"There is one large news agency, Tass, which is really a branch of the Union and disseminates its news under Government control.

"Tass provides all the bulletins for Moscow, and Tass officials make out the

A TALK WITH A RUSSIAN LISTENER

(Continued from previous page.)

down early, although owing to the differences of time, they appear to do so. Midnight in Moscow is only 10 p.m. Greenwich Mean Time.

"There is no regular broadcasting in the morning, except for occasional talks and weather bulletins. Most of the educational material is given in the early evening, when people go straight from their factories and offices to listening centres.

Local "Listening Centres"

"In the country districts people do not own sets, but go to listening centres or to evening classes where there is a wireless set working."

"Why do your stations work with such huge power?" I asked. "There is a lot of

stations. They are not all on the long waves, although it is commonly supposed that all our stations work on about 1,000 metres.

A Special Receiver

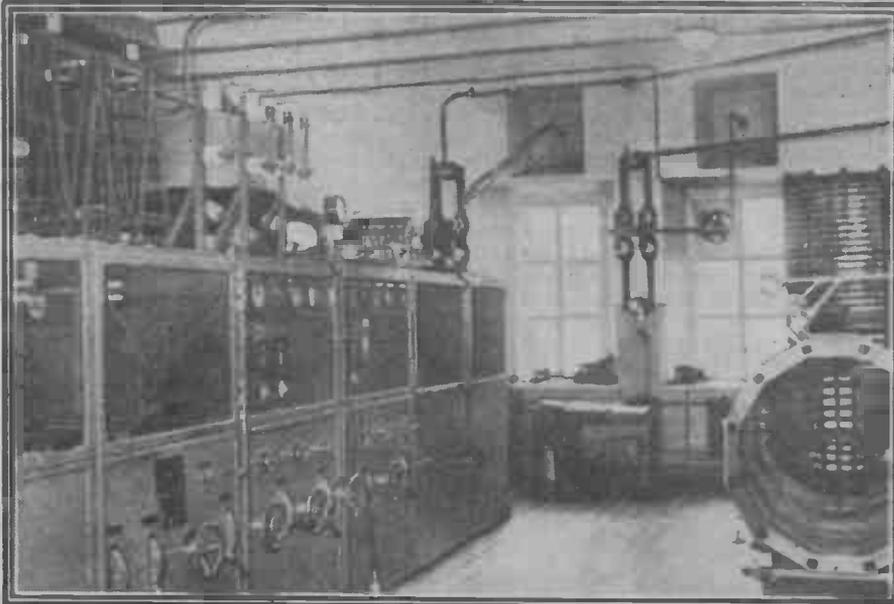
"The Soviet officials, who have issued a special type of receiver for educational centres, designed for long-wave reception, did this because they found that long waves are more reliable, just as is the case with your 5 X X.

"Six of the leading high-power stations are on a thousand metres and above, three are on the 900-metre mark, and only one, which you British listeners have probably never heard, is below 500 metres.

"The six main long-wave stations are Leningrad, Kiev and Tiflis; Leningrad is a 100-kilowatt, the other three stations are in Moscow.

"There is the old Moscow Popoff station, the new Trades Union station, which is now working with 165 kilowatts, and the Moscow Komintern 100-kilowatt station. The Trades Union station is only used for propaganda and seldom puts out any music.

DESIGNED AND BUILT BY RUSSIAN LABOUR



This colossal radio station is situated near Moscow, and was built entirely from materials manufactured in Russia, and erected by Russian workmen. It is used for telegraphic communication outside the Union, and puts out an aerial power of about 40 k.w. The huge tuning coils can be seen to the right.

bad feeling because Russia didn't join in any of the Geneva plans."

"We have been held up as the cause of a lot of trouble in European broadcasting, because we do not belong to the International Union at Geneva. Well, that may be so, but Geneva never seemed to appreciate the fact that Russia needed a large number of stations for propaganda.

"She is not interested in ordinary broadcasting and therefore morally feels outside the scope of the U.I.R. She did agree to abide by certain decisions of the Geneva Conference, but as Rome and Prague have produced such dismal failures in the way of wave-length schemes, Russia cannot be blamed for keeping clear of the chaos!

"As a matter of fact, there are not half so many stations in Russia as many British listeners suppose: in fact there are not half enough considering the immense population of Russian peasants. There are ten chief

"Alma-Ata is on 967.7 metres and Kharkov is just below on 937 metres. This station is known in the programme sheets as R W 4. It is becoming fashionable to call stations by their Soviet code numbers! Kharkov also has the transmitter just mentioned on 426 metres.

"What about the relays?" I asked.

Relying on "Radio Links"

"In certain districts of the Union there are relay stations which take the Moscow programmes. As a good many of these are radio relays—that is, they take the Moscow station by an ordinary set, and relay it on a different wavelength, it is obviously impossible to keep all the relay stations on the same wavelength as the central station.

"Which is the best station you have heard since you have been over here?" I inquired.

"I have listened often to the Moscow

USSR. You can easily recognise it: It starts up with the call 'Shooshaite govoret Moskva, radio stantziya imeni Kominterna! Odnovremennno rabotayoot radio-stantzii v gorodakh...' ('Listen, Moscow speaking...!') and works on 1,481 metres."

A LEAD-IN TUBE TIP

How to improve the efficiency of your set.

IN the whole of the British Isles there are well over four and a half million wireless sets, and of this huge number the majority probably use outside aerials. When this type of aerial is used it is essential to employ some kind of lead-in device, and it is a little tip about improving the efficiency of this part of a wireless installation that I am now going to give you.

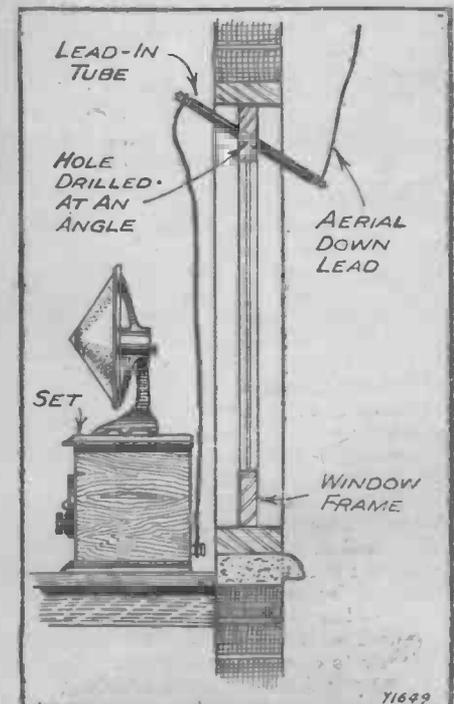
The weak spot in all these lead-in gadgets is that unless great care is taken when fixing them, they let in the rain, which at the best of times is very annoying. I am referring to the type of lead-in tube which necessitates a hole being drilled through the wood framework round a window.

Well Worth Trying

If you look at the accompanying sketch you'll see illustrated a scheme which I have found extremely effective. Instead of the hole being drilled horizontally through the window frame, it is cut at a slight angle, so that the outdoor end is a little lower than the end inside the room.

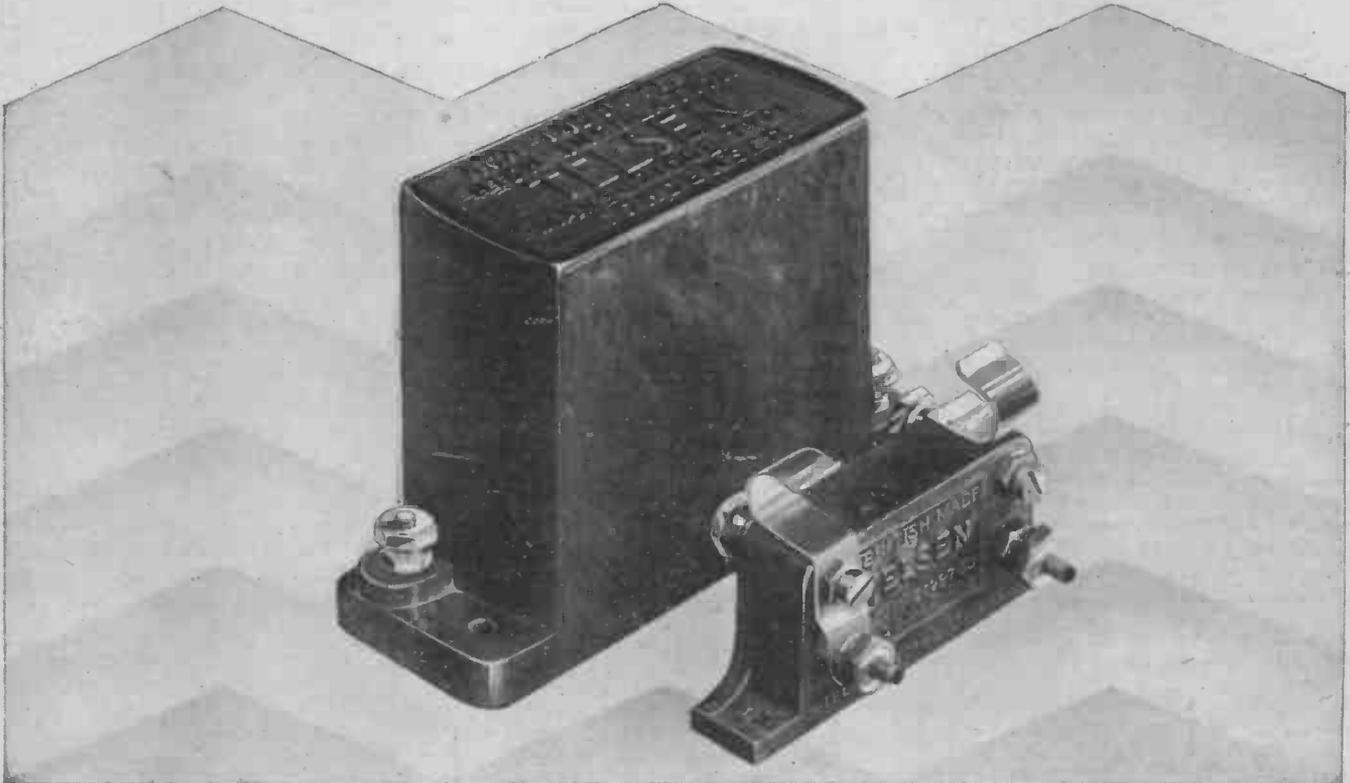
The result of this arrangement is that any rain that is driven into the hole round the lead-in tube runs out again immediately, owing to the angle at which the hole is cut. It is a very simple tip, but nevertheless remarkably effective.

KEEPING OUT THE WET



If the lead-in tube hole is drilled at an angle as illustrated above, you will have no more trouble with rain finding its way into the room.

TELSEN CONDENSERS



TELSEN CONDENSERS

MANSBRIDGE TYPE CONDENSERS

The preliminary research, the most modern plant in the world, the finest raw materials, the latest methods of manufacture, and the final test, all combine to give Telsen Mansbridge Type Condensers a high insulation through years of service with freedom from breakdown. The type of construction employed makes them genuinely non-inductive.

FIXED MICA CONDENSERS

(Pro. Pat. No. 20287/30)

Telsen Fixed Condensers are made in capacities from .0001 mfd. to .002 mfd. They can be mounted upright or flat, and up to .0003 mfd. Telsen Fixed Condensers are supplied complete with patent grid-leak clips to facilitate series or parallel connections.

The Telsen Short-wave Coil adds the Short Waves without coil changing



*Specified for the Telsen Triple 3.
See pages 1264-1265.*

TELSEN

**100% ALL-BRITISH
SHORT-WAVE COMPONENTS**

THERE are still no signs of any falling off in long-distance reception; in fact, during the past week or two conditions have been superlatively good and there is every indication that they will continue to be so for some little while.

I wrote a week or two ago that one could safely prophesy a record spring and summer for the reception of foreign stations. I based this statement mainly on the fact that so many of them could be received now in broad daylight with quite modest apparatus.

Power on the Increase.

There is, though, another factor, which will have a big effect upon reception later in the year. Many stations, which we already hear well, will shortly be increasing their power.

It will, for instance, not be long before Radio-Paris conducts the whole of his broadcasting service with 80 kilowatts behind it, whilst Huizen will soon have more than three times his present output power. Another old friend likely to become an all-the-year-rounder is Budapest.

In the past this station has given mag-

STATIONS WORTH HEARING

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

nificent reception during the darker months and has then disappeared altogether for weeks on end. This will certainly not be the case when his power goes up to 100 kilowatts.

Nor, I imagine, will Vienna desert us in the summer time when his new station, of the same rating as Budapest's, is ready. The top of the broadcast band will, in fact, be a very happy hunting ground, for Munich is also in for a forty-fold increase in power.

Daylight Reception.

Many readers have commented on the wonderful daylight reception recently obtainable from Leipzig. If he could manage these results with 2 kilowatts, what will he be like with 120? And how about Hamburg with 60 kw., Breslau with the same, and Milan and Hilversum with 50-kilowatts apiece!

Don't forget, too, that the French re-

gional provides for ten 60-kilowatt stations (Lille, Paris P T T, Rennes, Strasbourg, Bordeaux, Limoges, Lyons, Toulouse, Marseilles and Nice), and one of 20 kilowatts—Grenoble.

Among the privately owned stations, Toulouse will possess two high-

powered transmitters (P T T and Midi); Lyons will have La Goua as well as the P T T and Fécamp, though officially shown as having a rating of 1 kilowatt, is unquestionably using many times this power.

Three "Hunting Grounds."

At the present time there are three very happy hunting grounds for long-distance men on the medium wave-band. The first of these extends from 441 to 550 metres and includes Rome, Beromunster, Langenberg, Prague, Florence, Brussels No. 1, Vienna and Budapest. The second lies between 322 and 408 metres.

This includes Goteborg, Breslau, Milan, Brussels No. 2, Brno, Strasbourg, Hamburg, Lwow, Toulouse, Frankfurt and Katowice. The third patch extends from 227 to 253. In this region are Cologne, Nurnburg, Trieste and Gleiwitz.

SINCE readers' logs for the Competition still seem to be arriving apace, and I did not fix a "last date," I must postpone the results once more. Next week, however, I hope to publish them, even if logs continue to pour in!

I seem, by the way, to have established my reputation as a wizard. Not only were the two days before the Competition very dull (as far as reception conditions were concerned), but the entire week following was downright bad! And in the middle of it all were the twenty-four hours appointed for "P.W." readers to listen-in, when there were excellent conditions for every part of the world.

A Chance of a Lifetime.

Several of the entrants in the "amateur" section reported signals from all continents and upwards of forty countries. I have an idea (but only an idea!) that the winner of that section might hail from Cheshire. But more of that later.

The first half of the "International Good-Will Tests," organised by the American Radio Relay League, takes place in February, from the 21st to the 26th. These few days will offer unparalleled opportunities for logging DX stations, since the transmitting and receiving periods have been so arranged that large areas will be "silent" while the distant stations are "vocal."

In this connection I am asked to mention that the American station W9GV in Chicago will be transmitting continuously with automatic gear throughout the four-hour transmitting periods each day, and

SHORT-WAVE NOTES



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

By W. L. S.

will be very glad of reports from all and sundry. The wave-length will be in the 20-metre amateur band, and the address is W9GV, c/o Dr. Charles E. Seeleth, Edgewater Beach Hotel, Chicago.

From Cambridge I have received a copy of "Pye-Radiated News," the official organ of the Pye Short-Wave Radio Society. The most interesting piece of news, from the point of view of the "P.W." reader, is that membership of this society has now been thrown open to all and sundry, instead of being restricted to employees of the Pye concern.

For Cambridge Readers.

It is affiliated to the R.S.G.B., and has two transmitting stations of its own—G5PI and G6YP. Anyone living in the vicinity of Cambridge has thus another short-wave society available.

A few gentlemen seem to have got some queer ideas in their heads about short-wave work in general, and 7-metre stuff in

particular. I have recently had letters expostulating with me for wasting space on the subject of 7 metres and (worse still) belittling the noble efforts of my colleague Mr. Kelsey to awaken some interest in the subject.

Fortunately there are not many of them, and my remarks to them are short and sweet: "What do you wish to become? An experimenter with some interests in radio other than listening to dance music and talks, or a kind of glorified broadcaster? If you have the least love of experimenting, you will find 7-metre work a perfect Heaven."

I was under the impression that most short-wave fans soon found that the experimental work one can do is more interesting than the mere thrill of logging stations. It is only for these reasons that the long spells of bad conditions do not make one lose heart!

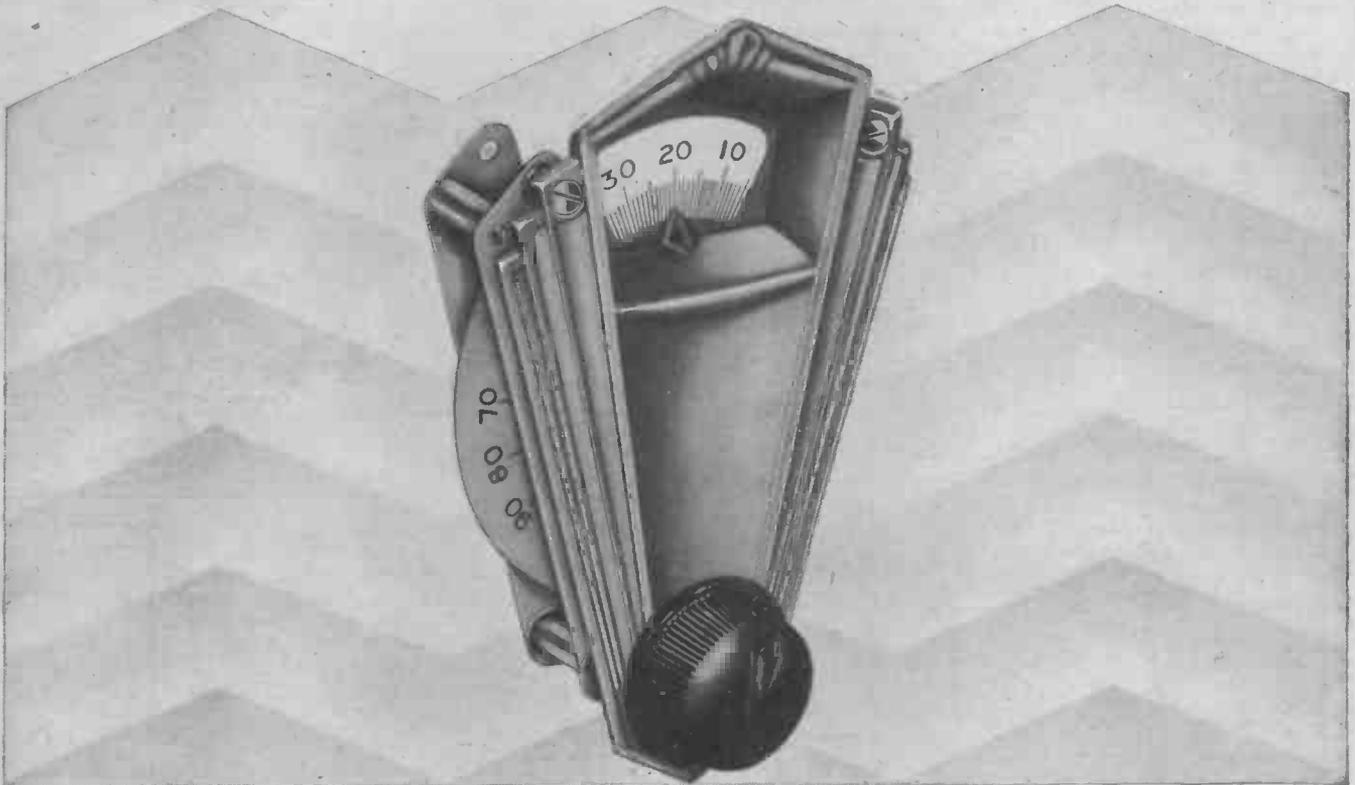
Mondays Only.

They don't worry the "tinkerer"—but the station-grabber is sorely annoyed by them. I think we shall have to organise a real experimenter's competition, with a prize for the most useful "gadget" evolved by a reader, instead of encouraging concentrated listening.

A letter from Northern Nigeria mentions an odd fact—that G5SW is only received well out there on Monday evenings, although the other short-wavers are good all the week. Does this mean that the B.B.C. are still doing their stuff with "aerial A" and "aerial B"? If not, what is the cause of the trouble?



TELSEN ILLUMINATED DRIVE



TELSEN ILLUMINATED DISC DRIVE

A good smooth "slow motion" drive is essential for short wave work. The Telsen Illuminated Disc Drive incorporates an improved movement which gives an exceptionally smooth action and a gear ratio of approximately 5-1, and the bold and well-proportioned figures make for delightfully easy tuning, and as the dial rotates over the full circle, all types of condensers are catered for. It is fitted with a handsome oxydised silver escutcheon of modern design, and the dial may be illuminated by means of an ordinary flashlamp bulb.

4 1/6

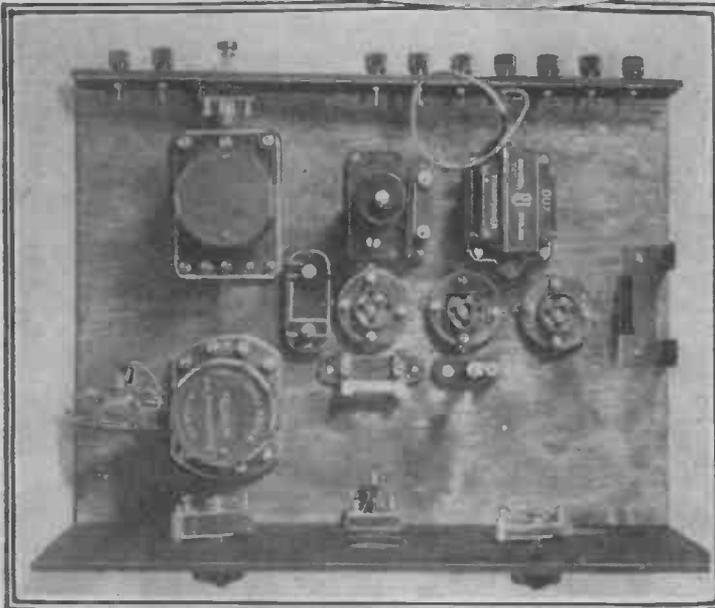
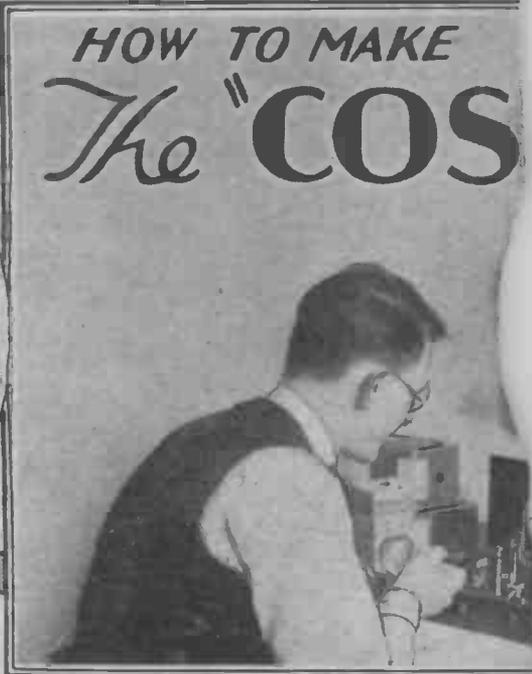
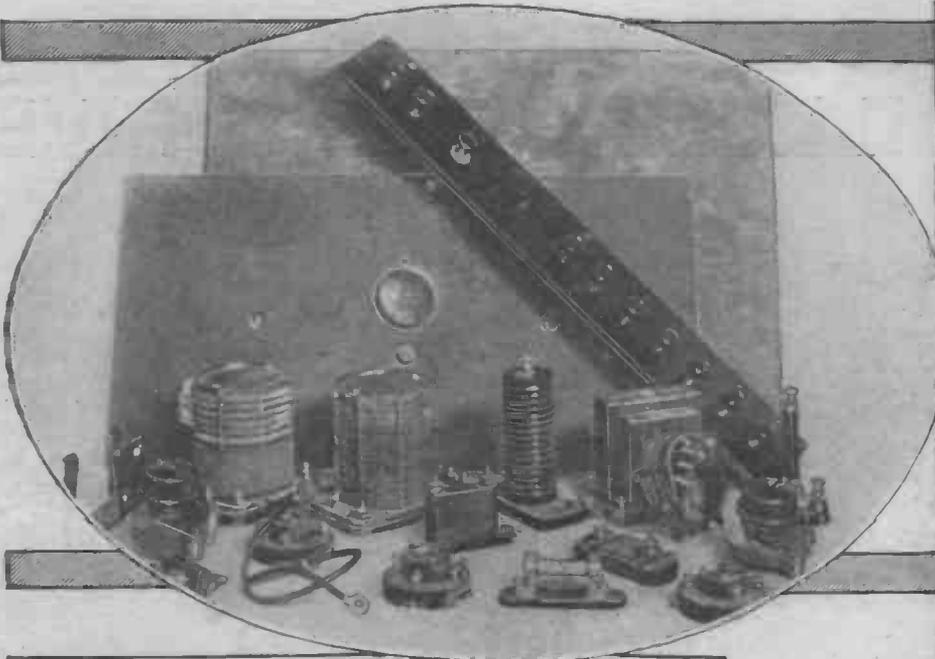
*Specified for The Telsen "Triple" 3.
See pages 1264, 1265.*

The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN
100% ALL-BRITISH
SHORT-WAVE COMPONENTS

HOW TO MAKE The "COSMIC"



few symmetrically placed controls so that you can form your own opinions.

Artistically arranged in the centre of the panel is the tuning control with which you are able to sweep through all the ordinary broadcasting wave-lengths (medium and long) without coil-changing or even switching.

Rational Tuning.

And the dial readings do not serve two different wave-groupings—you range from 200 to 2,000 metres as the dial moves through the 0-200 numbering.

Those who know nothing about wave-ranges, kilocycles, long and medium wave-bands, and so on, need never trouble to find out anything concerning such technicalities in order to tune the "Cosmic" for ordinary broadcasting.

HERE IS A NEW SET OF QUALITIES ENABLING GRAMMES FROM ALL GLOBE. AS AN ORDINARY RECEIVER IT CAN RIVAL SIGN, AND WITH ITS THE SPACE-SMASHING IT STANDS UNCHALLENGED THE "COSMIC" THREE BE 1932'S GREATEST

NO
COIL
CHANGING

ALL ROUND THE WORLD

THE reception of all wave-lengths, short, medium and long, with the one receiver is not in itself a new accomplishment. For years it has been possible to pick up short-wave programmes from America and Australia; and medium and long-wave programmes from all over Europe on the one outfit.

NO SWITCHING FOR ORDINARY BROADCAST RECEPTION—A TOUCH ON A SIMPLE SWITCH AND YOU ARE ALL SET FOR THE SHORT WAVES.

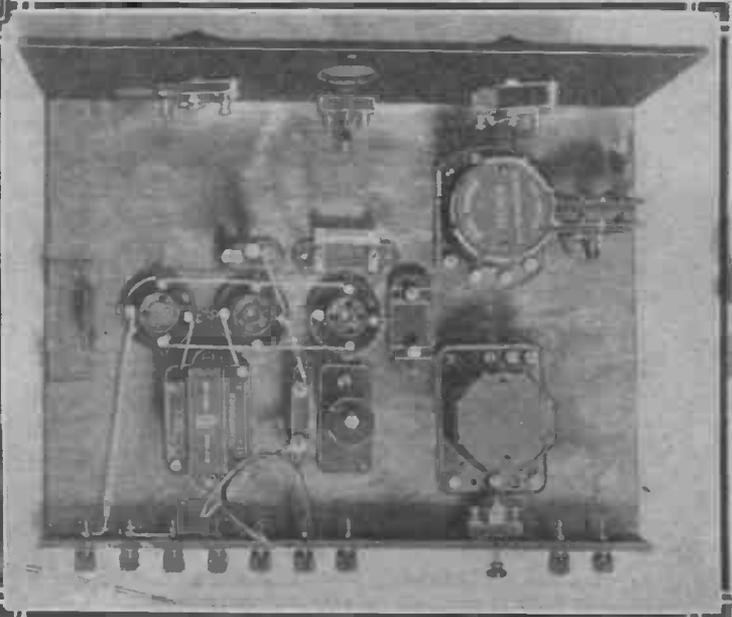
But never before has all-wave reception been so completely developed and refined as in the "Cosmic," where it is simplified to the extent that the very last vestige of the experimental has been stripped off it.

But let the "Cosmic" speak for itself—it is quite capable of doing that in no uncertain voice! Just glance at the front panel; I will briefly describe the use of the

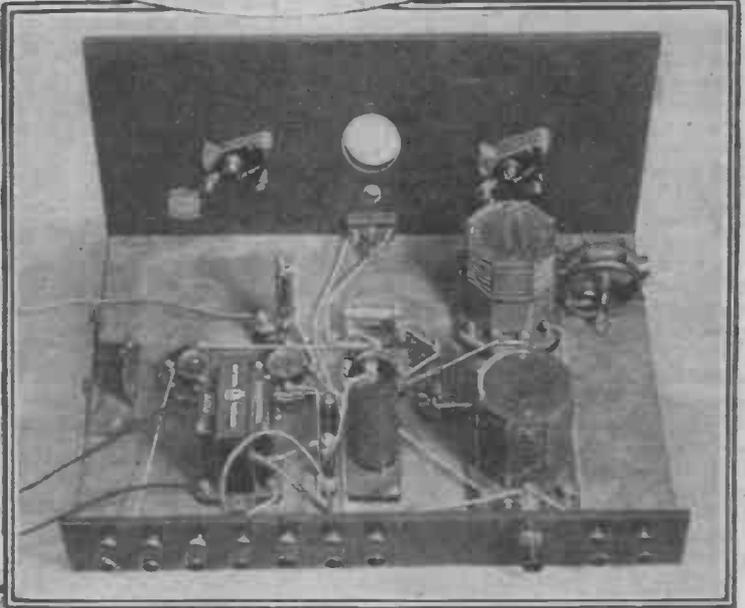
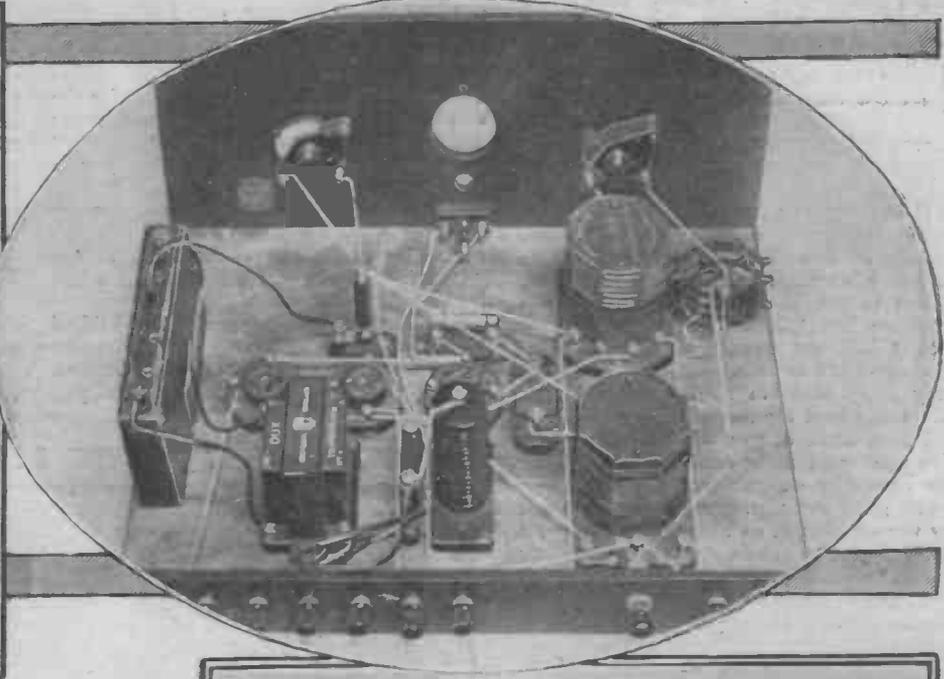
SUPERBLY SIMPLE

The photographs on this page illustrate the simple step-by-step assembly of the "Cosmic" Three from the separate collection of components (top left) to the finished receiver minus the Extensifier which is put on last (top right). A large and clear photo of the complete instrument appears on a following page.

INEXPENSIVE



MIC III



WITH ENTIRELY NEW
YOU TO CULL PRO-
QUARTERS OF THE
ARY BROADCAST RE-
ANY EXISTING DE-
POWER TO COMMAND
SHORT WAVES ADDED,
NGEABLY SUPERIOR.
B MUST INEVITABLY
RADIO SUCCESS.

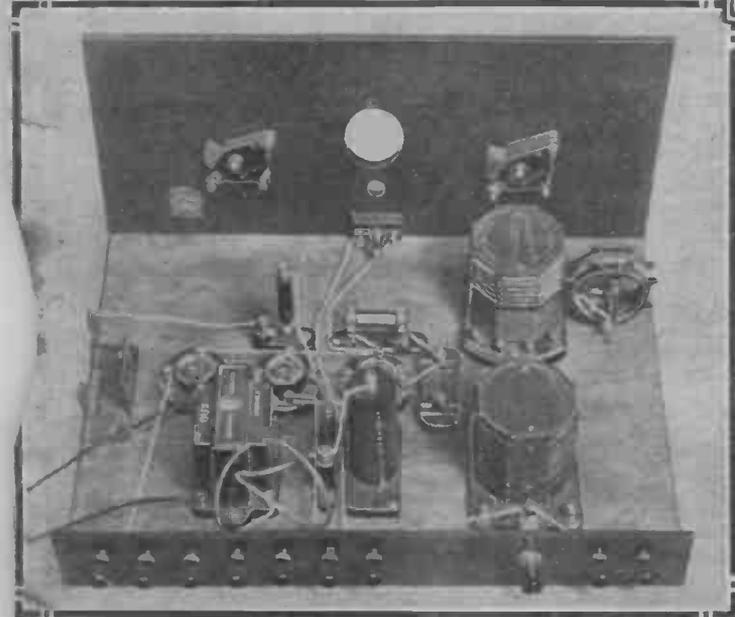
But as the two-figure dial readings, 0-99, happen to indicate the so-called "medium" wave-lengths while the three-figure readings, 101-200, coincide with the long wave-lengths, such as those of Radio-Paris, Daventry 5 X X, etc., you can immediately see by the dial readings whether you are sweeping through the long-wave or medium-wave stations.

Something Quite New.

Underneath the tuning control is the on-off switch, whose sole job is to turn the set on and off. And as there is no other switch on the panel, the risk of the set being left on a whole night or even week-ends because someone has "radio-grammed" or "wave-changed" instead of switching off, is eliminated.

The small knob to the right is the reaction adjustment,

D ON ONLY ONE DIAL!



ABSOLUTELY TROUBLE-FREE

If you refer to these photographs and to the blue-print and the point-to-point list of wiring connections (which appears on another page), you simply cannot go wrong in building this set. Completely successful results are assured so long as you follow the simple instructions.

NO SOLDERING

and there can be no one who is unacquainted with the functions of an article of this nature!

The remaining control is known as the "moderator," and this is something quite new. I think it is best described as a sensitivity-selectivity adjustment. It enables

**NEVER BEFORE HAS ALL-WAVE
RECEPTION BEEN SO COM-
PLETELY DEVELOPED AND
REFINED AS IN THE "P.W."
"COSMIC."**

you to get the very best results whatever your local conditions. You need not fear either that you will be swamped by a local station, or that you have got to lose power because of the need on the part of others for abnormally keen selectivity.

The "moderator" is your own compromise control. I think it is safe to say that it makes possible the obtaining of the

(Continued on next page.)

HOW TO MAKE THE "COSMIC" III

(Continued from previous page.)

theoretical maximum of results with three valves fundamentally arranged, as in the "Cosmic."

It is extremely important that I should make this point clear, although I have already dealt with it at some length in the circuit article which also appears in this issue.

But to put it at its bluntest, you can compare the "Cosmic" with any other Det.-2 L.F. set merely as a receiver of medium-wave broadcasting, and it will not only equal most in its effectiveness, but will easily beat the majority.

I hope some of you will take me up on this point and make comparisons, for they are decidedly enlightening and show how much good radio energy can in cases fall by the wayside in an attempt to achieve a modicum of station-separation, and how easily, with the inexpensive "Cosmic," it is possible to tune-in distant stations on the loudspeaker at real programme strength.

A Wonderful Transformation.

Simply by operating a small push-pull switch at the back of the set, and without effecting any other change whatever, the "Cosmic" immediately becomes a short-wave receiver. No coil changing, no screw or socket adjustments—just the movement of that one small switch, and the range of the set leaps outwards to the very Antipodes!

The controls perform their same functions, no alteration has to be made to the aerial, batteries or loudspeaker, but at a stroke the wave-range has sunk to the 20-metre upwards band.

The "Cosmic" is the DX family man's perfect set, because it has all the simplicity of controls, neatness and robustness of a first-class "broadcast" set for the household to listen to and handle, plus the potentialities of a good-class short-wave receiver.

But to make even that statement without further comment would be to imply an unnecessary qualification. The "Cosmic" is *everyone's* set—the first high-efficiency, all-wave outfit for general use, the precursor of a new all-wave era.

But don't imagine that the "Cosmic" can give results equal to those possible with a seven-valve super-heterodyne. It cannot. Let me try and give you something of an idea as to its capabilities.

Think of the best Det.-2 L.F. set for the reception of medium-wave broadcasting you have ever heard; I think the "Cosmic" will be better, or at least equal to it on the medium waves. Then cast your mind about for a similar set that was exceptionally good for receiving long-wavers like Radio-Paris. I am very confident that the "Cosmic" would give any such set a run for its money.

Finally, imagine the two above individual "best" sets and a good short-waver receiver all rolled into one unusually inexpensive, easy-to-build, flexible instrument—and you have the "Cosmic."

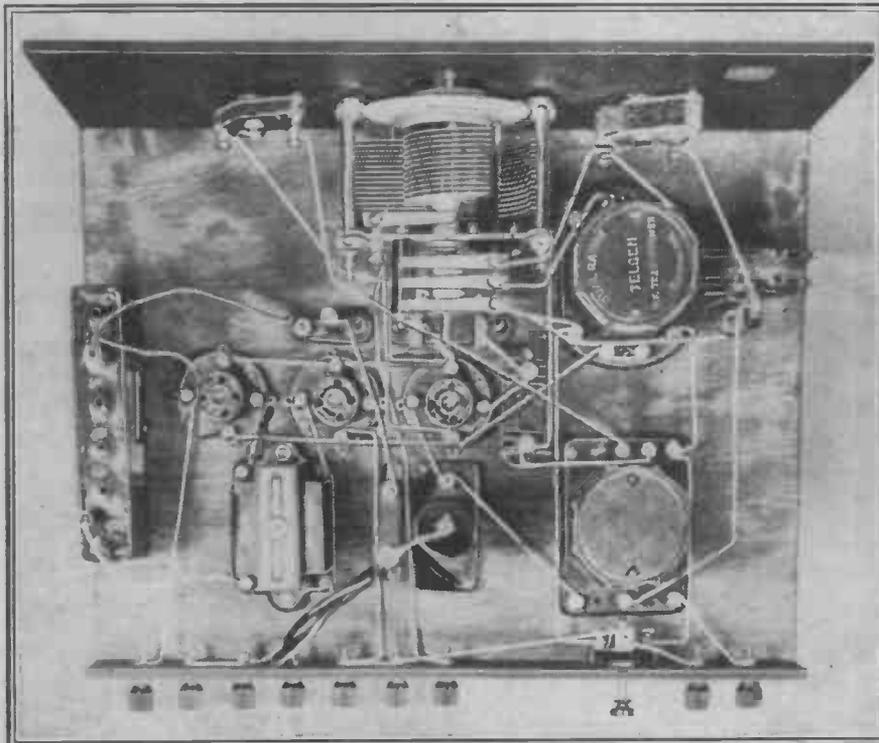
And if I have not yet managed to convince you that this latest "P.W." set is something quite out-of-the-ordinary in attractiveness and just the proposition tens of thousands of you have been waiting for, then I must ask you to be a little patient. Next week we come to the operating details, and it is because these will tell their own story to all those who read it, that I am going to cut these introductory remarks short and get on to the construction of the set.

The "Ginger" Control.

You will see in that operating article exactly how, in practice, the "Cosmic's" moderator control enables you to start gingering up things to a crisp, "hot" level, from above that point where the average

(Continued on next page.)

TESTED AND PROVED IN TOWN AND COUNTRY



You may notice slight differences in the run of the leads shown in this photo—the bends, etc., may not be exactly the same, for it is a different model from that shown in some of the other photos. We built and tested numerous models of the finished and perfected set in order that simultaneous tests could be carried out in different parts of the country.

YOUR GUIDE TO THE WIRING OF THE "COSMIC"

Spag. (100,000 ohm) to H.T. + 1 Term.
Other end Spag. (100,000 ohm) to nearer side of .01.
Anode V3 Valve Holder to L.S. — Term.
H.T. + 2 Term. to L.S. + Term.
H.T. + 2 Term. to H.T. + L.F. Transformer.
Grid V3 Valve Holder to G of L.F. Transformer.
Anode V2 Valve Holder to A of L.F. Transformer.
Join the three valve-holder filament terminals nearer panel together. (These are the positive.)
Join opposite three filament terminals together. (These are the negative.)
Grid V2 Valve Holder to .01 Fixed Condenser.
½-meg. Grid Leak Top Term. to Grid V2 Valve Holder.
H.F. Choke Top Term. to .01 Fixed Condenser.
Plate V1 Valve Holder to Bottom Term. H.F. Choke.
Left Term. L.T. Switch to L.T. + Term.
Pos. Fil. Term. V1 Valve Holder to Right Term. L.T. Switch.

One side of Grid Cond. to Grid Term. V1 Valve Holder and to 2-meg. Grid Leak.
2-meg. Grid Leak (other side) to Pos. Fil. Term. V1 Valve Holder.
H.T. — Term. to Neg. Fil. Term. V2 Valve Holder.
L.T. — Term. to H.T. — Term.
L.T. — Term. to Centre Term. 3-pt. Switch.
Earth Term. to Centre Term. 3-pt. Switch.
Grid Bias Neg. 2 Lead to L.F. Transformer (G.B.).
Grid Bias Pos. Lead to Neg. Fil. Term. V3 Valve Holder.
Grid Bias Neg. 1 Lead to Bottom Term. of ½-meg. Grid Leak.
1 of Short-Wave Coil to Plate Side H.F. Choke.
Aerial Term. to 4 of Short-Wave Coil.
6 of Dual-Range Coil to 7 Dual-Range Coil, and to Neg. Fil. Term. V1 Valve Holder.
6 of Short-Wave-Coil to Grid Condenser (.0003).
5 of Short-Wave Coil to Right Term. 3-pt. Switch.

8 of Dual-Range Coil to 5 of Short-Wave.
.00075 Condenser (M.) to 1 of Dual-Range Coil.
3 of Short-Wave Coil to Top Term. of Moderator Coil.
.00075 Condenser (F.) to Top Term. of Moderator Coil.
Left Term. of 3-pt. Switch to 5 of Dual-Range Coil.
Reaction Condenser (M.) to 5 of Dual-Range Coil.
Reaction Condenser (F.) to 7 of Short-Wave Coil.
Extenser (Fixed Vanes) to .0003 Grid Condenser.
Wire Extenser Self-changer contacts, as follows:—
Farthest from panel to bottom terminal of Moderator Coil;
Middle contact to 3 of Dual-Range Coil.
Nearest-to-panel contact to moving vanes of .00075-mid. Moderator Condenser.
Extenser (Moving Vanes) to Fil. Neg. V1 Valve Holder.
That completes the wiring.

HOW TO MAKE THE "COSMIC" III

(Continued from previous page.)

three-valver leaves off, and how you can apply this high-efficiency "hotting up" on all wave-bands, merely by the smooth rotation of one little knob.

Now a word or two about the components needed for the "Cosmic." The most economical way of securing these, unless you happen to have a number of suitable parts already in hand, is to purchase a complete kit from one of our well-known advertisers.

The Easiest Way.

This will save you considerable time and ensure that you get all the right makes and values. Also the kit will be complete to the smallest detail and the panel will be drilled.

So, if some of you are looking longingly at an old L.F. transformer or a dusty collection of valve holders with missing terminals, and wondering if such can be used for the "Cosmic," remember these points, and ask yourselves whether it is worth while taking all the extra trouble of gathering individual items together and risking a loss of efficiency through the employment of old parts of dubious integrity.

No, that would indeed be false economy. On the other hand, there will no doubt be many of you who would like to use existing cabinets which may differ somewhat in form and dimensions from the types implied by the baseboard and panel shapes and sizes of the "Cosmic" specification.

If it would mean the cramping of the parts, then I fear it is not possible. We spent a very long while over the layout of this set, and I can assure you that there are very vital reasons why it should not materially be varied.

Follow the Blue Print.

The various components simply must take up exactly the pattern of the full-size blue print, and this is particularly essential with the coils. I would strongly advise all constructors to follow the blue print just as closely as they can.

I do not mean to imply that they will fail to get results if they push one of the parts a sixteenth of an inch this way or that from its allotted position, because the "Cosmic" is far from being as tricky a proposition as that.

Indeed, we purposely built up two or three models slightly diverging in com-

SELECTIVITY AND POWER ARE UNDER YOUR CONTROL IN THE "P.W." "COSMIC" III.

ponent layout from the original in order to test for "temperament"!

There is a special article on another page dealing with the coils so that there is no

The reaction condenser is of the ordinary type and not "differential." The moderator condenser is a .00075 mfd. solid dielectric condenser. (It is not known as a "moderator" from a catalogue point of view.)

It so happens that at least one make of .00075-mfd. solid dielectric condenser has what is known as a "shorting" position. That is to say, at either or both limits of travel of the controlling knob the component automatically short-circuits itself.

But it also so happens that that won't matter a scrap in the "Cosmic"!

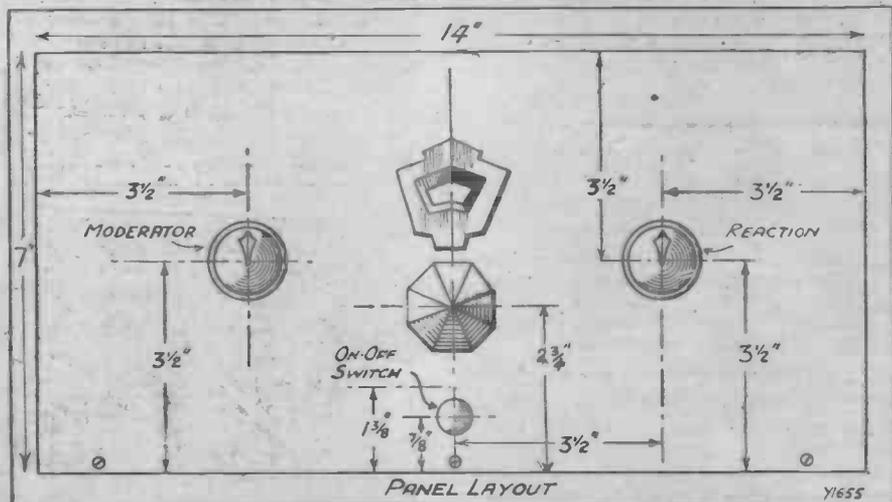
No Soldering Required.

The few other components are all quite standard.

Don't bother to solder connections; it is quite unnecessary to do so. As a matter of fact we are not strong advocates of soldering and consider that, for general purposes, it is best avoided.

And now for the most important part of

COMPLETE FLEXIBILITY—NO LOSSES



Although the controls are remarkably few in number, no sacrifices have been made in order to achieve this remarkable simplicity. Even the inexperienced listener will find it an easy matter to derive the "last ounce" out of the set.

need to make mention of them here. The H.F. choke must be of a "universal" type capable of functioning effectively on short as well as ordinary wave-lengths—that is a vital necessity.

the business—the wiring. We have prepared a wiring guide which, in conjunction with step-by-step photos shows you exactly how each wire was fitted to the original

(Continued on next page.)

YOUR MODEST SHOPPING LIST FOR THE "COSMIC"

- 1 Panel 14 in. x 7 in. (Permeol, Peto-Scott, Becol, Wearite, Ready Radio, Goltone).
- 1 Cabinet to fit with 10 in. baseboard (Pickett, Camco, Peto-Scott, Gilbert, Osborn, "Morco," Ready Radio).
- 1 Extender with vernier drive (Cyldon Formo, Wavemaster).
- 1 "Cosmic" Dual-Range Coil (Telsen, H.F. transformer, Sovereign, Goltone, Wearite, Leweos, R.I., Ready Radio, Peto-Scott, Tunewell).
- 1 "Cosmic" short-wave coil (Telsen, etc.). Note—The above coils can also be obtained as a complete unit from R.I. Ltd.
- 1 .00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen).
- 1 .0003-mfd. reaction condenser (Ready Radio, Telsen, Cyldon, Polar, J.B., Lissen, Graham Farish, Wavemaster, Ormond, Formo).

- 1 Push-pull on-off switch (Goltone, Ready Radio, Telsen, Tunewell, Peto-Scott, Bulgin, Wearite).
- 1 Three point push-pull switch (Ready Radio, etc.).
- 1 Moderator coil unit (Peto-Scott).
- 1 .0003-mfd. fixed condenser (Dubilier type 610, T.C.C., Telsen, Ready Radio, Lissen, Sovereign, Goltone, Graham Farish, Ferranti, Igranie, Watmel).
- 1 .01-mfd. mica condenser (T.C.C., Dubilier, Lissen).
- 1 Grid-leak holder (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Ferranti, Graham Farish).
- 1 2-meg. grid leak (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Watmel, Ferranti, Varley, Locwe, Igranie).
- 1 5-meg. grid leak and holder, (Graham Farish Ohmite, etc.).

- 3 Valve holders (Lotus type VHK, Telsen, Wearite, Igranie, Lissen, Bulgin, Clix, Graham Farish, Formo, W.B.).
- 1 H.F. choke (Leweos type 11, Telsen Binocular, Ready Radio, Wearite, R.I.).
- 1 L.F. transformer, medium ratio (R.I. Dux, Telsen, Varley, Igranie, Goltone, Lissen, Lotus, Leweos, Clix, Graham Farish, Formo, Sovereign, Atlas, Ferranti).
- 9 Indicating terminals (Belling-Lee, Igranie, Clix, Eelex).
- 1 100,000-ohm spaghetti resistance (Sovereign, Varley, Leweos, Bulgin, Peto-Scott, Telsen, Ready Radio, Igranie, Graham Farish, Lissen, Tunewell).
- 1 Terminal strip, 14 in. x 2 in. Grid-bias battery clip, (Bulgin). Battery Plugs, etc. (Clix, Belling Lee, Eelex, Igranie.) Glazite, Lacoline, Quickwyre, Jiffilinx. Flex, screws, etc.

HOW TO MAKE THE "COSMIC" III

(Continued from previous page.)

model, and the closer you get to that the better your chance of 100 per cent results.

As the "Cosmic" is the essence of simplicity there is a real danger that some may not appreciate the necessity for just that little extra care needed in wiring short-wave apparatus.

Use a covered conductor such as "Glazite" or a bare wire with "Systoflex" sleeving for preference, and avoid anything in the nature of straggling. You will see by looking at the photos that neat bending avoids a too-close proximity of vital leads.

When fixing the Spaghetti resistance into place, be sure not to subject it to strain.

Two flexible leads of thin rubber-covered multi-strand wire, such as is sold for the purpose, with grid-bias plugs on their ends, complete the wiring. You now have all the vital details of assembly, and next week I will tell you about the accessories required.

If, in the meantime, you build your "Cosmic" and begin to pull in programmes from all over the place—that isn't my fault!

THE "STAR" MODEL

De-luxe listening at a price within the reach of thousands of constructors—that is the "Cosmic" Star, in which you find a number of valuable refinements.

THE "Cosmic" Three is almost fantastically inexpensive in view of the advanced nature of its design and its powers and potentialities, for in the blue-print model we have deliberately avoided anything in the nature of refinements which would impose the slightest burden upon those whose requirements are fully met by that design as it now stands.

At the same time we had to recognise the claims of that large body of constructors who are prepared to pay just a little more for components and add a few more wires

to a construction in order to enjoy all that a "major" model can offer.

We have met these claims by the production of the Star model of the "Cosmic" Three and the full constructional details of this will appear in our next issue. In the meantime, we propose to give a complete summary of its technical specification.

"A Hot Short-Waver."

Of course, in all essentials it is similar to the blue-print model, and the novel circuit with all its original features remains unchanged.

The most important refinement is concerned with the short-wave side of the set—a refinement which will strongly appeal to the constructor who is desirous of devoting a goodly proportion of "Cosmic" time to combing the Americas and the Antipodes for programmes.

It comprises provision for reducing the capacity of the extenser to .00025 mfd. so that the short-wave stations are spread out more widely over the tuning dial and tuning facilitated. It is true that another small switch is necessitated, but the use of this is of an optional character—and we are sure many will take that option up!

Short-wave tuning is still further refined

by the inclusion of a slow-motion control for the reaction. These two features render the "Cosmic" Star model a really "hot" short-wave set which anyone is able to handle with the certainty of the fullest possible success.

The remaining addition is the provision of pick-up switching, a neat switch being tucked away on the terminal strip at the back of the set—accessibly but unostensibly.

So far, as you will have observed, we have avoided the use of the words "de luxe" and "luxury" in regard to the "Cosmic" Star. In actual fact, the "Cosmic" Star is very much a de luxe or luxury model, but it would be absurd for anyone to think that it is in any way a millionaire's model.

A Wonderful Proposition.

It is nothing of the sort. Naturally, it costs more to build than the blue-print model, but the value of the additional qualities is out of all proportion to their cost.

You want to compare closely the "Cosmic" Star with any ordinary set, for you will then clearly appreciate what a wonderful proposition it is.

Spend the extra money and go for the "Cosmic" Star if you possibly can, but if

you feel that your purse cannot stand that little additional strain, for goodness' sake don't avoid the blue-print model as an incomplete skeleton which is exasperatingly deficient.

Tens of thousands of you* will build the blue-print model and obtain the fullest satisfaction from it, for it is 1932's "Magic," and as many more will build it and add the "Star" refinements later on their own account. But those of you who "hitch yourselves to the 'Star'" will reckon you have very full value indeed for the additional outlay.

EXCEPTIONAL ALL-ROUND RESULTS



Here is the "Star" Model, in which there are such valuable refinements as slow-motion reaction and dual-capacity tuning for improved short-wave operation, and a gramophone pick-up switch.

WHAT YOU NEED FOR THE "COSMIC" THREE STAR MODEL

LIST OF COMPONENTS

- 1 Panel 14 in. × 7 in. (Permeol, Becol, Goltone, Ready Radio, Peto-Scott, Wearite).
- 1 Cabinet to fit with 10-in. baseboard (Pickett, Ready Radio, "Morco," Peto-Scott, Osborn, Cameo, Gilbert).
- 1 Ready Radio Duotune Extenser, or Cyldon, Formo, or Wavemaster Extenser with .0005 mfd. fixed condenser.
- 1 .00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen).
- 1 .0003-mfd. reaction condenser with slow-motion drive (Ready Radio).
- 1 .0003-mfd. fixed condenser (T.C.C., Dubilier, Telsen, Sovereign, Lissen, Ferranti, Formo, Graham Farish, Goltone, Igranic).
- 1 .001-mfd. fixed condenser (T.C.C., etc.).
- 1 .01 mica fixed condenser (T.C.C., etc.).
- 1 "Cosmic" dual-range coil (Goltone, Sovereign, Wearite, R.I., Lewcos,

- Peto-Scott, Ready Radio, Tunewell, or Telsen H.F. transformer).
- 1 "Cosmic" short-wave coil (Sovereign, etc.).
- NOTE.—The R.I. coils are supplied in pairs on a common base.
- 1 "Moderator" coil (Peto-Scott).
- 2 Push-pull on-off switches (Ready Radio, Telsen, Goltone, Lotus, Wearite, Peto-Scott, Colvern, Igranic, Graham Farish, Tunewell, Bulgin, Sovereign).
- 1 Three-contact push-pull switch (Ready Radio, etc.).
- 1 Radio-gram rotary switch (Ready Radio or S.P.C.O. push-pull types of above makes).
- 1 H.F. choke (R.I. type FY1, Wearite, Sovereign, Varley, Peto-Scott, Ready Radio, Lewcos).
- 1 L.F. transformer (Lewcos L.F.T.6, Ferranti, Telsen, R.I., Formo, Sover-

- eign, Climax, Varley, Igranic, Atlas Goltone, Graham Farish).
- 3 4-pin valve holders (Telsen, Graham Farish, Bulgin, Lotus, Wearite, Clix, Formo, Lissen, Igranic, W.B.).
- 1 100,000-ohm Spaghetti resistance (Lissen, Bulgin, Sovereign, Lewcos, Varley, Peto-Scott, Ready Radio, Telsen, Igranic, Graham-Farish, Goltone, Tunewell).
- 1 2-meg. grid leak and holder (Dubilier, Telsen, Ready Radio, Igranic, Loewe, Peto-Scott, Ferranti, Varley, Sovereign, Bulgin, Graham Farish).
- 1 .5-meg. grid leak and holder (Dubilier, etc.).
- 1 Terminal strip—14 in. × 2 in.
- 9 Terminals (Belling Lee, Igranic, Clix, Eelex).
- Glazite, Lacolline, Quickwyre, Jiffinx. Flex, screws, battery plugs, etc.

The COSMIC

An all-wave development of the greatest importance

Writes

G.P. Kendall B.Sc



WHENEVER it is announced that "P.W." is going to publish a set design which the technical department considers of sufficient importance to warrant a free blueprint it is a signal for everyone interested in the home construction movement to sit up and take notice.

For more years than one cares to remember every single one of these special "star" sets has been a maker of radio history, and it is quite obvious that the "Cosmic" will be no exception to the rule.

When I first heard of it and saw its circuit diagram I had no hesitation in coming to the conclusion that here was a set right in the forefront of radio development, and marking a very definite step forward in the design of all-wave receivers.

It was clear at the first glance at the cleverly worked out circuit that this was an arrangement capable of giving a really wonderful performance not merely on one wave-band, but on all three.

This is a point of tremendous importance, for there has in the past been so often an element of compromise in the design of all-wave sets. If the remarkable "Cosmic" circuit is suitably assembled there is quite definitely no question of a compromise on any wave-band, and it will work superlatively on every one. This seems to me a really noteworthy achievement, well in keeping with "P.W.'s" finest traditions.

Sensitive and Selective.

When I came to try out a model of the "Cosmic" I found that all my expectations were being realised, and that it actually possessed potential advantages which I had not suspected. I don't mind confessing that my laboratory tests showed that I had quite definitely under-estimated its powers, optimistic as I had been.

Sensitivity, selectivity, convenience of

Mr. G. P. Kendall, the famous inventor and designer of many well-known sets, was for many years Chief of Research for "Modern Wireless" and "Popular Wireless." His authoritative review of the COSMIC is consequently of the utmost value.

operation, quality of reproduction, all were even better than I had expected, and I decided right away that the "Cosmic" was one of those circuits by which all others must be "dated." I have no hesitation whatever in recording my conviction that it is a contribution of the greatest importance to that extremely promising aspect of radio development—the truly all-wave receiver.

When I heard that a "de luxe" version of the design was to be produced I was greatly interested, for this is a subject on which I hold strong views. I contend that the all-wave receiver definitely calls for certain refinements and special devices, which are perhaps only luxuries in a simple receiver, if it is to give under all conditions the full results of which the circuit is capable.

Importance of Slow-motion.

For example, there are such matters as the "slowness" of the slow-motion drive for the tuning condenser, the question of a slow-motion drive for the reaction control, and the choice of capacity for the tuning

(Advt. of Readu Radio Ltd.)

condenser, all of which problems must be satisfactorily solved if a loss of ultimate efficiency is to be avoided, not merely on the ultra-short but on medium and long waves as well.

I have done a great deal of experimental work on these matters myself, and I have also taken some pains to obtain the views of competent short-wave experimenters both at home and abroad. This letter in particular emphasises strongly the ideals to be aimed at in short-wave design.

Siluko,
via Benin City,
Nigeria.

Dear Mr. Kendall,—I think probably the following notes, based on four years' experience of short-wave work in excruciatingly bad conditions, will interest you in connection with the research you told me of in your last letter.

Atmospherics, of course, are the bane of our existence out here, but since you don't suffer in the same way I don't suppose you want to hear any more about them. They seem to be an insoluble problem, and, anyway, I could not discuss them adequately in terms suitable for a letter to people I have never seen!

Tuning condensers have always been one of my most difficult problems, for rubbing contacts have given me so much trouble that I now always fit special insulated pig-tails for myself as soon as I receive new condensers, and then there is the awkward question of the capacity to use.

Any set I make must be capable of working on long as well as short waves, and so it is no easy matter to get adequate ease of tuning for the very weak short-wave sigs. we get out here, and yet cover a wide enough range on the upper wave-bands. What I

(Continued on next page)

Tune your COSMIC with a DUOTUNE See following pages

G. P. Kendall's
views on the
"COSMIC"

(Continued from previous page.)

usually do by way of a compromise is to use a condenser of about .0002 with a good and really slow vernier dial in the interests of short-wave efficiency, and then use rather a multiplicity of interchangeable coil units to cover the other wave-bands.

One thing I would like to stress really strongly, and that is the need for making reaction a bit easier to control. People who live just across the way from short-wave transmitters can have little idea what this means when every short-wave signal you hear is weak and must be handled delicately and tactfully before it can be persuaded to come in at all.

For a long time now I have made a practice of fitting a good slow-motion dial to my reaction condenser, and I know this has had a good deal to do with the success I have achieved on short waves. I believe that if experimenters at home would only try this scheme they would discover that it can quite transform a short-wave set and add hundreds of miles to its effective range.

I hope these notes will provide the information you require.

Yours sincerely,
D. MARCUS.

Note particularly the stress Mr. Marcus lays upon the need for a slow-motion control for the reaction condenser, if real success is to be achieved on short-waves with ease. In the "Cosmic Three Star" design you will find that such a control is fitted, combined with a special system of mounting with an extension spindle and insulating coupler which completely eliminates risks of hand-capacity effects, even when a poor earth connection is used. This is one of the many features of the "Cosmic" design which make me so certain of its success.

Observe, too, that Mr. Marcus points out the extreme difficulty and importance of the tuning capacity problem. It is here that inefficient compromises have been so common in the past, and it is here that the "Cosmic Star" scores so decisively.

The Ideal Solution.

It has long been realised that for medium and long waves a capacity of .0005 mfd. is the lowest that can be used, yet for short waves a considerably smaller tuning capacity is essential for the best results. All sorts of expedients have been tried, yet until the coming of that remarkable new device, the "Duotune" condenser, no real solution had been found.

With the Duotune available, the difficulty vanishes, for it provides a complete and ideal solution of our all-wave tuning problem. In one compact component it gives as in effect two tuning condensers, one of .0005 mfd. and one of only .00025 mfd.

(Continued on page 1286.)

A.301

Specially designed
by G. P. Kendall B.Sc.
for the
COSMIC III ★

For short wave tuning you need a condenser of small maximum capacity. It gives easier tuning, as the change in capacity for a given movement is less than with a larger condenser, and the tuning in of weak or distant stations becomes much less critical. Losses are also reduced by eliminating a large area of idle plates.

For medium and high wave-lengths a larger capacity is necessary, as it gives a wider tuning range to the coils used. As tuning is less critical here the use of such a condenser is efficient as well as essential.

In an all-wave receiver the problem of efficient tuning over all the wave-lengths covered has been a great problem. Now Mr. G. P. Kendall, B.Sc., provides the solution with the DUOTUNE.

The DUOTUNE acts as a .00025 mfd. condenser when required and has all the advantages of a low capacity condenser for short wave tuning.

At the touch of a switch the DUOTUNE automatically becomes a .0005 mfd. condenser for medium and long wave tuning.

This unique feature of double tuning range with single knob control is obtainable only with the DUOTUNE.

Although specially designed for the Cosmic Star, your existing receiver will be all the easier to handle if fitted with the DUOTUNE.

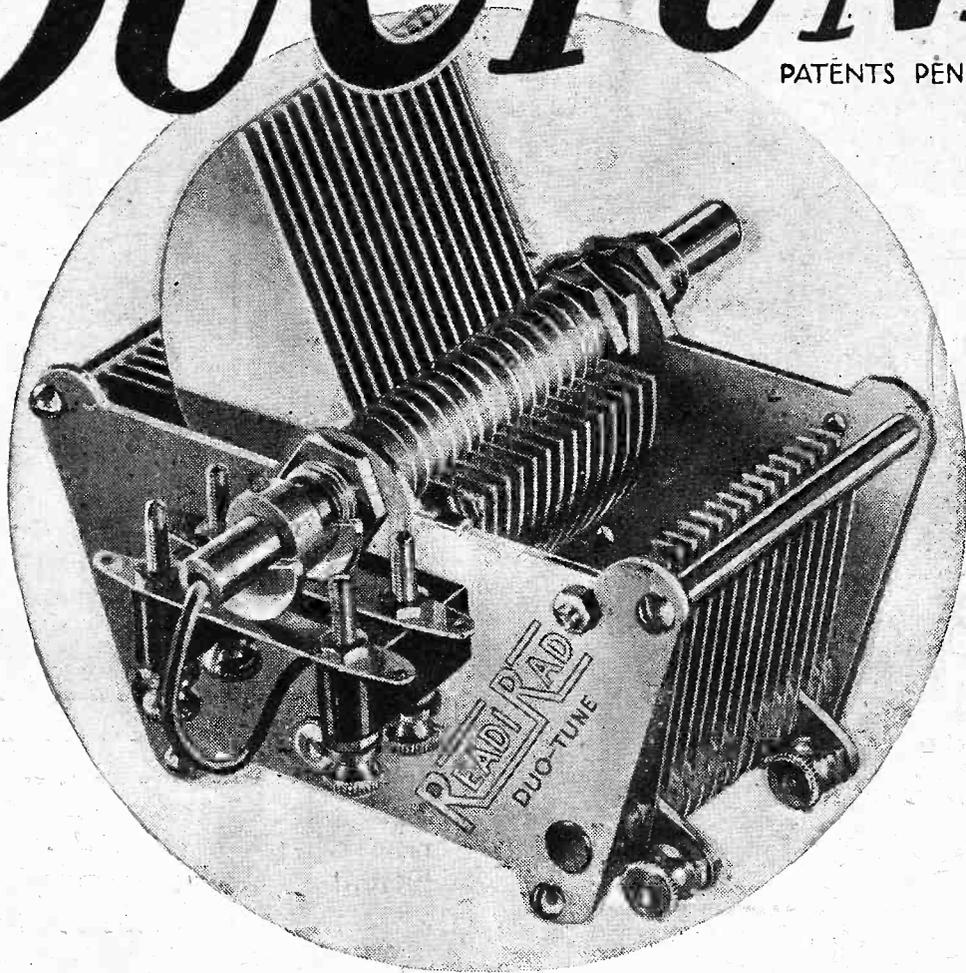
This new method of tuning, in combination with the Ready Radio 20 to 1 Slow Motion Tuning Control, gives a degree of accuracy in adjustment never before attained in an all-wave receiver.

Get one from your dealer to-day or order direct from Ready Radio.

The

DUOTUNE

PATENTS PENDING.



The only tuning condenser of its kind

Gives two distinct capacity ranges: .00025 mfd. and .0005 mfd. Combines the advantages of fine adjustment with wide tuning range. The "DUOTUNE" will improve the performance and ease of control in any all-wave receiver. The Extenser Model gives automatic wavelength switching, as well as acting as a .0005 mfd. condenser for normal tuning and a .00025 mfd. for more critical adjustment. Used with a Ready Radio 20 to 1 Slow Motion Drive it represents modern tuning control at its easiest and best. Positive pig-tail connection to moving plates—no rubbing contacts.

Price - 15/6

**Free Full-size Blue Print of the COSMIC III STAR
in next week's issue**

G. P. KENDALL'S VIEWS ON THE "COSMIC"

(Continued from page 1284.)

Thus we can use the larger capacity for medium and long waves, and so avoid the inefficiency of the expedients sometimes used to enable a smaller capacity to be employed here, while for short waves we can use the .00025 alternative capacity and get the easier tuning which is so essential to success on this range.

Dual Capacity.

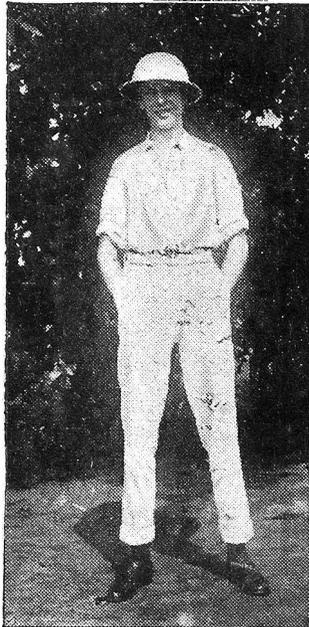
It should be emphasised, for this is important, that the dual-capacity property of the Duotune is *not* obtained by means of a fixed condenser in series. The fixed condenser method, while satisfactory up to a point, does not function effectively on the lower dial readings of the variable condenser, and comes definitely into the "Compromise" class. The Duotune, on the other hand, behaves when required as a true .00025 mfd. variable condenser right from minimum to maximum.

This important new device was produced in my own laboratory in collaboration with the experts of "P.W." to their specific requirements, and it has now passed successfully the most exacting tests which could be devised. In its perfected form I am confident that it will bring about an entirely new conception of the possibilities of all-wave working, and remove the last of the obstacles in the way of real success in this important new branch of radio.

Ease of Tuning.

So long as the obvious requirement of an adequate reduction ratio in the slow-

motion drive is met, a tuning capacity of .00025 mfd. gives excellent tuning on short waves, and makes it possible to tune-in distant transmissions with very little practice, but this question of the slow-motion ratio is one I feel I must emphasise. Opinions differ somewhat but my own view (very strongly held) is that 15 to 1 is the minimum, and something nearer to 20 to 1 is extremely desirable.



Mr. Donald Marcus, of Nigeria, whose interesting letter is quoted by Mr. Kendall.

Here, again, the "Cosmic Star" sets a fine example of scientific design, for its slow-motion ratio for the Duotune is actually 20 to 1, and this makes it not merely possible but relatively easy to tune-in distant short-wave stations. That, it must be admitted, is something which can rarely be said, even of highly specialised short-wave receivers.

Smooth Reaction.

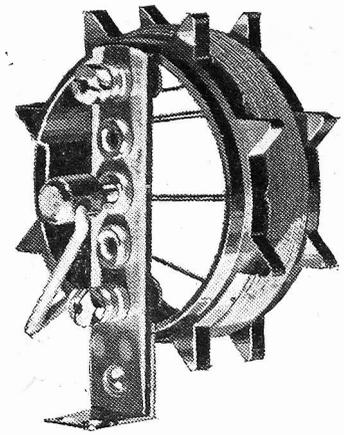
The slow-motion control on the reaction condenser naturally plays a very important contributory part in achieving this highly creditable state of affairs. In many sets the reaction control is actually more critical than the tuning on short waves, and it is here that the "Cosmic" shines especially. In the course of my tests I found that its reaction was actually easier to adjust on short waves than that of the average set of its type on medium and long waves.

And so I conclude my survey of the "Cosmic" as it appears to me. It is a fine set, and I wish it every possible success, for I know it will do credit to its designers and bring pleasure to everyone who makes it.

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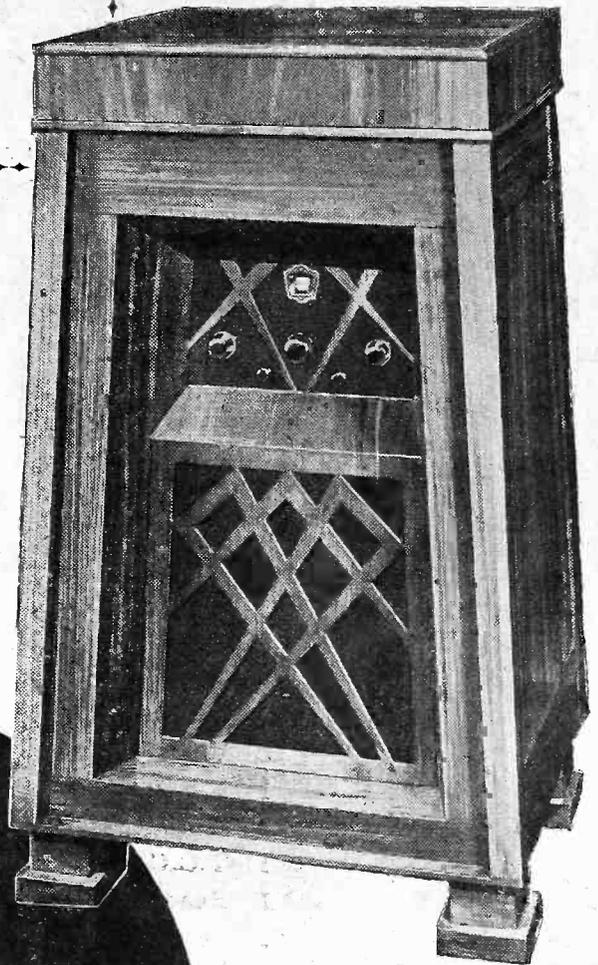
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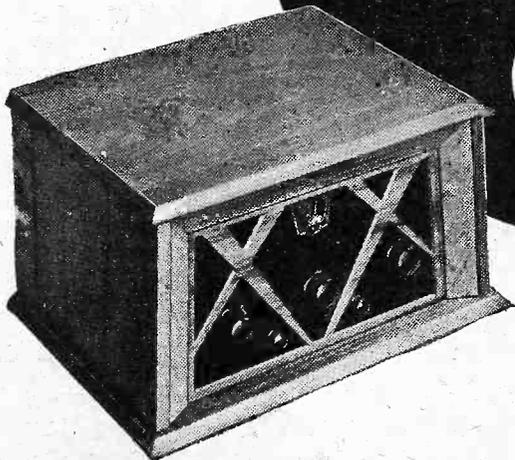
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1 Slow Motion Disc Drive for above	3	0
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3 Valve Holders	1	6
1 R.I. "Cosmic" Dual Coil Unit	12	6
1 ReadRad Moderator Coil	2	6
1 T.C.C. .001 Fixed Condenser, Type "S"	1	6
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1 Lewcos 100,000-ohms Spaghetti Resistance	1	6
1 ReadRad Radiogram Switch	2	9
1 T.C.C. .0003 Fixed Condenser, Type "S"	1	3
1 ReadRad Wave-Change Switch	1	6
1 R.I. Hypermite L.F. Transformer	12	6
1 Grid Leak, 2 megohm and Holder	1	4
1 T.C.C. .01 Fixed Condenser, Type 40	1	9
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9 Belling-Lee Terminals, Type "R"	2	3
1 Packet of Jiffilinx for wiring	2	6
3 Belling-Lee Wander Plugs	6	
Flex, Screws, &c.	1	2

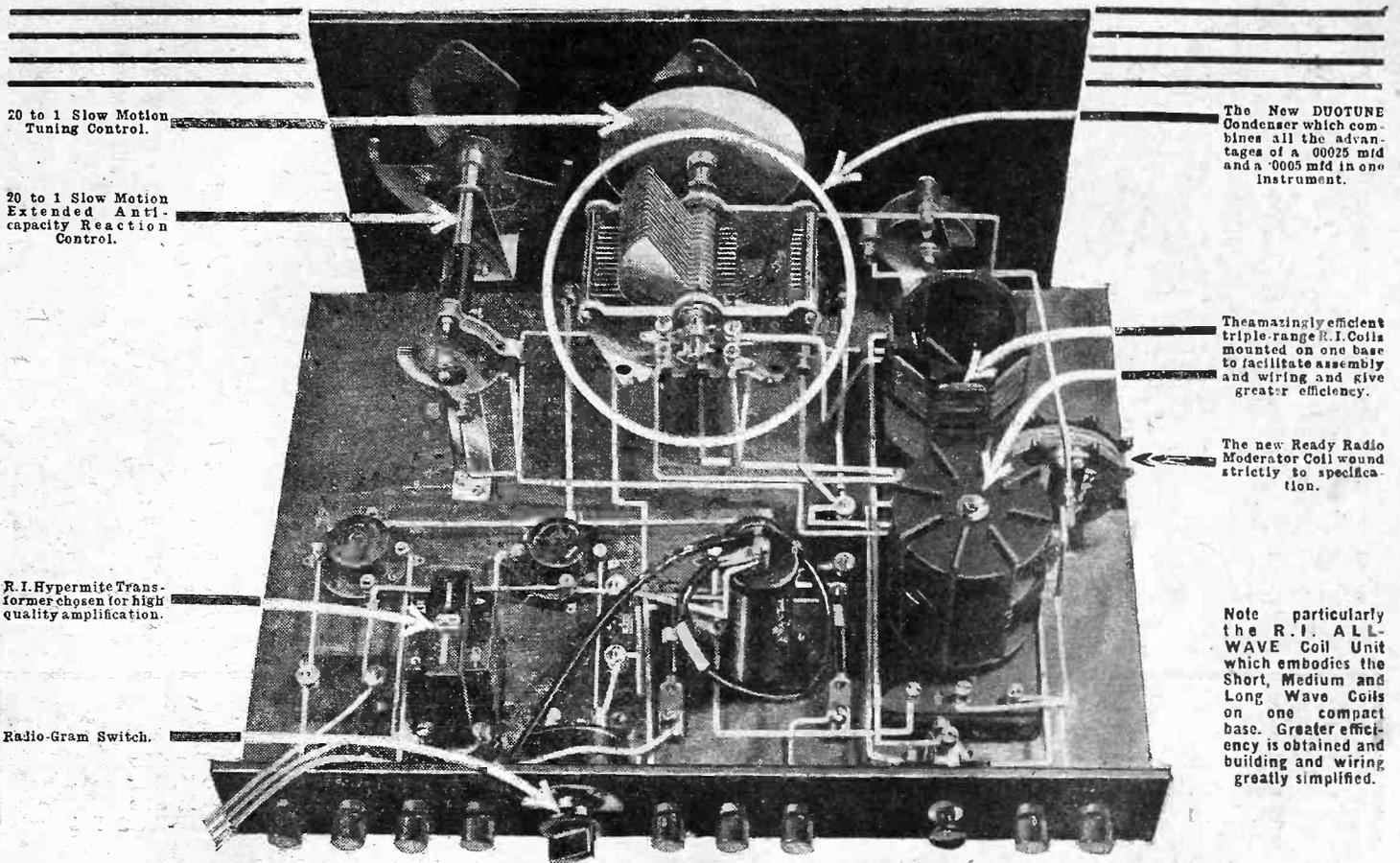
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20 to 1 Slow Motion Tuning Control.

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R.I. Hypermite Transformer chosen for high quality amplification.

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The New DUOTUNE Condenser which combines all the advantages of a .00025 mfd and a .0005 mfd in one instrument.

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Note particularly the R.I. ALL-WAVE Coil Unit which embodies the Short, Medium and Long Wave Coils on one compact base. Greater efficiency is obtained and building and wiring greatly simplified.

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recommended by

G. P. KENDALL, B.Sc.

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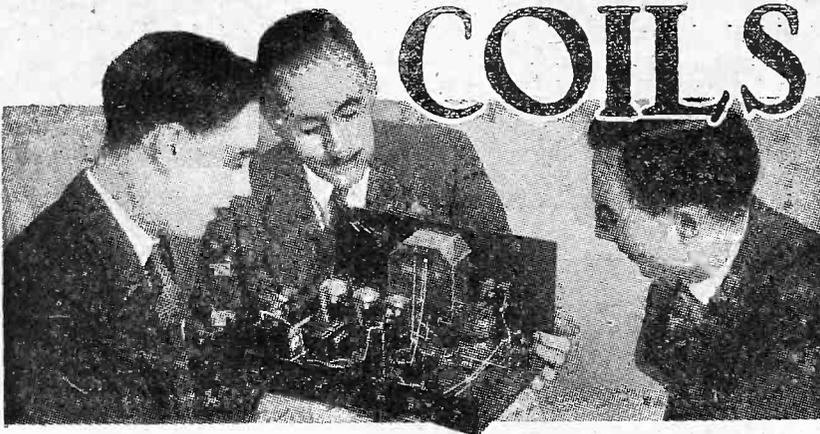
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COILS FOR THE "COSMIC"

By G. T. KELSEY

who describes them in detail and explains the slight differences which exist between some of the commercial versions.

At the present time, when radio standardisation seems to be the aim all round, it may perhaps appear at first sight to be contrary to "P.W.'s" pro-

use of existing moulding tools, and thereby passing on the benefits of lower production costs to "P.W." readers.

Perhaps we should explain before we go any further that the variations which do exist have absolutely no effect upon the efficiency of the finished receiver. The inductance values in the case of every one of the coils that has been approved by us are identical with "P.W.'s" specification, and the only differences which do exist—and which we are going to cover very fully in this article—are in connection with terminal numberings.

The actual terminal numberings are mostly done when the formers are pressed out originally, and as to alter

them would have meant new tools and a higher-priced finished article, we have pursued the policy which, although it has considerably complicated our job, we confi-

dently believe will meet with the approval of every "P.W." reader.

Now about the actual coils themselves.

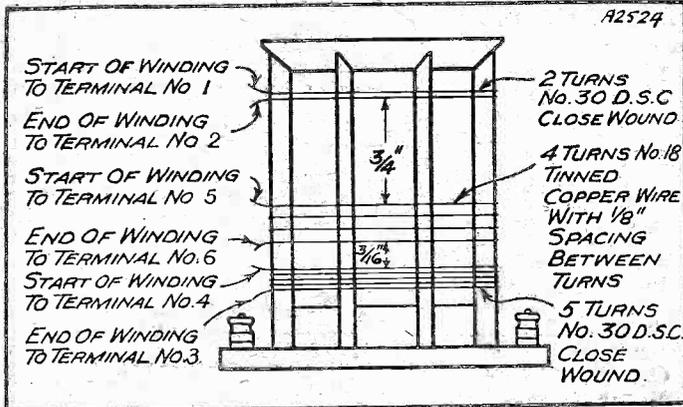
As you will observe from the blue print and drawings of the "Cosmic," there are three coils in all, one for the medium and long waves, one for the short waves, and a very simple coil-quit winding for the moderator coil.

The Dual-Range Coil:

The short-wave and moderator coils you can quite easily make for yourself providing you obtain the right kind of formers; but with regard to the medium- and long-wave unit, the home constructor difficulties of slotting ribbed formers are so troublesome to overcome that it is not worth while tackling it yourself, especially as, in consequence of our lower-production-costs campaign, the prices of the commercial ones are so very reasonable.

It is extremely doubtful, even if you did attempt to make the dual-range unit, whether you would save anything in cost by the time you had bought the special former and the necessary wire. So that in connection with this particular coil our advice is very definitely that you buy one of the commercial makes available, and you
(Continued on next page.)

FOR THE SHORT WAVES



If you want to make your own short-wave coil, you will be able to obtain all the necessary details from this diagram. The ribbed former should be 2 3/4 inches to the outside of the ribs.

gressive policy to tell you that the various makes of coils for our "Cosmic" receiver are not quite standard in so far as terminal numberings are concerned.

Far from being contrary to our general policy, we want to explain, even before we make any reference to the coils themselves, that the slight variations which do exist are due entirely to our desire to fall in line with the present economy campaign. To put it bluntly, it is a matter which affects your pocket.

And, just to illustrate our point, may we digress to the extent of saying a word or two about the manufacture of coils in general, and the "Cosmic" coils in particular?

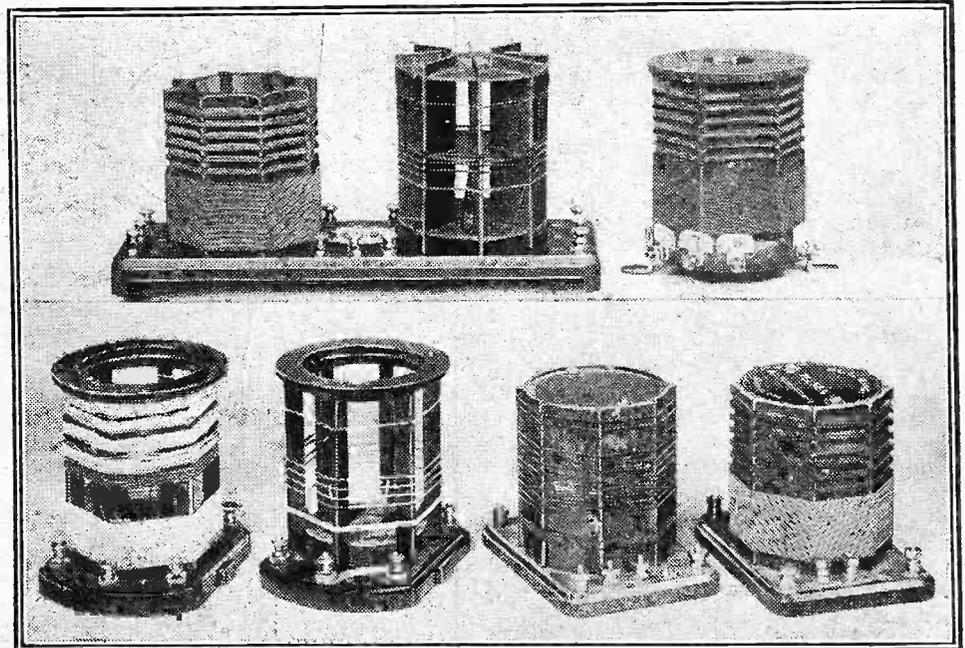
You will all be familiar with the types of formers used for these new coils, but possibly not all of you will appreciate that the press tools with which these formers are made cost, in some cases, hundreds of pounds to produce.

To Benefit Readers.

Now, had we approached the various manufacturerers and said "These are the coils for our new set, and we would like you to produce your version similar in every respect." it would have meant in almost every case a completely new set of moulding tools, and the connection between costly new tools and the price of the finished coil is immediately apparent.

Rather than follow that course, "P.W." decided upon the policy of enabling the manufacturers wherever possible to make

"COSMIC" COILS IN MASS PRODUCTION



Various firms are manufacturing the coils at extremely reasonable prices so it will hardly pay you to make your own coils. Above you see a representative collection including the R.I. combined unit on the left (above), the Sovereign dual-range coil on the right (above), the Goltone dual-range and short-wave coils on the left (below), and the Telsen short-wave and dual-range coils on the right (below).

**COILS FOR THE
"COSMIC."**

(Continued from previous page.)

will then be certain to obtain a far better coil than you could possibly hope to produce yourself.

But for those who like making coils, the short-wave unit and the moderator coil are very easy, and if you follow the instructions given below there is absolutely no reason why your finished coils should not be every bit as efficient as the commercial ones available.

For the short-wave coil, which is wound on a Goltone standard short-wave former with six-terminal base, you will require about a yard of No. 18 gauge tinned copper wire and a quantity of No. 30 D.S.C. If you get an ounce reel of the latter you will have sufficient left over for the moderator coil as well.

The Short-wave Windings.

Commence the winding of the short-wave coil with two turns of the 30 D.S.C. wire, which should be positioned approximately half an inch from the top of the former. By the way, with regard to the fixing of the ends of the windings on this former, the ideal way, of course, is to drill small holes in the ribs. But bakelite mouldings are very brittle, and unless you are very careful in the drilling process the chances are that the ribs will break.

For this reason you may find it best to secure the ends simply by giving them a single twist round the appropriate rib.

The main grid winding of the short-wave coil is done with the No. 18 gauge tinned copper wire, and it consists of four turns with an eighth of an inch spacing between each turn. The start of the winding should be commenced at a distance of three-quarters of an inch from the two-turn winding already on.

The third and last winding of this former consists of five turns of the number 30 D.S.C. closely wound, and at a distance of three-sixteenths of an inch from the lower end of the grid winding. All three windings should be in the same direction.

When all these windings have been done, the next thing is to connect the various ends to the appropriate terminals on the coil base, and for this purpose you cannot do better than to refer to the diagram accompanying this article, in which the correct procedure is shown.

How to Connect Up.

So much for the short-wave coil—and there was nothing very difficult in that, was there? Now, before we pass on to the construction of the other coil—which, if anything, is even more simple than the short-wave unit—it would perhaps be as well for us first to tell you how this particular short-wave unit should be connected up, since the terminals markings are not quite the same as those shown in the original wiring diagram.

Referring to the wiring diagram, shown on this page, in which the actual coils are omitted, but in which the various coil leads are marked A, B, C, etc., Lead A should be joined to terminal 1; lead B to terminal 2;

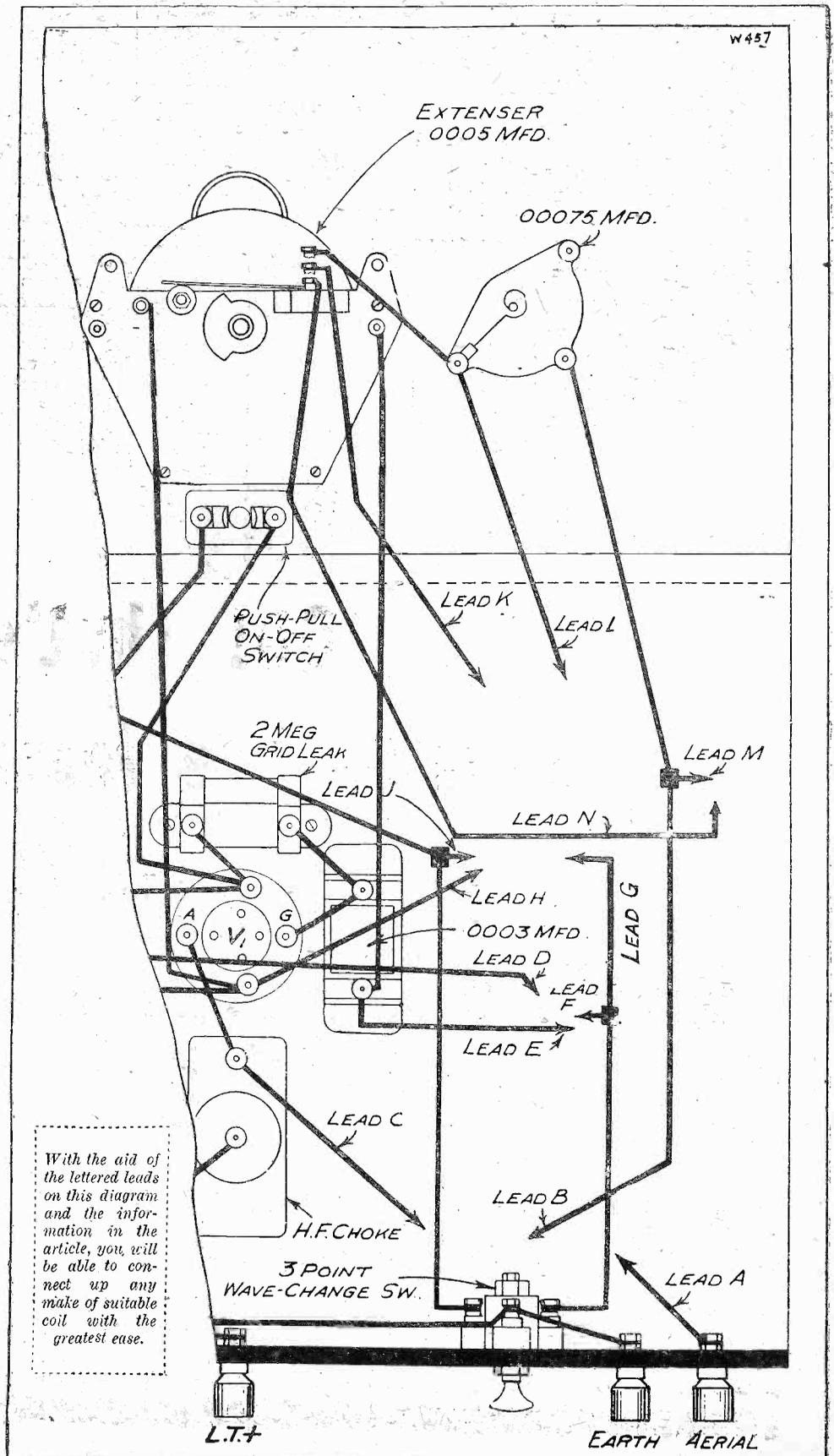
lead C to terminal 3; lead F to terminal 6; lead E to terminal 5; lead D to terminal 4.

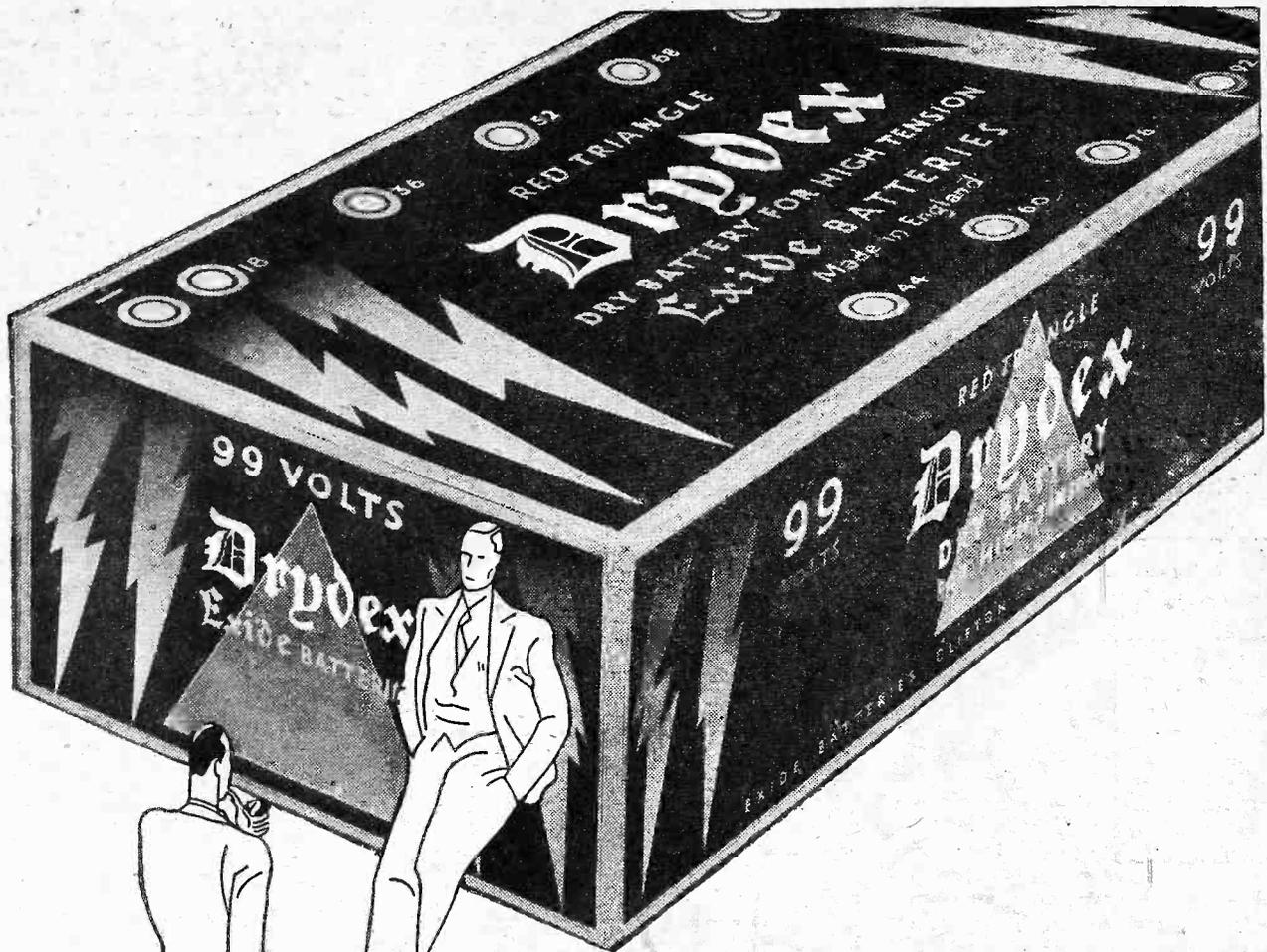
Now for the construction of the moderator coil, which is wound on a standard "P.W." coil quoit. The winding consists of 35 turns of the 30 D.S.C. wire with tapings at 21 and 27 turns. Fix one end of the wire to the coil quoit and wind on 21 turns as a single layer

This will just about fill the complete width of the available winding space on the quoit, and, this point reached, twist a loop in the wire for tapping purposes, and then wind a further six turns over the top of the first layer. When this sixth turn from the

(Continued on page 1315.)

THE "COSMIC" COIL CONNECTIONS





'Oh! that's not long!

Mine has lasted much

longer than that!

Mine's a Drydex'

● THE Exide DRY BATTERY

Made entirely in England employing British labour and British capital.

Obtainable everywhere from all good dealers in sizes and types to suit every wireless set. Also for torches, pocket lamps, cycle-lamps and bells.

Mr. S. of Hereford, says:—

"I have had a Drydex in use on my 3-valve set for eleven months and it still shows a voltage of 90. The life of other makers' batteries (and I have had many) were mostly three months, so in future Drydex for me."

Exide Batteries, Exide Works, Clifton Junction, nr. Manchester. Branches at London, Manchester, Birmingham, Bristol, Glasgow, Dublin & Belfast



Contribute to the COSMIC

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SOLID BASE BOARD**
The single base board ensures easy fixing and compact assembly.

**ALL
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**The
Skeleton
FORMER**
The skeleton former of the short wave coil is of special insulated material and reduces to a minimum dielectric losses. The former of the Dual Range Coil is of best British Ebonite.



List No. BY31.
Overall Dimensions:
7½ × 2½ × 3½ ins. high

12'6

TRIPLE WAVE COIL

Specified for best results
**in the COSMIC III
and "COSMIC" III STAR**

The heart of the Set.

The importance of reducing High Frequency losses in this circuit cannot be too highly stressed. For that reason the R.I. Triple Wave Coil Unit possesses distinctive and exclusive advantages.

THREE COILS IN ONE
The Dual Range Coil and **short-wave coil** are combined together in one unit which deals with long, medium and short waves, and ensures easy fixing and compact assembly.

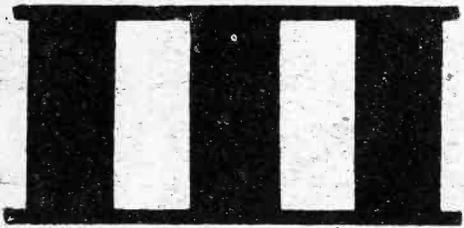
MINIMUM OF DIELECTRIC LOSSES
The "former" on which the short-wave coil is wound is of skeleton construction, on the same principle as the famous Dual Astatic Choke. It reduces to a minimum dielectric losses which are bound to occur in coils where this skeleton construction is absent.

RIGOROUS SCIENTIFIC TESTS
Every coil is carefully tested in the "Cosmic" III and "Cosmic" III Star circuits and, in addition, checked with a wavemeter over the entire range of broadcast and short-wave bands.

CHOSEN BY EXPERTS
This unit has not only been specified by "P.W." for the "Cosmic" III, but also Mr. G. P. Kendall, B.Sc., Chief Engineer, "Ready Radio," has specially selected it for use in the "Cosmic" III Star Set (as advertised on page 1288).

The VITAL COMPONENTS THAT

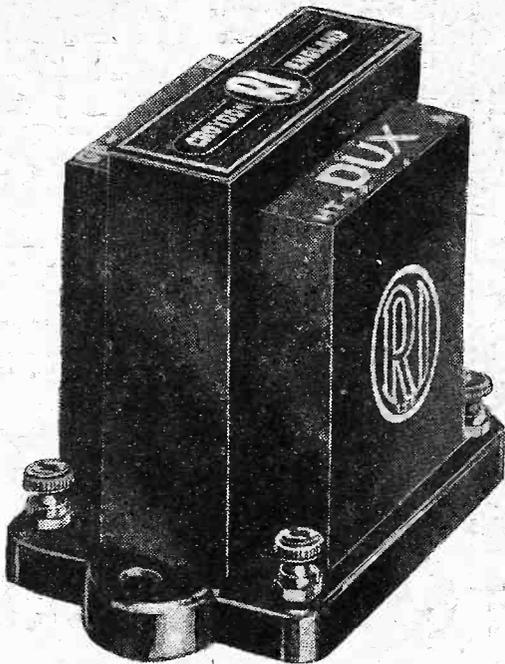
Efficiency of the



The simple fact to remember before commencing to purchase components for this excellent circuit, is that it costs less to buy R.I. productions first rather than after you have found that others have disappointed you. It is less expensive this way, which gives you from the start the results claimed by the designer and upon which you rely to justify your expenditure of time and money.

These Components comprise fundamental L.F. and H.F. Features of the "Cosmic" III and "Cosmic" III Star. Their specification by "P.W." and Mr. G. P. Kendall, B.Sc., Chief Engineer "Ready Radio" is proof of their pre-eminent suitability for the Set.

The latest edition of the R.I. Catalogue is the finest component reference obtainable. Ask your dealer or us for a copy.



The "DUX" TRANSFORMER

The "P.W." designers first selection for the "Cosmic" III. A remarkable transformer that has attained enormous popularity by unequalled performance in hundreds of thousands of sets.

"DUX" has been specified as first selection for the "Cosmic" III because it is the lowest priced transformer that is really efficient. Good L.F. amplification is a vital feature in the circuit, and "DUX" has been proved by test to give a performance equal to that of transformers costing many times its price.

Full technical information and diagrams are published relative to "DUX," as with all R.I. productions. Ask your radio dealer for a copy.

INDUCTANCE 30 HENRIES.

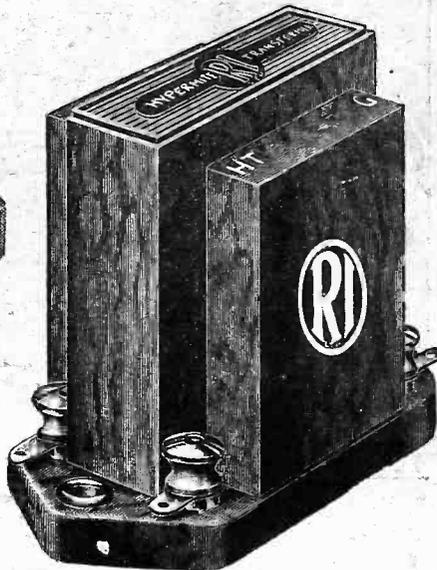
Ratios: 1:3½ (standard) or 1:4½

(Auto-connection).

Weight: 11½ ozs. Sizes: 3½ x 2 x 2½ ins.

List No. DY 29.

6'9



The "HYPERMITE" TRANSFORMER

Specified by Mr. G. P. Kendall, B.Sc. for the "Cosmic" III Star Set because it possesses a high permeability core of "Nickalloy" and gives therefore greater and more uniform amplification requisite to the finesse of reception for which this "Star" circuit was designed. "Hypermite" was the first popular priced Nickel-iron alloy core transformer, and is chosen by more experienced set builders for best results. Ask for technical information and diagrams.

Inductance 50 henries.

Ratio 3½ to 1.

Dimensions Overall:

2½ x 1½ x 2½ ins. high.

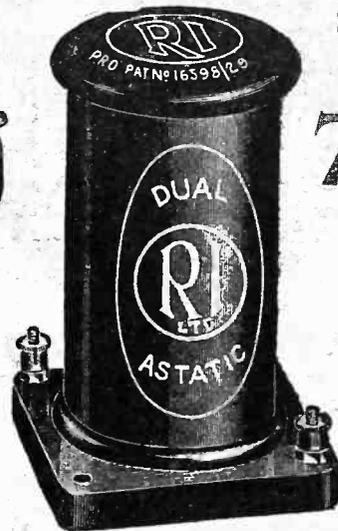
Weight 7 ozs.

12'6

DUAL-ASTATIC H.F. CHOKE

This choke is pre-eminently best for the "Cosmic" III and "Cosmic" III Star in both of which it functions most satisfactorily over the entire broadcasting wavebands, cutting out all blind spots and resonant losses. Complete freedom from H.F. interference with adjacent components is assured by its astatic winding and skeleton former construction.

List No. F.Y.I.
Resistance D.C. 650 ohms. Inductance 60,000 micro-henries. Overall dimensions: 2 ins. square x 3½ ins. high.



7'6

GOVERN SUCCESS



THE MIRROR OF THE B.B.C.

By O.H.M.

POLICY UNSETTLEMENT

THE STRUGGLE FOR ENTERTAINMENT VALUES—LADY SNOWDEN ACTIVE—ROUND THE PROGRAMMES.

I FEEL a sense of uncertainty and doubt at Savoy Hill on many aspects of policy and procedure. The situation is not unlike that of five years ago when the Corporation took over from the Company, or again, when Mr. Whitley succeeded Lord Clarendon as Chairman three years later. These occasional phases of uncertainty are probably inevitable, but they should be curtailed as much as possible.

The Struggle for Entertainment Values.

For years I have chronicled the varying fortunes of the struggle between entertainers and uplifters for control of programmes. The latter sustained several serious reverses last year, but recently the tide has turned so strongly as to justify general anxiety.

The only way to be sure of safeguarding entertainment is to make all other parts of programme work subsidiary. Thus, for instance, talks should not be admitted without qualifying as entertainment. But the present attitude at Savoy Hill is rather the reverse—talks and education have been removed from the orbit of entertainment and are given equal status and independent existence.

I do not like this at all. The B.B.C. must see to it that the right point of view is applied. If this is not done, the monopoly will be endangered before the end of the present Charter.

Lady Snowden Active.

Lady Snowden, although redoubling her efforts for Opera, finds time to do even more than formerly for the B.B.C. Members of the staff in difficulty and perplexity find in her an ever-responsive and sympathetic adviser. The under-dog in particular is her interest; and as long as she is connected with the B.B.C., juniors need have no fear they will be forgotten.

Round the Programmes.

Another Columbia hour, or to explain it more fully, another relay of an American programme arranged by the Columbia Broadcasting Company, will be given from the London Regional transmitter on Monday, February 15th.

Next time the fare will consist of negro spirituals, which should contrast well with the light entertainment given by the "Stars of American Radio" that aroused so much controversy among listeners a few weeks ago.

By the way, people are still writing to me about that programme; their opinions generally being so fundamentally opposed that it would be quite impossible for anyone (since Solomon is no longer with us) to weigh up the pros and cons and give a verdict.

Some say it was the most wonderful programme ever put out from any station, others that it was the world's worst rubbish. Both statements are correct if you go no further than to say that some people like that sort of entertainment, and that others most emphatically do not.

Shouting by one side or the other does not alter it. The matter upon which there can be no dispute whatever is that technically it was a great achievement.

It showed what can be done in these long-distance relays. Meanwhile, those who did not like the first programme can afford to sit tight and wait for one they do appreciate, which will, in turn, no doubt be the "world's worst" for those who went into hysterics of delight over the last.

A PROMINENT B.B.C. OFFICIAL



You might not think it, but this is a picture of the Midland Regional Director! He was not on duty, of course, at the moment the camera caught him, but was in fancy dress at a Birmingham masquerade given by Sir Barry Jackson.

A potted version of Dibden's opera "The Waterman," is to be included in the vaudeville programme for London Regional listeners on Wednesday, February 17th, when the orchestra will be as the composer himself intended—string and harpsichord.

On the following evening and again on Saturday, February 20th, the eighth chapter of John Watt's singing serial "Songs from the Shows" will be broadcast. I understand that Mr. Watt is devoting this next show to numbers from famous revues.

I hear that Mr. L. du Garde Peach's play, "Marie Celeste" which was first broadcast last April, is to be revived in the near future. The story, as most listeners know, is based on one of the greatest mysteries of the sea, namely what happened to the crew of a brigantine which put out from New York for Genoa in 1872, and some weeks later was found adrift off the Azores with all sails set, but with not a soul aboard, either dead or alive. The play imagines a solution, which is as good as any other, of this mystery that will never be cleared up. The Productions Department at Savoy Hill is hoping to reassemble the original actors for the revival.

Halifax and Hexham.

Halifax, which has been described as perhaps the handsomest of all the large manufacturing cities of Yorkshire, is to provide the religious service for North Regional listeners on Sunday, February 21st, when the microphone is installed in the old Mother Church of what is reputed to be the largest parish in England, and to which to-day are attached about fifty daughter parishes.

The service will be conducted by the Vicar of Halifax, the Rt. Rev. Bishop Frodsham, who for twelve years was Bishop of Northern Queensland, and has also travelled extensively in the Far East and Australasia. Bishop Frodsham, whose interest in all social and educational problems is well-known, served as Chaplain to the Australian Forces during the War.

On the following evening the North Regional programme will include an historical play written by Richard Fisher

(Continued on page 1308.)

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

ALTHOUGH I am not one to be excited over the prospect of a Shakespeare week at the local theatre, and although, strange to relate, I have never been to the Old Vic, I was tempted to listen to the broadcast version of "The Taming of the Shrew."

Apart from the excessive speed at which it was carried through—all too speedy, for my liking—I have no adverse criticism to make on the production. In fact, I found it surprisingly interesting.

To my mind, Shakespeare, when broadcast, approximates very closely to Shakespeare when read. With nothing to distract one, or to engage the eyes, one can concentrate wholeheartedly on the words. There is so much in Shakespeare that, inevitably, one misses a good deal both in reading it and in watching it on the stage.

This is where "Radio-Shakespeare" helps. It gives one an opportunity to listen to Shakespeare's glorious *style*, and thus to make fresh discoveries. At any rate, this is how it struck me the other night.

Two talks which have given me pleasure of late were "The Press," by Mr. Kingsley-Martin, and "Science and Civilisation," by Mr. Belloc. I like the frank way in which the former is dealing with his subject, and I feel certain, that at the end of his course of talks, I shall feel less prone to throw down my morning paper with a gesture of disgust, remarking "There's nothing in the paper this morning."

Sir Samuel Hoare's talk on "India since the Round Table Conference" was

(Continued on page 1310.)

MARCONI SCREEN GRID VALVES ARE PLANNED FOR EXTREME RANGE.

THEIR CHARACTERISTICS PROVIDE GREATER OVERALL MAGNIFICATION
 Whether the station comes in at the top or bottom of the scale it will be at its loudest and steadiest when your receiver is aided by the impressive practical performance of Marconi screen grid valves. Every Marconi screen grid is designed for optimum overall magnification, stability, selectivity, ease of control and strict economy in use. There are types for both single H.F. and multi-stage receivers—each with an ideal characteristic for its purpose.

Examine the curve of VMS. 4, the first "variable Mu" type. Note the careful proportioning and complete control over amplification. Note also the rigid, mica bonded grid construction. Finally, observe the workmanlike assembly of Marconi S.22, a high efficiency 2-volt type. Features such as these tell their own story to any technician.

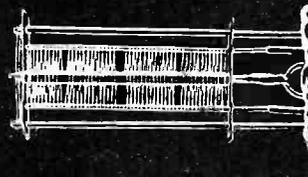
A.C. Mains types

- MS4. multi-stage 22/6
- MS4.B. single stage 22/6
- VMS.4 variable-Mu 22/6

D.C. Mains types

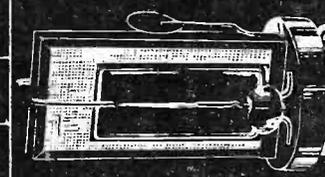
- DS. multi stage 22/6
- DSB. single stage 22/6
- S.22 multi stage 20 $\frac{1}{2}$ -
- S.22 single stage 20 $\frac{1}{2}$ -

2-volt types



THE "COSMIC THREE"
 USE THESE MARCONI VALVES

- Detector HL.2 8/6
- L.F. L.2/b 8/6
- Power P.240 13/6



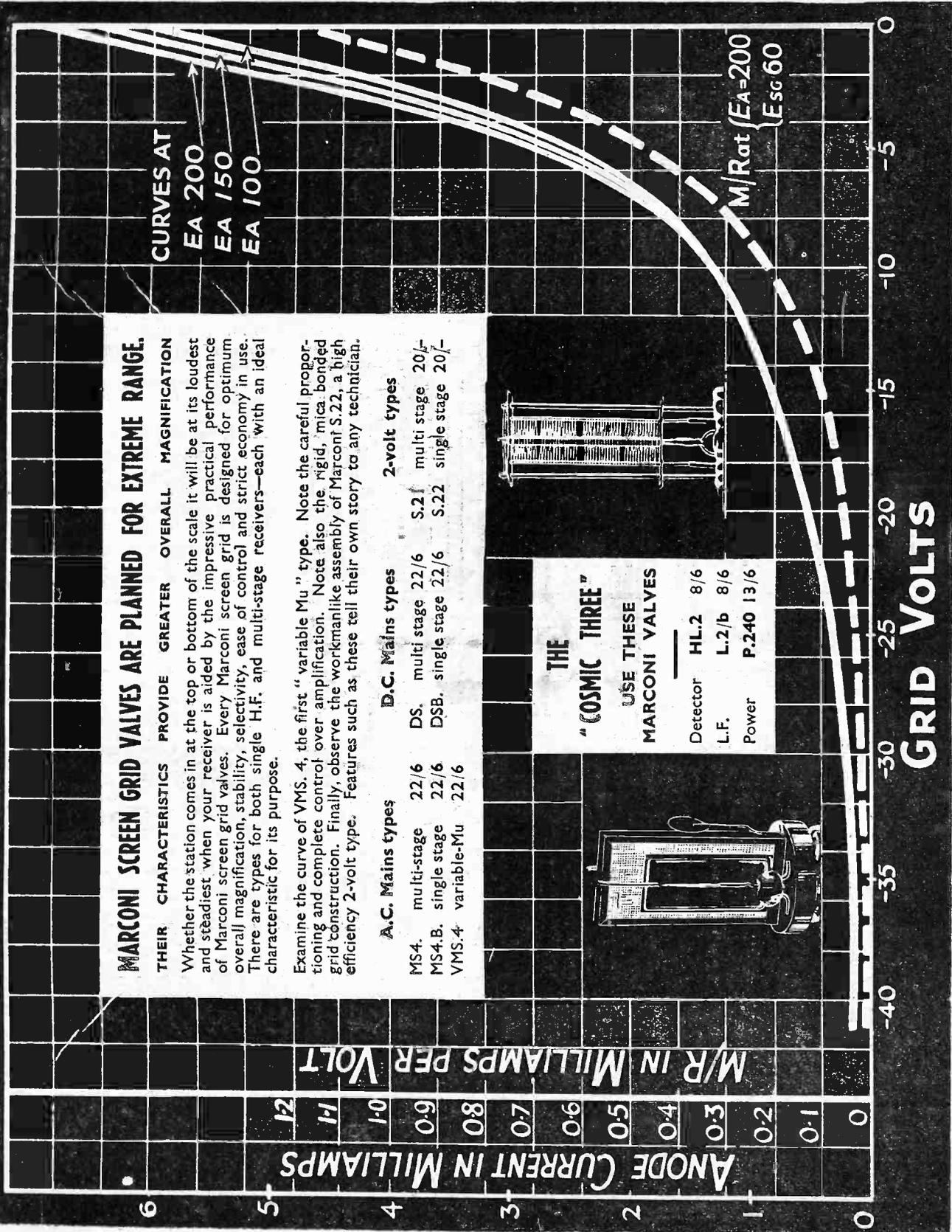
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TYPE "B" Non-rotating name. Cross-hole for solid wire or tag. Slot and nut to eliminate soldering. 2 BA stem. Price 6d. each.

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**BELLING-LEE
TERMINAL
MOUNT.**

Takes two terminals of any make. Mounts them anywhere, vertically or horizontally. Particularly suitable for use with Belling-Lee Terminal Type "B." Price 8d.

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A MAGNIFICENT "CONSTRUCTOR" NUMBER

The March issue of THE WIRELESS CONSTRUCTOR, on Sale this week, is extraordinarily powerful in its "constructor" material. For example, there is another long article about John Scott-Taggart's record-breaking achievement, entitled:

MORE ABOUT THE "S.T.300" And then there are full how-to-make details of THE "VIKING" BAND-PASS FOUR

By Victor King

A loudspeaker set of up-to-the-minute design for multi-station reception, by Victor King, who designed the most successful set of 1931. In his new "four" he has risen to entirely new heights. Further contributions tell you how to construct inexpensively and at modest cost,

AN EFFICIENT WAVE-TRAP—A TWO-VALVE L.F. AMPLIFIER—AN H.T. UNIT FOR A.C. MAINS

Among the general articles are:

THE HEART OF THE MODERN SET

By John Scott-Taggart

(who explains exactly what an S.G. valve is and does).

MAKING RADIO READABLE

By Herbert K. Simpson

(who tells you just what you want to know about other fascinating whys and wherefores of wireless).

THE MAN BEHIND THE VAUDEVILLE—OPERATING A KELSEY ADAPTOR

In fact, there is a whole mine of really readable and helpful information.

THE WIRELESS CONSTRUCTOR

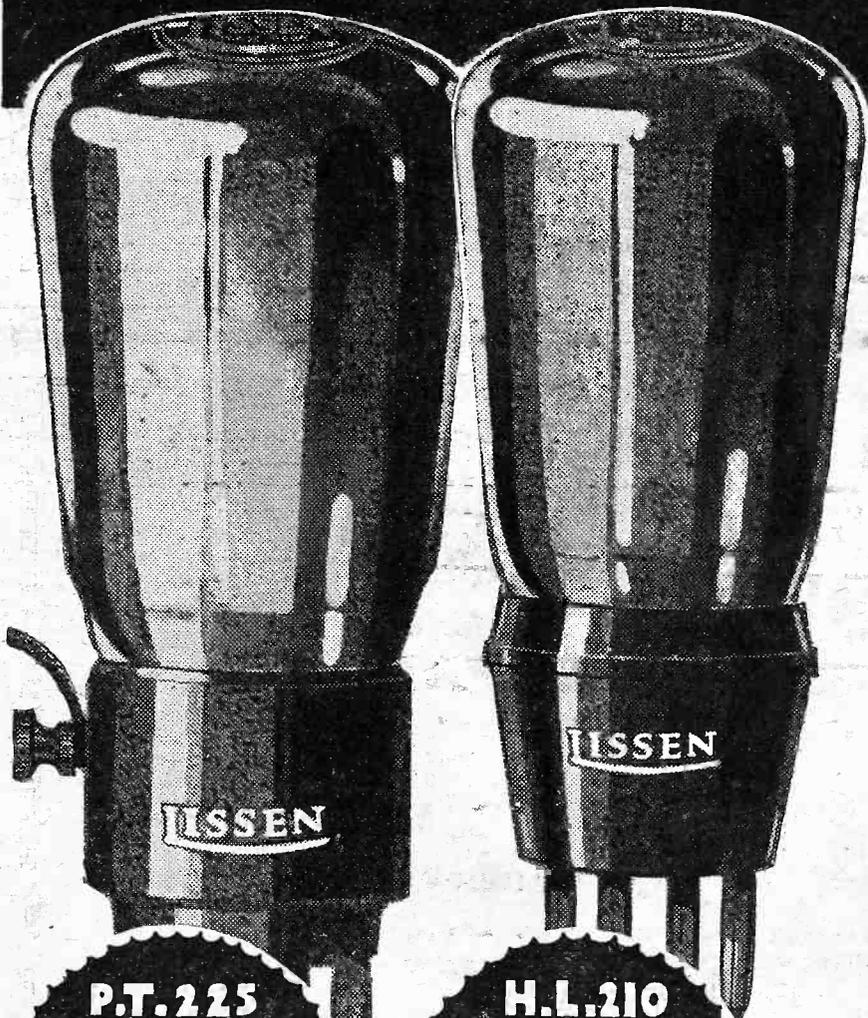
ON SALE THIS WEEK

::

PRICE SIXPENCE

These
TWO VALVES
make any 2 valve circuit

BETTER FOR RANGE AND VOLUME



P.T.225
12'6

H.L.210
5'6

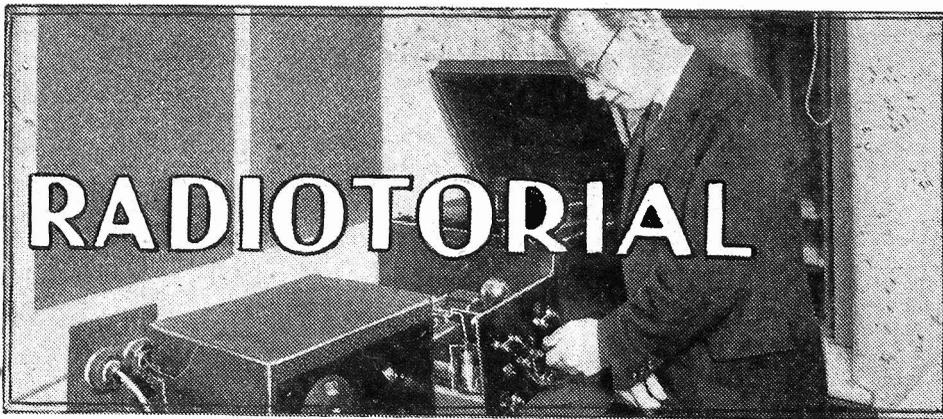
If you would like your radio louder—if you want to get the Continental stations at fuller loud-speaker strength—if you have any two-valve set and would like to have it perform like a three—*replace the detector valve with a lively Lissen Detector and the power valve with a Lissen Power Pentode.* Immediately you will notice a tremendous step up in volume on all stations—far greater liveliness in tuning, longer range and finer quality of reproduction.

To get these improved results you do not have to alter your receiver at all. Simply buy a Lissen Detector Valve, H.L.210, price 5/6, and a Lissen Power Pentode, P.T.225, price 12/6, and plug them in. The Lissen Power Pentode takes only 7 m/A of H.T. current, and can therefore be run off ordinary batteries. With these valves you get **IMMENSELY INCREASED VOLUME AND GREATER RANGE WITHOUT PAYING MORE FOR IT.**

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VALVES

OTHER TYPES AND PRICES :—
H.210, 5/6. L.210, 5/6. P.220, 7/3. P.X.240, 8/-.
S.G.215, 12/6. 4-volt and 6-volt types also available.

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

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

TROUBLE WITH A CHARGER.

F. H. S. (Northampton).—"Some time ago, on the recommendation of a friend, I decided to do my own accumulator charging at home. The scheme he was using was a simple one employing a transformer and two valves (Philips 329 and 328), and in the diagram supplied with these the accumulator was

shown connected directly in the charger circuit—i.e. the positive side of it to a centre tapping on the mains transformer, and the other side (—) to the grid pin of one of the valve holders.

"As I did not want to be continually undoing and doing up the accumulator I decided that I would use a double-pole double-throw switch, wiring the accumulator across the centre terminals of this.

"When thrown in the charge position the two outer contacts which it then engaged were wired up as shown in the makers' diagram; and when thrown in the other position the other two contacts on the switch were taken

to L.T. + and — on the set. I have checked over this arrangement half a dozen times, and I still cannot see any fault with it. But in practice it does not work at all well.

"Although the accumulator is a 40 actual, I do not seem to be getting as good results from it as when it was taken to the charging station, and its specific gravity seems to be very little altered even after a charge of four or five days.

NOT CHARGING PROPERLY.

"I have not got a voltmeter of my own, but occasionally I am able to borrow one, and then it always seems as though the accumulator is a bit below par. That is to say, voltage is never well up, and as the hydrometer is never well up either, I think there must be something wrong with the charging.

"The only difference I can see between it and my friend's arrangement is that the rectifying valve does not light up as brilliantly as his does. But my valve on his charger is as bright as his own. Could you offer any suggestions?"

Everything seems to point to a very poor contact in the charging circuit. We should examine that double-pole double-throw switch again very carefully indeed, cleaning all the contacts with emery cloth and making sure that all the springs, etc., are really tight.

As the charging voltage is rather a low one for such cases, it is quite possible that a little film of grease or impurity of some kind is preventing the proper charging current from flowing, which would result in a dimmed valve, as you describe. If you could borrow an ammeter and connect this in the charging circuit you would know at once whether a satisfactory charge was being made or not, but, failing that, try and improve the connections so that your valve glows as brightly as the other.

DISTORTION WHEN USING A PICK-UP.

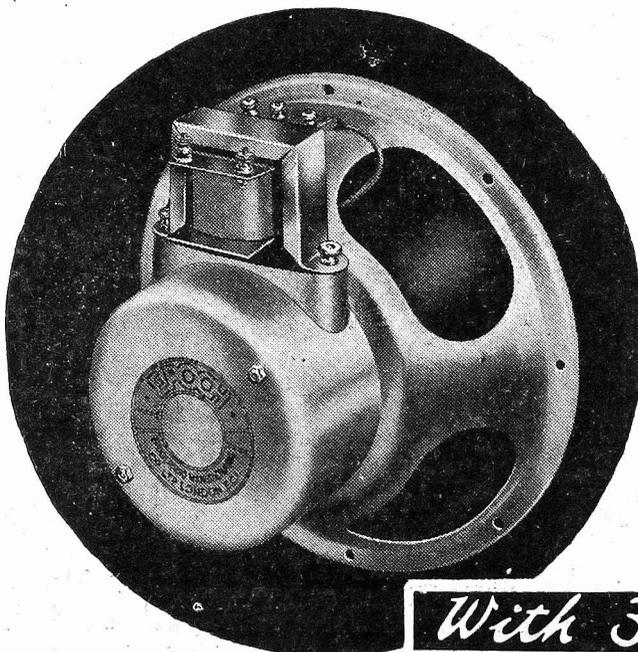
D. R. (Shaftesbury).—"The set I am using is not a home-made one, but was bought complete as a four-valver, S.G., Detector,

(Continued on page 1302.)

EPOCH

SPECIFIED FOR THE COSMIC III
REAL PIONEERS—YEARS AHEAD
PERMANENT MAGNET

in experience, research and design



MODEL J.1. 18 months before the many so-called pioneer claims to the production of the Permanent Magnet Moving-Coil

Speakers, Epoch designed, developed and manufactured the first practical Permanent Magnet. Epoch's leadership in this class is definitely established by a new standard of comparison for performance and price set by Model J.1. The lowest price 9% cobalt steel Permanent Magnet Moving-Coil Speaker on the market. Comparable to instruments costing pounds more. The 3-Ratio Transformer fitted makes it ready to work instantly from any set with Pentode or Super Power output. When purchasing a Moving-Coil insist upon EPOCH.

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Complete with aluminium covered cobalt steel magnet, one-piece moulded linen diaphragm and 3-ratio input transformer. Ask your dealer for it. He will gladly demonstrate this or any Epoch Model. If you have any difficulty send for nearest dealer's name or call at our new showrooms and hear it.

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(Complete with 3-Ratio Input Transformer.)

THE LATEST MODEL. 1 lb. HEAVIER MAGNET. EXTRA-ORDINARILY SENSITIVE. NO ADVANCE IN PRICE.

EPOCH RADIO MANUFACTURING CO., LTD., EXMOUTH HOUSE, EXMOUTH STREET, E.G.1

At the junction of Rosebery Avenue and Farringdon Road.

With 3-Ratio Input Transformer

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1300.)

and two L.F. It is exactly as it left the makers' hands, except for the fact that on the advice of an acquaintance I fitted a pick-up.

"The original connections to the detector valve were from grid leak and grid condenser to the grid. I altered this, and connected instead the grid to the centre terminal of a single-pole double-throw switch.

"One side of this is joined to grid leak and grid condenser, so that when put over that way the connections were just as before. The other side of the switch was taken to one pick-up terminal, the other terminal going to L.F. negative.

"With the arrangement I get plenty of volume, but a certain harsh distortion which I find very objectionable. Can there be anything wrong in the wiring, which looks all right to me?"

It is quite likely that the trouble would be cured immediately by the application of grid bias which at the moment you do not appear to be using. Normally a detector valve gets its grid bias from circuit connections, without a connection to a grid-bias battery. When used for pick-up purposes it is usual to provide about 1½ volts negative grid bias to the valve.

You say that at present one of your pick-up terminals is connected to a terminal on the switch. This is O.K., but the other should not be connected direct to L.F.—but to a negative plug for the grid bias plugged in at about 1½ (or possibly 3) volts.

The rest of the circuit is O.K., so you may find that this simple alteration will completely remove your trouble.

COMPRESSION-TYPE CONDENSERS ON LONG WAVES.

The following letter from a "P.W." reader contains a tip which may be so useful to other readers that it is reproduced here instead of under the heading of Correspondence:

"Dear Sir,—Just a word in praise of the 'Super-Coil'—Three, which I built about a year ago and still wants a lot of beating. The object of this letter is to help anyone who has had trouble with the working of this particular circuit on long waves. Wave-change was O.K. but reaction poor, strength very poor, some hand capacity, etc.; but the trouble was traced to the .002 condenser which controlled selectivity on long waves. This I took out, and found that the moving plates did not open when the knob was unscrewed. Fully expecting this was the trouble. I pulled open the plates a little wider to make sure that they opened the full width—viz. to the full extent of the adjusting screw's travel. On fixing once more together and fixing in the set, the trouble was over. Hoping this will help someone else, as I have gained much knowledge from the "Radiotorial" columns of POPULAR WIRELESS, of which I am a regular reader,

"Yours truly,
"H. S."

VALUES FOR AUTOMATIC GRID BIAS.

"PUZZLED A BIT" (Plymouth).—"Being very interested in the new type of valves run from the mains, I have been looking over a three-valve circuit of this kind for a long time. I have got the general idea all right, except for the automatic grid bias."

"What I cannot understand about this is the reason for different resistances used, and which seem wrong way about in the set in question.

"I take it that the explanation about voltage drop across the resistance is in order, this voltage being used to bias the grid of valve instead of a battery. But it is stated 'the higher the bias resistance the greater the voltage developed across it.'

"Nevertheless, the bias resistance for the L.F. valve is 600 ohms, while that for the last valve, where more bias is needed, is only 350 ohms.

"Both resistances are alike, and both have a fixed condenser across, so why should the high resistance be used for the low grid-bias valve? It cannot be a printer's error, as one of the photos shows the 600 ohms. Is it O.K. to put them this way round, and how does the high resistance give the low voltage with same connections as the other?"

If both circuits passed a current of the same value, the high resistance (600 ohms) would be giving a greater bias voltage than the low resistance (350 ohms). But what you have overlooked is that the voltage depends on resistance multiplied by current.

The actual voltage (V) is the product of resistance (R) in ohms and current (I) in amperes. $V = R \times I$.
To take an instance, suppose the L.F. valve takes 5 milliamps. Expressed in amps this is .005, so the formula becomes $V = R \times I$.
 $= 600 \times .005$.
 $= 3$ volts.

(Continued on page 1304.)

IS YOUR SET GOING WELL?

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

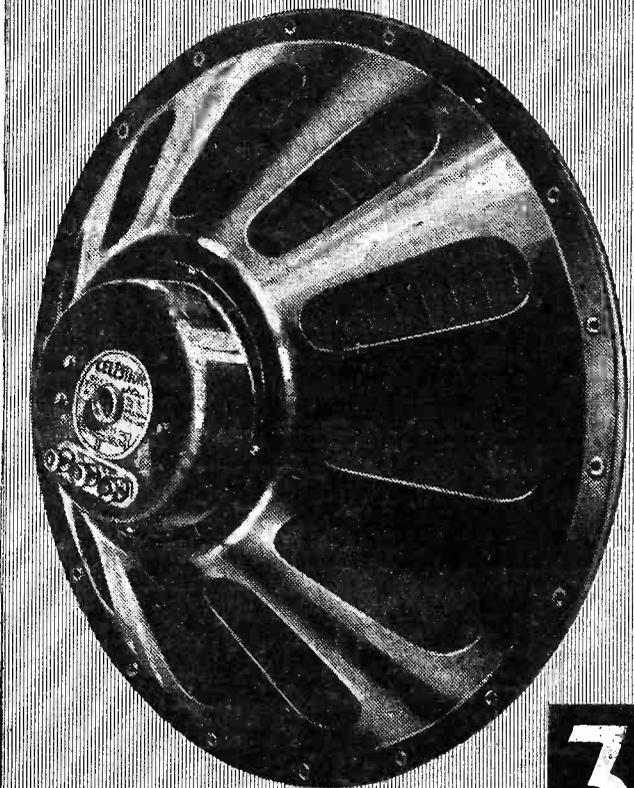
Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

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**GIVES LUXURY RECEPTION -
REPRODUCES SPEECH &
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The Celestion M.12 at 35/- is unquestionably the finest speaker ever offered. It definitely places Celestion quality within the reach of all. It incorporates the famous Reinforced Diaphragm, a patent exclusive to Celestion, which to a large degree is responsible for the infinite superiority of Celestion speakers.

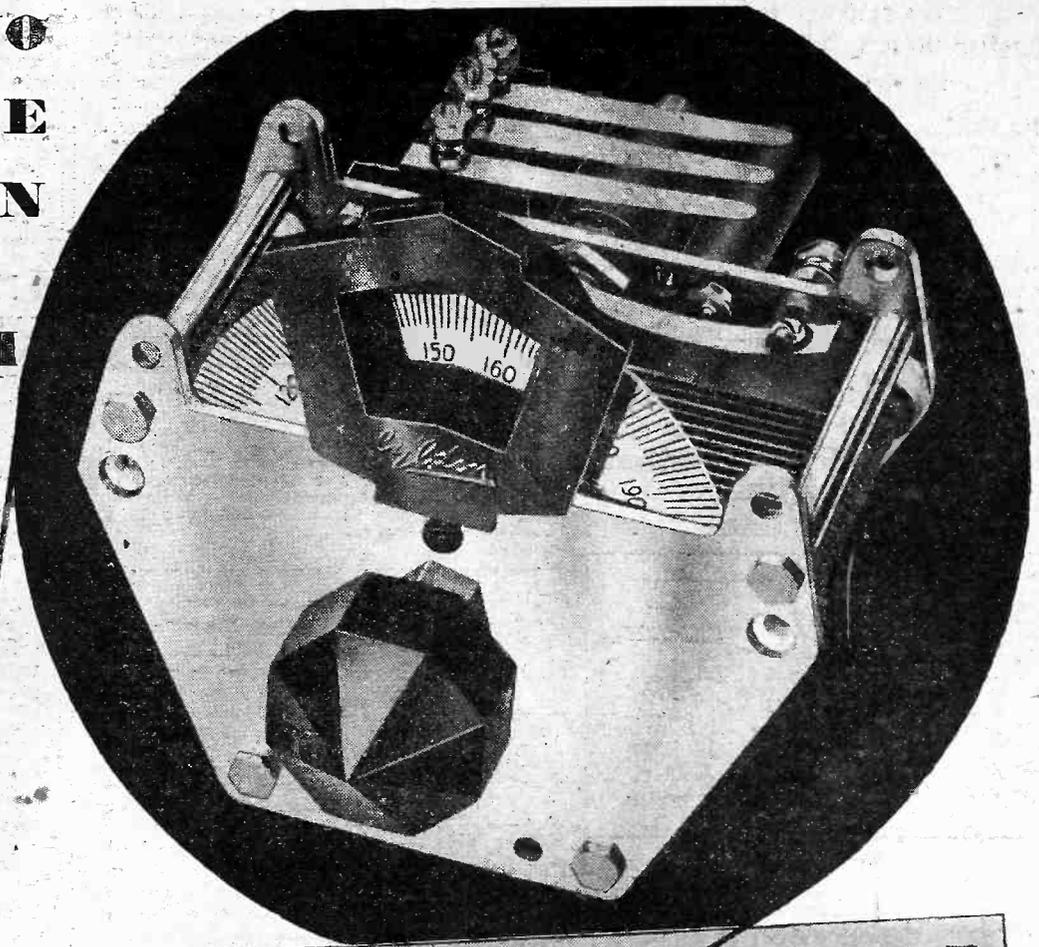
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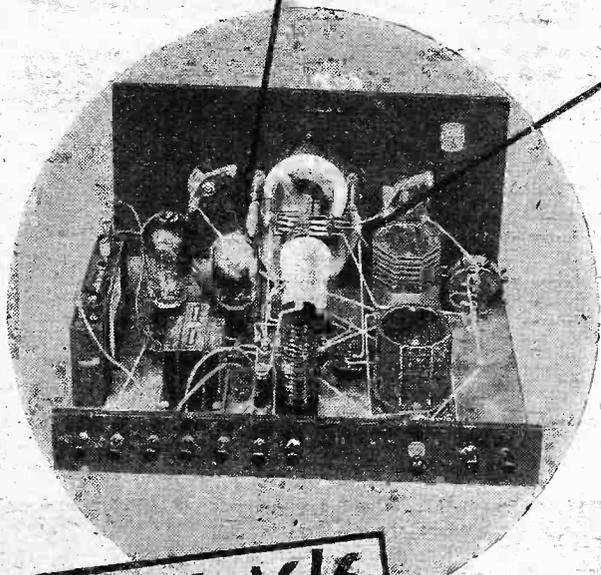
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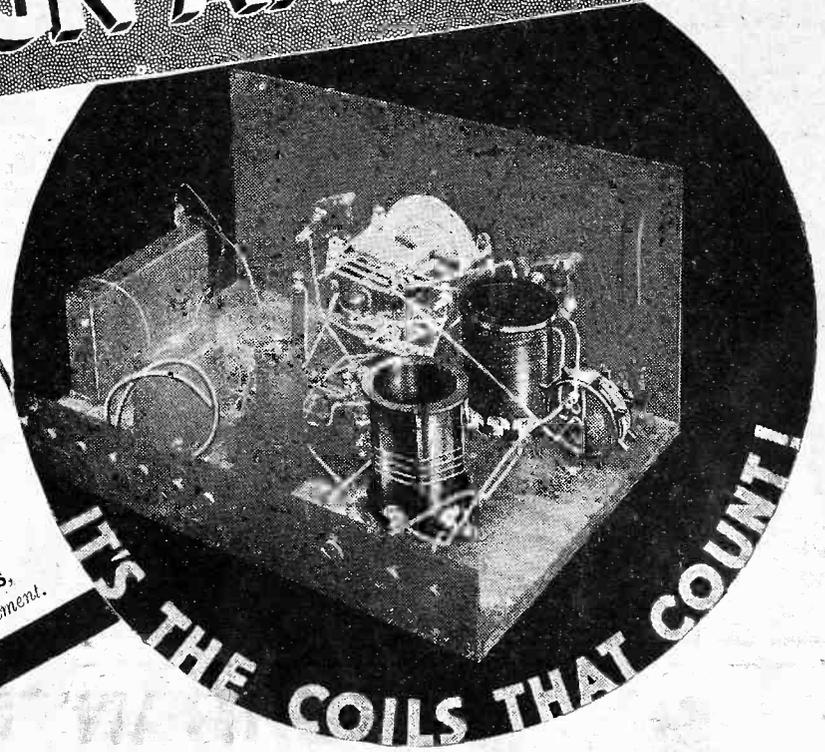
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1304.)

Certainly. A charging current always flows in a reverse direction to that of the current, which is normally taken from the accumulator being charged. It is, in fact, the reverse process, and if it were sent through the accumulator, as you appear to have expected, it would in effect have assisted the accumulator to run down more quickly! Obviously not what is wanted!

RECEPTION WITH H.T. SWITCHED OFF.

H. C. (Derby).—"I read, a few weeks ago, that it is possible to use the mains as an aerial, and decided to try it. The mains are 200 A.C., so I connected up to one side through a 2-mfd. condenser with a compression condenser in series to aid selectivity, and then switched on.

"I got very good results in volume and selectivity, but after a while I decided to dispense with the compression condenser and use the tappings on my coil (a P.J.), so I switched off H.T. (mains driven) and forgot to switch

half, but the English stations and several of the more powerful foreigners came in very well. The puzzle is—how do you derive H.T. with the mains switch off?

"To make things definite, my brother, living next door, tried, and got the same results with two 2 mfd. in series."

It is not easy to see exactly what was happening from your description, but there are one or two points that certainly call for comment. Apparently you expected the large condenser to act as a satisfactory insulator of very high "resistance" or impedance, and that no current would pass through it. Actually the impedance of a 2-mfd. condenser at 50 cycles (which is probably the periodicity of your mains) would be somewhere in the neighbourhood of only 1,500 ohms, whereas a .0002-mfd. condenser would have an enormously high impedance at this frequency.

Apparently the effect occurred only when you shorted the compression condenser in series with the large condenser, thus altering the impedance of this circuit from an extremely high value to something of the order of about 1,500 ohms.

A Possibility

It often happens that mains switches do not completely cut off the supply, and although yours apparently "tested O.K." we should not be inclined to be too certain. It seems probable that, with

by this means. If a mains aerial is to be tried we recommend the use of only the best quality mica type condensers of quite small capacities, say about .0002 mfd., and we would remind you that the electricity supply company may have strong objections to any connections being made to the mains in an unapproved manner.

(You ought not, for instance, to use a condenser which has been tested at less than three or four times the mains voltage.)

A READER'S LOUDSPEAKER TIP.

"I am writing in the hope you will publish this letter in case any other 'P.W.' reader should meet with the same troubles I have discovered and cured," says a kindly, Eltham reader.

Unfortunately, his four-page letter is too long for reproduction in full, but one point he calls attention to is so easily overlooked that space is found for it below.

"One snag I have met, no less than four times in the last six months, is that of the loudspeaker going out of adjustment when finely adjusted. Apparently continued heavy currents have drawn the adjustment out, but it has always sounded to me like loss of H.T., but on putting a meter to the sets I found the reading O.K. I therefore carried out general circuit tests and found things all correct.

"Eventually, on touching the loudspeaker adjusting screw, I have been nearly deafened with the sudden rush of full volume. I found this on other sets besides my own.

"I wonder how many other constructors have wasted time over such a little fault as this? And yet I have no recollection of seeing it explained in 'P.W.'"

"It sounds as if it is an obvious fault, but really it is not so obvious that it can be located straight off when called in to service somebody else's set, because one is then dealing with a multitude of possibilities.

"Thanking you for the very excellent material you provide for us in 'P.W.' I read 'Modern Wireless,' 'Wireless Constructor,' as well.

Yours respectfully,
"EXPERIMENTER."

AN ADVERTISER'S CORRECTION.

In our last week's issue the advertisement on page 1198 referring to the new Telsen Short-Wave Coil contained an error in the specification. The description of the coil should have read: "When tuned by a .00025 condenser, a wave range of 20 to 75 metres can be covered by the operation of a switch as in ordinary broadcast practice."

"S.W. PANEL, No. 58,

"SEMI-FIXED" OR "COMPRESSION" CONDENSERS.

This popular type of condenser is really a kind of cross between a fixed and a variable condenser.

Its make-up is like that of a fixed condenser, but one vane is made of springy metal, on which the adjusting screw rests.

When the control knob is slackened the plates open, thus reducing the capacity of the condenser. A lock-nut enables it to be set permanently at the desired value.

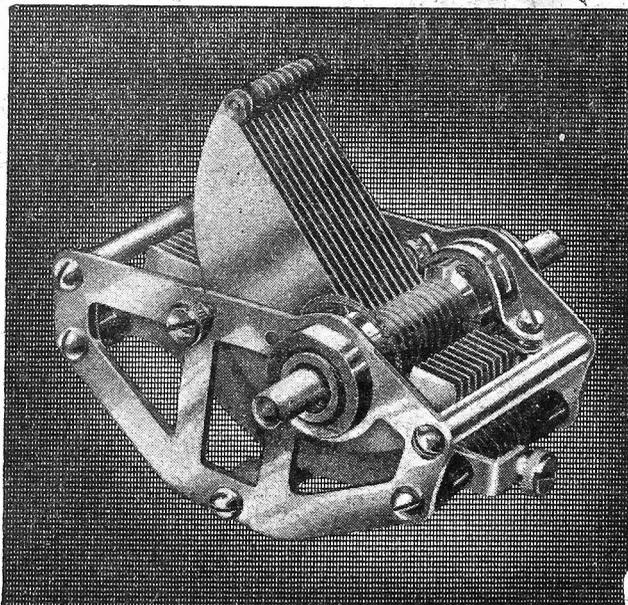
Most of the variation in capacity takes place in the last turn of the adjusting screw—a fact which mitigates against the satisfactory use of this type of condenser for tuning.

off L.T. On shorting the compression condenser, I was surprised to hear the set working without H.T.

"I straightaway tested the H.T. switch, expecting a short; but it was O.K., so I tried again, to find the tuning was flat, volume about

a fairly low impedance to earth via the condenser, enough current was passing through the primary of the mains transformer (even with the switch off) to provide the secondary with quite an appreciable current for rectifying.

It is easy to lose a lot of power by incorrectly connecting large condensers in a mains circuit, and there is also considerable risk of doing unexpected damage



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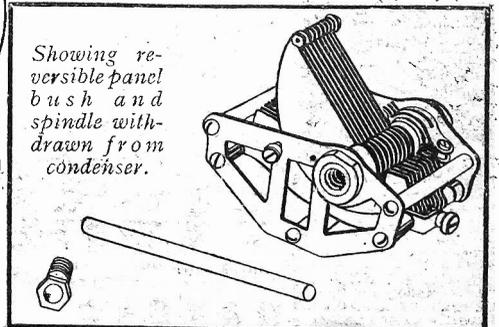
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- Extremely low-loss yet rigid construction.
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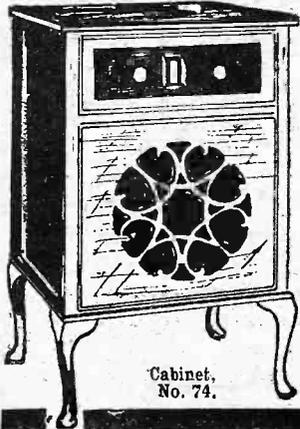


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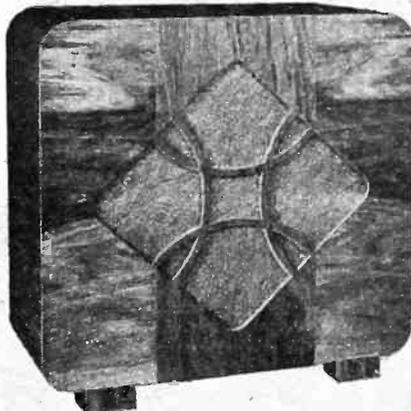
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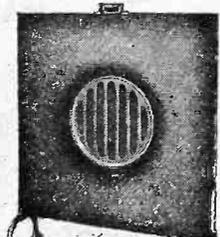
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MIRROR OF THE B.B.C.*(Continued from page 1296.)*

about the Battle of Hexham, perhaps the most decisive encounter in the many struggles between the Houses of York and Lancaster in the Wars of the Roses.

The battle was fought on Hexham Levels, a short distance from the town, and resulted in an overwhelming defeat of the Lancastrians who, greatly outnumbered, found themselves penned between the Yorkist Army and the River.

Housing Problems.

Most people know the story of how Queen Margaret threw herself and her son at the feet of the Robber Chief at Deepdene, who agreed to protect the fugitives, and of the cave, which is still to be seen, in which she and her son are said to have sheltered. The play is full of dramatic incidents, and Mr. Fisher has put in a lot of work to make it as historically accurate as the known facts permit.

Earlier the same evening Sir Ernest Simon, who for a short time was Under-Secretary at the Ministry of Health in the last Government, is giving an introductory talk in the series on "Housing Problems of the Industrial North."

Sir Henry Coward, famous all over the world for his ability in choral matters, will be in charge of the Huddersfield Choral Society Concert which Northern listeners are to hear shortly, when the soloists will include Isobel Baillie (soprano) and Walter Widdop (tenor).

The programme includes Coleridge-Taylor's "Hiawatha's Wedding Feast,"

Parry's "Blest Pair of Sirens," and Mendelssohn's "Hymn of Praise." For those who like lighter fare there is another relay of vaudeville items from the Argyll Theatre, Birkenhead, at 6-30 p.m., on Wednesday, February 24th.

Birmingham's Studio.

I have already given some details of the plans to extend and bring up-to-date the B.B.C. offices and studios at Birmingham, but I find that the full scheme is rather more ambitious than I first thought and has for its ideal the use of no fewer than four studios at the same time when necessary.

The big new studio, to which I have already referred, will be different from anything in this country, the roof being barrel-shaped to allow for the free percolation of tone. The present large studio will also be redecorated and used for general purposes, and what is now No. 2 Studio will remain for talks and gramophone broadcasts. Lastly, the Effects Studio, which at present is also the Dramatic Producer's office, will be brought up to date.

Another Request Programme.

Meanwhile, Midland listeners have plenty to look forward to in the forthcoming programmes, among which is the Cheltenham Musical Society's Concert on Monday, February 22nd, when the City of Birmingham Orchestra, under the conductorship of Leslie Heward, is including Schubert's C Minor Symphony ("The Unfinished") in its programme.

On the following evening, Mr. Frank Cantell is arranging another request

programme of favourite orchestral pieces and songs, among which, I hear, are "The Policeman's Holiday," "The Teddy Bear's Picnic," and Waldteufel's Waltz "The Skaters."

Tuesday, February 23rd, brings a little comedy "The Bear," by Anton Tchekov, which is to be performed by the Birmingham Repertory Theatre Company. The action takes place in Russia in the home of a young and beautiful widow who, since the death of her husband, has vowed to undergo permanent seclusion and mourning, a decision which does not coincide with the ideas of a blustering neighbour to whom the widow's husband was indebted to the extent of what is described as a lot of money.

The Eighth "Nine-Thirty."

His bearish temper does not altogether suit the widow, and how she deals with the matter is the subject of this delightful play, which will be relayed from the studio of the Repertory Theatre, about which I have already written in previous issues. The cast includes Mary Marvin, Oswald Dale Roberts and Michael Barry.

The eighth of Charles Brewer's light entertainments called Nine-Thirty Novelties will be heard by Midland Regional listeners on Saturday, February 27th, and promises to be one of the brightest shows of the series, probably because several of the sketches have been done by women writers who introduce a new note of humour into the dialogues. The show will also include another burlesque talk by P. A. Hall, on "What To Do With Our Boys," the "career" chosen for this occasion being "piracy."

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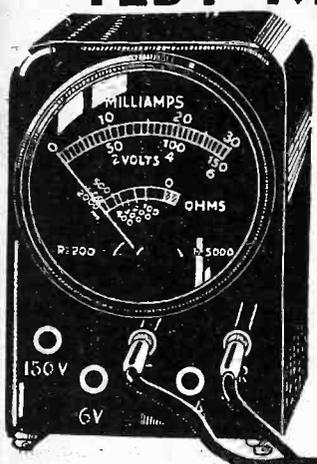
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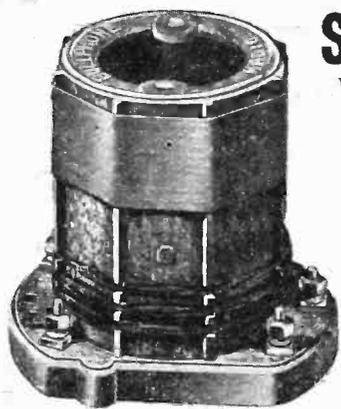
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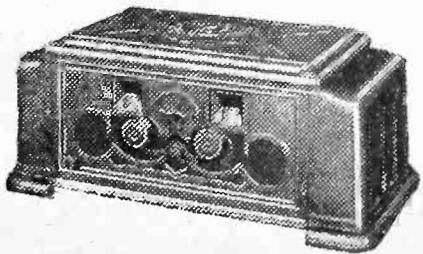
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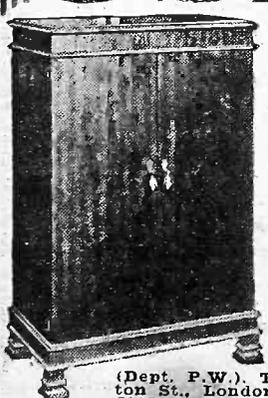
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THE LISTENER'S NOTEBOOK

(Continued from page 1296.)

interesting not so much as a statement of Government policy, as for the fact that that statement was made via the microphone. This, surely, is an innovation.

We know that wireless has been used for broadcasting party politics during an election campaign. Chancellors have also revealed their budgets, and Mr. Thomas has been known to make appeals for Empire, but never, I think, has the Government had its spokesman at Savoy Hill to broadcast its policy on any current question, as Sir Samuel did.

This may be the beginning of a new phase in the history of broadcasting, one in which the Government will work in closer relationship with the B.B.C.

Continental Music.

Of continental music I think the most pleasing broadcast of late was the first three acts of Verdi's "Falstaff" from Radio-Paris. It is curious that "Falstaff" should not occupy a more preponderant place in Verdi's repertoire, in view of its remarkable score, which was written in the third and last phase of the composer's lifetime.

In fact, after the production of "Falstaff" in 1893, Verdi wrote nothing more for the stage. But Verdi, it seems, is better known by his earlier compositions: "Rigoletto," "Il Trovatore," "La Traviata," "Aida," and "Othello." An especially satisfactory feature of the "Falstaff" production was the introduction of explanatory comments between the acts relating to both scenery and the story. Even the "cuts" were explained, thus giving listeners the story in its completeness.

An Early Composer.

I suppose musical listeners appreciated the opportunity to hear a sonata and a fantasy by that early English composer, William Young, which was broadcast by the Barbara Pulvermacher Quintet.

An instrumentalist himself, Young was a member of the Count of Innsbruck's band in the middle of the 17th century. It was during this period of his career that he got into touch with a movement for the development of the Sonata form.

So keenly interested was he in this, that when he returned later to England to serve in Charles II.'s private band, he was able to bring back with him a set of twenty sonatas of his own composition.

The Prince's Speech.

Is it true that the Prince of Wales dislikes speaking before the microphone? And is this dislike simply because he cannot see his audience? If so, I can appreciate the difficulty he feels.

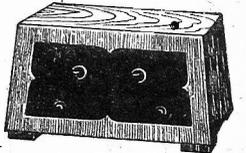
It must be difficult, particularly to the occasional broadcaster, to grasp the idea that he is being listened to by such a vast audience. Arthur Cranmer once told me that he could only overcome this difficulty by singing to the microphone as if it had a personality, and that it was to this personality that he made his appeal.

But the Prince's "Youth" speech did not come from Savoy Hill. He had a crowded Albert Hall to help him, where enthusiasm was almost wild. The result was that his appeal lost none of its sting, and listeners heard a speech which for fervour and forcefulness must rank very high among broadcast speeches.

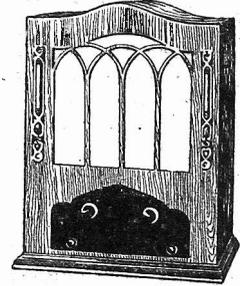
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TECHNICAL NOTES

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

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

Concerning Condensers.

It is not commonly known that the insulation-resistance of a fixed condenser having a waxed paper dielectric falls rapidly with rise of temperature. For instance, the insulation-resistance at a temperature of 50 degrees centigrade may be only one-fifth of the value at a temperature of, say, 20 degrees centigrade.

This emphasises the importance of having the normal insulation resistance of the condenser as high as possible. Perhaps I may mention, in this connection, a very good example of a well-made paper condenser, this is the Ferranti C2c type, having an insulation resistance at 20 degrees centigrade of 1,500 megohms (when used as a 1-microfarad condenser, which I shall explain presently) and about 300 to 400 megohms at 50 degrees centigrade.

You will notice that even at the higher temperature the insulation resistance is still extremely high, and, of course, in actual practice you would use the condenser in such a way that its temperature was not allowed to rise to anything like the higher temperature mentioned.

Condensers which have to carry large alternating currents are specially designed for the purpose, and extra provisions are allowed with regard to their cooling. This does not apply to condensers of small capacity, where the power consumption, and the heat consequently generated, is small.

Multi-Capacity Units.

The Ferranti C2c type condenser is rather interesting in other ways. It is a double condenser, consisting of two 1-microfarad condensers arranged in series, with three terminals, two outer terminals and one centre terminal.

If the centre terminal is used together with either of the outer terminals the capacity is 1 microfarad. If the two outer terminals only are used the capacity consists of two 1-microfarad condensers in series, that is, a total of .5 microfarad; if the centre terminal is used as one terminal whilst the two outer terminals are connected together and used as the second terminal, the arrangement obviously consists of two 1-microfarad condensers in parallel, with a total capacity of 2 microfarads. It is thus possible to get instantly any one of three capacities—.5, 1, or 2 microfarads.

The condenser has a test voltage of 750 volts D.C., and may therefore be used up to half this voltage on D.C. supplies, or to one-third of this voltage with A.C. or rectified A.C. or if used in the output-filter circuit of a receiver.

It is undesirable, however, to connect a condenser of this capacity across the secondary of a mains transformer because, owing to its large capacity, it will consume

(Continued on next page.)

BEWARE THIS POWER THIEF

—electrical leakage may be robbing you of your money and your Set of the vital power it needs



Above you see how the current can creep along the smooth unbroken top of the old-type H.T. Accumulator. Compare with it the separate air-spaced cells of the Lively 'O' (right). Note also that additional means are now provided for using ordinary wander plugs for tappings.



MADE IN TWO SIZES:

Type HT	
Standard 10 volt Unit (2,750 Milliamps)	5/6 each
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Extra large capacity 10 volt Unit (5,500 Milliamps)	6/9 each

THE big bugbear of H.T. Accumulators—electrical cell-to-cell leakage—has been definitely eliminated. In the older H.T. Accumulators each 10-volt unit was made as a single glass cell, with a smooth, "one-piece" top. This smooth top has serious disadvantages. Moisture settles on it, forming a film which provides a direct electrical connection between the positive and negative terminals. As a result, power "leaks" along the top of the cell, causing serious waste.

In the Lively 'O' H.T. Accumulator each 2-volt cell is separated from its neighbour by an air-gap. Air is one of the finest insulators known. Thus electrical cell-to-cell leakage is eliminated. All the power stored up in it is available for working your Set. There is no "falling-off" in voltage due to leakage or self-discharge. It gives your Receiver the H.T. that it needs—pure, smooth current in abundance.

The Lively 'O'



H.T. ACCUMULATOR

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TUNEWELL

TECHNICAL NOTES

(Continued from previous page.)

an appreciable current, and as this is added to the already existing load the total may seriously overload the transformer.

The Ferranti C3c condenser is of similar type to the C2c, but gives three capacity ranges of .05, .1, and .2 microfarads. It is tested up to 1,200 volts D.C., and may therefore be used on supplies up to 600 volts D.C. or 400 volts A.C. or rectified A.C., this voltage being, of course, measured between the middle terminal and either of the outer terminals.

Tuneable Hum.

This particular condenser has been specially produced by Ferranti for overcoming a fairly common trouble known as tuneable hum—namely, a type of mains hum which is evident only when a powerful station is tuned in.

In this case the two terminals of the condenser are connected respectively to the two anodes of the rectifying valve (where this is the type of rectifier used), whilst the middle terminal is connected to H.T. negative or earth.

In the case of a metal rectifier, the two outer terminals are connected respectively to the two ends of the secondary of the transformer and the centre terminal to earth. This arrangement provides an easy path to earth for the radio frequencies and prevents them from getting into the mains and being modulated by the mains frequency and so appearing as audible hum.

An arrangement of this kind has been used for some years in America in connection with gas-discharge rectifying tubes. Its object in that case, however, is not that mentioned above, but rather the suppression of spurious oscillations which are often set up by rectifiers of the kind mentioned.

The C3c condenser may be used for ordinary by-passing purposes, and is specified in Ferranti constructional amplifiers, where it is used in connection with resistance feed for an A.F.7 transformer in order to bring up the bass and compensate the amplifier throughout.

When to Use a Counterpoise.

I am often asked whether it is better to use an ordinary earth or a counterpoise. This depends a good deal upon particular conditions. An ordinary earth is, as a rule, much simpler to make, and for that reason the vast majority use this type of earth, those who use the counterpoise type being very much in the minority.

The counterpoise earth involves a certain amount of trouble and it is seldom convenient. At the same time, it is far better to have a good counterpoise than an inefficient earth of the ordinary type. The counterpoise will generally have a much lower resistance, since the whole of the aerial circuit becomes a metal conductor.

(Continued on next page.)

COSMIC III CONSTRUCTORS

See Pages 1241, 1243 and cover ii

[Advt.]

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TECHNICAL NOTES

(Continued from previous page.)

Almost invariably the majority of the resistance in an ordinary aerial-earth circuit occurs in the earth connection. I do not mean the actual connection between the set and the earth lead, but the connection between the "earth" itself and the ground. Moreover, it varies according to the state of the ground and the time of the year.

A properly constructed counterpoise earth acts as an earth screen, and in this way it overcomes effects which are sometimes due to variations in the electrical conductivity of the ground beneath the aerial.

Local Interference.

There is one particular advantage of a counterpoise which I think is not generally recognised, and that is that it often helps very much in eliminating the interference caused by electrical machinery and so on, particularly where this is communicated by earth currents.

I have known of cases where most persistent interference, from neighbouring electric railways, electric signs, and so on, has been ultimately got over by the use of a counterpoise "earth."

I should perhaps mention before leaving this question that the counterpoise should run actually below the aerial. I have sometimes seen an aerial in the back garden of a house and a counterpoise in the front garden, which, of course, although it gives some sort of results, is all wrong.

Remember that the aerial and the earth, whether the earth be an ordinary earth or a counterpoise, constitute a condenser, and it is usually much better to have this condenser with the plates opposite each other or as nearly so as possible.

Short-Wave Television.

A good deal of interest is being taken in Germany in the development of short-wave television and some little time back a series of experimental television transmissions were inaugurated through the short-wave station at Doberitz, which is mid-way between Nauen and Berlin.

The experiments have been mainly based upon the transmission of images of cinematograph films. Horizontal scanning is used and a wave-length of 143 metres. The number of scanning points to the picture is about 3,000, and a rather high rate of picture frequency is used, so as to get over the usual drawback of flicker in the received images.

A good deal of general experimental progress has been made, but one of the difficulties has been the weak modulation, which is only about ten per cent. Tests are being continued with a view to exploring particularly the possibilities of television transmission on short waves.

Cleaning Terminals.

The other day I happened to try a little device which has been on the market some time for cleaning terminals, particularly battery terminals. It consists of a little steel ring or loop with sharp edges and provided with a suitable handle.

The cutting ring is simply slipped upon the shank of the terminal (the terminal not having first been removed), and then

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

is rotated so that it cuts away all the corrosion and dirt on the terminal.

As it is used with a rotary motion it gives a much more satisfactory result than trying to scrape the terminal with a pen-knife, which at the best of times is a fiddling business.

By turning the cutter the other way up and threading on the terminal nut, it is possible to clean the underside of the nut as well. This little device is very handy, especially when you have many batteries to deal with. It is called the Coney terminal cleaner and the price is 4½d.

A "Rising" Characteristic.

A small low-frequency transformer may often have a "rising" characteristic—either accidental or more frequently intentional!—and so may be useful in the set.

It helps to correct the weakening of the higher tones which is sometimes brought about by the action of the tuner and the detector.

This is pretty well known and many experimenters use the rising characteristic very skilfully for the purpose which I

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with "Popular Wireless" next week.

have just mentioned. But there is sometimes a drawback, inasmuch as a transformer of this kind is apt to produce a high-pitched whistle. In fact, if the valve used with the transformer happens to be especially efficient, the oscillation and whistle may become very pronounced.

Curing Instability.

Often the trouble may be overcome by connecting a fairly high resistance—say, a grid-leak of one megohm or half-a-megohm—across the secondary winding of the transformer. A bypass condenser sometimes does the trick instead of the resistance.

Another dodge which you might try, if you are troubled with this whistle, is to reverse the connections to the primary or to the secondary winding of the transformer. Incidentally a change-over or reversal of the connections is always

(Continued on next page.)



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TIPS FOR THE COSMIC III

See Pages 1241, 1243 and cover ii.

Adv.

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Use the 1 meg. for your S.T. 300

Write for complete catalogue of Accessories and Components.



TECHNICAL NOTES

(Continued from previous page.)

worth trying, as you never know when it may give you better results.

I mentioned recently the use of a pre-set condenser in series with the aerial for the purpose of improving selectivity. This often does have a pronounced effect upon the selectivity, but at the same time, particularly if it is set to a low value, it is apt to reduce the signal strength rather a lot.

It often becomes a question whether you have any signal strength which you can afford to sacrifice, and generally resolves itself into a compromise between losing signal strength and gaining selectivity.

COILS FOR THE "COSMIC"

(Continued from page 1292.)

first tapping is reached, another loop should be made, and the winding is then completed with a further eight turns, making 35 in all.

With regard to connections, again referring to the coil-less wiring diagram appearing on this page, lead M should be joined to the start of the coil quoit winding, and lead N, which should be a flexible wire terminating in a crocodile clip, slips on to the tapping at the 21st, 27th, or 35th turn, which, of course, is the end of the winding. The procedure for finding the correct position for this clip is to be described in appropriate articles.

Many Different Makes.

Having given the constructional details for the short-wave unit and the moderator coil, it would now be as well for us to tell you something about the various commercial coils, and the way in which they should be connected up.

Dealing first of all with the dual-range unit, there are, at present, nine makes from which to choose. The Telsen (the one used in the original set), the Sovereign, the Peto-Scott and the Ready Radio have similar terminal numberings, and they should therefore be connected up exactly as shown in the blue print. The R.I. coil also has terminal markings corresponding with those shown in the blue print, but we shall have something to say about this particular coil a little later on.

Where the Leads Go.

The other coils—the Goltone, the Wearite, the Tunewell and the Lewcos—have terminal markings slightly different from those shown in our blue print, but there is nothing confusing about them, and if you carefully read the following details in conjunction with the coil-less wiring diagram accompanying this article, you will find them quite as simple as the others to connect up.

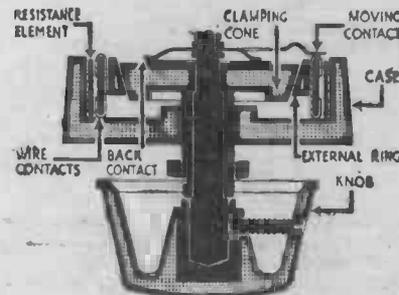
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COILS FOR THE "COSMIC"

(Continued from previous page.)

Lead L should be joined to terminal 3; lead K to terminal 2; lead G to terminal 4; lead H to terminal 5; and lead J to terminal 6.

The Goltone, the Wearite, the Tunewell and the Lewcos short-wave coil units, the terminal connections of which are exactly identical with those of the home-constructed coil described in an earlier paragraph, should be connected in circuit in the manner prescribed for the homemade version.

With regard to the other short-wave coil units, the Sovereign, the Peto-Scott and the Ready Radio have exactly similar markings to the Telsen, which is the one shown in the original blue print.

In the case of the R.I. coils, both the dual-range unit and the short-wave coil are mounted on a common base. The terminal markings of this combined unit tally with those shown on the original blue print, but there is just one small point to note.

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It will be noticed in the case of the R.I. combined unit that the terminal numberings are duplicated, but in order to avoid confusion, the numbers corresponding to the short-wave coil in the original blue print have rings round them. In other words, referring to the wiring diagram in this article, leads A, B, C, D, E, and F should be joined to the ringed numbers, and leads G, H, J, K, and L should be connected to the unringed numbers.

By way of conclusion, and to do away with any possibility of confusion, we ought perhaps to point out that the Telsen dual-range coil is the only commercial dual-range coil with a No. 7 terminal.

This particular terminal, as will be seen from the blue print, is joined to terminal No. 6 in the same coil, but in the case of the other coils (excepting the Goltone, Wearite, Tunewell, and Lewcos, the connections for which we have already described), as they are not provided with a No. 7 terminal, the lead between terminals 6 and 7 shown on the blue print should be ignored.

IMPORTANT ANNOUNCEMENT COSMIC III

See pages 1241, 1243, and cover ii.

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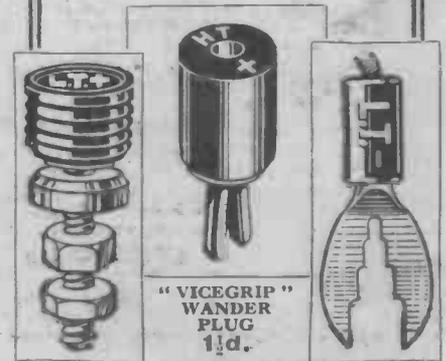
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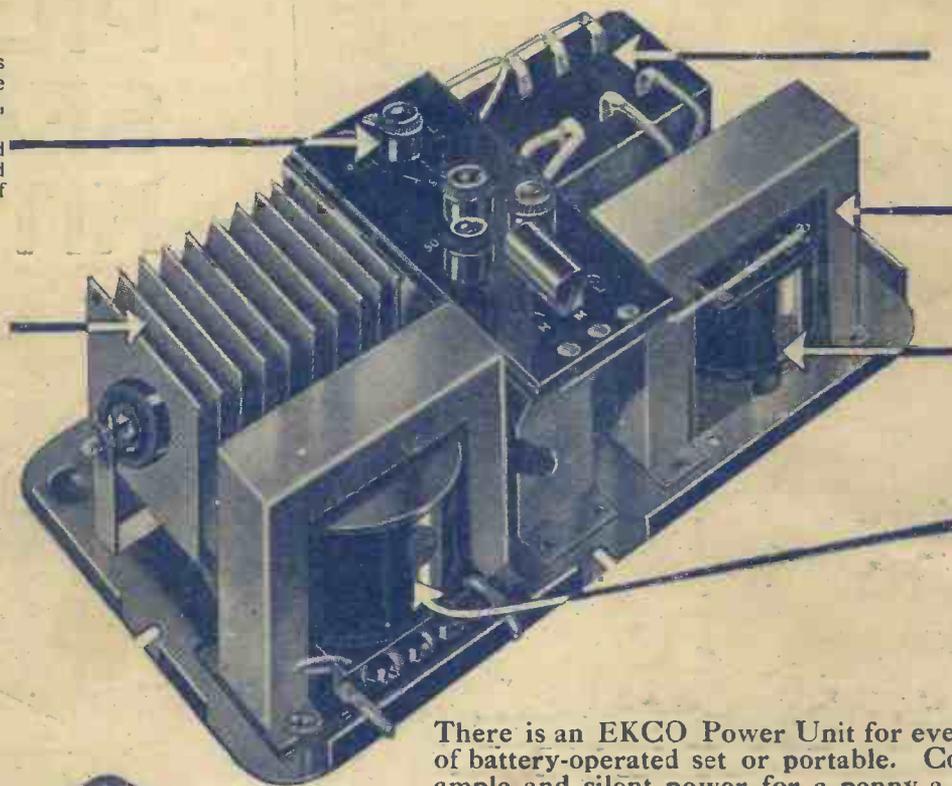
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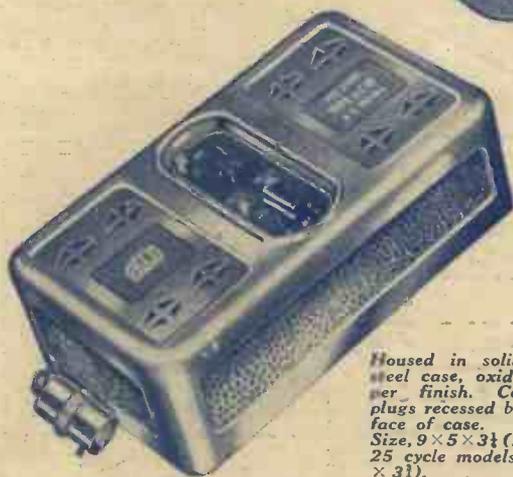
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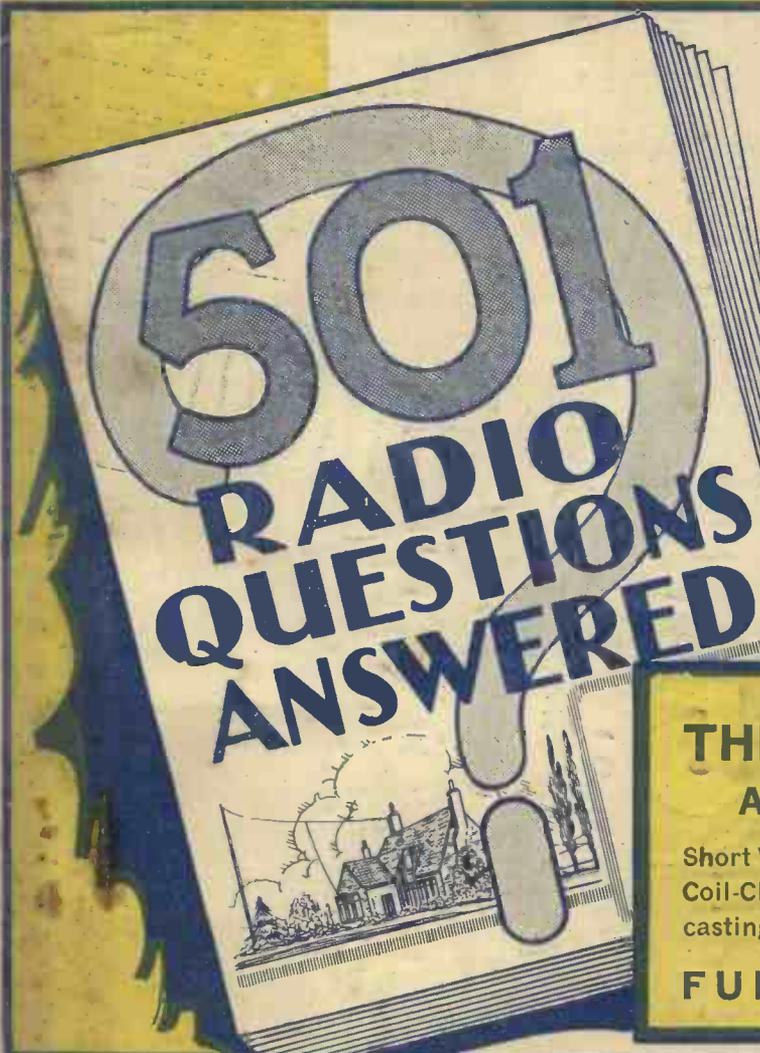
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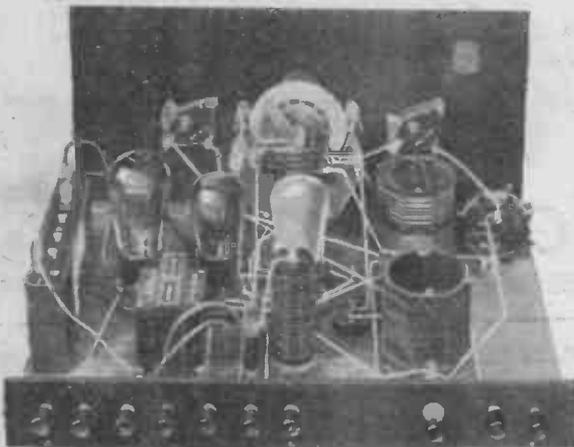
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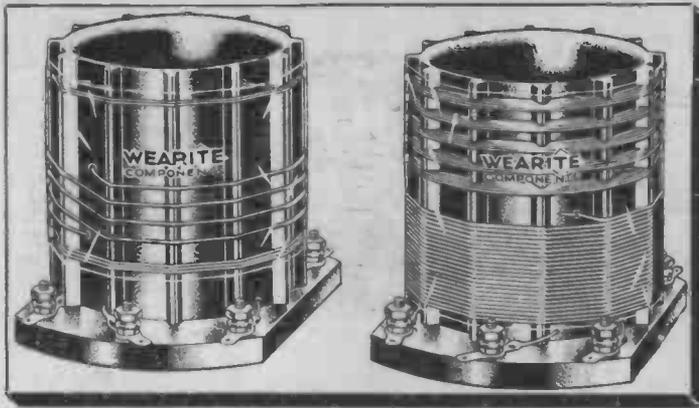
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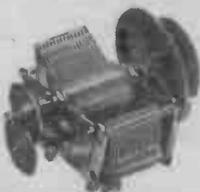


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Also ask to hear the M.12 Chassis, 35/-

**WRITE FOR
FREE
LEAFLET**

CELESTION

The Very Soul of Music

CELESTION LTD., London Road, KINGSTON-ON-THAMES.
London Showrooms: 106, Victoria Street, S.W.1.

**ALL ROUND
THE WORLD
ON ONE
DIAL**



PRICE **14/6**



**EXTENSER
CONDENSER**
Officially Specified for the
"COSMIC" III

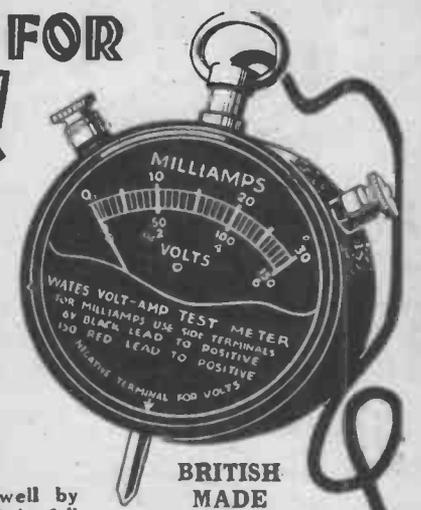
FREE!

*Catalogue and full-size wiring diagram sent on request.
Write to-day.*

ARTHUR PREEN & CO., LTD., Golden Sq., London, W.1.

**NO NEED FOR
A RADIO!
DOCTOR!**

**WATES
"3 IN 1"
FINDS
EVERY
FAULT**



**BRITISH
MADE**

Keep your set working well by having this remarkable "3 in 1" Pocket Meter on hand for frequent tests. **BRITISH** made and truly accurate. Tests **LT** (0-6 volts): **HT** (0-150 volts): Current consumption (0-30 milliamps). High resistance. All readings on one dial. Saves its cost many times and keeps your reception up to concert pitch.

Of all Radio Dealers or direct from us. **8/6**
Smart Plush lined Case, if required, **1/9** extra.

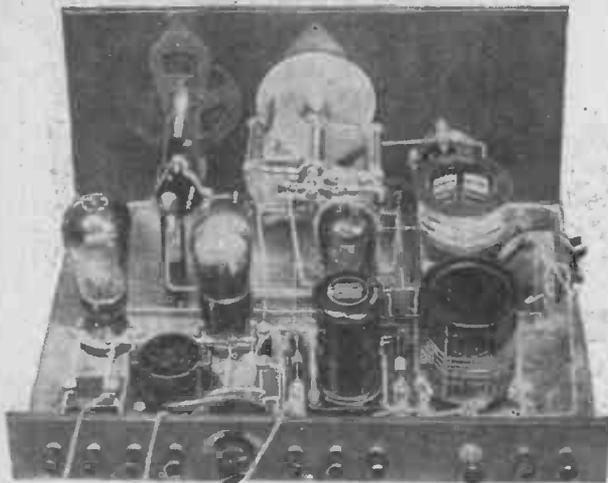
★ WRITE FOR EXPLANATORY LEAFLET

STANDARD BATTERY CO.
184-B, Shaftesbury Av., London, W.C.2

WATES 3 in 1 POCKET METER

PILOT AUTHOR KIT

EXACT TO SPECIFICATION



COSMIC III STAR

- Chosen and first specified by "Popular Wireless" Experts.
- Officially approved therefore by a world-famous technical authority you can trust implicitly.
- Backed by Peto-Scott, ESTABLISHED IN 1919, consistent advertisers in this Journal ever since.
- The only kit of parts that guarantees strict adherence to the Author's first specified components.
- Enables the Author's published, set to be duplicated exactly in every way.
- All Panels Ready Drilled and Slotted.

IMMEDIATE DELIVERY—CASH—C.O.D. or H.P.

THIS IS THE KIT AS USED AND SPECIFIED BY THE DESIGNER

	s.	d.
1 Panel, 14 in. x 7 in. READY DRILLED AND SLOTTED FOR PANEL CONTROLS	4	6
1 Baseboard, 10 in.	1	0
1 Ready Radio Duotune Extender	18	6
1 Ready Radio .00075-mfd. solid-dielectric variable condenser	3	6
1 Ready Radio .0003-mfd. reaction condenser with slow-motion drive	7	0
1 T.C.C. .0003-mfd. fixed condenser	1	3
1 T.C.C. .001-mfd. fixed condenser	1	6
1 T.C.C. .01-mfd. mica fixed condenser	3	0
1 Goltone "Cosmic" dual range coil	5	6
1 Sovereign "Cosmic" short wave coil	4	0
1 Peto-Scott moderator coil	2	6
2 Ready Radio push-pull "on-off" switches	1	8
1 Ready Radio 3-contact push-pull switch	1	6
1 Ready Radio radio-gram rotary switch	2	9
1 R.I. type F.Y. H.P. choke	7	6
1 Lewcos L.F.T.6 L.F. transformer	10	0
3 Telsen 4-pin valve holders	1	6
1 Lissen 100,000-ohm Spaghetti resistance	1	9
1 Dubilier 2-meg. grid leak and holder	2	9
1 Dubilier 5-meg. grid leak and holder	2	9
1 Terminal strip, 14 in. 2 in.	1	3
9 Belling-Lee terminals	2	3
10 ft. Glazed Connecting Wire	6	
3 Battery plugs, screws, flex, etc.	8	

Any parts supplied separately. If order value over 10/-, sent carriage paid—all O.O.D. post charges paid.

KIT-BITS

*Selected C.O.D. Lines
You pay the postman
—we pay post charges.*

1 ReadRad Duotune Extender	18	6
Set of Cosmic Coils as specified	12	0
Set of specified Valves	11	0
Cabinet—to specification	17	6

FINISHED INSTRUMENT

Factory wired and assembled from specified components. Broadcast tested. Complete with valves and cabinet and including royalties.

CASH or C.O.D. **£8:0:0**

EASY WAY

25/- Balance in **13/6**
DOWN 11 monthly payments of

RECOMMENDED ACCESSORIES

- Drydex 120 v. H.T. Battery - 24/-
(Triple Capacity Type.)
- Drydex 9v. G.B. Battery - 1/-
- Exide 2v. 30/60 L.T. Accumulator - 11/-
- Blue Spot 100U. Unit and Chassis - £1:19:6

See Further Peto-Scott Announcements on Pages 1317, 1319, Cover iii.

87/6

KIT 'A'
CASH OR C.O.D.

PRICES OF COMPLETE KITS IN SEALED CARTONS

KIT "A" Author's Kit, less valves and cabinet

CASH or C.O.D. **£4:7:6**

EASYWAY 12 monthly payments of **8/-**
Valves as specified, £1:10:6. Cabinet, 17/6

KIT "B"

Author's Kit, with valves but less cabinet.
Cash or C.O.D. **£5:18:0**
EASYWAY 12 monthly payments of **10/10**

KIT "C"

Author's Kit, complete with valves and cabinet.
Cash or C.O.D. **£6:15:6**
EASYWAY 12 monthly payments of **12/5**

PETO-SCOTT

77, CITY ROAD, LONDON, E.C.1. Co., Ltd.
Telephone: Clerkenwell 9406-7-8.
62, HIGH HOLBORN, LONDON, W.C.1.
Telephone: Chancery 8266.

Messrs. PETO-SCOTT CO. LTD., 77, City Rd., London, E.C.1
Please send me C.O.D./CASH/H.P.

for which I enclose £ . s. d. **GASH/H.P. Deposit.**

NAME

ADDRESS

P.W. 20-2-32.

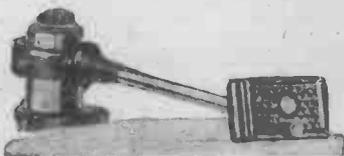
FOREIGN STATIONS
simply pour in!



MODEL WS 400
20 Gns.
British Made.

IF you want to get Foreign stations as easily as you switch on the light, you need a BLUE SPOT Four Valve Screened Grid Receiver. It is all-electric and trouble free, and the BLUE SPOT Speaker embodied in the set ensures the most perfect reproduction possible. Models for A.C. Mains from £18 to 27 Gns. Write for Catalogue No. P.W.27.

A BLUE SPOT PICK-UP
for Your Gramophone



Turn your gramophone into a Radio Gramophone by fitting a BLUE SPOT Pick-up instead of the ordinary sound box and plugging in to your BLUE SPOT Receiver. The improvement in clarity and tone quality of your records is literally astounding. Price, complete with self-contained volume control.

63/-

THE BRITISH BLUE SPOT COMPANY LTD.
BLUE SPOT HOUSE, 94/96 ROSOMAN ST. ROSEBERY AV., LONDON, E.C.
Telephone: Clerkenwell 3570. Telegrams: "Bluspot, Isling, London."

Distributors for Northern England, Scotland and North Wales:
H. C. RAWSON (Sheffield and London) Ltd., 100 London Road, Sheffield; St. Mary Parsonage, Manchester; 183 George Street, Glasgow.

Registered Trade Mark.



Hutcheonad



Attention!

FERRANTI
Band-Pass—3

Construction of this remarkable set is almost as simple as that. You get your Free Chart of the words of command, line up the parts of your kit, and just drill them into the most up-to-date, cleverly designed constructor's Receiver that even Ferranti have sponsored.

This Set is for both long and medium-wave reception: it has adequate selectivity for all needs, and simply delightful reproduction. The charts are clear and concise, and no soldering is required. The components are put up in kit form and may be obtained from your dealer.

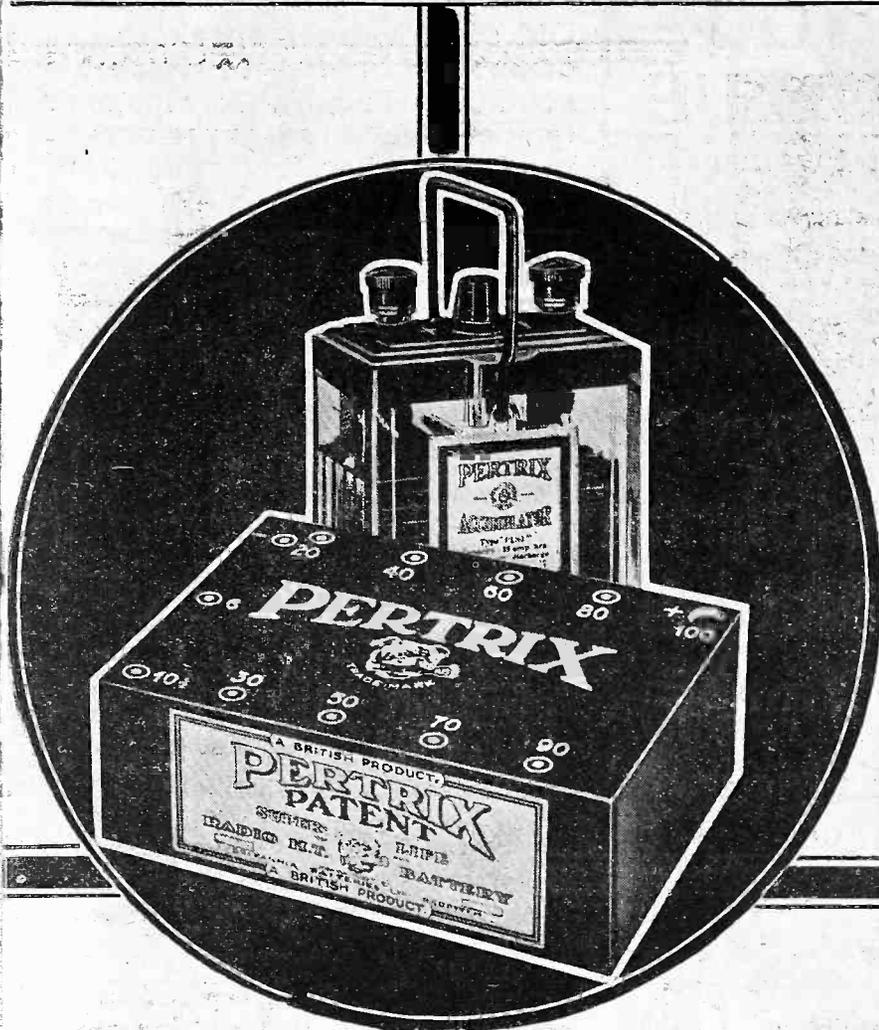
Anyone who can drill a hole and drive a screw can now build a Receiver which will give definitely better results than any Set ever put out for the home constructor. Better even than the famous 1931 S.G.3.

Charts are available for both A.C. Mains and Battery Receivers.

Ask your dealer for a Free Chart, stating Mains or Battery (or send 1½d. stamp) and start building NOW from designs by

FERRANTI

FERRANTI LTD. Constructors Dept. HOLLINWOOD, LANCs.



**A
Quality
standard
ensuring
perfect
reception and
unequalled
long-life
economy!**

PERTRIX
SUPER LIFE
DRY BATTERIES
&
ACCUMULATORS

The in-built quality of Pertrix Dry Batteries and Accumulators combined with craftsmanship in manufacture definitely assures finer, farther and more pleasing reception. To change to Pertrix is to enjoy a new experience — an experience of BETTER wireless, smooth, silent power combined with a LONGER LIFE which means a new economy.

Install Pertrix to-day and KNOW how good and how economical YOUR set can become. Of all good Radio Dealers.

Made by BRITANNIA BATTERIES, Limited,
at Redditch, who also make:
Batteries for Central Stations — Batteries for
Country House Lighting—Emergency and Stand-
by Lighting Batteries for Theatres, Cinemas,
Hospitals, etc. — Batteries for the Starting and
Lighting, and Lighting and Ignition of Motor Cars,
Motor Cycles, Buses and Coaches — Batteries for
Electric Vehicles, Trucks, Locomotives, Ships and
Yachts—The only Nickel-Iron Alkaline Battery on
sale in Britain that is entirely made in this country

WE BUY FROM YOU— IF YOU BUY FROM US

Read these amazing examples of what we can do:

- We bought a 5-valve transportable (R.S.V.P.) battery set from a customer for £5.
- We bought an old Amplion cone from a customer for 8/-.
- We bought 3 1-year-old 2-volt Mullard Valves from a customer for 10/6.
- He bought an Amplion Mains Six from us (Twenty guineas).
- He bought a Celestion P.M. Moving Coil from us (£2.7.6).
- He bought a set of three Mazda mains valves from us (£2.17.6).

TELL US EXACTLY WHAT YOU HAVE TO SELL. USE THIS FORM AND FILL IN AS MANY DETAILS AS YOU CAN.

Old sets, valves, speakers and component parts—in workable condition—bought. Any make or type of wireless set or radiogram, valves, speakers and component parts supplied.

BUY YOUR SPECIFIED KIT FOR THE "COSMIC" III FROM US. WE WILL BUY YOUR OLD SET PARTS.

I WANT TO SELL

SET MAKER..... CABINET OR PORTABLE?

 MAINS OR BATTERY?..... HOW MANY VALVES?

 YEAR BOUGHT..... SPECIAL POINTS

VALVES MAKE..... TYPE NUMBER.....

 MAKE..... TYPE NUMBER.....

 MAKE..... TYPE NUMBER.....

SPEAKER MAKE..... TYPE.....

I WANT TO BUY

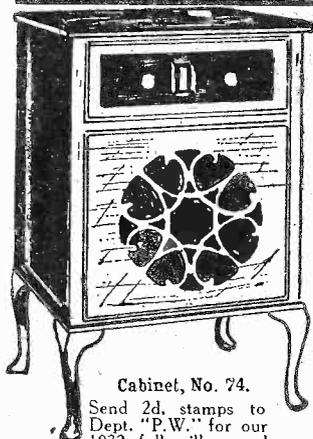
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STATE WHETHER CASH OR H.P. TERMS

SENDING IN THIS FORM PUTS YOU UNDER NO OBLIGATION.

MUTUAL RADIO BUYERS

235, Regent Street, London, W.1.



Cabinet, No. 74.

Send 2d. stamps to Dept. "P.W." for our 1932 fully illustrated catalogue of Radio & Home Furniture.

YOURS for
Balance at 5/- weekly.
This Handsome Radiogram Cabinet

Size: 3 ft. 3 ins. high, 2 ft. wide, 1 ft. 4 ins. deep. Takes panel 2 1/2 ins. by 9 ins. or smaller (vignette supplied). Side doors, if required, for "Music Magnet Four," 5/- extra.

Ready To Assemble, CASH	Easy Terms
in Oak - - - -	£1.17.6 £2. 1.0
Assembled - - -	£2.10.0 £2.15.0
Assembled & Polished	£3. 0.0 £3. 6.0

Securely packed and carriage paid.
5/- extra on above prices for Mahogany.

WOODCRAFTS CO.

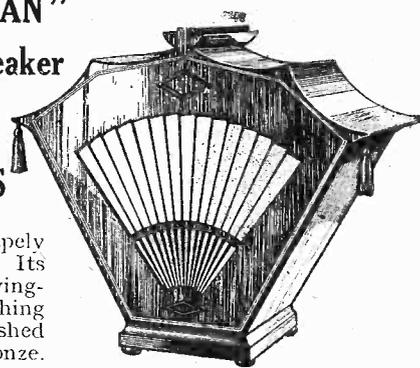
(Dept. "P.W.") 15, Cygnet Street, Selater Street, Bethnal Green Road, London, E.1

Branches all over London. Telephone: Bishopsgate 9093

SELFRIDGE'S Radio and Television Dept.

The ERICSSON "FAN"
Moving-Coil Loud Speaker

OFFERED AT
HUGE REDUCTIONS



The Ericsson "Fan" is shapely and beautifully designed. Its outward grace conceals a moving-coil loud speaker of astonishing purity and response. Finished in Mahogany or Mottle Bronze.

We have been fortunate in obtaining a limited number of these beautiful speakers, which we are offering at this very low price. Fitted with a permanent steel magnet which requires no energising, and with the input transformer incorporated in the speaker it represents an exceptional Bargain.

A LIMITED NUMBER ONLY.
Specially suitable for use with Radio-Gramophone Sets. Usual Price £6.6.0

SPECIAL PRICE 66/- or by 7 equal monthly payments of 10/-
EACH

SELFRIDGE'S RADIO AND TELEVISION DEPT., FIRST FLOOR.

SELFRIDGE & CO., LTD., OXFORD STREET, LONDON, W.1.

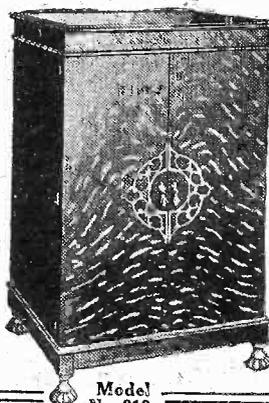
OSBORN

**RADIO CABINETS
MADE BY CRAFTSMEN FOR PARTICULAR PEOPLE.**

Model No. 219. A Radio or Radiogram Cabinet, 3 ft. 9 ins. high, 2 ft. 2 ins. wide, 1 ft. 6 ins. deep. Baffle board behind. Front 24 ins. x 24 ins. Metallic Fabric for Front. Front included opening at top and back. Takes Panel 2 ft. x 9 ins. or smaller. Complete with Motor Board. Send 3d. in stamps for new 1932 beautifully illustrated Catalogue.

PRICES: Machined Ready to Assemble: Oak, £3.5.0; Mahogany, £3.10.0; Walnut, £4.0.0. Assembled Ready to Polish: Oak, £4.5.0; Mahogany, £4.10.0; Walnut, £5.0.0. Assembled and Polished: Oak, £5.5.0; Mahogany, £6.0.0; Walnut, £6.15.0. All Models Carr. Paid.

CHAS. A. OSBORN
(Dept. P.W.), The Regent Works, Arlington St., London, N.1. Telephone: Clerkenwell 5095. And at 21, Essex Road, Islington, N.1. Telephone: Clerkenwell 5634.



Model No. 219.

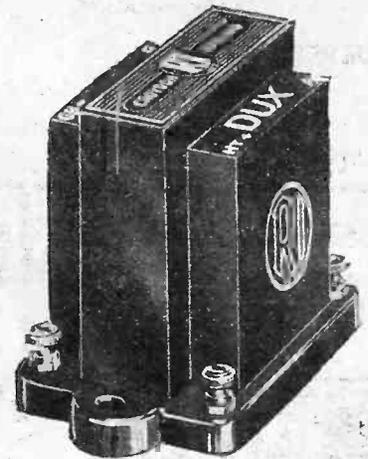
The Vital Components for the **COSMIC III**



R.I. Cosmic Coil Unit. List No. BY 31. Overall Dimensions 7½ x 2¼ x 3½ ins. high.

These components comprise fundamental L.F. and H.F. features of the "Cosmic" III and "Cosmic" III Star. Their specification by "P.W." and Mr. G. P. Kendall, B.Sc., Chief Engineer, "Ready Radio," is proof of their pre-eminent suitability for the Set.

Their inclusion in your set will give you, from the start, the results claimed by the designer. Buy R.I. components first and justify your expenditure of time and money.



The "DUX" TRANSFORMER

The "P.W." designers' first selection for the "Cosmic" III. A remarkable transformer that has attained enormous popularity by its equalled performance in hundreds of thousands of sets. "DUX" has been specified as first selection for the "Cosmic" III because it is the lowest-priced transformer that is really efficient and which gives the good L.F. amplification which is a vital feature in the circuit. Inductance 30 henries. Ratios: 1 : 3½ (standard) or 1 : 4½ (autoconnection). List No. DY 29.

6/9

COSMIC COIL UNIT

The reduction of dielectric losses in "Cosmic" III is vital—and for that reason the R.I. "Cosmic" Coil Unit possesses distinctive and exclusive advantages.

Its big features are:—

One complete unit, combining coils for Long, Medium and Short waves, permits easy fixing and compact assembly. The skeleton construction of the short wave coil former, reduces dielectric losses to a minimum.

Every coil is carefully tested on the "Cosmic" III circuit and checked with a wavemeter over the entire range of broadcast and short wave bands. This is not advertising licence but a definite statement of fact.

This unit has not only been specified by "P.W." for the "Cosmic" III, but also Mr. G.P. Kendall, B.Sc., Chief Engineer, Ready Radio, has specially selected it for use in the "Cosmic" III Star Set.

12/6

DUAL ASTATIC CHOKE



This choke is pre-eminently best for the "Cosmic" III and "Cosmic" III Star, because of its remarkable efficiency on the short waves as well as the medium and long waves. It is the only choke that cuts out all blind spots and resonant losses—an important feature for short wave work. Freedom from H.F. interference with adjacent components is assured by its astatic winding and skeleton form of construction. List No. FY 1.

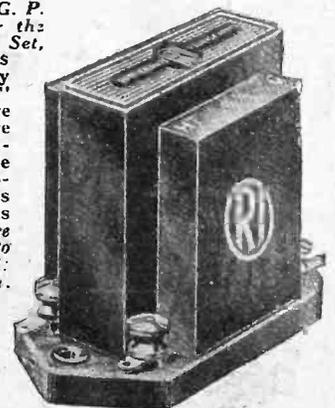
7/6

**Get the R.I.
"COSMIC" III
BLUE PRINT &
WIRING
INSTRUCTION
SHEET**

These will materially assist you in fixing and wiring up your "Cosmic" III, and enable you to get first-class results from the start. Ask your dealer or write to us direct. They are free.

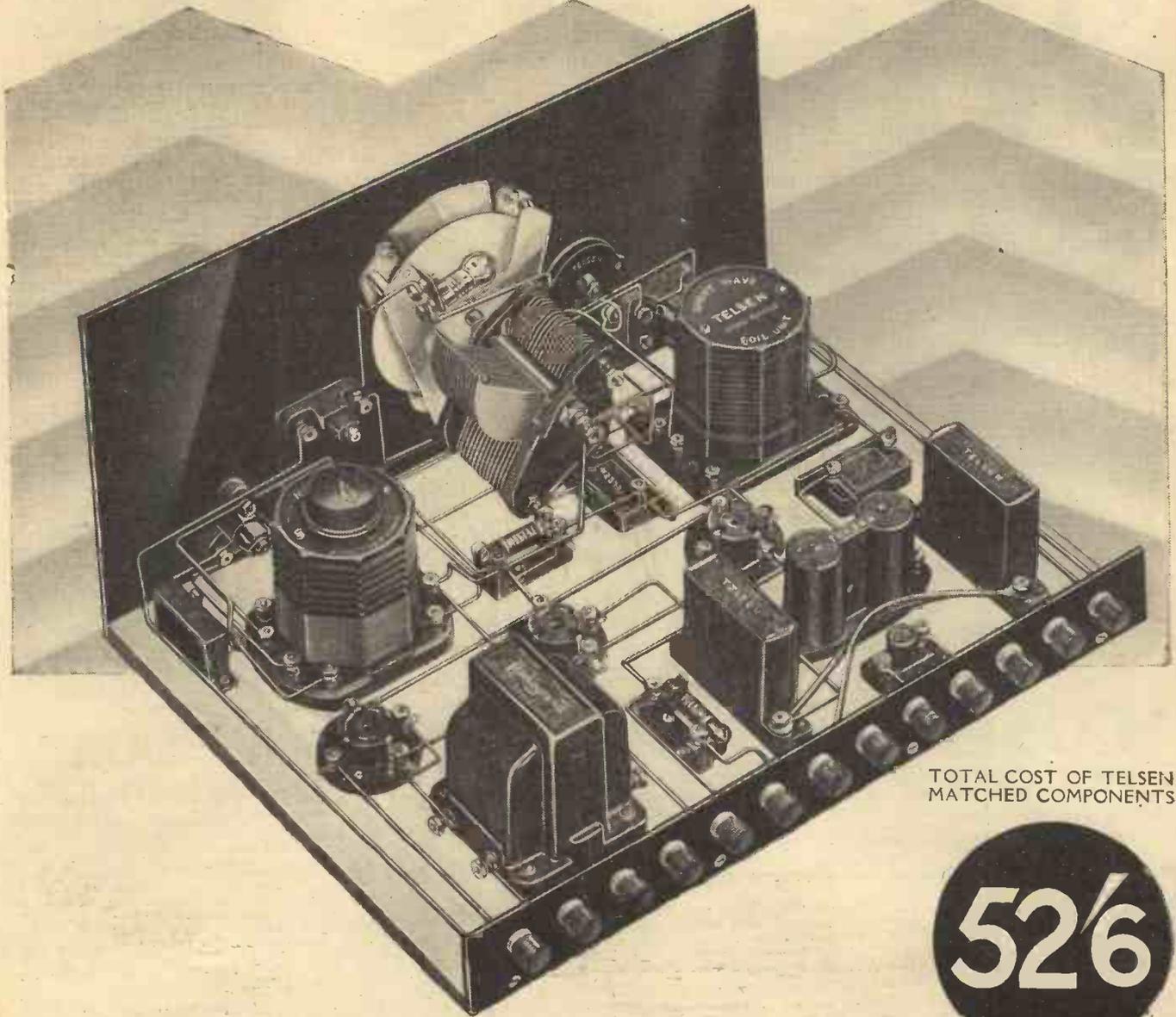
HYPERMITE Transformer

Specified by Mr. G. P. Kendall, B.Sc., for the "Cosmic" III Star Set, because it possesses a high permeability core of "Nickalloy" and gives therefore greater and more uniform amplification requisite to the finesse of reception for which this "Star" circuit was designed. Inductance 50 henries. Ratio 3½ to 1. Dimensions overall: 2¾ x 1¾ x 2¼ ins. high. Weight 7 ozs.



12/6

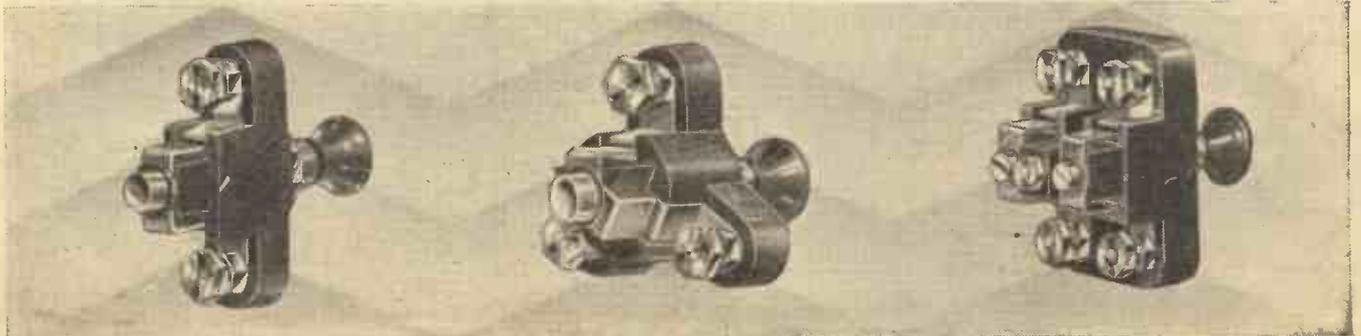
TELSEN TRIPLER THREE



TOTAL COST OF TELSEN
MATCHED COMPONENTS

52 1/6

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

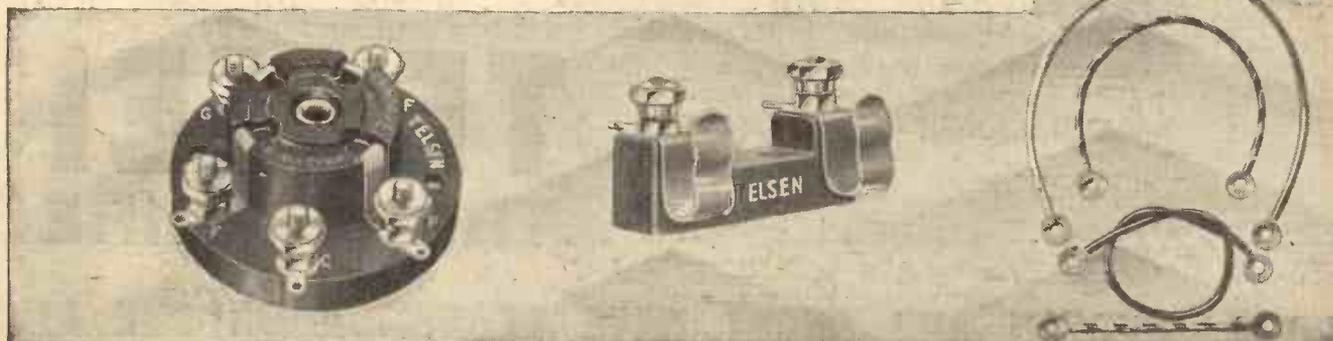
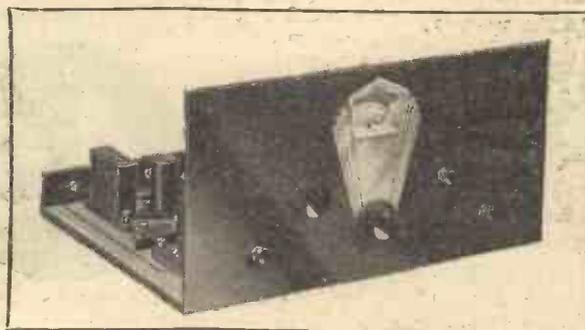


TELSEN

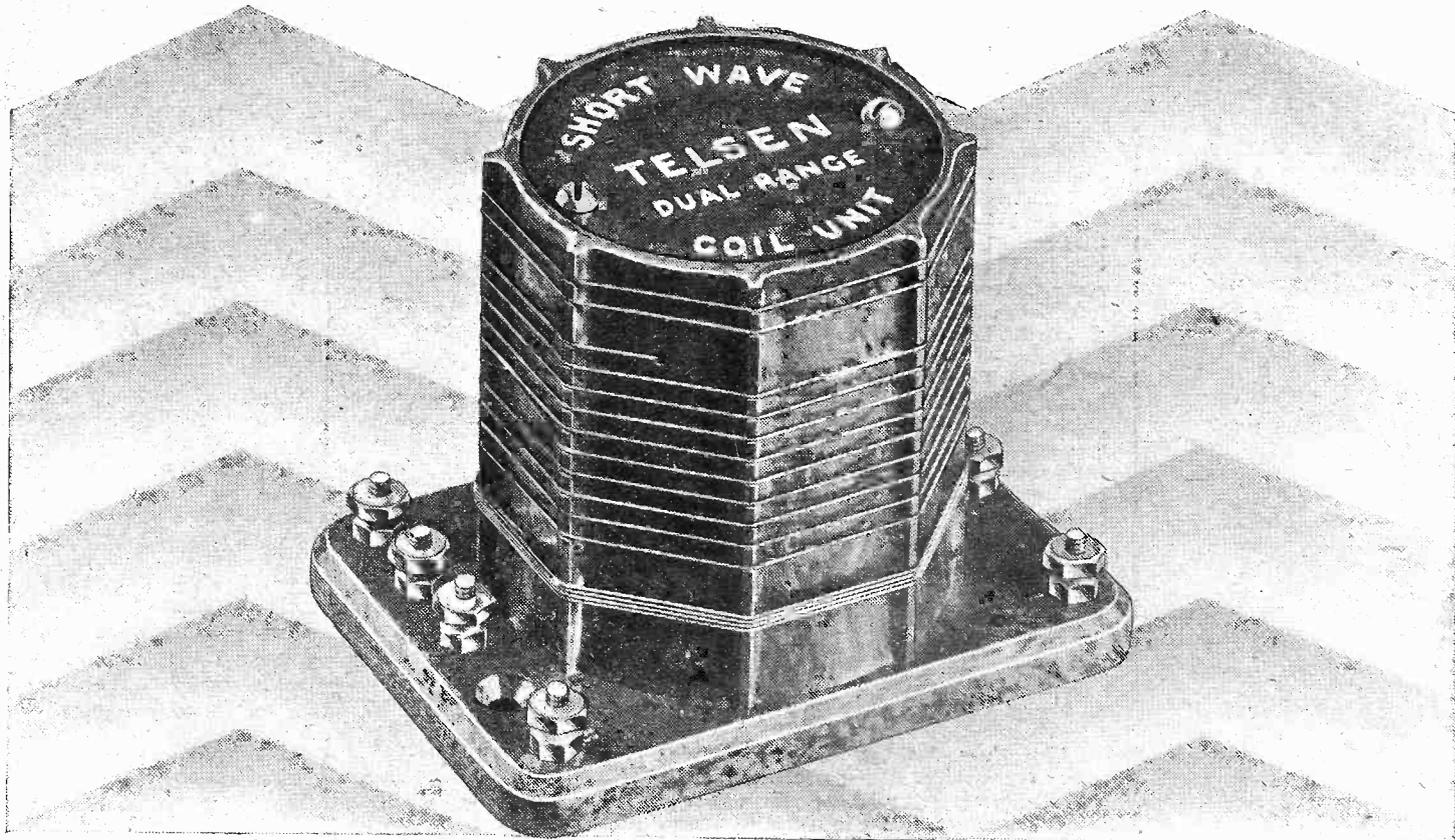
TRIPLE THREE RECEIVER LIST OF COMPONENTS

	s.	d.
3 Valve Holders	1	6
1 .0001-mfd. Mica Condenser	6	
1 .0003-mfd. Mica Condenser	6	
1 .001-mfd. Mica Condenser	6	
1 Grid Leak, 2 meg.	9	
1 Grid Leak, 1 meg.	9	
2 Grid Leak Holders	1	0
1 Aerial Coil with Selectivity Adjustment	7	6
1 Dual Range S.W. Coil Unit	4	6
1 .0005-mfd. Logarithmic Variable Condenser	4	6
1 .0003-mfd. Reaction Condenser	2	0
1 2-point Switch	1	0
1 3-point Switch	1	3
1 4-point Switch	1	6
1 Radiogrand Transformer	8	6
1 50,000-ohm Spaghetti Resistance	1	6
1 25,000-ohm Spaghetti Resistance	1	0
1 .01-mfd. Mansbridge Condenser	1	6
1 1-mfd. Mansbridge Condenser	2	3
1 Binocular H.F. Choke	5	0
1 Fuse Holder	6	
1 Illuminated Disc Drive	4	6
	52	6

Full wiring chart, building and operating instructions are included in the new issue of the Telsen Radiomag, price 3d. at your dealer's, or, if you have any difficulty in obtaining a copy, write direct enclosing 4d. in stamps to "Radiomag," Telsen Electric Company, Limited, Aston, Birmingham.



TELSEN SHORT-WAVE COIL



TELSEN COMBINED DUAL-RANGE SHORT-WAVE COIL UNIT

The Telsen Combined Dual-range Short-wave Coil Unit for the first time brings the construction of short-wave receivers into line with the simplicity of modern practice. When tuned by a '00025 condenser a wave range of 20 to 80 metres can be covered by the operation of a switch as in ordinary broadcast practice. No coil changing is necessary and no other coils are required, as the unit incorporates windings for aerial, tuning, and reaction circuits. The coil is also suitable for use with sets covering all wave-bands with a '0005 tuning condenser. In this case the dual-range feature is not employed.

WAVE RANGE OF 20-80 METRES

The Telsen Short-wave Coil adds the Short Waves without coil changing

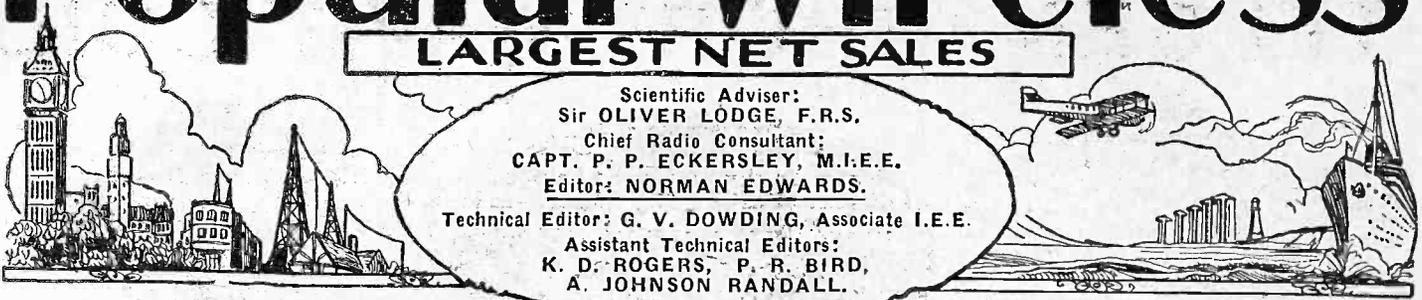
46

TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

Popular Wireless

LARGEST NET SALES



Scientific Adviser:
Sir OLIVER LODGE, F.R.S.
Chief Radio Consultant:
CAPT. P. P. ECKERSLEY, M.I.E.E.
Editor: NORMAN EDWARDS.

Technical Editor: G. V. DOWDING, Associate I.E.E.
Assistant Technical Editors:
K. D. ROGERS, P. R. BIRD,
A. JOHNSON RANDALL.

PARIS AGAIN
BRIGHT AND BRACING
ROOSTERS' ROSTER
THE EMIGRANTS

RADIO NOTES & NEWS

MY MULE
LOOSE TOPS
FRANCE FOLLOWS
ULTRA-SHORT

Paris Again.

THIS time I went on a Sunday, and by wireless. The Sunday programmes of our B.B.C. did not look attractive; they have worn grooves in my mind; quintet, song, quintet, brass band, service, Tom Jones and epilogue. So I set the Kid on to exploring, and he struck the Radio-Paris gramophone broadcasts—and how excellent they are! We had the pleasantest (radio) Sunday ever known here, and I don't really believe that we did wrong or are any the worse for it.

Bright and Bracing.

THE fellows who designed those programmes have my salaams; they know just exactly the sort of stuff to inject into the ether on a dull February Sunday. If they were made Governors of the B.B.C. that Corporation would become so popular that (a) the Americans would try to buy it, or (b) the licence fees would be increased. And, oh, how I should love to know the charming lady who announced the H.M.V. records! I know that she is Miss Faith Shipway, of Middlesex, but her voice is a string of pearls, next to that of Miss Cecil Dixon's!

"The Roosters' " Roster.

REFERRING to the caption beneath our photograph of the "Roosters" in our issue of January 23rd, good old Percy Merriman tells me that no less than four of the present party are original, war-time "Roosters," and that Septimus Hunt is of the 1919 vintage, thus being a thirteen-year-old. Fred Pain joined this merry gang three years ago. Another point rubbed in by Percy is that with his party the word "star" is not understood; it is "The Roosters" first, as a party. Individual bouquets are welcomed—off stage! Thank you!

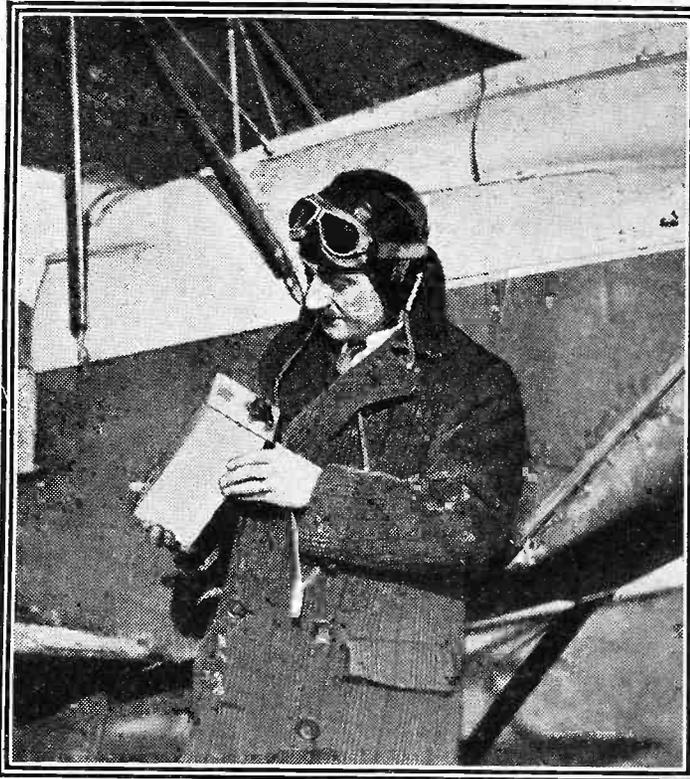
Society Gossip.

THE Hon. Sec. of the South Croydon and District Radio Society, 14, Campden Road, South Croydon (phone, Croydon 1540), will bear out my statement

that his society is the very thing for keen radio chaps of that great Surrey town. Their headquarters are at the Horse and Groom, Cherry Orchard Road, East Croydon. Could a real man of Surrey be dead to a clarion call like that? (Though I reckon our Kentish ale takes a bit of beating!) Well, there's a fine programme all ready, technical and otherwise, and plenty of scope for friendly argumentation.

on the mercy of an enlightened electorate—and beg that the fiend—or—friend, who employs his fleeting years in sending me prospectuses of courses in electrical engineering will chuck it. I mean, desist! I refuse, absolutely and finally, to correspond; and I don't want any more engineering. I have had my whack of lying down, face upwards, under naughty and oily machines which refused to "do their stuff," and I am looking forward to spending my declining years with my waistcoat comfortably shoved against this ghastly desk. (But, oh, for the oily wad of cotton-waste and the sound of a three-cylinder vertical!)

SIR ALAN LIKES THE LOOK OF IT!



Here is Sir Alan Cobham at Heston Aerodrome inspecting the newly-evolved small radio set for light aeroplanes, which enables the pilot to keep in touch with the ground and obtain weather information and other navigational aids. Heston Aerodrome can often be heard on about 830 metres warning all and sundry of storms to come.

Why not look in and see the fun for yourself? Then you'll join up!

Personal Protest.

I KNOW that a mere scribbler, such as I, has no rights under Magna Charta, the Habeas Corpus Act, or the Tail-Waggers, Franchise. Hence I throw myself

back to carry on the nudging of local authorities. I thank him for his good wishes, would like to know what a "chancer" is, and deeply regret that I cannot decipher his handwritten P.S., as I feel sure it contains something specially fine. (Write again, Otto. Your other letter was attended to promptly by us.)

(Continued on next page.)

The Emigrants.

RADIO INSTRUMENTS LTD., have shown me a copy of a letter received by them from Mr. K. M. Beavan, who four years ago took with him to Australia an R.I. transformer, bought in Lincs. somewhere about 1922. Mr. Beavan has packed the old "4 to 1" into a five-valver, and it is still doing its work excellently. He says: "I think this is absolutely wonderful." Well, knowing R.I. and its products—I don't. It's just natural.

I Am Offered a Mule.

A MOST amusing letter from O. S. (Gordonia)—which is somewhere in South Africa. His text is, "Wake up, England," especially radio exporters, for he, like so many others there, is annoyed because he can get only American components. "The British manufacturer is letting us down severely," he says, "and is still living in the days of 'Wait and see.'" He offers to lend me an Army mule to nudge "old sleepy England awake," but wants it

"ARIEL'S" RUNNING COMMENTARY ON RADIO (Continued)

"Loose Tops."

PEOPLE who lug their valves out of the sockets with the abandon with which they pull bull-terriers away from poms, frequently complain that their valves

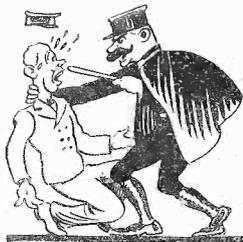


wobble in the sockets. They should, of course, catch hold of the pup—I mean valve—by the base instead of the bulb. An ingenious reader of Birkenhead tells me that such dog-owners should run

a thin stream of seccotine or fish glue round the junction of the bulb and the base, stick the wobbler back in its socket and thenceforward let the beggar alone. After all, if a valve is pulling its weight why disturb it?

France Follows Britain.

I SHOULD like to put on record that, following our noble selves, France has decided to equip her police with radio, and proposes to dash some £55,000 on the job, as a starter.



I am a great admirer of the French police. Ask a gendarme the way to the Madeleine, just across the road, and you will get as dignified a salute as he would give to the ghost of Napoleon.

I happened to be in Paris the other day when the Communists tried to rush the Chamber of Deputies. Hordes of police instantly sprang from nowhere, all set and ready, and gathered the boys in by the lorry-load, with no trouble except to my chauffeur, who was shot down some frightful alley and nearly exploded with adjectives.

The "Admirable Crichton."

THIS character in the well-known play was a man who could do all sorts of things which surprised people—because he was only a butler—but his name has passed into usage to typify a person with numerous accomplishments of diverse natures, and such a one is Mr. John Scott-Taggart, who has just reappeared in the world of technical radio journalism. When some weeks ago I said that "he pushes a pretty pen," I did not know that he had written a novel; now I do know, and I am confirmed in my estimate of his gift of writing.

"The First Commandment."

I AM not a professional literary critic, but I manage to keep abreast of the "best sellers," both English and American, and have cultivated a fairly captious critical faculty as a result of years of reading. Nevertheless, Mr. Scott-Taggart's novel, "The First Commandment" (Hutchinson, 7s. 6d.), succeeded in making my

interest as a reader predominate over my analytical and literary self—one of the qualities of a successful story. Mr. Scott-Taggart confided to me that he wrote it as "a whimsical divertisement"; many another writer couldn't do as well in dead earnest. J. S.-T. knows his Fleet Street, and has spun a clever story round a would-be Dictator of the Press, his failure—and his success. Good luck to it!

The New Empire Station.

"EMPIRE DAVENTRY," I may record, is going to be the biggest, or the most important, broadcasting centre in the world. Seventeen aerials—and the Empire is to be divided into five zones, for

SHORT WAVES.

In scientific circles there is a strong feeling in favour of perpetuating the memory of the great physicist by changing the name of one of the days of the week to "Faraday."—"Punch."

MY VALVE SLOGAN.

Something lent, something "done."

An Edinburgh resident recently claimed damages from the B.B.C. on account of the disturbance caused to his gramophone by his neighbour's loudspeaker. In a postscript he offered to swap his gramophone for a super-het.

The B.B.C. authorities consider that "effects" produce a realistic atmosphere; but it does not appear to have occurred to them that a few "moo's" would add greatly to the interest of the fat stock prices.—"Punch."

THE BRAIN-WAVE.

The heads of the Broadcasting Corporation Assembled together in perturbation. For a recent "thriller" had failed to thrill, and they wanted something to fill the bill.

A different programme every day
Is a terrible task, say what you may,
And though jazz is the handiest fill-up known,
Men cannot live upon jazz alone.

But at last the biggest brain of the bunch
Announced to the rest that he had a hunch.
"I know what will get us out of our fix,
Why not broadcast a conjuror's tricks?"

"Listeners can close their eyes," quoth he,
"And imagine the things that they cannot see."
The corporation are happy now.
They are certain that item will prove a wow.
—"Morning Post."

each of which the most suitable wave-lengths will be used. Two 20 kw. transmitters, hard at it day and night. Come, this is Empire broadcasting as it ought to be done! So far so good! The order for the station has, however, been given to a firm controlled by the American International Telegraph and Telephone Corporation, though the material will actually be made in England. "Buy British," sees the Guvment!

Error by B.B.C.

I HAVE just finished listening to the playlet—"Friday Morning," most of which describes the thoughts and feelings of some of the passengers on one of the Croydon-France air-liners which is having a bad time, has to turn back, and makes a forced landing. It "put the wind up" my little family, and I am sure that

we shall never fly to France. Such a nice, tactful way of popularising the British air-transport business, wasn't it? The B.B.C. passes a sketch like that, yet boggles at a word or a subject which might—quite harmlessly—offend some strait-laced, squeamish listeners! As a coincidence, this sketch followed Vernon Bartlett's talk from Geneva, during which he referred to the workers of the Imperial Airways' new 38-seaters!

"Loud Laughter."

I HAVE never understood why the B.B.C. allow audiences in their studios on certain occasions. Theatres and music-halls don't allow friends of the staff to guffaw on the stage. And not long ago I was right down mad about it, for Scott and Whaley were badly interfered with by the laughter of the people in the studio. It was like listening at the keyhole of a private entertainment, and listeners, including myself, missed a very good joke. Can't something be done about this?



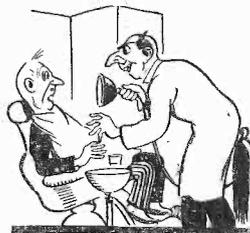
Aircraft Wireless.

I WONDER whether people in general know how vital a factor radio is in the operation of air services. On a recent Imperial Airways flight from Croydon to Cairo radio saved two days, for through the help of the D.F. station at Malta the pilot was enabled to fly there direct from Naples, instead of calling at Catania. Similarly a night stop at Tripoli was obviated, and Benghazi was reached the day after Malta was left. Ten minutes after the machine landed at Cairo the officials at Croydon were informed by a radio message from the 'plane, via Malta!

Ultra-Short.

NO, I don't refer to the lower parts of the 1932 bathing costumes, but to the waves with which the Baron von Ardenne, of Germany, is experimenting.

This gentleman believes that by means of very short waves he can produce the same effects as chloroform and certain other anaesthetics. Well, it's all in a lifetime, but when my next excursion to the dentist falls due—not so long hence, blow it—I would rather trust to a few sniffs of the jolly old "gas" than to a bit of broadcasting. Another idea of the baron's is said to be that mental weakness can be corrected by ultra-short waves. Pooh! The B.B.C. has been trying to do that for us for years on medium waves!



ARIEL.

The "COSMIC" III

FURTHER DETAILS

By G. V. DOWDING, Associate I.E.E.

The "P.W." "Cosmic" Three breaks entirely new ground in radio reception technique in that it provides everything demanded by the experienced "fan," while, at the same time, it can be built and successfully used by the man who is making his first venture into home radio in general, and home-set-construction in particular. Nevertheless, no compromises which are not under your direct control have been made.



CAN there be anyone who is not thrilled by the first try-out of a new radio receiver? The constructional work is fascinating enough, but those first few minutes "on the air" are, I am certain, the moments that the home constructor looks forward to most of all.

And when you have a set like the "Cosmic," replete with new features and potentialities, the occasion is one to be remembered.

Make the most of it. It is only at very infrequent intervals we are able to introduce originality plus real effectiveness to the degree that is found in the "Cosmic," and there is no one who can predict how long we may have to wait before the next vital development in radio reception technique is forthcoming.

Therefore, you will be well advised to start your "Cosmic" off smoothly, and not to handicap it with easily avoidable faults.

To commence with, carefully check the wiring and see that all dust and waste scraps of material are removed.

Your Aerial.

Next survey your aerial and earth and ask yourself whether these are as good as they might be. The "Cosmic" Three has given excellent results on a moderately short indoor aerial (it won't work on a frame), but it will bring in a vastly greater number of stations if it is used with a good outdoor aerial.

And it may be as well if we give something of an idea as to what is generally considered to be a good outdoor aerial these days.

A single wire is all

that is needed, and the ideal length is 75 ft. There is no good purpose served in having a greater length than that.

Height is the most important factor, and the higher you can make either or both ends of the aerial the better. Try and poke it up above surrounding walls and buildings and keep it as far away from such things as possible.

About the Earth.

The best all-round earth is a water-pipe, and the lead which runs to this should be a thick and short wire. Clips, with which it is possible to make excellent contact between wire and pipe, are available at all radio shops.

The "Cosmic" is, of course, a loudspeaker set, and it is capable of delivering sufficient

power for the operation of a moving-coil loudspeaker. And, needless to say, the better the loudspeaker the more chance you will give the "Cosmic" of showing what it can do in the way of quality response.

A separate article regarding the valves for the "Cosmic" appears on another page in this issue, so it will be unnecessary for me to mention them here.

You will get results, and very good results, too, with an H.T. battery giving up to 100 volts, but the extra eleven volts of a battery of 120 volts rating can do some exceedingly useful work.

And inasmuch as there is a power valve to be served, it will prove economical in the long run to buy a battery of the double- or treble-capacity type.

Be generous with your grid bias. Don't try and make 9 volts do if 12 is recommended for your particular power valve, for that would be false economy as you would be using an unnecessarily large H.T. current.

A Grid-Bias Warning.

And for goodness' sake don't plug the positive grid-bias plug into the negative socket of the G.B. battery. Make very sure that it is firmly planted in the positive socket, or your H.T. current consumption will rise to enormous dimensions.

Of course, there would be terrible distortion, but the constructor with a reversed grid-bias battery who has searched for the cause of distortion elsewhere is by no means unknown.

And always switch the set off before changing the grid-bias voltages. If you neglect to do so you will impose a severe strain on the power valve. What is known as "loss of emission" is sometimes caused or, at least, expedited by neglecting that simple precaution.

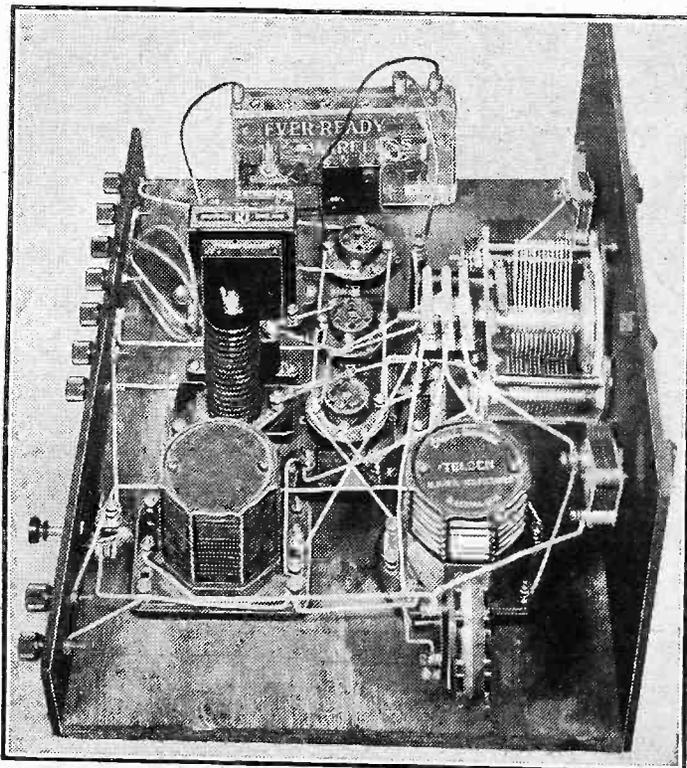
Operating the "Cosmic."

Having connected everything up and made sure that all is exactly as it should be, set the controls in preparation for a trial run round the dial.

That is to say, twist the reaction knob right round to its minimum capacity position (this will probably be anti-clockwise), see that the moderator coil plug is inserted into one of its sockets—it doesn't matter

(Continued on next page.)

FOR WORLD-WIDE RECEPTION



By merely pulling out that little switch on the terminal strip at the back, the set becomes at once a short-wave receiver instead of a two-band receiver of medium- and long-wave broadcasting. There is no coil-changing and only that one simple "transformation" switch!

THE "COSMIC" THREE

(Continued from previous page.)

which for the time being—and, if necessary, open the short-wave switch at the back by pushing it in.

You are now all set for the reception of long- and medium-wave stations, so switch on by pulling out the filament switch, and run your "Cosmic" through its paces.

Start by rotating only the extenser dial. This will give you the "feel" of the receiver and enable you to note where the locals come in.

Don't criticise the selectivity or the power of the set at this juncture, for these qualities are largely controlled by the moderator.

Still leaving the reaction at minimum, you can then try a run through the medium waves (0-100 on the extenser dial), using the moderator this time.

The setting of this control for greatest volume will vary with different stations, and the farther you adjust away from that point of greatest volume the greater will be the selectivity of the set for stations on adjacent wave-lengths.

The Moderator Tapping.

The moderator coil tapping (which is concerned only with medium-wave stations) allows you to compensate for different aerial lengths and local conditions, and you should try each tapping until you have found that one which enables you to "moderate" for greatest volume, and just tune off again, for both the longest and the shortest of the medium-wave stations.

Let me explain this in detail. Supposing we take the London National and Northern Regional transmitters as two easily received stations at opposite ends of the medium wave-band. A little reaction may be needed to bring both in, however.

Your best moderator tapping will no doubt be that one with which the London National comes in at best volume, a little way before you have turned the moderator condenser right round to its minimum capacity position (anti-clockwise), and when the Northern transmitter is loudest, at about the same distance from the other end of the moderator-condenser adjustment.

But I am not going to stress the details of the moderator adjustment for medium waves. The point is that however the control is handled you will get better results than if it were not there at all!

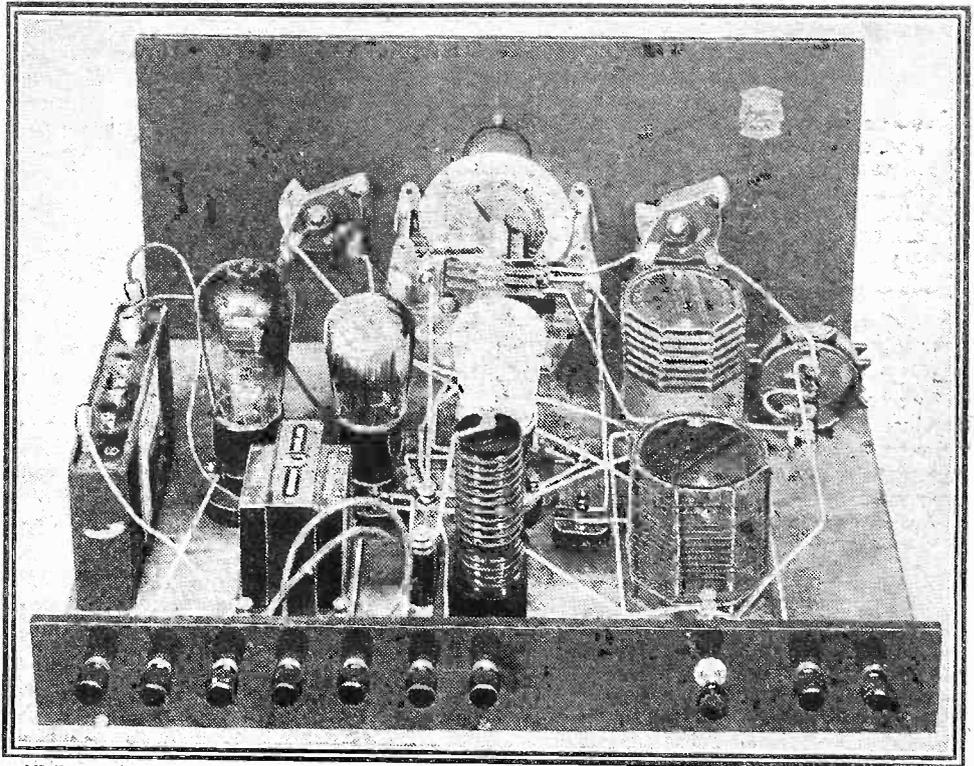
Under Your Own Control.

If some of you like to juggle with it (not forgetting the tappings), you can work up to an abnormal degree of efficiency.

to acquire a "tuning knack" have to be "spoon-fed" as well.

But with the "Cosmic" you can adapt yourself and your own local conditions both at once. Operate haphazardly and you will get good results; operate discriminatingly and endeavour to correlate the "feel" of the moderator with the "feel" of tuning and reaction, and you will surprise yourself with the number of programmes you will

ALL READY FOR THE AMERICANS!



All-the-world wireless reduced to the simplest and most effective dimensions. And just note how little is added to enable the set to tune-in the short-wavers as well as ordinary broadcasting. There is one small switch and one inexpensive coil—but the coil also serves as a medium-wave coupler!

It is up to the individual operator. That is one of the big advantages of the "Cosmic." Generally it is the practice for the set-designer to decide upon a compromise between sensitivity and selectivity which becomes a fixed quantity, as it were, of his set. And as he has to bear in mind the "hammet" of ham-handed people, those who could and would willingly be prepared

bag! This subject will be dealt with at great length in a further article.

When you are tuning the extenser through 0/200 degrees you are roaming about the long-wave band, and the moderator functions slightly differently. Its coil tappings do not now matter at all. And when you turn the moderator-condenser knob round

(Continued on next page.)

COMPONENTS FOR THE "P.W." "COSMIC" THREE

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> 1 Panel 14 in. × 7 in. (Permeol, Peto-Scott, Becol, Wearite, Ready Radio, Goltone). 1 Cabinet to fit with 10 in. baseboard (Pickett, Cameo, Peto-Scott, Gilbert, Osborn, Moreo, Ready Radio.) 1 Extenser with vernier drive (Cyldon, Formo, Wavemaster). 1 "Cosmic" Dual-Range Coil (Telsen H.F. transformer, Sovereign, Goltone, Wearite, Lewcos, R.I., Ready Radio, Peto-Scott, Tunewell). 1 "Cosmic," short-wave coil (Telsen, etc.).
Note—The above coils can also be obtained as a complete unit from R.I. Ltd. 1 00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen). 1 0003-mfd. reaction condenser (Ready Radio, Telsen, Cyldon, Polar, J.B., Lissen, Graham Farish, Wavemaster, Ormond, Formo). | <ul style="list-style-type: none"> 1 Push-pull on-off switch (Goltone, Ready Radio, Telsen, Tunewell, Peto-Scott, Bulgin, Wearite). 1 Three-point push-pull switch (Ready Radio, etc.). 1 Moderator coil unit (Peto-Scott). 1 0003-mfd. fixed condenser (Dubilier type 610).
T.C.C., Telsen, Ready Radio, Lissen, Sovereign, Goltone, Graham Farish, Ferranti, Igranie, Watmel). 1 01-mfd. mica condenser (T.C.C., Dubilier, Lissen). 1 Grid-leak holder (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Ferranti, Graham Farish). 1 2-meg. grid leak (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Watmel, Ferranti, Varley, Loewa, Igranie). 1 5-meg. grid leak (and holder if required) (Graham Farish Ohmite, etc.). | <ul style="list-style-type: none"> 3 Valve holders (Lotus type VHK, Telsen, Wearite, Igranie, Lissen, Bulgin, Clix, Graham Farish, Formo, W.B.). 1 H.F. choke (Lewcos type 11, Telsen Binocular, Ready Radio, Wearite, R.I.). 1 L.F. transformer, medium ratio (R.I. Dux, Telsen, Varley, Igranie, Goltone, Lissen, Lotus, Lewcos, Climax, Graham Farish, Formo, Sovereign, Atlas, Ferranti). 9 Indicating terminals (Belling-Lee, Igranie, Clix, Eelex). 1 100,000-ohm spaghetti resistance (Sovereign, Varley, Lewcos, Bulgin, Peto-Scott, Telsen, Ready Radio, Igranie, Graham Farish, Lissen, Tunewell). 1 Terminal strip, 14 in. × 2 in. 1 Grid-bias battery clip (Bulgin). Battery Plugs, etc. (Clix, Belling-Lee, Eelex, Igranie). Glazite, Lacoline, Quickwyre, Jifilinx, Flex, screws, etc. |
|---|--|---|

THE "COSMIC" THREE

(Continued from previous page.)

in a clockwise direction, you run straight from a highest selectivity—least volume condition to a greatest volume—least selectivity condition. This is the same for all wavelengths and does not vary as with different stations.

ONLY ONE TUNING DIAL!



Turn the one tuning knob, and without switching or coil changing both medium and long broadcasting wave-lengths are covered. The same controls are used for short-wave reception.

If you have built in one of those .00075-mfd. condensers, which has an automatic "shorting-out" action at each end of its movement, you will notice that the short-circuiting coincides with greatest power—least selectivity.

When the switch at the back of the set is pulled out (closed) the receiver at once becomes a short-waver. The tuning is then operative on what would normally be the "long-wave" section of the Extenser dial, and you may not get full reaction over the whole of this tuning range.

But that does not imply a limitation in wave-range. In actual fact the "Cosmic" covers an unusually wide short-wave band. But the shorter the wave-lengths the greater the difference in wave-length for a given movement of the Extenser dial. And it is unlikely that you will be able to use the whole of the available capacity range of the .0005-mfd. extenser.

A Final Vernier.

You need not imagine that the set is faulty and that you are losing stations—you will be embracing far more than are contained on both the medium- and long-wave bands put together!

The moderator control can be used as a final "vernier" on a difficult station, but in the normal way it plays no part in the short-wave tuning. This is accomplished with only the extenser and the reaction adjustments.

You must have the set oscillating when

ROUND THE WORLD WITH THE
"COSMIC" THREE
See 'Popular Wireless' Next Week

searching for short-wave stations, and you locate these by their "squeak." But do not apply too much reaction; just keep the set easily oscillating.

And remember that a short-waver occupies an infinitely smaller area of a tuning dial than does an ordinary distant station. You must tune very slowly indeed, or you will whip by the stations without even hearing their carriers.

Once you have decided to investigate the potentialities of an interesting-sounding "squeak," it is necessary very carefully to reduce the reaction at the same time as you "hold" its tuning by juggling the extenser-control in microscopic movements in order to "resolve" it and hear the speech or music.

Tuning-in the short-wave stations certainly demands a little patience, but it is vitally worth while. You get so many surprises. It often happens that a loud carrier which you expect to be a European station turns out to be an Australian and a weak carrier next to it a European!

A Fascinating Field.

But you must be prepared for wide variations in conditions. At times the short-wavers come over exceptionally well, and dozens of them can be tuned in one after the other. But on other occasions you may find it difficult to get only a few and that after some rather intensive searching.

Don't blame the "Cosmic" set for this, or for a period when stations fade badly. The "Cosmic" Three is designed to give everyone the chance to explore these fascinating new radio regions, but it is unable to change the natural conditions which affect them!

Were it not for the rather "freaky" nature of these short-waves it would not, I suppose, be possible to achieve astonishing results, such as the picking up of broadcasters from the Antipodes, even although your aerial is short and low.

Now, that is all about the short waves for the time being. In a later issue there will be a special contribution on the subject by Mr. G. T. Kelsey.

But I must not forget to give you the tip that although within limits you want to put as much H.T.

on the H.T. plus 2 terminal as is possible, for this serves the power valve; the same does in no way apply to the H.T. plus 1 terminal, which is "solo" to the detector.

H.T. Hints.

Using one of the recommended valves, about 80 volts is a reasonable H.T. for that, but it often happens, especially on the short waves, that something less gives a

RECOMMENDED ACCESSORIES

LOUDSPEAKER.—Epoch, W.B., B.T.-H., Celestion, Blue Spot, H.M.V., Graham Farish, Marconiphone, Amplion, R. and A.

VALVES.—Detector: Mazda H.L.2. 1st L.F.: Marconi L2B, Cossor L210, Mazda, Eta, Tungram, Osram, Mullard, Six-Sixty, Darlo, Lissen, etc.

Output: Cossor 230 X.P., etc.

BATTERIES.—H.T. 120 volts: Pertrix, Ever Ready, Lissen, Magnet, Edlswan, Drydex.

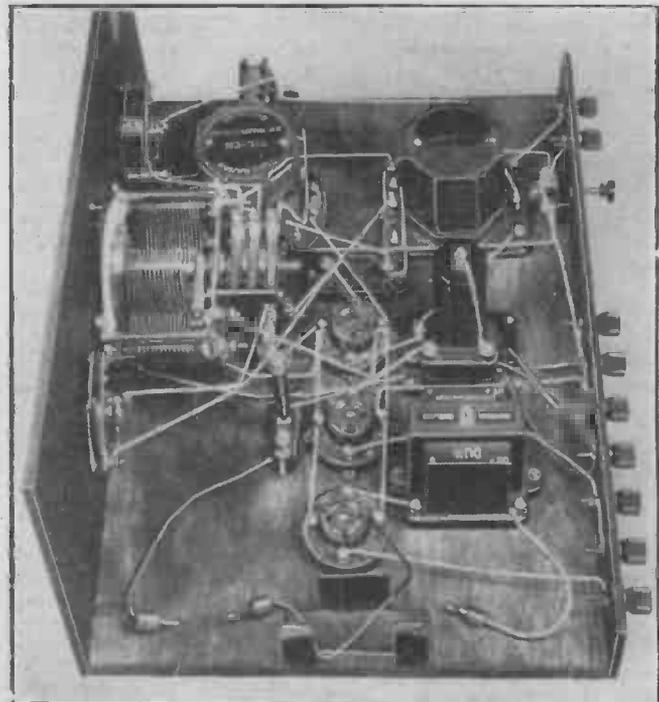
G.B. 16-18 volts: Ever Ready, etc.

ACCUMULATOR, 2 volts: Exide, Pertrix, Ever Ready, G.E.C., Edlswan, Lissen.

smoother reaction control. You can go as low as 40 volts, if you find the results are thereby improved.

In conclusion, I must apologise if this article has been rather dull. But I have had too much fact and too little space at my disposal to make it easy to be interesting. But in a future issue I am going to expand the "operating" theme into a "round the world" with the "Cosmic" Three type of article; and I expect you will find that much smoother reading, although I trust it will be informative as well!

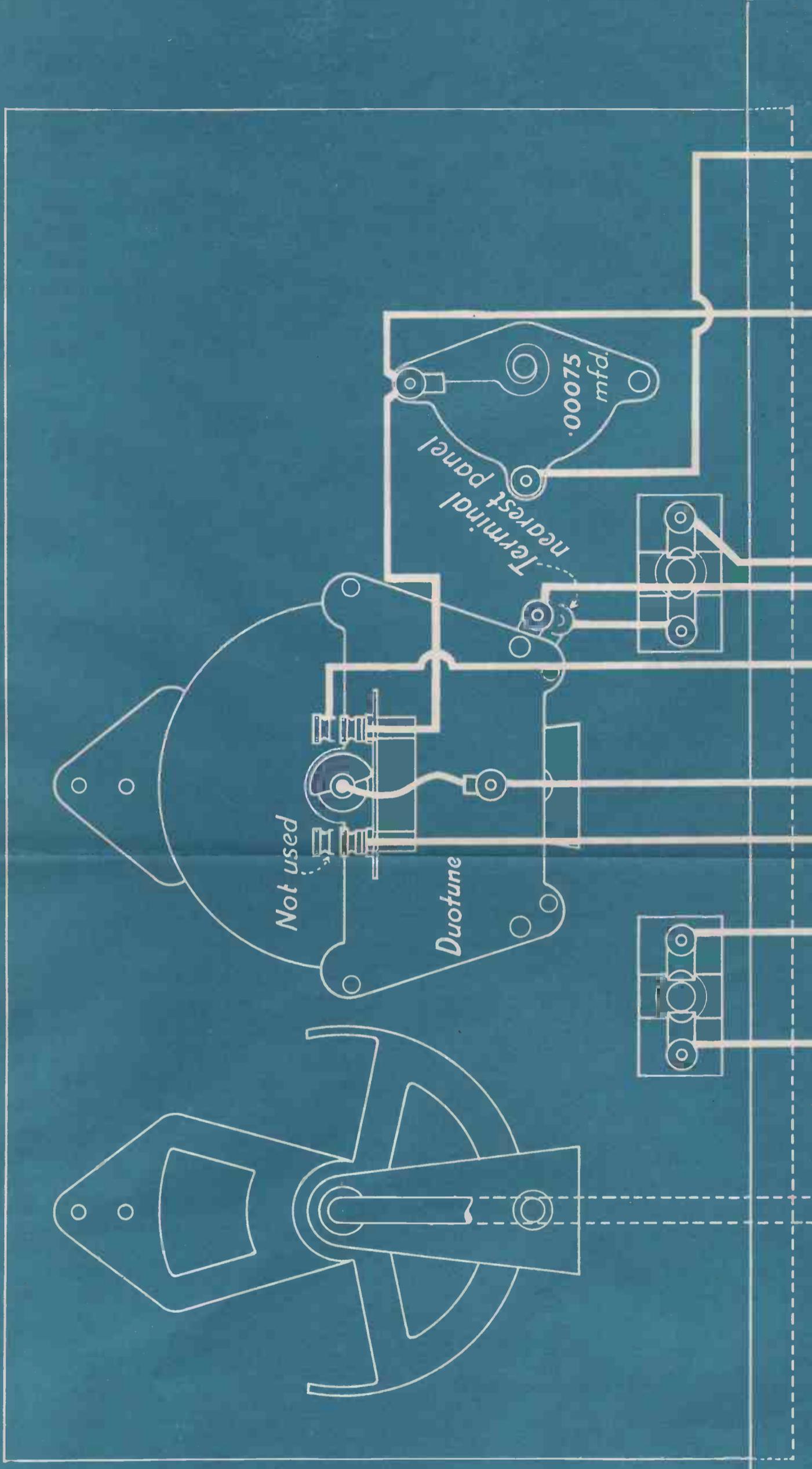
TRI-BAND SIMPLICITY!

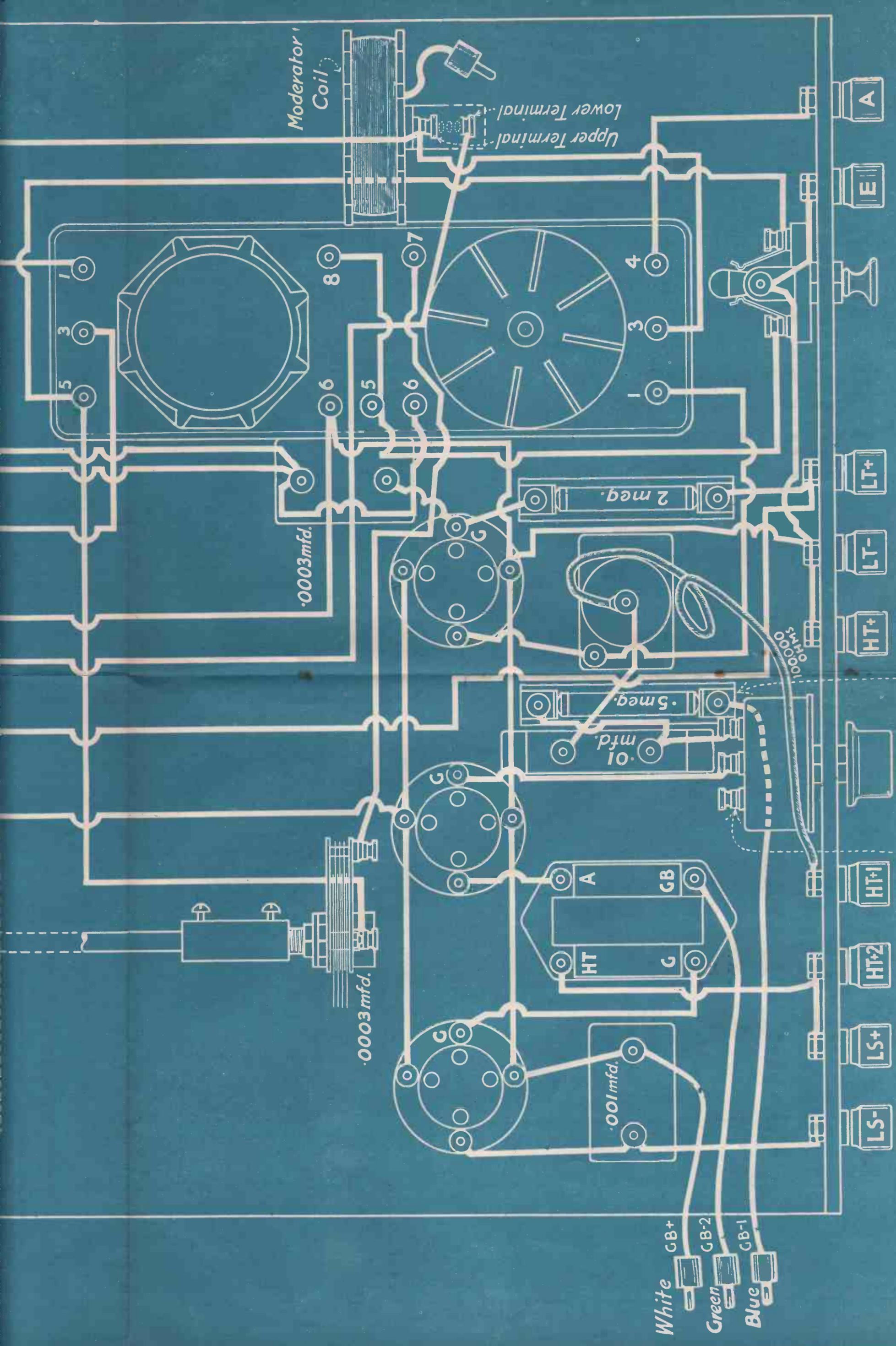


The finished set looks simple because both the circuit and the layout of components were intensively worked at for months until simplified efficiency was achieved on all the wave-bands.

THE "P.W." COSMIC III STAR

Full Size Blue Print, Price 6d. Presented Free with issue of Feb. 20, 1932





Connect Pick-up here and here

Checked and passed by G.P.Kendall B.Sc.

These are the **EXACT** parts shown on this blueprint

COSMIC III★

	s. d.
1 Ebonite Panel, 12" x 7", drilled to specification	4 0
1 Baseboard, 14" x 10"	1 0
1 Ebonite Terminal Strip, 14" x 2"	1 0
2 L.T. Switches	1 8
1 ReadiRad .00075 Moderator Condenser	3 6
1 Duotune Extenser Condenser	15 6
1 Slow Motion Disc Drive for above	3 0
1 ReadiRad .0003 Extended Slow Motion Reaction Condenser with Bracket	7 0
3 Valve Holders	1 6
1 R.I. "Cosmic" Dual Coil Unit	12 6
1 ReadiRad Moderator Coil	2 6
1 T.C.C. .001 Fixed Condenser, Type "S"	1 6
1 ReadiRad Standard H.F. Choke	4 6
1 Lewcos 100,000-ohms Spaghetti Resistance	1 6
1 ReadiRad Radiogram Switch	2 9
1 T.C.C. .0003 Fixed Condenser, Type "S"	1 3
1 ReadiRad Wave-Change Switch	1 6
1 R.I. Hypermite L.F. Transformer	12 6
1 Grid Leak (2 megohm) and Holder	1 4
1 T.C.C. .01 Fixed Condenser, Type 40	1 9
1 Grid Leak, .5 megohm, and Holder	1 4
9 Belling-Lee Terminals, Type "R"	2 3
1 Packet of Jiffilinx for wiring	2 6
3 Belling-Lee Wander Plugs	6
Flex, Screws, &c.	1 2

Any part can be purchased separately.

Ready Radio Ltd

Eastnor House, Blackheath, S.E.3

The Ready Radio COSMIC Kit contains the actual components as shown on the P.W. Cosmic Star Blueprint. Make sure you use correct parts.

All Ready Radio COSMIC Kits are tested and passed before despatch under the supervision of Mr. Kendall.

12,500 British Workers are employed by the firms who manufacture the Ready Radio COSMIC STAR Components and Accessories.

KIT A 89/6

OR BY EASY
PAYMENTS
DEPOSIT OF 10/3
AND 9 MONTHLY
PAYMENTS OF 10/3

(This Kit consists of full set of components as listed here).

KIT B (with the addition of 3 Mullard Valves) £5 : 17 : 0 or by easy payments, deposit 11/- and 11 monthly payments of 11/-

Recommended Equipment

for the COSMIC III★

Any of these accessories can be obtained for cash or by easy payments from Ready Radio.

3 Mullard Valves as specified (P.M. 2DX; P.M. 1LF and P.M.2)	1 7 6
1 Pertrix Accumulator, Type PXC3	11 0
1 Pertrix 100v. Standard Capacity H.T. Battery	13 0
or 1 Pertrix 120v. Ultra Capacity H.T. Battery	19 6
1 Pertrix 9v. Grid Bias Battery	1 3
1 R. & A. Speaker Unit, Type 40 or 1 Blue Spot 66R Unit with Major Chassis	16 6 2 10 0

Immediate Despatch

1 Colliaro Gramophone Motor, Type B30, with Automatic Stop and Unit Plate	1 13 0
or 1 Colliaro Electric Induction Gramophone Motor	3 0 0
1 Ready Radio Pick-Up	1 7 6
1 ReadiRad .5 meg. Volume Control	5 9
1 Ready Radio Cosmic Cabinet, Table Model	1 1 0
or 1 Ready Radio Cosmic Radio-Gram Cabinet	3 7 6
1 Ready Radio Eliminator (A.C.) with Trickle Charger, Type BS.	5 17 6

Ready Radio Ltd

Eastnor House - Blackheath - S.E.3

SPECIAL FEATURES OF THE READY RADIO COSMIC III STAR

The COSMIC III STAR, when built strictly to this blue-print, is a 3-valve receiver capable of giving world-wide reception on all wavelengths—long, medium and ultra-short. It is extremely sensitive and selective and gives excellent quality at full volume.

It is delightfully easy to operate, tuning being by a single knob operating the wonderful DUOTUNE Extenser Condenser through a 20 to 1 Slow Motion Disc Drive. The Reaction Condenser is mounted on an extended control in order to obviate hand capacity effects and is wonderfully smooth in adjustment, being operated through a 20 to 1 Slow Motion Disc Drive.

The triple range R.I. Coils, mounted on one base to facilitate assembly and wiring, combined with the Ready Radio Moderator Coil form a tuning system of the very latest design and utmost efficiency.

An R.I. Hypermite Transformer is incorporated to give high quality amplification.

At a flick of the radio-gram switch the COSMIC III STAR becomes a highly efficient amplifier of gramophone records. The pick-up can be permanently connected to the two terminals indicated on the blue-print, so that it is only necessary to operate the switch when changing from radio to gramophone reproduction.

A job worth doing is worth doing well: build your COSMIC III STAR strictly to the specification of this P.W. blue-print. You will be more than delighted by its performance.

Advt. of Ready Radio Ltd., Eastnor House, Blackheath, S.E.3. Telephone: Lee Green 5678. Telegrams: Readrad, Blackvil, London. Showrooms: 159, Borough High Street, London Bridge, S.E.1 (2 minutes from London Bridge Station).

THE COSMIC III STAR IS TUNED WITH A DUOTUNE EXTENSER

(Patent Pending)

A revolutionary invention by G. P. Kendall, B.Sc.

Specially designed for all-wave tuning.

The DUOTUNE is the only tuning condenser of its kind. It is an air-spaced condenser of highly efficient design with two distinct capacity ranges. For normal tuning of medium and long wavelengths it has a maximum capacity of .0005 mfd., thus giving sufficiently fine tuning for these wavelengths with a wide tuning range.

At the touch of a switch it becomes a .00025 mfd. condenser and is thus particularly suitable for short-wave work where a small maximum capacity is advisable and adjustment is more critical. This change of capacity is effected by connecting the two sections of the fixed plates in parallel and there are consequently no idle plates which would cause losses.

The DUOTUNE consequently possesses the unique feature of giving efficient tuning over all wavelengths—long, medium and ultra-short, in one condenser operated by a single knob. It is in effect two instruments in one.

In addition to this feature the DUOTUNE Extenser Model, as specified for the COSMIC III STAR, also incorporates a switching device which automatically changes from medium to long-wave tuning as the knob is turned.

When used in conjunction with the Ready Radio 20 to 1 Slow Motion Tuning Control the DUOTUNE gives a degree of accuracy and ease of control never before attained in any receiver.

DUOTUNE - Price 15/6

20 to 1 Slow Motion Disc Drive, 3/-

Advt. of Ready Radio Ltd., Eastnor House, Blackheath, S.E.3. Telephone: Lee Green 5678. Telegrams: Readrad, Blackvil, London. Showrooms: 159, Borough High Street, London Bridge, S.E.1 (2 minutes from London Bridge Station).

THE B.B.C.'s "PAUL PRY" SCHEME

Our broadcasters cannot force you to disclose intimate details of your family life, but they are pleading very hard for a voluntary disclosure of such things.

THERE is something really funny about the various ways the B.B.C. contrives to get into hot water—and the newspapers. (It's the same, really, as far as the B.B.C. is concerned!)

The latest effort from Savoy Hill turns on what some papers have described as the "Paul Pry" Scheme.

Why the B.B.C. should want to conduct an inquiry into the privacies of family life is a mystery. The official explanation is that the scheme was conceived with the idea of "interesting listeners and making them think!"

Well, the B.B.C. has something to think about these days, for I doubt whether any of Savoy Hill's escapades have ever received such a torrent of abuse, derision, and general disapproval.

Worse Than Income Tax.

Of course, the odds are the experiment will be a complete "flop," for the B.B.C. intends sending out thousands of question forms—that is, to those who ask for them!

We have seen one of the forms, and it contains a multitude of questions which will give the average householder more trouble to deal with than half a dozen income-tax forms.

You will be invited to answer such questions as whether husbands and wives were cousins or otherwise related when they first met; how old they were when they left their parents' homes; whether they are now living apart, and so on and so on.

Wives will be requested to inform the B.B.C. what arrangements they make for housework and the care of children; how much the servant gets; whether the husband makes any allowance to his wife, etc., etc.

But the gem of the "inquisition" form is headed "Meeting of Partners," which asks, with regard to husband and wife, their parents, and their married children, whether they first met:

"At the home of the husband's parents; at the home of the wife's parents; at the house of friends; in a place of entertainment; at a school or university; on holiday; in religious, political, or philan-

ANOTHER "RECORD"!



The first English girl announcer from France, is Miss Faith Shipway, who conducts the H.M.V. Sunday afternoon gramophone concerts from Radio Paris.

thropic activities, or in some other way (If the latter, give particulars!)"

The B.B.C. kindly offers to send stamped addressed envelopes—at the expense of licensed listeners, of course!—for the return of the forms when filled up. Forms are to be sent to Sir William Beveridge, c/o the B.B.C., Savoy Hill, Strand, London, W.C.2.

What It Will Disclose.

The returned forms (if any) will then be handed over to the London School of Economics for analysis and tabulating—and probably in ten years' time some learned Professor—or more likely a committee of learned Professors—will publish a ponderous work which will inform an incredulous (but awestruck) world that, as a result of the "Paul Pry" scheme, the following important information has been obtained:

That umpteen per cent of the men who answered the questions were suffering at the time from (a) mental aberration, or (b) a sense of humour working overtime.

That x per cent of them married girls with blue eyes who liked fox trots, ice cream, and who met their husbands on a 93a bus returning from a Salvation Army meeting held in the Albert Hall on such-and-such a date at, approximately, 9 p.m.

A large percentage of the feminine answers will indicate that (a) husbands don't make their wives proper allowances, and that (b) the servant gets more than she's worth because she can't nurse the baby and cook the Sunday dinner at the same time.

Private Lives.

And probably Sir William Beveridge and his B.B.C. friends will discover—by the time the forms have been minutely examined, and cross-indexed for file purposes, that they have collected a mass of information which is inaccurate, and therefore useless, for the simple reason that it is psychologically absurd to expect people to put on paper the *real truth* about their private lives.

Still, if that fundamental part is realised, the B.B.C.'s "Paul Pry" scheme will have been worth while—perhaps!

AT last the stream of logs has ceased to flow in. At all events, should any more arrive after I have written this, I am afraid the senders cannot be very keen, and I doubt whether their lists will rival those of the champions.

Before we go any further, let me give the winners their Honourable Mention:

Amateur Class:

Mr. F. N. Baskerville, 9, Arthog Drive, Hale, Cheshire.

Broadcast Class:

Mr. W. H. Rowley, 7, Clarence Place, Stonehouse, Plymouth.

Forty-three Countries!

In the first class our friend F. N. B. sent in a fine log of forty-three different countries, including all the "DX" that one could expect to hear at this time of year. He appears to have slept for about three hours and to have taken about half an hour for breakfast—otherwise his log

"P.W.'s" SECOND SHORT-WAVE COMPETITION

was continuous! He had to stop at 8 p.m. on the Sunday, as "the family were beating down the shack door"!

In the second, W. H. R., also a regular correspondent, made a very creditable bag which included Sydney, Nairobi, Chi-Hoa, nine "Yanks," and several others. He, also, doesn't appear to have been favourably disposed towards sleep.

The "runners-up" are Mr. D. Pickard, of Nelson, Lancs, in the Amateur Class; and Mr. G. Lansdell, of Salisbury, in the "Broadcast."

I am surprised to see that no Londoners

figure in the "high lights," as I know conditions in London to have been excellent during the period. Perhaps the "Cockneys" will show us what they can do next time.

Nearly everyone sending in logs says that he enjoyed every minute of the time, and that the thrill of listening with a definite object is better than the business of searching round aimlessly. The moral to that is—more competitions in future. Well, I will see what can be done to make the next a little more difficult!

Much Useful Data.

The business of judging has not been easy, but I am convinced that the best man has won in each class, and I have learnt from the logs a good deal about the times at which stations come over best! I will analyse some of this information for the benefit of other readers from time to time.

Many thanks, everybody.

W. L. S.



WHEN my present contract with the British Broadcasting Corporation comes to an end on March 12th, 1932, I shall look back on what I believe are the four most momentous years of my life.

It was at my own request that my contract (which ordinarily would have continued until March, 1933) was severed, but I cannot too strongly emphasise the fact that my relations with the B.B.C. have always been most cordial and friendly. They still are.

"Uncle Jack."

The fact that Mr. Henry Hall's dance orchestra will shortly be replacing my own in the B.B.C. studios does not mean that my connection with the microphone has been definitely and finally severed. I have no sincerer wish than that I shall continue to be heard, even if only periodically, by British wireless listeners.

It is now several years since I made my wireless debut—to be exact, on December 26th, 1925, from the lately demolished Hotel Cecil. Listeners of those days may remember that I was "Uncle" Jack Payne then, and was heard fairly often in the Children's Hour. It was not until early in 1928, however, that I was invited to replace Sidney Firman, whose London Radio Dance Band, had hitherto provided the official dance fare for listeners.

Only four years—but much music has flowed over the aerials since then. They have been four years of almost incredible progress. Wireless broadcasting has grown from a pleasing incidental into a national necessity. One shudders to think what Britain would be like to-day without her broadcasting.

Those Sixteen Boys.

They are four years which have brought me my modicum of fame. I have been, so to speak, a part of the general system of scientific progress. By that, I do not mean to suggest that I have been a pioneer in my own particular branch of broadcasting work, but rather that progress in broadcasting technique and the demand for good dance music has increased to such an extent that I have had to progress with them or fall short in my endeavours to please my public.

From the beginning, I have always endeavoured to cultivate what, for want

An authoritative article in which the famous leader of the B.B.C.'s dance orchestra gives you his real reason for leaving the B.B.C.

of a better term, I must call "microphone consciousness." Even the delicately conceived instrument that is the microphone of to-day has certain limitations as well as certain decided advantages over visible forms of entertainment. And it is not until one is fully conscious of those limitations and advantages that one can hope to serve it, and the public it represents, with any degree of success.

It has been said that my dance orchestra has evolved a playing technique which is peculiarly its own. That, I candidly admit, is true. It caters both for dancing and entertainment, whereas most dance bands are concerned only with a dancing public.

"AU REVOIR, MIKE!"



Jack Payne hopes to return to the microphone at intervals, so it is not good-bye but au revoir.

Thus, to me, the played note and the spoken word have assumed a more than ordinary importance. I have always strived to instil a hundred per cent auditory value in everything my orchestra performs.

When I first started regular broadcasting from Savoy Hill, there were ten instrumentalists in my band. Now there are sixteen (soon to be enlarged to nineteen), but that difference of figures in no way represents the advancement of broadcasting progress. If it were possible to assess that in round numbers, I should put the figures in the neighbourhood of a hundred to one.

His Real Reason.

I have sound reasons for saying that while the microphone is a splendid servant to those who understand it, it is, as well, a most exacting master. It has a delicate and most voracious appetite. Since, for instance, my orchestra started broadcasting, it has played no fewer than four thousand separate tunes. In 1931, we played one thousand individual tunes in an actual broadcasting time of 650 hours. And for every hour we appeared before the microphone, there were at least three hours given to orchestrations and rehearsals.

In addition, I had other important business to attend to—such as the making of gramophone records, and frequent vaudeville appearances throughout Great Britain. I do not give these facts in the mere pleasure of self satisfaction, but rather to illustrate the enormous demand made on me—and my "boys." And it is because this demand is so severe that I finally decided to ask the B.B.C. to release me from my agreement. *That is the fundamental reason* for my desire to leave the B.B.C.

1,000 Letters a Week!

Although my four years at Savoy Hill have provided me with a wealth of experience, and an invaluable insight to the mushroom growth of wireless, I still sometimes wonder whether I fully appreciate the enormous power invested in broadcasting.

It is easy to write in trite terms of "wireless wonders," and so on, as many writers have already done; but it is far more difficult to assess the magnitude of those wonders in national life. Certain it is that very few people outside the British

(Continued on page 1372.)

THE MIRROR OF THE B.B.C.

By O.H.M.

A GREAT ELGAR PRODUCTION

BROADCASTING HOUSE—CONDENSER MICROPHONES—ORCHESTRAS BY THE ALPHABET—"O.B." TRIUMPHS, Etc.

THE B.B.C. is planning a great Elgar production for next season. It will be either his "Apostles" or "The Kingdom," and the full National Chorus will participate.

Broadcasting House.

It is understood that the move of the rest of the staff from Savoy Hill to Broadcasting House will take place about a month after Easter. Most of the major difficulties encountered at the new building have been overcome and it remains only to complete construction and adjust details.

The new studios will be more efficient than any other set of broadcasting studios in the world. Office accommodation, however, is not so promising, and a considerable proportion of the staff will be less comfortable in the new building than they were in the old.

Condenser Microphones.

The music department of the B.B.C. has been concerned about "blasting" during the concerts from the Queen's Hall. As a result, experiments have been undertaken with condenser microphones, which, it is hoped, will overcome the difficulties.

Orchestras by the Alphabet.

There is growing irritation at the stubbornness of the B.B.C. in declining to abandon the method of describing whatever orchestra is playing by referring to "A," "B," "C," or "D," which is not understandable by the vast majority. The B.B.C. should go back to the old system of simple ways and sensible description, such as "Theatre Orchestra."

"O.B." Triumphs.

The Outside Broadcast Department at Savoy Hill recently carried out its 10,000th relay, a record which I very much doubt any broadcasting organisation in the world can equal under circumstances comparable to those at the B.B.C. headquarters.

The Department is in for its usual busy time, which comes about the middle of every March, in connection with a number of important sporting events all falling within a few days.

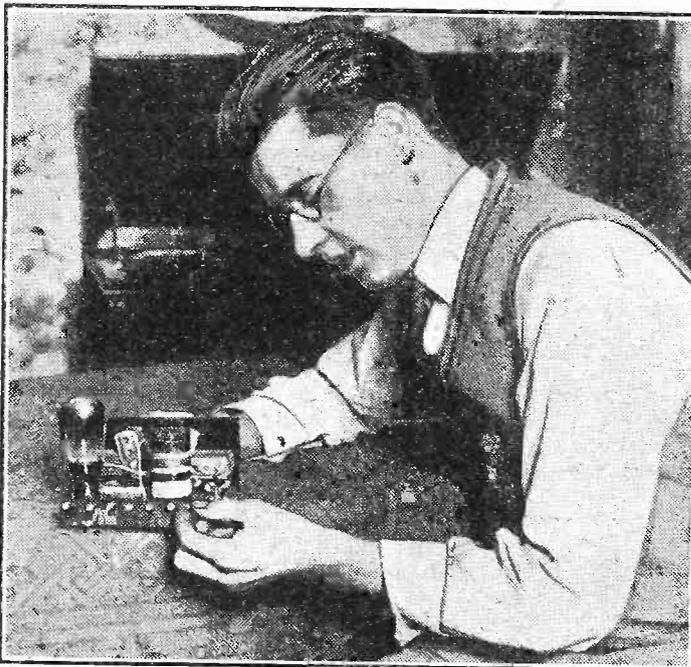
On Wednesday, March 16th, there is the preliminary test cruise over the Boat Race course with the short-wave transmitter aboard the "Magician" for the University Boat Race which takes place four days later, and with this job satisfactorily through the outside broadcasters will travel off post-haste to Aintree, where the whole of Thursday, March 17th, will be devoted to testing the microphone and circuits to be used for the Grand National commentary which happens on the following day.

Friday night will be spent in motoring back to London for Saturday's Boat Race, and no sooner will this be finished than the responsible officials are off to Twickenham to superintend another commentary, this time on the England versus Scotland Rugby Match which starts in the early afternoon.

A Leap-Year Feature.

A programme which occurs only once in four years, when February has an extra day, has been carefully planned by the Productions Department at Savoy Hill. It will take the form of a special Leap Year Vaudeville entertainment which, from what I hear, will include a Buggins' sketch and a musical extravaganza by Reginald Beck and Temple Abbadly. All being well,

HE GETS VERY "SHARP" TUNING!



If you look closely at the variable condensers you will observe they are made from razor blades! It's only a one-valvet, but this Newcastle enthusiast who made it can get four British and two German stations on the 'phones.

Another Pirate Drive.

In due time we shall no doubt hear of the results of the latest drive by the Post Office against wireless pirates in the Bolton and Burnley areas. It would not be at all surprising if the total number of British licences reaches five millions by the end of the year.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

CONGRATULATIONS to the Yorkshire Comedy and the Driffield Players!

I liked your two plays, although you did take them at the easy rather. Of course, we were warned beforehand that you have very settled ideas about speed of speech; and nothing, apparently, will make you accelerate. All the same, you provided excellent entertainment, and I think the North Regional authorities showed good discrimination in getting hold of you.

One-Act Plays.

"Safe Custody" was extraordinarily good. Didn't you think the story had a rather unexpected finish? I felt all along that the wily postmistress ought to have something up her sleeve; but it wasn't her sleeve after all, was it?

I shall have more to say about this programme in due course.

British Music for the Continent.

The B.B.C. is contributing to the series of International Broadcast Concerts for European listeners on Sunday, February 21st, when a programme of representative British music will be performed in the London Studio. Among the items chosen are "Brigg Fair," by Delius; Elgar's "Enigma Variations," Holst's "Fugal Overture," and Ireland's "Pianoforte Concerto," the last-mentioned work being played by Helen Perkin, to whom it is dedicated.

"Only a Baby's Rattle."

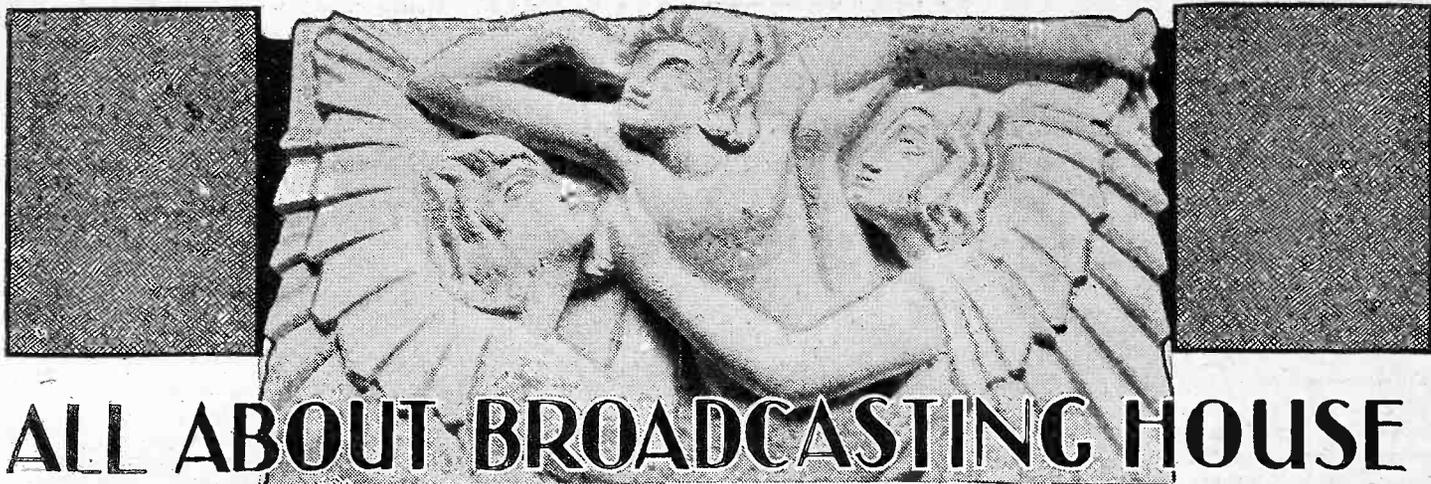
Among the items included in a recent broadcast of "New Songs for Old," arranged by Gordon McConnel and Christopher Stone was a number entitled "Only a Baby's Rattle," given by Olive Groves, which was originally sung by Tots Davis, a well-known artiste of the 'nineties, and which won for her Alley Sloper's Fifty Pound Ring. The broadcast brought a letter from Miss Davis, who still has the prize ring in her possession.

I hope the South will follow the example of the North, as I am all in favour of fostering the dramatic spirit. The one-act play seems quite a suitable medium; it has the advantage of being short, the cast is usually small—and, consequently, the cost of production can't be exorbitant.

Christopher Stone.

Have you noticed how the amiable Christopher Stone is creating a perfectly new gramophone record vocabulary? For some time now we have been familiar with his "optimism," "pessimism" and "hot" classifications, but it was quite new to me to hear dance records described as "Light Wines." Very apt, Christopher! and congratulations—if it is a term of your own!

(Continued on page 1403.)



ALL ABOUT BROADCASTING HOUSE

*By The Chief Engineer of the B.B.C. Mr Noel Ashbridge
B.Sc. Lond. AMICE*

IN an article which appeared in a recent issue of POPULAR WIRELESS, the studio and control-room equipment was described, and the general plan of working explained. There now remains the various apparatus which is used for controlling, monitoring and recording the programmes and rehearsals, and certain other apparatus which is associated with the control-room.

Battery or Mains Drive?

Dealing with the latter first, we have to consider the important question of providing low- and high-tension supplies for the 65 control-room amplifiers which were mentioned in the previous article.

In one or two countries on the Continent engineers in charge of control-rooms lay great stress on the fact that all amplifiers obtain their supplies direct from machines, and that no storage batteries are used.

At first sight it would appear that the use of machines would offer considerable advantages, but it has to be borne in mind that there are several dangers which have to be guarded against when a large number of amplifiers are supplied from machines. One of the most important is probably the risk of mains failure or the blowing of main and branch fuses.

There is also the danger of commutation noises, and the possibility of cross-talk due to the impedance of the machine providing what amounts to a coupling between the various amplifiers in circuit.

Accumulators Preferred.

More or less complicated smoothing and decoupling apparatus would be necessary, and exceptionally careful maintenance of commutators and insulation absolutely essential.

It is hardly necessary to point out that for a broadcasting system a very much lower level of background noise is necessary as compared with, say, an ordinary telephone system. In cases where a large number of amplifiers are in use at the same time, it is doubtful whether the use of machines is justified, having regard to all these circumstances.

Moreover, it is doubtful whether any very great advantage is gained by their use,

Here is another fascinating instalment of the story of the new B.B.C. Headquarters, told by the Chief Engineer himself. It is packed with interest for the ordinary listener as well as for the student of modern radio technique.

except possibly in connection with the first cost: a good battery permanently and well installed, has a life which should be comparable with a machine, and normally requires little or no more maintenance.

It would be unwise to be too dogmatic on the advantages and disadvantages of each method, but after careful consideration it was decided to use batteries for all control-room supplies at Broadcasting House.

tension batteries give a voltage of 300, and have a capacity of 75 ampere hours.

There are in addition batteries for grid negative, having a voltage of 24 and capacity of 10 ampere hours, and for relay operation with a voltage of 24 and a capacity of 1,000 ampere hours.

"Outsize" Capacities.

There is also a separate battery for exciting carbon type microphones having a capacity of 8 volts, 500 ampere hours. The machines for charging these batteries are situated at some distance from the control-room, and are designed to give a minimum of mechanical and electrical disturbance.

With this object in view they run at a lower speed than usual for the size of the machine, and are installed on special beds, designed to prevent the transmission of vibration to the floor.

This completes the essential equipment for the studios and control-rooms, but there are several rooms used for the control of programmes which contain apparatus of considerable interest.

First of all there are four "music control-rooms." As many readers probably know already, the volume control of musical programmes is carried out by musicians, who are free to vary the volume of the input to the line to the transmitter within prescribed limits indicated by a special type of volume meter.

Limited Control.

These limits are fixed with regard to the technical considerations of permissible ratio of maximum to minimum, from the point of view of both transmitting and receiving. However, apart from these limitations the musician is free to produce the best artistic effect he can,

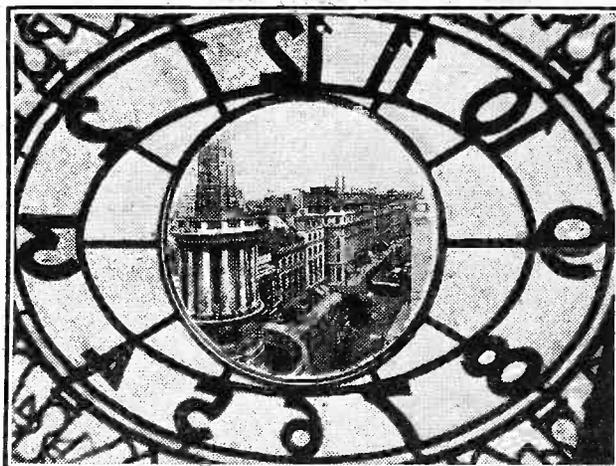
working, of course, from the score.

These rooms are specially equipped for the purpose, and the control of the programme is, so to speak, handed over to one of these by the engineer in charge of the switching position in the control-room.

The musician is provided with one handle only, which controls the gain of the "B" amplifier concerned, and one meter to register the volume he is delivering to the line.

(Continued on next page.)

AS THE CLOCK SEES IT



This interesting photograph was taken before the clock in Broadcasting House was fixed in position. It shows Langham Place, with Church in the foreground.

Great care has been taken to prevent cross-talk due to the resistance of the leads and batteries themselves. The former have been carefully designed using very large section copper bus-bars, arranged in such a way as to have an absolute minimum of resistance.

The capacity of the filament batteries for the microphone amplifiers is 6 volts, 2,000 ampere hours, and there is a separate battery for all other amplifiers with a capacity of 6 volts, 3,000 ampere hours. The high-

ALL ABOUT BROADCASTING HOUSE

(Continued from previous page.)

The volume indicator is called a programme meter, and has a decibel scale, that is to say, equal increments on the scale register equal increments in the loudness actually heard by listeners.

Of course, the meter in itself cannot function according to this law, and the effect is produced by supplying it from an amplifier whose output in relation to the input is logarithmic. This is a great advance on the older method, where the volume indication was given by two meters, one showing the maximum limit only and the other the volume according to a linear law.

Special Volume Meter.

This latter type of volume meter is misleading and difficult to read when the volume is near the minimum allowable. With the addition of a loudspeaker this comprises the whole of the essential equipment in these rooms, but they are, of course, connected to the control-room and studio telephone system and are provided with coloured lights for signalling purposes.

Another feature of interest is the recording room, where apparatus is installed which makes it possible to record any programme or rehearsal and play it back within a few minutes. The method at present used by the B.B.C. is the Stille system of recording on steel tape.

Briefly, the process consists of passing a steel tape between the poles of an electro-magnet, which removes any previous recording and leaves the tape with a certain amount of permanent magnetism. It is then passed between the poles of a

Of course, the tape has to be reversed before this can be done, otherwise the music would be reproduced backwards. A good frequency characteristic is obtained by using amplifiers both for recording and reproduction having non-linear frequency characteristics which compensate for any non-linearity in the process of recording itself.

A Useful Machine.

The great advantage of this method over wax discs and photographic films lies in the fact that play-back is possible immediately after recording, the only delay being that necessary to reverse the tape.

The principal application of recording in B.B.C. work is in connection with "post-mortems" of running commentaries, and other extempore programmes, and generally to allow artistes and speakers to hear their own performance, with the object of effecting improvements in their future work.

The process can equally well be used for re-broadcasting during the evening programmes of exceptional interest which take place at times when most people are unable to listen. Several machines will be installed, as there are already many calls on the one machine which is at present available at Savoy Hill.

With regard to the monitoring of programmes, there are several listening rooms other than those associated with the studios which were mentioned in the first part of this article. These are as follows:

- (1) The press listening rooms.
- (2) The engineers' listening room.
- (3) The lines listening and test room.
- (4) A listening room for the programme supervisor.

The Listening Rooms.

There are two press listening rooms, i.e. one for each programme. They are merely large rooms acoustically treated and provided with high quality loudspeakers.

The engineers' listening room is similar, but has facilities in the shape of special wiring for carrying out tests under a variety of conditions. The lines room is used for making measurements on lines of all kinds; that is to say, O.B. lines, trunk lines, and lines to the Continent.

It is equipped with apparatus for measurement of line characteristics, degree of cross talk, etc., and it is in this room that the possibilities of new Continental routes are examined and line difficulties of all kinds can be investigated by means of actual measurements.

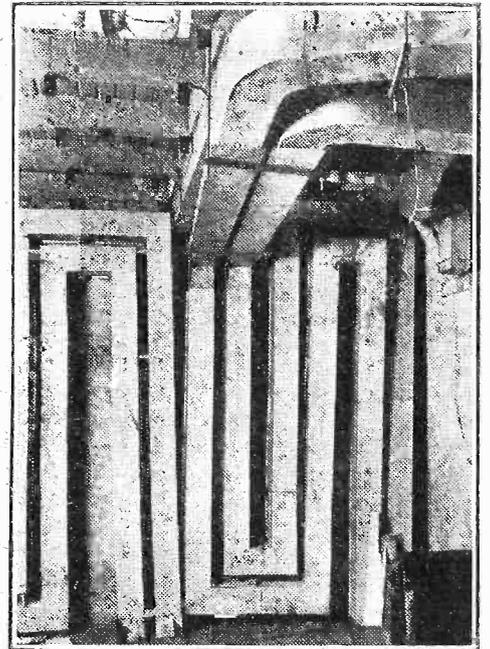
The programme supervisor's room is intended more for observing the progress and timing of programmes than for quality checks, and is fitted with facilities for listening to every programme; and, of course, it is linked by telephone to all points in the building.

In the basement there are four echo rooms similar to the two existing ones at Savoy Hill. The title of these rooms is a survival of many years ago, and they

would be more correctly called "reverberation rooms," since their function is to increase artificially the apparent reverberation time of any studio.

In the past this method has been used to improve the acoustics of studios which were too dead, as well as to produce dramatic effects of various kinds. Generally speaking, however, the studios at Broadcasting House will give the correct amount of reverberation without the addition of the artificial variety, so that the main use of the so-called "echo" rooms will be for producing dramatic effects.

NOT ORGAN PIPES!



They look like the pipes of a big organ, but actually they are part of the ventilating system at the new B.B.C. H.Q. There are in all approximately 150 tons of ventilating duct in the building.

Several of these rooms are necessary, however, because it is usual to use several studios during the production of a play. The output from the various studios used during the performance of plays is controlled, or "mixed," by the producer himself, or his assistant, using what is called a "dramatic control unit."

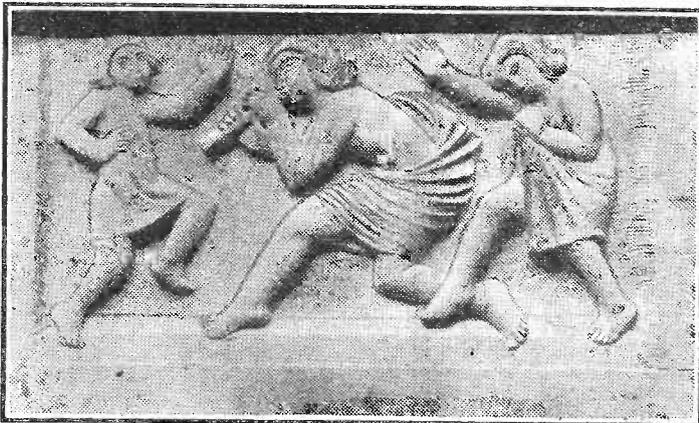
An Improvement in Quality.

There are two rooms fitted for this purpose, each provided with the mixing apparatus, by means of which the volume from any one studio may be varied in relation to others, or one group varied in relation to another group. There is also a system of light signalling to warn artistes that their cue is approaching.

In conclusion, it might be as well to say something concerning the acoustics of the studios at Broadcasting House. The quality will be noticeably different from that given by most of the studios at Savoy Hill, and we quite expect that at first some people will complain that there is too much "brilliance."

No doubt within the first few days of the general change-over there will be slight dislocation owing to the intricacies of the apparatus generally, but the whole object of the new headquarters is to provide better technical and programme quality, and it is hoped with confidence that listeners as a whole will not be disappointed.

A TOOT ON THE FLUTE!



Some of the sculptural work by Mr. Eric Gill, which is hailed as a great achievement. This group represents "Ariel and Children."

second electro-magnet, the coils of which carry the music or speech currents to be recorded.

The permanent magnetism in the tape is then varied in accordance with these currents, and a permanent magnetic record of the programme is left on the tape. Reproduction merely consists of again passing the tape between the poles of an electro-magnetic system, when the variation of the magnetism in the tape causes corresponding currents to flow in the coils of the electro-magnet.

A 29 Gn. Radio-Gramophone

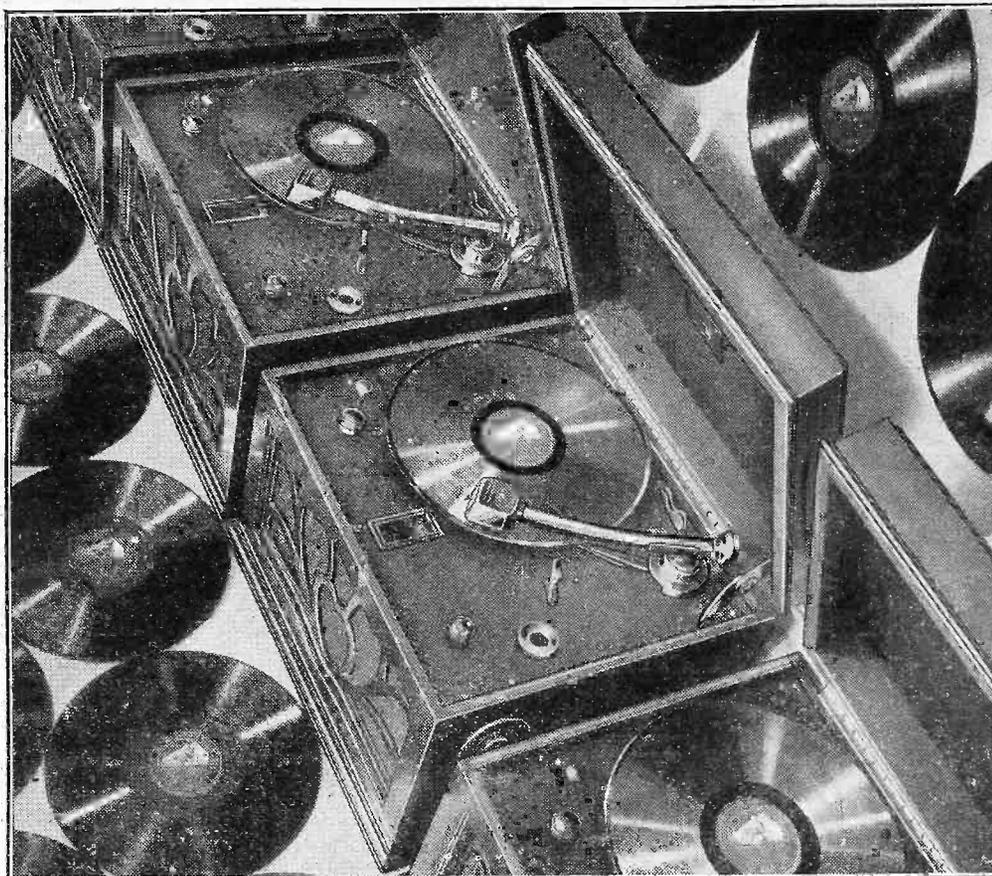
... made by His Master's Voice

**IF YOU
KNOW LITTLE
OF RADIO
READ WHAT
THE EXPERTS
SAY**

"The quality of reproduction of both broadcasting and gramophone records is of the high standard one expects from H.M.V. products. A full round bass is balanced by crispness in the upper register without over-emphasis of sibilants or objectionable needle scratch. It goes without saying that the quality of material and standard of workmanship in the chassis is irreproachable, while the finish of the cabinet work is of the customary H.M.V. excellence."—*Wireless World.*"

"An unusual type of set is the H.M.V. model 501 three valve table radio-gramophone. Included in the table cabinet is a three valve all mains set, a moving coil loudspeaker, gramophone pick-up and electric motor. The price is 29 Guineas, a figure that should appeal to many set-buyers wanting radio-gramophone reproduction without the expense usually associated with radio-gramophones."—*Wireless Magazine.*"

"Tests soon proved the excellence of the Model 501 radio-gramophone under working conditions. All the laboratory staff agreed with me that the quality of reproduction is outstandingly good. This applies to the loud and soft settings of the volume control. On the radio side it was evident that selectivity, even with a fairly long aerial, is above the average. I found the wave-length calibrations quite accurate enough to locate distant stations, of which a large number have been logged."—*Amateur Wireless.*"



Model 501.

If you are an expert . . .

HERE IS THE TECHNICAL SPECIFICATION

VOLTAGE RANGE. A.C. Model—100-130 volts, 200-250 volts, 50-60 cycles. D.C. Model—200-250 volts.

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His Master's Voice



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GOOD conditions continue to be with us and there is every indication that they will continue to do so for some little time. Dame Nature seems to have realised that last year she gave us an overdose of atmospherics, for so far as 1932 has gone she has behaved very kindly towards long-distance men in this respect.

By all the rules she should become kinder and kinder, since a sunspot minimum is due two years from now. We don't know enough about atmospherics to say that they are directly caused by sunspots; it is pretty certain, though, that when these spots are large and numerous atmospherics are usually more than a nuisance.

Last year we suffered from something very like a second sunspot maximum, which occurred at a time when old Sol should have been getting over his troubles.

Fewer Atmospherics.

In the complete absence of atmospherics that we are enjoying, long-wave reception is magnificent. This is a great boon, especially at the week-ends, for it enables the wireless set to provide entertainment in the home at those times when the B.B.C. are broadcasting solid chunks of silence.



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

There is such a wide choice on the long waves now and stations are so uniformly good that it is difficult to single out any for special mention. I would, though, call your particular attention to Huizen, Radio-Paris, Warsaw and Kalundborg. Not only do they come in well, but they can usually be relied upon to provide just the kind of programmes that suit the majority of tastes.

Medium Wave Troubles!

On the medium waves a few stations are having their troubles, though most of the bigger ones are coming in as well as ever they did. The troubles referred to are caused mainly by heterodyne interference due either to wave-length wandering on the part of older stations or to "butting in" on the part of certain newer ones.

A certain amount of confusion has been caused at the top of the band by Palermo, who ought to share 542 metres with Sunds-

vall. Lately he has been working on shorter wave-lengths and Vienna amongst others has suffered somewhat. Riga has been often pretty well blotted out.

Another interloper, whose call-sign I have not managed to pick up, has interfered at times with Rome.

I rather fancy that the offender must be one of the Norwegian relays.

Below the "Two-Fifty" Mark.

Grenoble has interfered with Milan and the bad patch between about 413 and 430 metres is still with us. On the other hand, Breslau is now free from the heterodyne that was recently spoiling him and things are better than they were down below 250 metres.

Budapest, though not constant, often provides wonderful reception. You should never fail to try for him when you are indulging in long-distance work.

If he is good he is always worth listening to, whilst if he is weak you have plenty of other alternatives. Munich continues to be disappointing, but Vienna, when not heterodyned, and Brussels No. 2, are fine stations. Prague comes in splendidly and Langenberg is a station upon whom you can rely.

R.W.H.

MANY weary hours have I spent judging the entries for our short-wave Competition (the second of that ilk), and you will find the results on another page, if the Editor has had room for them this week. I have learnt much from the logs sent in, and the senders all say that they have thoroughly enjoyed themselves, so that the whole thing may be voted a success.

I must now deal with some letters that I have been allowing to "pile up," and which I think are of general interest to readers. First I must refer to one from the winner of the last Competition, in the "Broadcast" half—our friend, R. W. S., of Little Wakering.

"Hors De Combat!"

He has been put out of action this time by illness, but he asks me to tell the winner that he will have more of a run for his money next time! Hard luck, R. W. S.!

J. B. M., of Glasgow, whose notes pour in upon me with great regularity, now tells me that the Portuguese station mentioned before appears to be Oporto, working on about 46.5 metres. He also sends me his short-wave log for the year 1931! I hope to make use of this for the benefit of other readers in a future issue.

J. R. B., of Edinburgh, appears to be a lively lad. In the same breath he asks for a "Junior Section" for short-wave enthusiasts between 13 and 15, and tells us that they will show us the way to tune in stations! He says they are probably

SHORT-WAVE NOTES



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

By W. L. S.

more skilful at the job than all the "poor old men" like myself. He must be convinced that I am at least 85.

Another of the "juniors," to wit, W. H. G., of Settle, Yorks, also sends in an interesting account of experiences during the Christmas season and thereafter. He mentions a station signing G 6 R X on telephony, and suspects that he is not an amateur, and resides at Rugby. Correct both times, W. H. G.!

An Interesting Letter.

E. W. W., from Northern Nigeria, writes to say that he finds "Radio-Roma-Napoli" on 25.4 metres, infinitely more consistent than G 5 S W, and that a really powerful and regular transmission from the latter station would certainly boost up sales of short-wave gear in outlying parts.

I am convinced that he is perfectly right.

If the new Empire station really turns out to be a success, I think the few people that make short-wave gear at the moment will come into their own. Incidentally, their special line will doubtless be invaded by several newcomers.

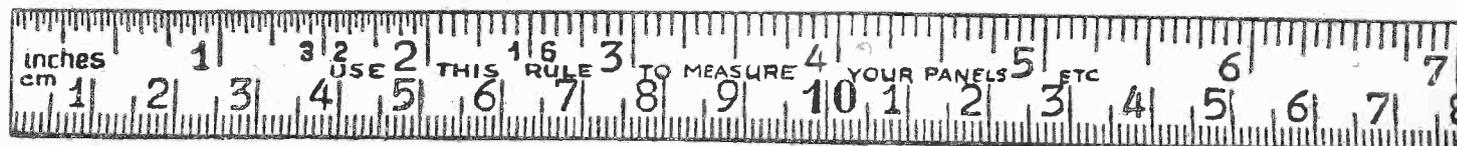
Next, does any short-wave enthusiast live near Virginia Water, Surrey? If he does, and will write to me, I will put him in touch with W. H. C., an "S.G. Four" enthusiast who burns the midnight wats in that neighbourhood to the accompaniment of the Kooka-Burra bird from Sydney.

Converting the S.G. Four.

To several enquiries about the possibility of adapting the said "S.G. Four" for broadcast reception, may I reply that it is perfectly easy? A set of plug-in coils is the total requirement in the way of new gear, although it is an advantage to have a loose .0005 variable, mounted in a box, and equipped with crocodile clips. This may then be clipped across the grid tuning condenser to enable a wide range to be covered.

It is not always necessary to treat the S.G. tuning condenser in this way, since the aerial-series condenser can be varied to bring the tuning range on to the .0001 already installed.

Quite a lot can be done with the .0001's (or .00013's) as they are, but rather a lot of coil-changing is necessary. If, however, you have two 50's, two 60's and two 75's, you will be able to cover the broadcast band without any gaps.



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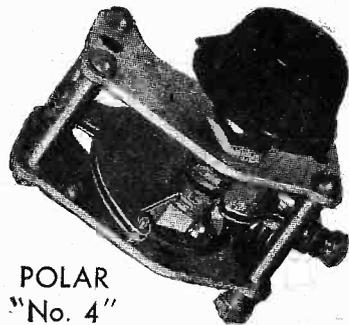
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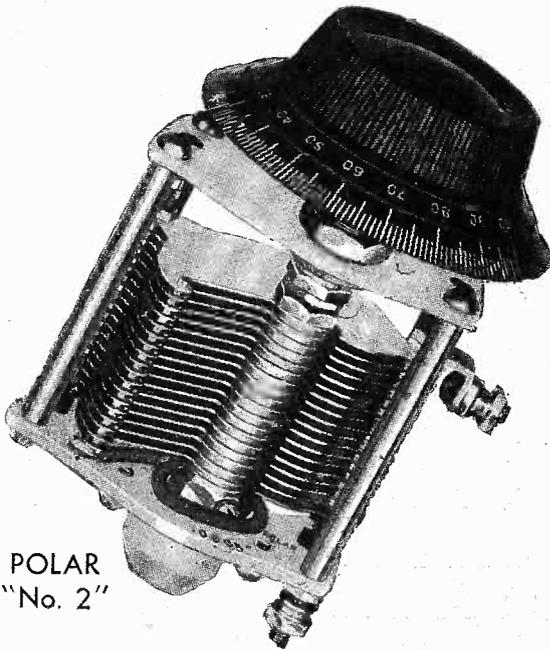
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ON THE OTHER SIDE

A TALK WITH AN ITALIAN LISTENER

AN old friend of mine, an Italian, visiting me in Berlin, leaned over the table and smiled.

"In Italy," he said, "we have a proverb, *a tavola non s'invecchia*—'One does not grow old at table.' And yet, with all the importance we are supposed to attach to food, we don't have good programmes at mealtimes, as you British people do, and as there are here in Berlin. We have no programmes at *la prima colazione*—breakfast, you say—only one at lunch, and only a news bulletin to accompany our evening *cena*."

Controlled by the Government.

"Will you give me a rough idea of the sort of programmes you do get?" I invited.

"*Con piacere*," he said. "We *Lazio*s are very proud of our broadcasting.

"Ordinary broadcasting is in the hands of the Ministry of Communication, and the general rules are very much the same as those under which the Post Office has 'ownership' of the ether in England.

"The *Unione Radiofonica Italiana* has been granted a monopoly very much on the same lines as that given by the B.B.C.'s charter, and the U.R.I. (please don't confuse this with the I.R.U., the International Radio Union) was formed some years ago by a group of business men who saw the possibilities of broadcasting.

Licences!

"Your licence costs ten shillings, doesn't it? A receiving licence in our country costs three lire, which you can work out

Continuing a novel new series, this article will enable listeners to Rome, Milan and other stations of sunny Italy to visualise what reception conditions are like over there, and how Italian listeners fare for programmes.

with lire at ninety-two to the pound, before Britain went off the gold standard. Most of the money goes to the Treasury, which, I can assure you, is a constant source of annoyance to listeners!

"There are compulsory subscriptions to the broadcasting service, and amateurs pay ninety-six lire a year for this, the whole of the money, less a little for the cost of collection, going to the U.R.I.

"There is a very good scheme whereby a set used for communal wireless—where there are a lot of listeners, and where

otherwise there would be a shortage of revenue—is charged at a higher rate. One concern which has a number of sets in various centres for a wired wireless system pays two thousand lire a year for each set! Would you British listeners stand for a tax of about twenty-five pounds?"

Low Proportion of Listeners.

"Are there many listeners?" I asked.

He continued: "The proportion of listeners to population is still fairly low over most of Italy, except round good reception centres—Rome and Milan, you know.

"You British listeners may not know that Italy has so great a population as forty-one millions, and as so many areas are agricultural, the country, as a whole, is behind England in its keenness for radio. Our country is divided up into ninety-two provinces, with a *prefetti* in charge.

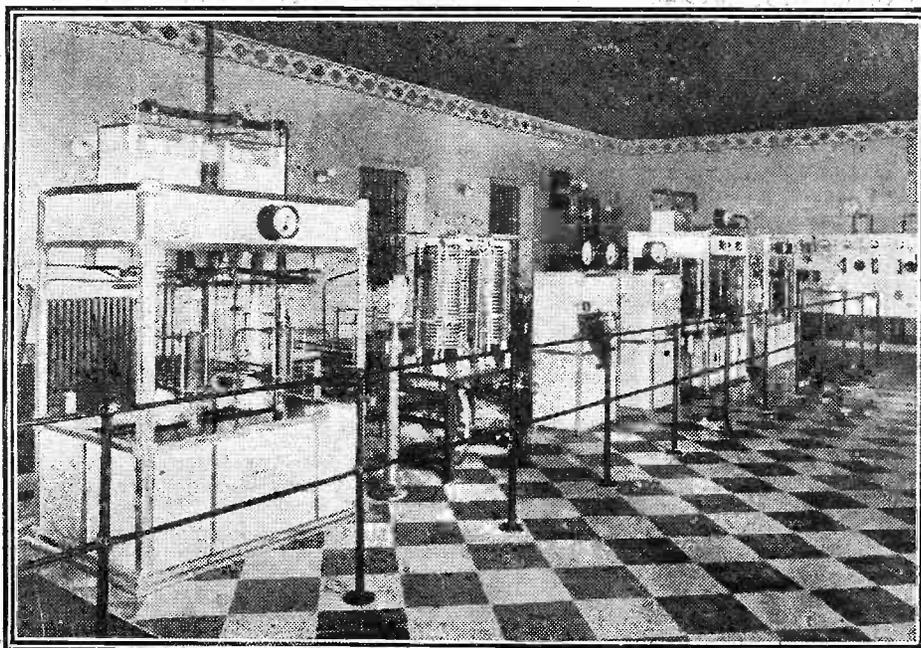
"Each province is cut up into *comuni*, governed by *podesta*. *Podesta* correspond to the mayors of an ordinary broadcast town. In very poor country districts only the *podesta* can afford wireless sets!

"For areas of several hundreds of square miles there are people who have no sets, and many who have not heard wireless at all!

Six Regions.

"It may help British listeners to Italian stations to know that the country is divided up into sixteen historical regions. Turin is in Piedmont, Milan in Lombardy, and Naples in Campania. These names are often mentioned in station announcements, and may be confusing to Britishers unless one knows to (Continued on next page)

THE MAIN PANELS AT MILAN



A view of the transmitting gear at the Milan station. With a power of 7 kw., and using a wave-length of 331 metres, Milan works in conjunction with Turin, Genoa and Trieste.

USING PAPER VENEERS

How to make expensive-looking cabinets at little cost.

By W.W.

SINCE one of the leading radio manufacturers demonstrated that a successful and expensive-looking cabinet could be produced ridiculously cheap by lithographing an imitation hardwood grain on a cheap foundation, a quantity of paper veneers have been placed on the market.

The advantages of being able to give a soap-box a perfect walnut, or "burr" elm finish for, say, 2d., and then use it as a radio cabinet, are great. The disadvantages? If you happen to be one of those unfortunate people who have laboured in vain to produce a likeable finish on a crude case—one of those who as a consequence decided to work the actual wood in future regardless of cost—you will know.

Overcoming the Difficulties.

I should like to refer to one or two points as regards the mastering of the most frequent troubles. To be forearmed is half the battle, so firstly I will present the worst of these.

In pasting paper veneer preceding application it swells, and the paste often soaks through to the face side. Consequently, it cannot be fixed evenly or cleanly.

The instructions for fixing, generally printed every eighteen inches or so over the back of the sheet, are mostly heavily impressed and stand out high on the face side. In fact, the actual letters may break away leaving an unwanted stencil.

Before starting the actual job, make sure of the following: Does the paste recommended (ordinary flour paste) discolour the face of the veneer if it be accidentally smudged? If it does, add a pinch of alum, or table salt. Either of these will generally rectify this fault.

The paste should be cold and contain no lumps. It is an advantage when mixing the paste to pour boiling water on to the flour, stirring until its consistency is cream thickness. This method is better than mixing flour with cold water to a paste, then boiling.

To what extent does the veneer shrink when moisture is applied? This must be determined and allowed for in the cutting. Some papers, employing an amount of fibre in their make-up to assist in getting "realism," shrink quite a lot.

Preparing the Cabinet.

The rough case should be treated with a thin solution of glue or size. Panels of any size should be held near a light and looked at from an angle.

Rough knots and joints should be treated in the same way; and, although it is not necessary to get a polish finish on the work, it must be remembered that thin paper veneers are likely to show defects beneath them after a coat of polish has been applied.

The veneer for panels should be cut to avoid getting the printed instructions on the back. Incidentally, if the panels are held in position with a mould it is better to spend time in taking them out to work. Working on a table is less trying, and it

will be found easier to cover the whole panel than to fit the covering to the mould.

I do not advise anyone to try to veneer small moulds. Only the plainest of half rounds of big size can be done successfully—that is, unless elaborate veneering tools are available. Better use moulds in the actual wood, or one that will match in staining.

Covering Large Panels.

When laying the pasted veneer on the surface of the work, start at one side or edge and work across to the opposite. Large panels should be fixed temporarily in a vertical plane and worked in the manner a decorator uses when hanging wallpaper.

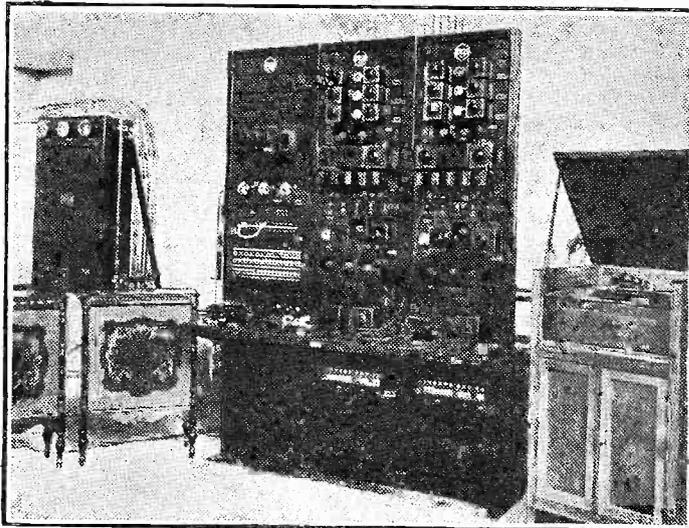
Air bubbles that cannot be rubbed or brushed out without forming a crease should be pin-pricked, then dabbed with a clean cloth. Have a supply of whiting within reach, and should any paste appear dust it with this.

Any weakness standing high should be carefully pressed with a warm (not hot) flat iron.

After the actual veneering has been accomplished it is best to set the work aside for a time. It is essential to make sure that it is perfectly dry before attempting to stain or polish it. To do this, place a small looking-glass face downwards on a part where you know a liberal supply of paste was brushed on.

If it is smeared when you take it away, you can be sure that dampness still remains.

"EH-YAR, RADIO-ROMA!"



The control panel at the Rome broadcasting station. Rome has a power of 50 kw., operates on a wave-length of 441 metres and has a lady announcer.

It is best to apply the first coat of polish with a brush, smoothing it afterwards with the bare fingers and the palms of the hands. If the polish will not take, apply a thin coat of size, glue, or a mixture of milk and egg.

In selecting a veneer it is as well to remember that if ordinary orange shellac polish is going to be used, the effect will be several shades darker.

NEXT WEEK.

A TALK WITH A GERMAN LISTENER.

Intimate—Informative—Interesting.

A TALK WITH AN ITALIAN LISTENER

(Continued from previous page.)

what they refer. We did very well out of the Prague Conference, and have eight main stations and eight separate wave-lengths within the medium band.

"Our total list of stations includes: Trieste, Turin (Torino), Genoa (Genova), Naples (Napoli), Rome, Bolzana (I V Z), Milan (Milano), Palermo and Florence."

Relayed Programmes.

"Are they separate stations?" I asked.

"No," he explained. "Milan, on 331 metres, is connected by land-line link with Turin on 274 metres and Genoa on 312·8. My local Palermo works only in the evening time from six or seven o'clock onwards, and is on its own.

"Rome, run by the Ente Italiano Audizioni Radiofoniche, is relayed by Naples on 319 metres. The short-wave Rome station, which generally works on 25·4 metres, is also connected with the studio several days a week, and takes the main I R O Rome programme.

"There is a studio at Naples, too, and small items, such as shipping bulletins and occasional news reports, come from Napoli.

"Do you know that a popular feature in the programmes of Rome and Milan is the *Giornale radio*, which corresponds somewhat to the *Journal Parle* of Radio Paris, and is, in my mind, an improvement on your B.B.C. news bulletins.

"The *Giornale* is given early in the morning by Rome and at about ten o'clock at night by Milan, depending on how late the eight o'clock variety programme lasts.

"We are lovers of opera proverbially, and excerpts from operas by Mascagni and Petri are generally to be heard in the even-

times, sometimes with the more classical operas.

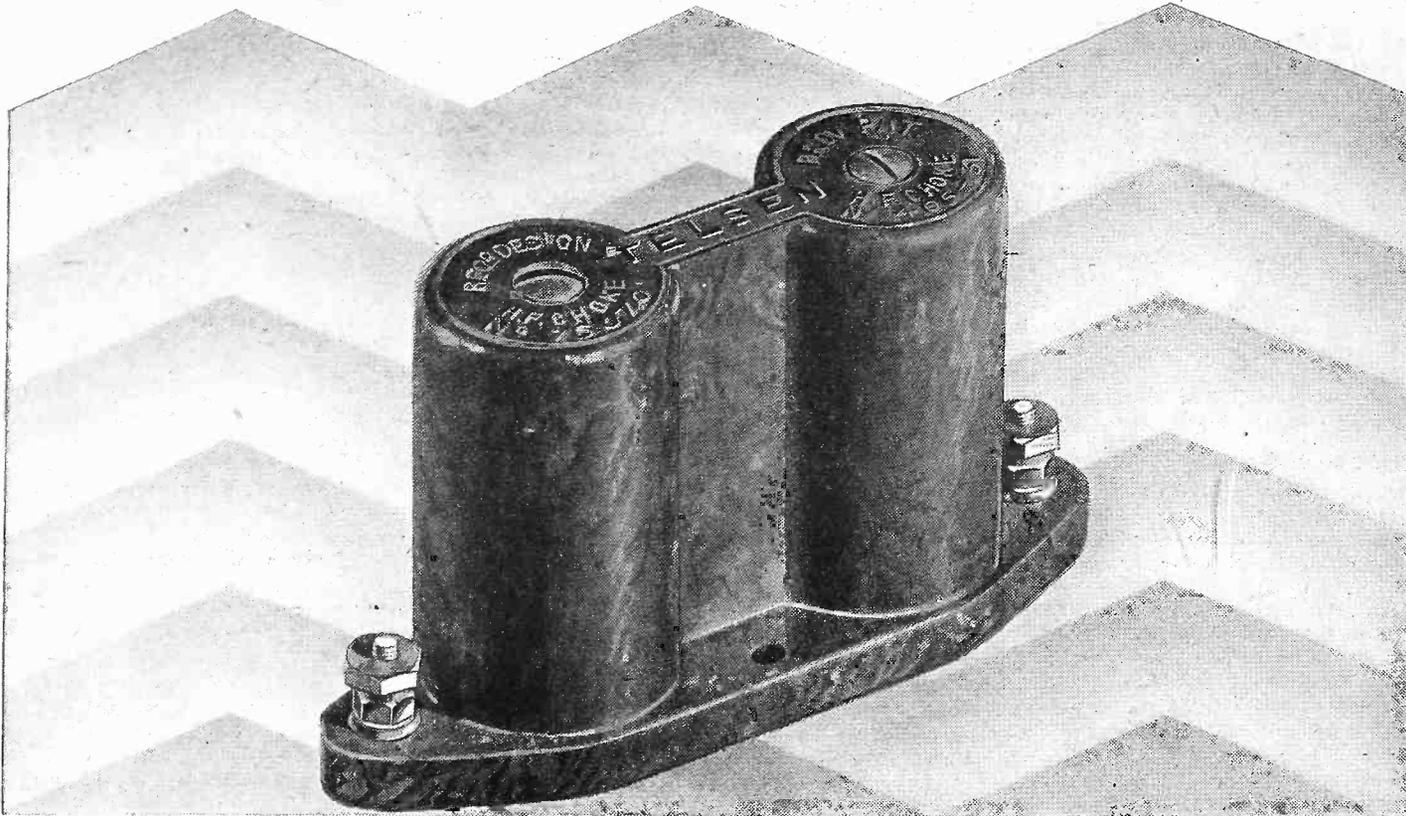
"It is a custom to give short talks in the intervals, and these are often of an advertising nature. We hate them, but they help towards the broadcasting funds.

An Early Starter.

"Rome is the only station which works all day, and on certain days of the week it starts up at seven-fifteen in the morning with a weather forecast and news bulletin. Most of the other stations don't start until the early evening, so you see we don't get a surfeit of programmes.

"There is no late night dance music, either, thanks to the dictator! Although a patriot, I prefer the way you do things in England."

TELSEN BINOCULAR CHOKE



TELSEN BINOCULAR H.F. CHOKE

The Telsen Binocular H.F. Choke is efficient on all wavelengths down to 20 metres, thus enabling the short-wave band as well as the medium- and long-wave broadcast bands to be worked with the same H.F. Choke. Whatever the circuit or waveband the Telsen Binocular H.F. Choke is the safe choice for highest efficiency.

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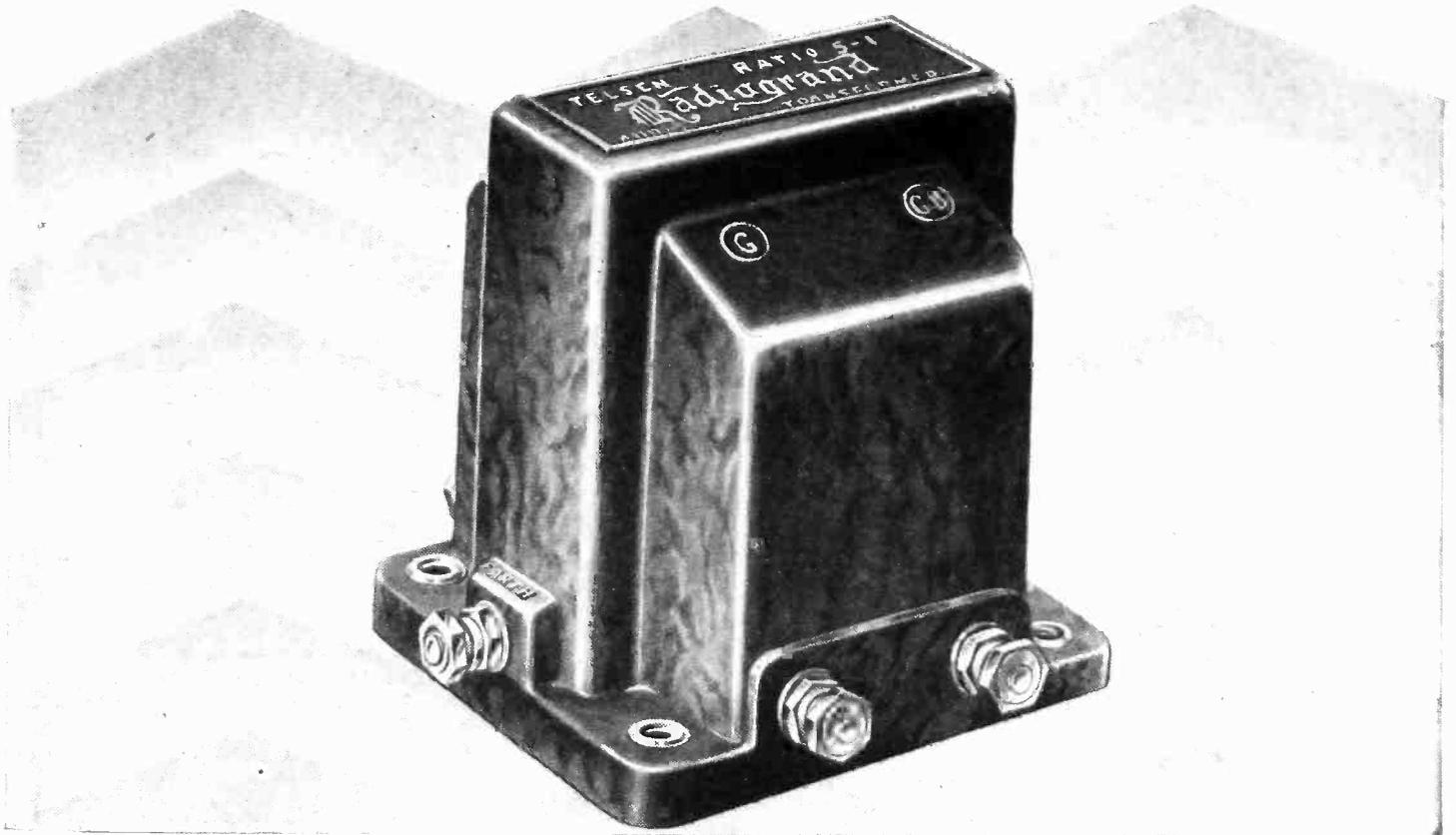
The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

TELSEN RADIOGRAND TRANSFORMER



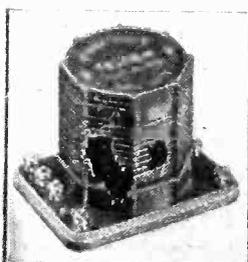
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The Telsen Short-wave Coil adds the Short Waves without coil changing



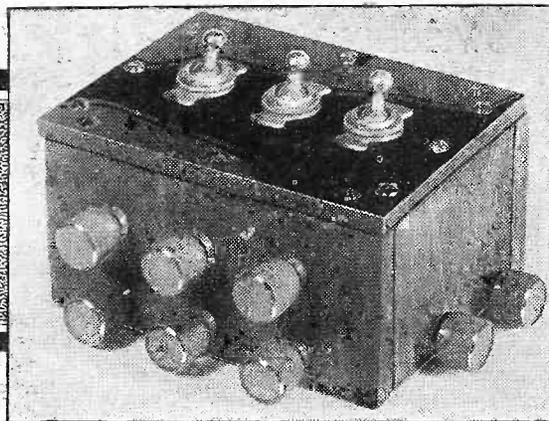
Adv. of The Telsen Electric Co., Ltd., Aston, Birmingham.

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TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

SWITCHING YOUR SPEAKERS

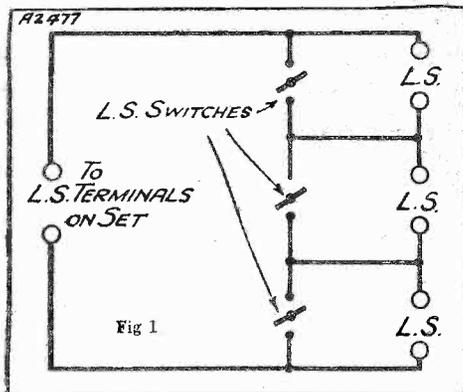


An exceedingly useful gadget which will enable you to connect your set through to different rooms at the touch of a switch. Described by a "P.W." Technician.

IT is possible to use two loudspeakers instead of one with practically any set, while the majority of three-valvers will comfortably operate at least three.

And it is a simple matter to arrange these speakers in different rooms of the

HOW IT'S DONE



Three sets of loudspeaker terminals are provided, with a shorting switch across each pair. All three are connected in series, so by opening one or more of the switches the individual speakers can be brought into action at will.

house. The first essential is that the receiver should have a choke-capacity or transformer-coupled output, as otherwise the high-tension current will be conveyed to the distant points.

Many sets are equipped with such output arrangements, but even those that are not can easily be fitted.

All you need for the choke method is an output choke of good make (this will cost from 8s. or so upwards) and two 2-mfd. fixed condensers.

The Filter Circuit. The choke is connected to the loudspeaker terminals of the set instead of a loudspeaker, and one terminal of each fixed condenser also is joined to each of the set's loudspeaker terminals.

The Filter Circuit.

That leaves one unoccupied terminal on each of the fixed condensers, and it is these which you now employ as the loudspeaker terminals.

And they can be connected either direct to a speaker or to a small switchboard, such as we are going to describe, so that the several loudspeakers can be switched in and out of action just as you require.

The switchboard circuit is simplicity itself. It comprises merely three switches and four sets of terminals. Glance at Fig. 1 and visualise exactly the same circuit with the switches entirely removed.

You will see that when three loudspeakers are connected up across three of the pairs of terminals, and when the "To L.S. terminals on set" are joined up in the indicated manner, the impulses originating in the set pass through each loudspeaker successively.

That is known as a series connection.

Shorted Out.

The object of the switches is to short-circuit those loudspeakers which you do not want to work. When any one switch is "closed" it provides such a low resistance path for the electrical energy that virtually none of it passes through the loudspeaker itself.

We hope you thoroughly grasp this, because the switches act in exactly the opposite way to electric lighting switches or, for that matter, to on-off switches on radio sets.

When any of these are closed a circuit is completed and something happens—a light springs into existence, or a radio set is started off. But it is when the appropriate switch on our loudspeaker switchboard is snapped "open" that a loudspeaker comes into action.

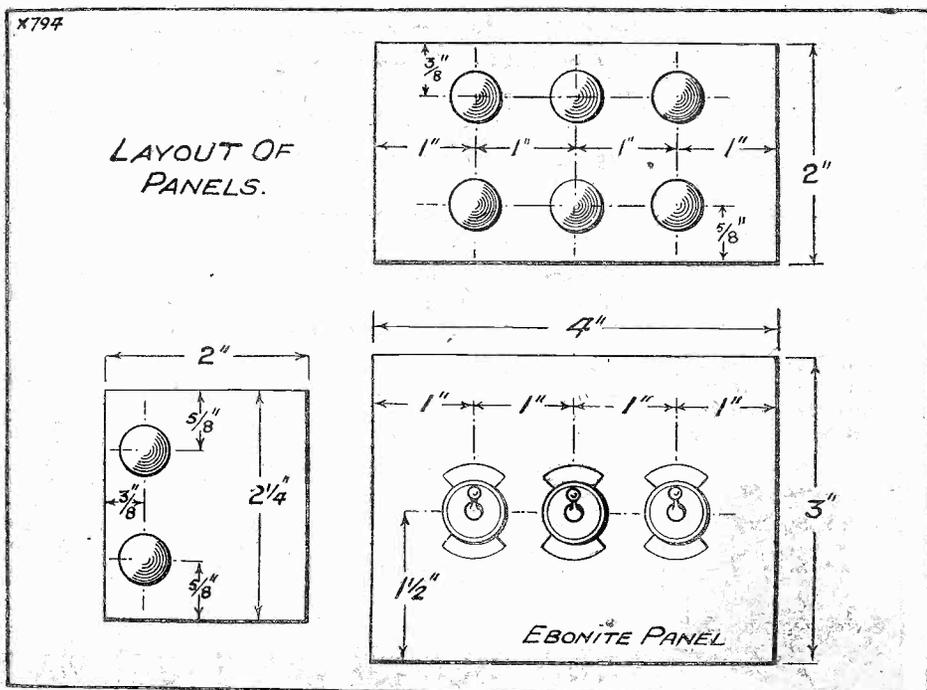
Easy to Make.

There is no confusion in practice, because the little snap switches used for the job can be mounted either way up. So when you are making the board, see that the switch knobs point upwards for the "closed" position—that is, if you intend mounting the board on the wall with the switches in line.

A real advantage is that even when it happens that one or two pairs of the terminals are out of use, or there is a break in one or other pair of extension leads, the working of the remaining loudspeakers is in no way jeopardised, for all you have to do is to close a switch or switches and short them out of action.

(Continued on next page.)

ALL THE MAIN MEASUREMENTS



You will require four pieces of wood about 3/4 in. thick, and a small piece of ebonite for the panel. Although only one end and one side are shown here (those carrying the terminals) the sizes of the remaining end and side are exactly the same.

SWITCHING YOUR SPEAKERS

(Continued from previous page.)

And now for the construction of the little switchboard; we will deal at greater length with the general subject of running extension wires afterwards.

There is absolutely no necessity to make the switchboard exactly to the dimensions given, you can make it either larger or smaller if you so desire. Also you can add more output terminals and control switches if your set is sufficiently powerful to run a

WHAT YOU NEED

- 1 Panel, 3 in. × 4 in. (Permeol, Peto-Scott, Ready Radio, Goltone, Becol, Wearite).
 - 2 Pieces of wood, 2 in. × 2½ in.
 - 2 Pieces of wood, 2 in. × 4 in.
 - 8 Terminals (Belling & Lee type R, Bulgin, Igranic, Clix, Eelex).
 - 3 On-off snap switches (Bulgin, B.A.T., Igranic).
- Screws, wire, etc.

larger number of speakers, and you can afford to purchase these extra instruments.

A full list of the few components needed is given, and little need be said about them, for they are all of a simple nature.

It is not vital that ebonite should be used, although it has strong claims to attention for its appearance as well as for its electrical qualities. You could use a hardwood, but if you do, avoid painting or varnishing it.

Teak is an excellent wood, both for the

panel and the body of the device. Finally, make the wiring connections carefully, and if you do solder employ a non-acid flux, and make robust, clean joints.

Should you fix the loudspeaker switchboard to a wall it might stay there for years.

A convenient place for fixing the thing is on the skirting board of a room—at about the height they usually fix an electric power-point. But if it is so placed, it wants to be close to where you generally sit, and easily accessible, and not hidden behind furniture.

The Wiring.

The idea is, of course, that the switch-board should be installed in the same room as the radio receiver, and that extension wires should radiate out from it to other rooms in the house. So it can quite well be fixed to the actual set itself, and perhaps this is the most logical procedure.

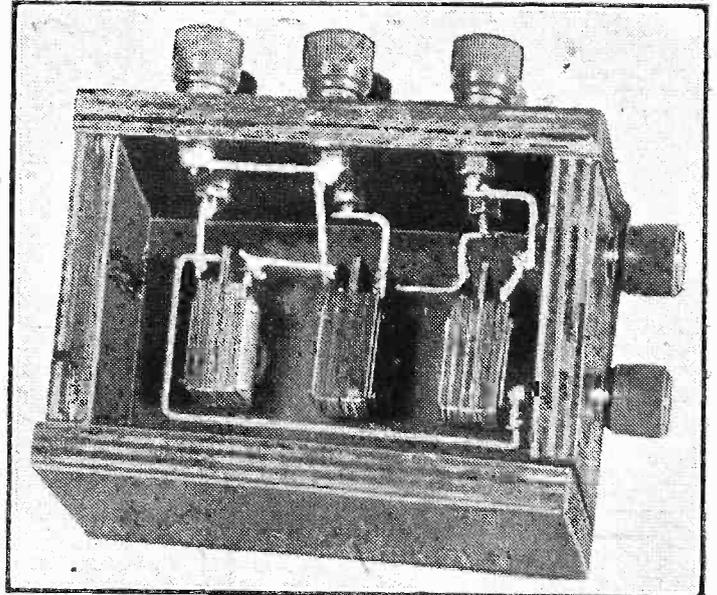
Anyway, this is a matter that rests with the individual constructor though we must not forget to mention that it is no difficult business, with the aid of "Rawl-plugs," and a couple of right-angled pieces of metal to act as brackets, to mount the board on the wall at such a height that it can quickly be reached without stooping down.

As you will be employing a choke or

transformer output at the set, you do not need to carry out the wiring to those distant loudspeakers with the care that has to be devoted to electrical power wiring. As a cold matter of fact, you need take no precautions at all so far as safety is concerned.

Nevertheless, it pays to be discriminate

LOOKING INSIDE THE UNIT



A view of the finished unit, looking in from the back. A convenient place to fix it is on the skirting board, close to the set.

if you want your extension leads to give good service. You can use that ordinary silk-covered or even cotton-covered wire such as figures in coil construction, but the twin conductor made especially for loudspeaker extension leads is readily available and does not cost much more than single conductor.

Moreover, it is flexible and will not easily break. If your rooms are fitted with picture railings these will provide excellent concealment for the wires, while they can almost equally well be run round skirting boards of the moulded pattern. Drawing-pins at intervals will provide good fixing.

Arranging the Leads.

Generally speaking, it is tidier to work up from the floor rather than down from the ceiling or picture rail or tops of doors. It is so easy to hide a wire coming up from the floor level behind the table the loudspeaker is standing on.

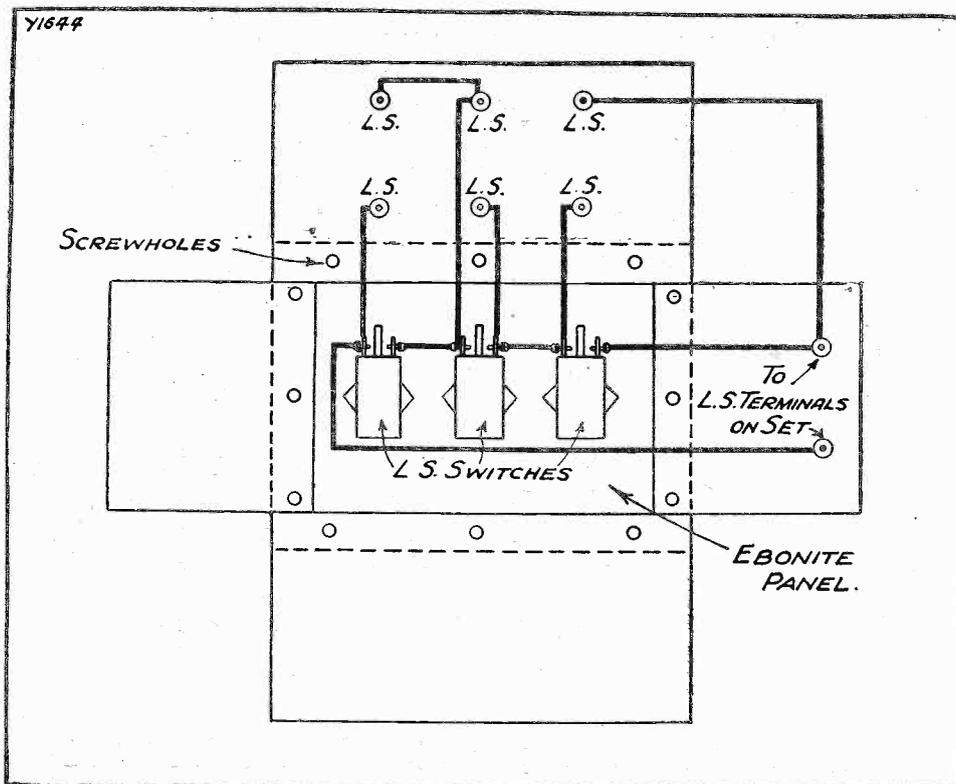
And failing the raising of floorboards, the wires can be laid under the linoleum or carpet.

Now it is all very well for you, in the largeness of your heart, to switch on a loudspeaker in the kitchen or elsewhere for someone else's benefit. But that someone else might not want to have the "noise" coming through just then!

That someone else can easily be provided with a control of his or her own. All you have to do is to fix a switch of the kind you are using for the switchboard across the terminals of the distant loudspeaker. The instrument can then be shorted out of action.

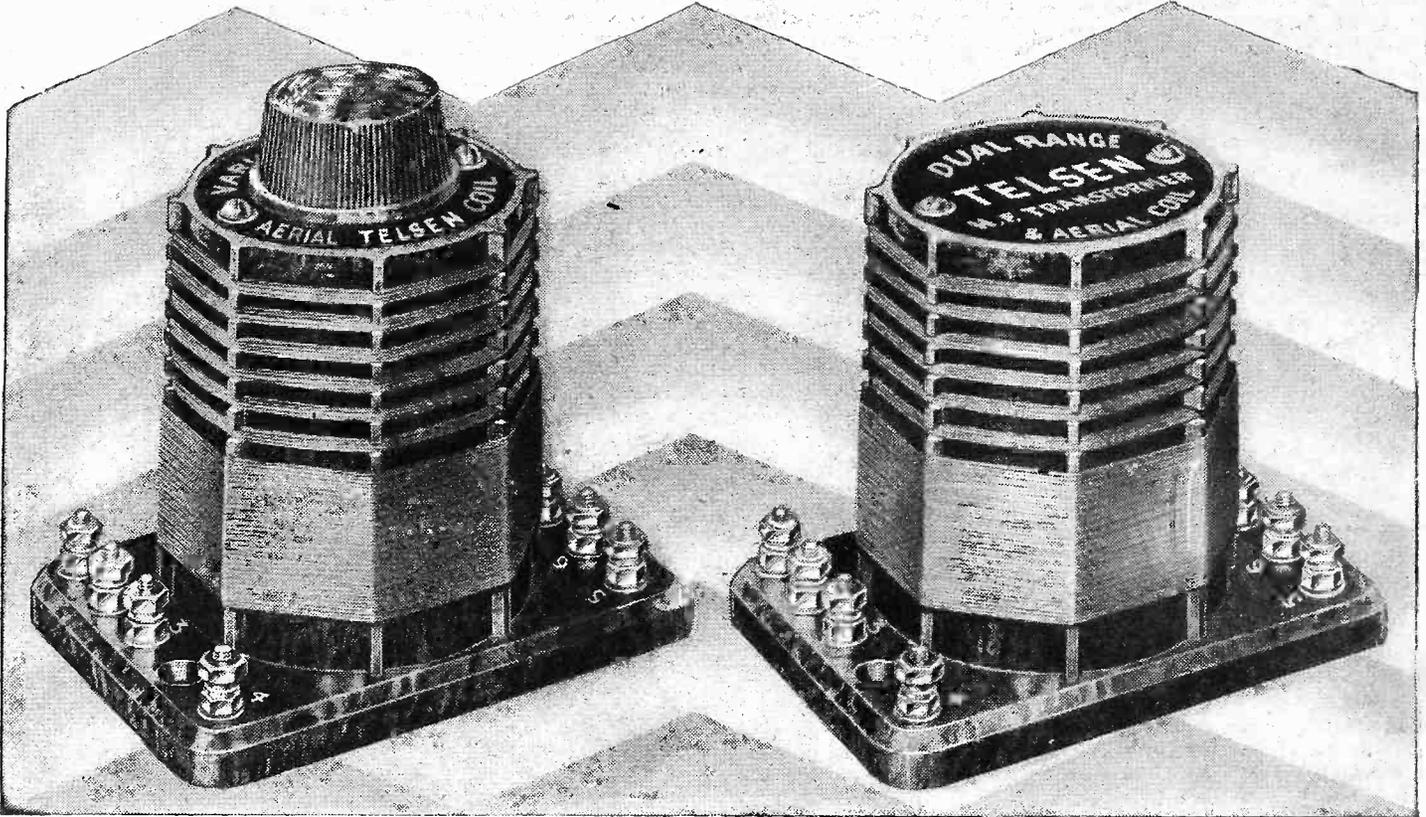
There is also the question of the volume at the distant loudspeakers. This can be regulated by means of variable resistances connected across each; you should use resistances adjustable from zero to about twenty-five thousand ohms.

WIRING UP THIS HANDY UNIT



This diagram is to assist you with connecting up. It is a perfectly straight job, and should not give you any difficulty. The switches, by the way, are of the ordinary "on-off" type.

TELSEN AERIAL COILS



SELECTIVITY . . .

TELSEN DUAL RANGE AERIAL COIL FOR THE TRIPLE THREE

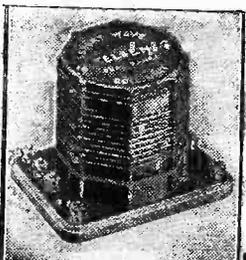
This incorporates a variable selectivity device. Aerial coupling is reduced to the degree demanded by local conditions—local station interference, is simply and efficiently avoided. Independent primary and secondary windings make it suitable for any position in the circuit. Wave-changing is simplicity itself—by a switch mounted on the panel. Price 7/6

H.F. TRANSFORMER & AERIAL COIL

is primarily designed for H.F. amplification in conjunction with screen-grid valves. It is arranged so that it can be connected as a tuned-grid or tuned-anode coil, or as an H.F. transformer. It also makes a highly efficient aerial coil where the adjustable selectivity feature is not required. A reaction winding is incorporated. Price 5/6

7/6
5/6

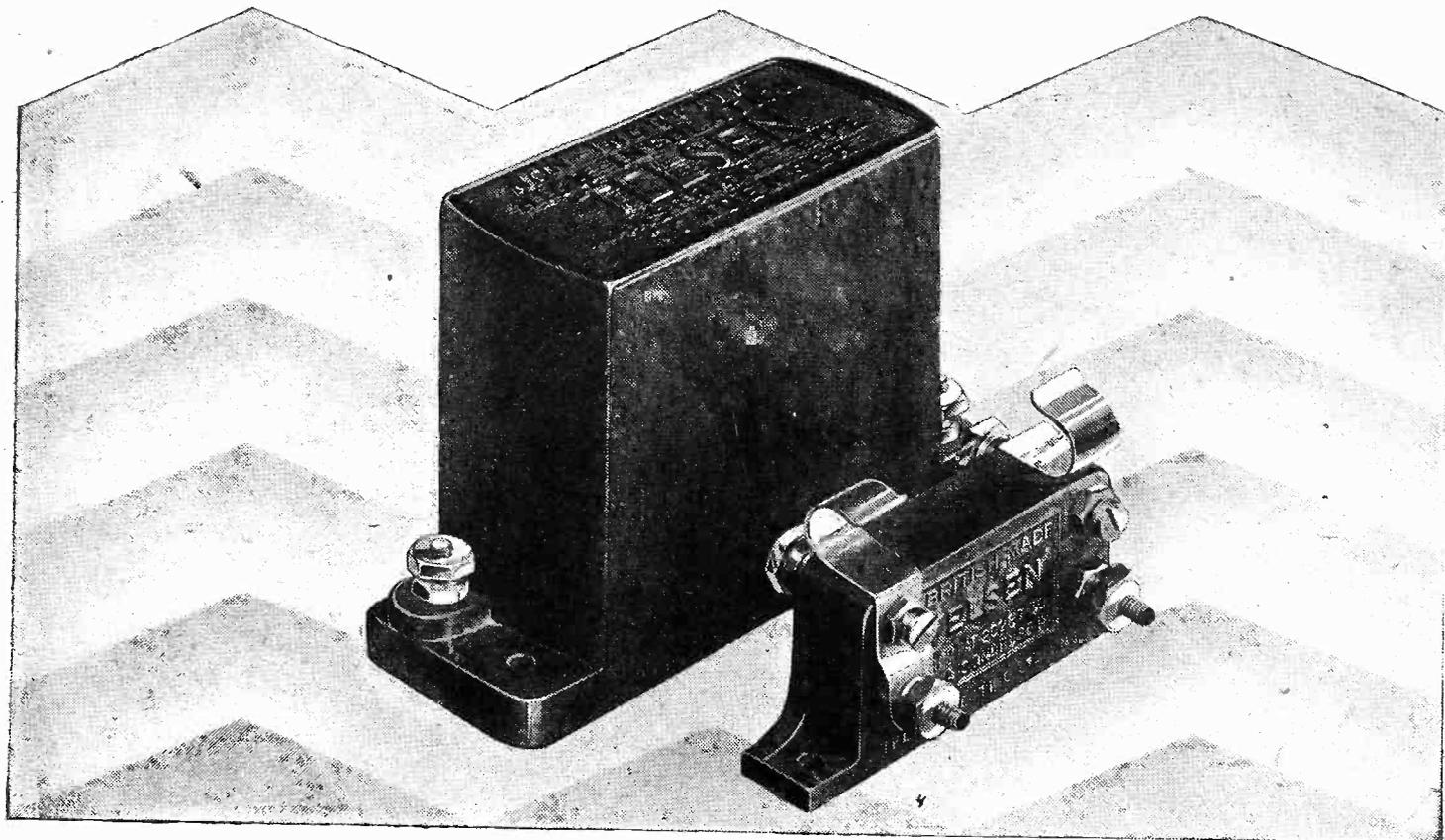
The Telsens Short-wave Coil adds the Short Waves without coil changing



TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

TELSEN CONDENSERS



TELSEN CONDENSERS

MANSBRIDGE TYPE CONDENSERS

The preliminary research, the most modern plant in the world, the finest raw materials, the latest methods of manufacture, and the final test, all combine to give Telsen Mansbridge Type Condensers a high insulation through years of service with freedom from breakdown. The type of construction employed makes them genuinely non-inductive.

From 1/6

FIXED MICA CONDENSERS

(Pro. Pat. No. 20287/30)

Telsen Fixed Condensers are made in capacities from .0001 mfd. to .002 mfd. They can be mounted upright or flat, and up to .0003 mfd. Telsen Fixed Condensers are supplied complete with patent grid-leak clips to facilitate series or parallel connections.

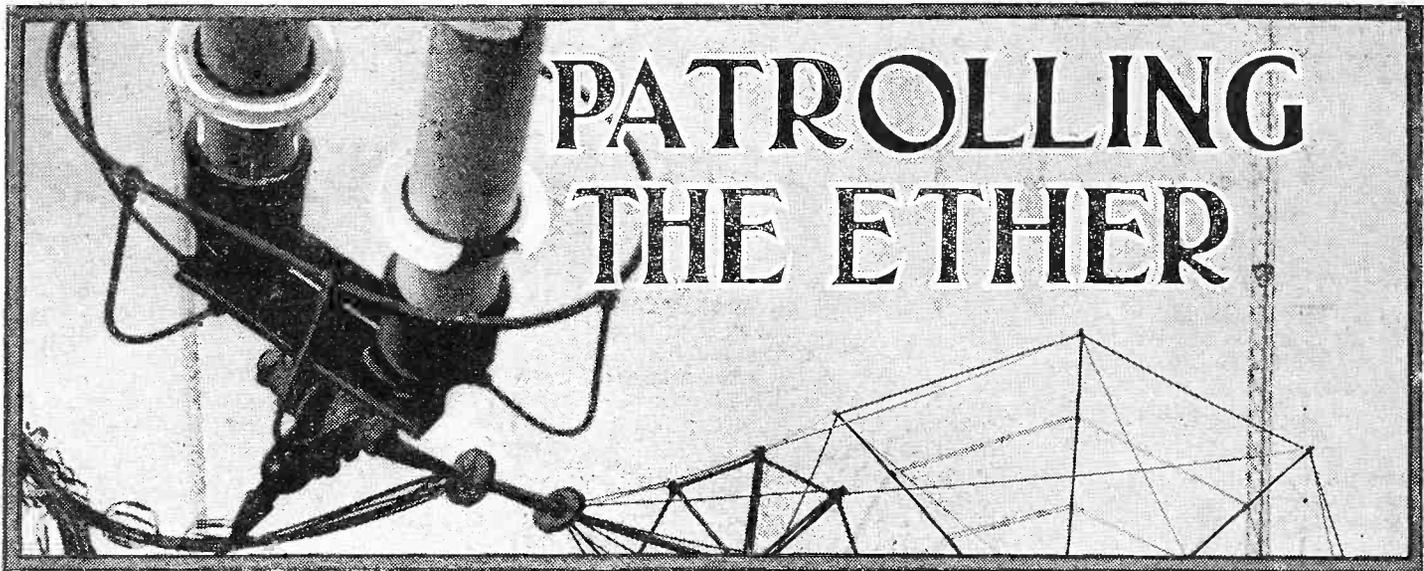
The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN

TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL



PATROLLING THE ETHER

WHEN I was at the Tatsfield Testing Station of the B.B.C. a few weeks ago, one of the engineers there referred to the frequency checking work which the Post Office engineers do. I am afraid it had never occurred to me that the Post Office people, even those in connection with Rugby, ever went in so seriously for test work.

A visit to the Post Office Headquarters seemed to be indicated, and permission was obtained to investigate the work at the Post Office Research Station at Dollis Hill, and the frequency measuring station at Colney Heath, near St. Albans.

Crystal-Controlled Plant.

The leading light of the department in charge of this very exacting work is Lt.-Col. A. S. Angwin, of the G.P.O. Engineer-in-Chief's Staff.

The Post Office engineers have very accurate frequency-checking plant, similar to that used at Tatsfield and at tuning-fork controlled relay stations of the B.B.C. They carry out their checking for Rugby and for short-wave transatlantic work.

The Post Office short-wave plant is crystal controlled, and so accurate is this control, developed at their research station, that when the crystal is kept in a thermostatically governed oven it has an accuracy within 5 parts either way in a million!

These crystals are an inch square and have to be very accurately ground. They are about $\frac{1}{2}$ -millimetre thick and adjustment of the frequency is made by a screw-down micrometer device which varies the little airgap between the top contact of the crystal holder and the face of the crystal itself.

The Post Office, in connection with broadcasting, does far more checking than just going round with a "pirate" detecting van. Serious wavelength and frequency-checking work is carried out by the P.O. engineers, as Our Special Correspondent here explains.

The calibration needed in connection with all this apparatus is the subject of Post Office test work.

I asked how these crystals are coupled up to the first valve, and was told that the first valve of the following stages of amplification and frequency doubling is a tuned-anode arrangement with the crystal holder joined in the grid circuit, between grid and filament.

A Special "Heptode" Valve.

Following this is a special valve known as a "heptode" with one filament, two grids and two plates. There are two further stabilising grids coupled back to the plates

in the ordinary neutralising fashion, and so this valve actually has seven electrodes! This is a special power valve for push-pull amplification with only one valve.

When these crystal control stages are built up they are checked by the tuning-fork gear.

Dollis Hill is the chief station and here is an electrically vibrating tuning fork in two ovens. It consists of a U-shaped steel bar, the limbs of which move inside coils connected in the grid and anode circuits of a power valve outside the ovens.

How the Tuning Fork Works.

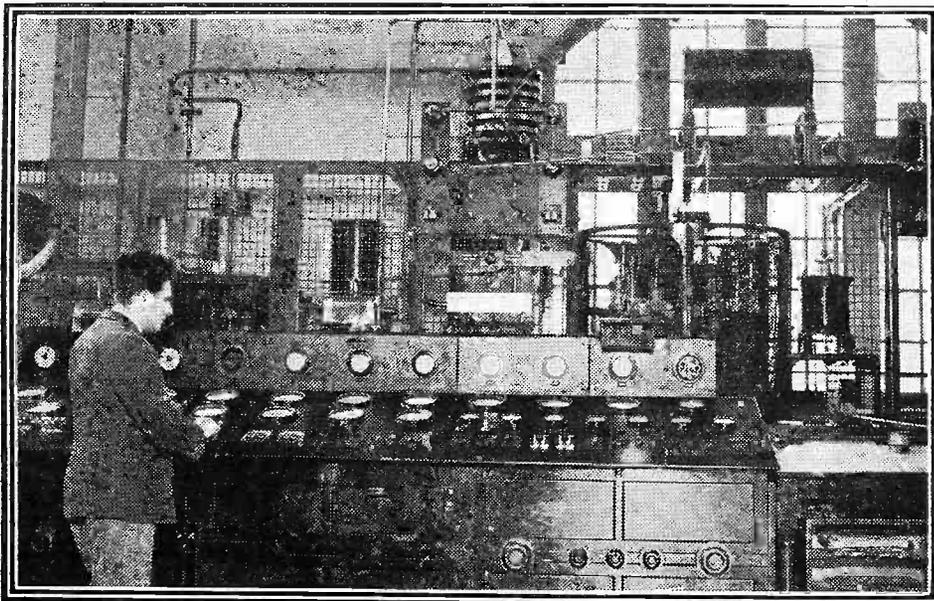
When the H.T. is switched on to the power valve it starts oscillating at an audible frequency, the grid and anode coils being coupled via the metal of the tuning fork. According to the size of the coils and the amount of metal in the tuning fork, so the frequency of the note is decided. At Dollis Hill the frequency is exactly a thousand cycles a second, and the fork vibrates at this enormous rate.

The vibrations (electrical) set up by the valve cause the tuning fork to wobble, just as the loose laminations of a bad L.F. transformer tend to hum when the current is switched on.

The only difference is that the Dollis Hill fork is meant to wobble when the valve oscillates! If the length of the fork were to change, the frequency of the thousand-cycle note would be upset, even though the size of the grid and anode coils were to be fixed, and so the greatest care is taken to see that, owing to temperature changes, the fork length does not vary. Were this not done the fork would expand in hot

(Cont'd. on next page.)

A RADIO LINK WITH THE NEW WORLD



The control table of the number one Transatlantic Telephone Channel—the transmitter works on long waves—at the G.P.O. Rugby station.

DON'T RUIN YOUR LOUDSPEAKER

A Useful Connecting Tip
By FRANK BRIGGS.

DO you know that there is a right and a wrong way of connecting up a loudspeaker? I will not go so far as to say that this is the case with every set, however, but with the large number of modern instruments that still do not incorporate an output filter or transformer in the anode circuit of the last valve.

Connecting-up Correctly.

In quite a number of cases it is probably economy that influences the designer against its inclusion. For although there are certain loudspeakers with which it is essential to use some form of filter or transformer arrangement, such as moving coils and a few inductor types, most of the more inexpensive units are so designed that they can be joined up direct. But most of them must be joined up a certain way.

The reason for this may not seem very obvious at first, but it is really very simple. Unless a filter scheme is used, the loudspeaker windings are called upon to carry the full anode current of the power valve. Now if it is not flowing in the right direction it will tend to weaken the magnets. In fact, if used in this manner for long, it will actually demagnetise them considerably. This is one of the causes why many old loudspeakers often lose much of their "punch."

You will probably find that the majority of speakers are marked "positive" and "negative" for this very reason. However, some of the less thoughtful manufacturers omit to do so, or it may be that the marking gets rubbed off. At any rate, here is a tip which will enable you to find out the correct way of joining up unbalanced armature type speakers.

The "Click" and the "Plop."

First of all switch off the set, but leave the loudspeaker connected. Now turn the adjusting screw at the back until the diaphragm is just clear of the magnets. This is indicated by the loudspeaker emitting a nice healthy "plop." Not a "click," for that indicates just the opposite, that the two parts have come in contact.

The next step is to switch on the set, and if the speaker is joined up the right way the reed or diaphragm will be heard to "click" against the magnets. The reason for

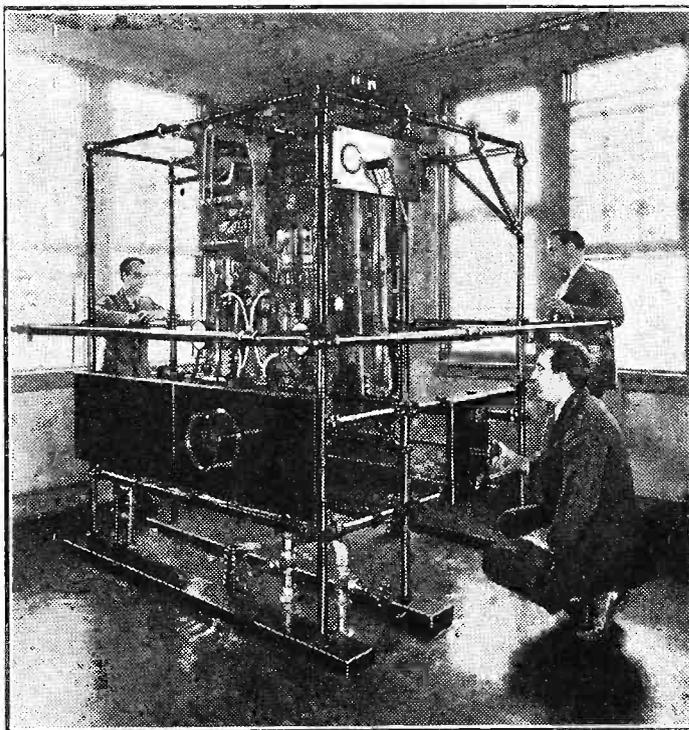
this is that the current being in the right direction assists the magnets, and so they pull the moving armature out of adjustment. It must then, of course, be readjusted with the set still switched on.

With an Output Filter.

On the other hand, if you have the connections wrong, there will be no "click," because the H.T. current tends to make the magnets slightly weaker. Once the right arrangement has been found, the terminals should be marked for future occasions. By the way, regarding the L.S. terminals on the set, the one that goes to the valve anode is L.S. negative and the other which is joined to H.T. positive, is the L.S. positive terminal.

In cases where an output-filter system is employed it does not matter one iota which way the loudspeaker is connected up, as the only currents which pass through its windings are the speech currents, and these, in this case, are of an alternating nature, namely, varying in direction.

TUNING A TRANSMITTER



Engineers making final adjustments on the new short-wave transmitter at Bound Brook, New Jersey. The station is owned by the National Broadcasting Co. of America and has been built so that their programmes can be broadcast to the whole world. You'll hear them on your "Cosmic."

THE "ECKERSLEY" THREE

A reader's enthusiastic appreciation.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to express my appreciation of Capt. P. P. Eckersley's tuner, which does really give selectivity, volume, and quality at the same time. Practically all the tuners I have used previously provide one of the above factors at the expense of the other two.

There is one point regarding the coil switching I should like to mention. It seems to me that two switches are really unnecessary, and that one four-point switch (e.g., Telsen four-point, two-pole, with both plunger contacts joined), or one three-point switch using the plunger as a common earth connection would suffice. The extension screen could be cut away to make room for the switch.

Yours faithfully,

W. A. COX.

Kirkby-in-Ashfield, Notts.

PATROLLING THE ETHER

(Continued from previous page.)

weather and would vibrate slower, causing the note to drop.

To keep the temperature absolutely constant the fork is enclosed in two ovens, one inside the other! These electric ovens are thickly lined with asbestos and heat-insulating material so that no matter how the temperature changes outside in the room the electric elements keep the inside oven absolutely constant.

The B.B.C. has very similar tuning-fork gear at the relay stations, but in this case only one oven is used. The Post Office tuning fork is accurate to the order of one part in a million.

I asked how the fork was checked, and was told that time signals sent out via Rugby were used to correct a phonic motor which, in turn, is checked against the vibrating tuning fork.

The Multivibrators.

The fork at Colney Heath vibrates in the same way, but is not enclosed in electric ovens because, as it is checked every day by the telephone with the Dollis Hill fork, there is no need to go to the same care at Colney Heath in heat insulating.

The Colney Heath fork is accurate to the order of about ten parts in a million.

When the engineers want to check up the wave-length of a broadcasting station a multivibrator is switched on to the tuning fork and any desired harmonic up to the 115th is obtainable. When they want to check the wave-length of a station lower than this a second multivibrator is used, maintained at the 20th harmonic of the first vibrator.

In this way they can get up to practically the highest radio frequency, although the fork itself is still vibrating at the relatively low frequency of one thousand cycles per second. The B.B.C. uses nine valve amplifiers for frequency doubling after the tuning fork.

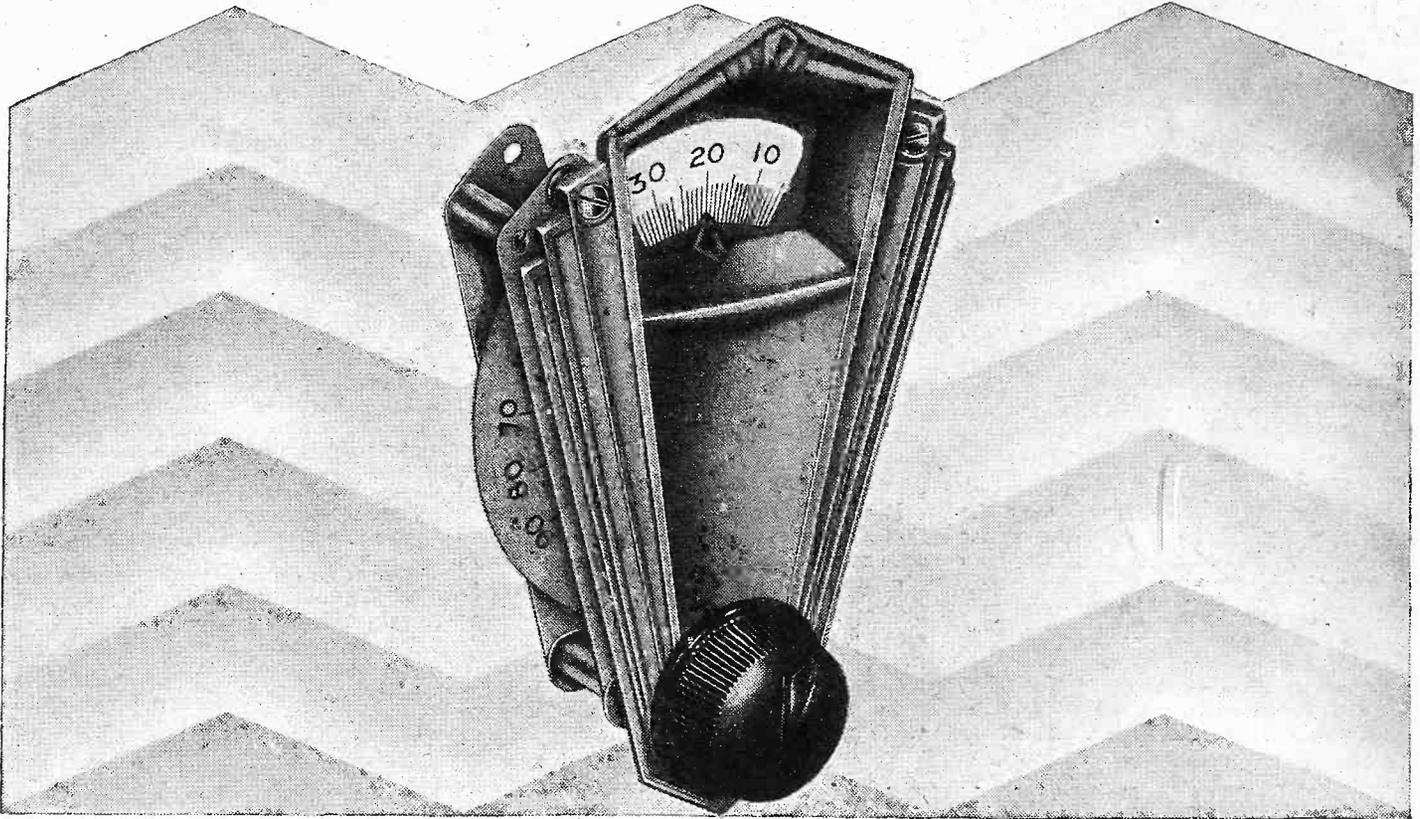
Checks via 'Phone-Line.

Each valve is tuned to a suitable harmonic of the preceding stage, and in this way the frequency is increased from audio to radio, and the final stage of these nine frequency doublers is coupled up to the actual B.B.C. relay transmitter. This method of frequency doubling is not flexible enough for a Post Office job where they need to be able to detect any desired harmonic without retuning the whole outfit; that is why multivibrators are used.

Every day the Dollis Hill engineers ring up those of Colney Heath, and the tuning fork, through its multivibrator, is connected on to the 'phone line. Occasionally the two forks are checked against the standard frequency transmissions of the N.P.L. (National Physical Laboratory) and they tell me that the Dollis Hill fork agrees to one part in a million and the Colney Heath fork to eight parts in a million.

The National Physical Laboratory has similar tuning forks in electrically-heated ovens, and ordinary listeners probably do not realise how much work goes on behind the scenes in checking up the wave-length of commercial stations.

TELSEN ILLUMINATED DRIVE



TELSEN ILLUMINATED DISC DRIVE

A good smooth "slow motion" drive is essential for short wave work. The Telsen Illuminated Disc Drive incorporates an improved movement which gives an exceptionally smooth action and a gear ratio of approximately 5-1, and the bold and well-proportioned figures make for delightfully easy tuning, and as the dial rotates over the full circle, all types of condensers are catered for. It is fitted with a handsome oxydised silver escutcheon of modern design, and the dial may be illuminated by means of an ordinary flashlamp bulb.



The Telsen Short-wave Coil adds the Short Waves without coil changing



TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

FROM THE TECHNICAL EDITOR'S NOTE BOOK.



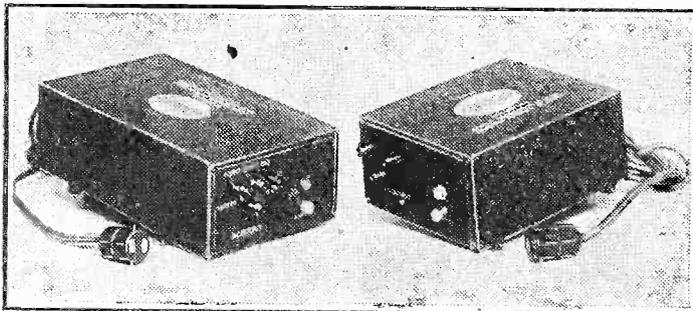
FERRANTI H.T. UNITS.

THE mains transformers which I saw being made at Ferranti's Hollinwood works would hardly fit into a radio mains-unit, for they were approximately the dimensions of the average-sized living room in an average-sized house—or thereabouts!

But those huge transformers concern the "other end" of the mains—the power station end. Actually, the particular ones in course of construction during my visit were destined to be links in the great new grid system which is stretching its tentacles over the countryside.

Therefore, it is eminently fitting that Ferranti should turn their attention to the radio user's end of the mains. And they

FOR A.C. MAINS USERS



The two Ferranti mains units (E3 is on the left).

have been doing so with conspicuous success for many years.

Recently they sent me samples of two new Ferranti mains units, inexpensive A.C. ones designed on sound engineering lines. Type E2 sells at £3 10s. 6d. and provides 120 volts at 15 milliamperes.

There are two "fixed" tappings, 120 and 60 volts under normal working conditions.

Type E3 is similar in general design, but provides 150 volts at 25 milliamperes and has three tappings, one of which is variable. It retails at £4 16s. 6d., and is, of course, suitable for use with larger sets.

These Ferranti units are constructed in strict accordance with the I.E.E. recommendation as regards safety, and they are built into stout metal cases of attractive appearance.

We carefully tested both of them with appropriate sets and found them to be perfectly satisfactory.

Tested and Found—?

THE ELECTRON SCREEN AERIAL.

The value of a good outdoor aerial must by now be fully recognised by all radio enthusiasts. But many are unable to erect one of conventional pattern owing to their not possessing garden facilities.

Others object to having poles poking up from among their flower beds and wires horizontally overhead.

A very successful alternative, one might in fact say a complete alternative, is to use an Electron Screen Aerial.

It is a product of the New London Electron Works, Ltd., and is available at practically any radio shop.

It comprises a patented metal construction of compact dimensions and neat appearance mounted on solid wooden supports.

Stout fixing nails, and efficient insulating buffers are supplied and the Screen can easily be fixed to a chimney stack or side wall of the house or suspended in a loft or roof space.

No brackets are required, and lead-in tubes and insulators are unnecessary.

We tested one of these Electron Screen Aerials at no great height and obtained very good "pick-up." Foreign stations could be tuned in as easily as with a suspended wire.

The price of the Screen is 15s., and in view of the fact that it does not call for the troublesome overhauling of the usual outdoor aerial, we are sure large numbers of listeners will

turn to it gratefully as the solution of their aerial problems.

A NOVEL COMPONENT.

The simplification of radio receivers by making one control serve two or more purposes is a most commendable goal at which to aim.

But there is a right and wrong way of approach to it. The wrong way, of course, is to make compromises and sacrifices so that while the one knob controls several factors it does not do so with full efficiency—jack of all trades and master of none, to apply an old tag!

However, it appears to me that in the Six-Sixty "Multi-stat" you have an example of the application of the principle in the right way.

This novel component performs the following functions: 1. Radiogram switching. 2. Radio volume control. 3. Pick-up volume control. 4. On-off switching.

But, as you will note, these operations do not overlap, so that any one given movement of the one control knob of the device never does or need do more than one task.

There is a "zero" position when the set is switched off; move the knob in one direction and you switch on either pick-up or radio (according to the direction), and the following movements give volume control.

PLEASE NOTE

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

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

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

In the "Multi-stat" the radio volume control is by means of an H.F. or detector valve filament resistance variation, and for the pick-up there is the conventional potentiometer.

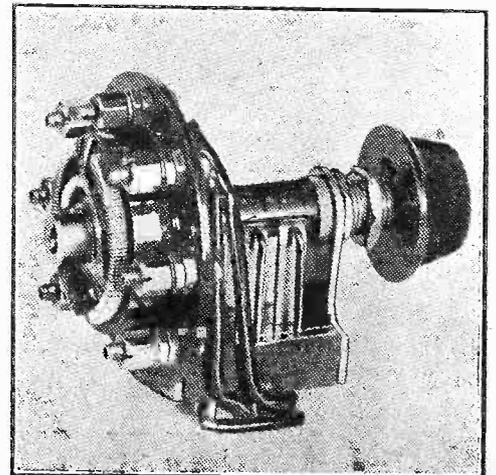
The model of the Six-Sixty "Multi-stat" for battery sets costs 8s. 6d. It is a very compact, easily wired component and, although the knob works a little stiffly in face of the switching and resistance variations, it efficiently does all that is claimed for it.

NEW MARCONIPHONE PUBLICATIONS.

The Marconiphone people have recently published two neat leaflets, and these show, in a concise and handy form, the complete range of Marconiphone instruments.

The one leaflet gives cash prices, while the other one details the payments applicable to each model in accordance with the Marconiphone Radio Purchase Plan.

THE "MULTI-STAT"



A new component having original features made by the Six-Sixty Radio Co. Ltd.

TYPICAL OF TELSEN VALUE



TELSEN VALVE HOLDERS

(Prov. Pat. No. 20236/30).

The Telsen four- and five-pin valve holders embody patent metal spring contacts, which are designed to provide the most efficient contact with split and non-split valve legs, and are extended in one piece to form soldering tags. Low capacity and self-locating.

4-pin Valve Holder - - - Price 6d.

5-pin Valve Holder - - - Price 8d.

GRID LEAK HOLDER Price 6d.

FIXED MICA CONDENSERS

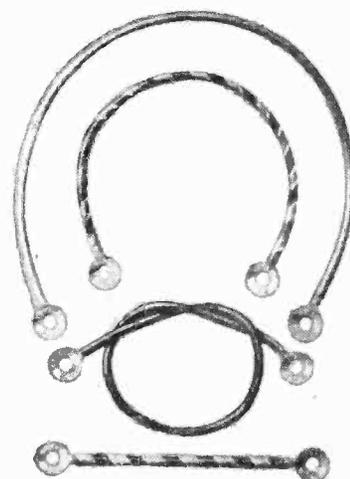
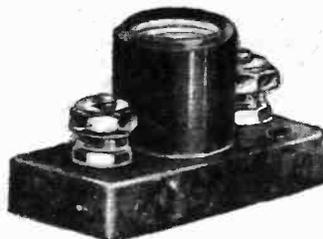
(Prov. Pat. No. 20237/30).

Price 6d.

FUSE HOLDER - - - Price 6d.

SPAGHETTI FLEXIBLE

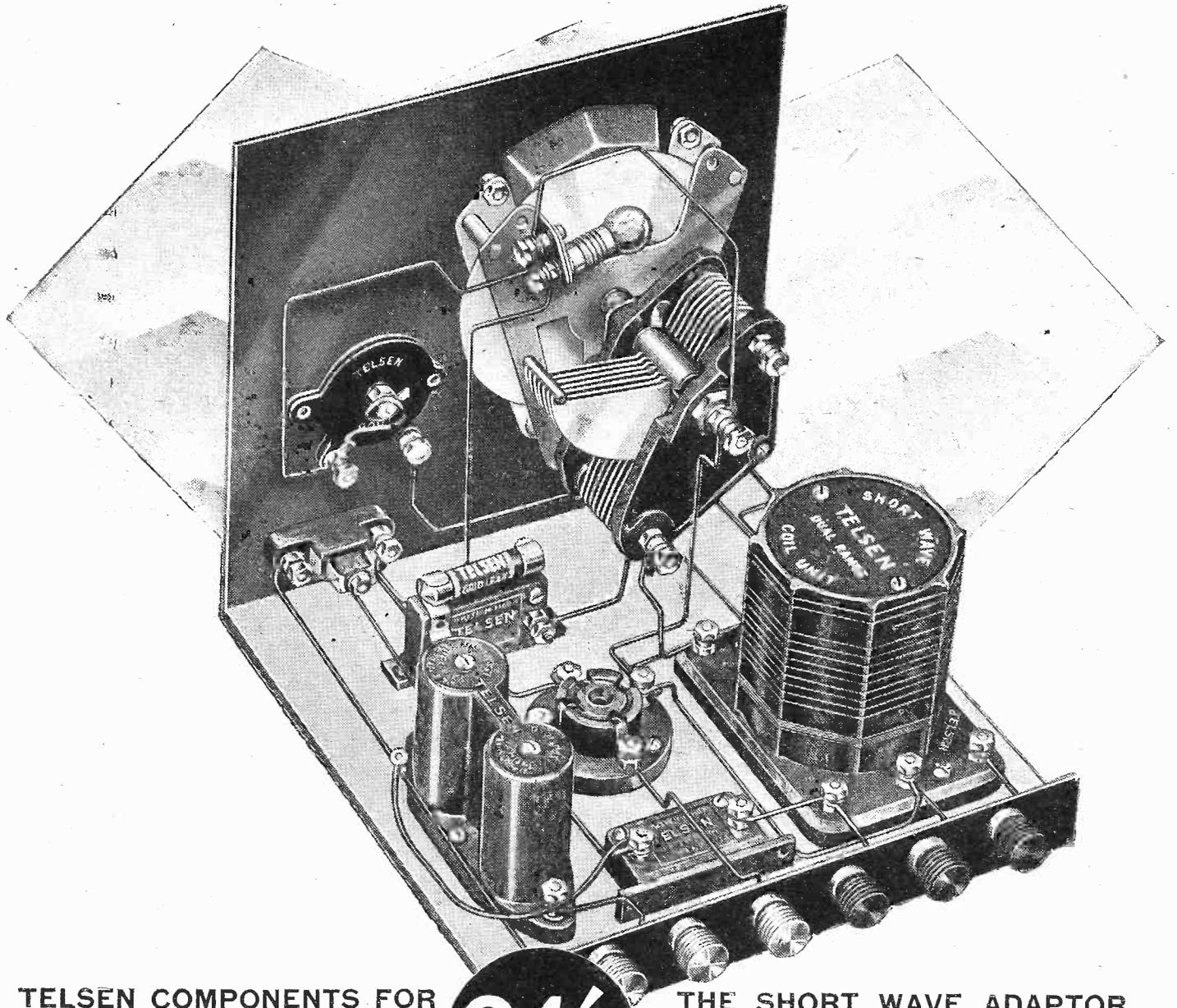
RESISTANCES - - From 6d.



TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

TELSEN SHORT WAVE ADAPTOR



TELSEN COMPONENTS FOR

24⁹

THE SHORT WAVE ADAPTOR

AMERICA

YOUR NEXT DOOR NEIGHBOUR

AUSTRALIA

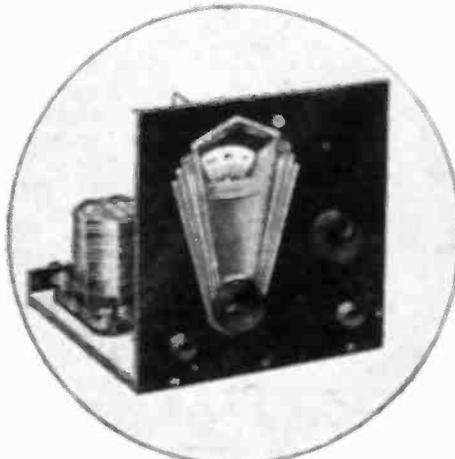
ROUND THE CORNER

Telsen now puts the keen constructor in command of the Short Waves—without altering his present receiver. The Telsen Short Wave Adaptor enables an ordinary receiver to reach America, Australia, Africa, Russia, the Far East, etc., etc.—it can be constructed in an hour with a pair of pliers and a screwdriver. No coil changing—no controls inside the set. The greatest development yet in the history of Short Wave reception.

THE TELSEN SHORT WAVE COMPONENTS YOU NEED

1 Valve Holder	4	6
1 0001 Mica Condenser	6	
1 0001 Mica Condenser	6	
1 Grid Leak, 2-25mg.	8	
1 Short Wave Coil Unit	4	6
1 00025 Logarithmic Variable Condenser	4	6
1 0001 Reaction Condenser	2	0
2 Two-Point Switches	2	0
1 Binoocular H.F. Choke	5	0
1 Illuminated Disc Drive	4	6
	24	9

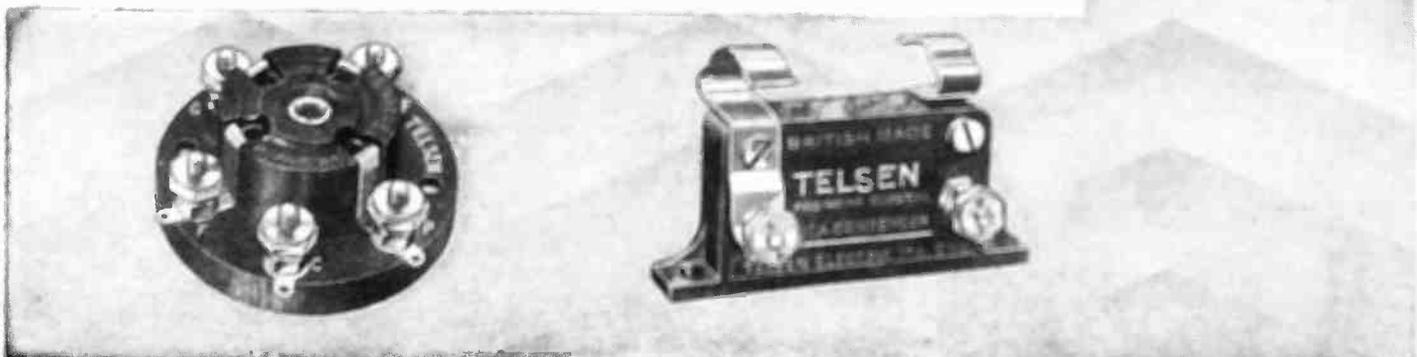
Panel 7 x 7 ins.
Baseboard 7 x 7 ins.



Full wiring chart, building and operating instructions are included in the new issue of the Telsen Radiomag, price 3d. at your dealer's or, if you have any difficulty in obtaining a copy, write direct enclosing 3d. in stamps to "Radiomag" Telsen Electric Co., Ltd., Aston, Birmingham.

TELSEN

SHORT WAVE ADAPTOR





THE weather during the past year has been particularly rainy and, as usual, wireless has received the blame. However, the belief that wireless is the cause of wet weather is certainly growing, for whereas in the past the belief has been limited to what might be termed the vociferous minority, now this minority appears to be increasing, so much so, in fact, that a petition has been sent to the League of Nations asking that all wireless stations might be closed down for six weeks. The idea being to see if it made any difference to the wet weather.

"Just Like Our Weather."

Of course, if such a concession were obtained it would be just like our weather, at any rate, to behave itself exceedingly well during that period and thus prove the minority to be right; whereas in reality they are quite wrong. The question is, does wireless cause rain or does it not? In short, has wireless any effect at all on the weather?

Fundamentally our rainy weather is caused by the moist air depositing its moisture on the earth. We happen to be situated on the edge of a vast ocean of water, the Atlantic, and as our prevailing wind, which is, of course, merely the air in motion, travels over this vast expanse of water, it naturally collects a great deal of water (owing to the action of the sun's rays) in the form of vapour and dumps it on our shores.

Heating and Cooling the Air.

It does this principally because of our geographical situation, and because the high mountains on our Western seaboard force the air to rise higher and become cooler. Now, when air becomes cool, it releases its moisture and we have rain.

Other factors also enter into the scheme, such as cold winds from the Polar regions, which also cool the warm air coming up from the Atlantic and thus rain is produced.

And now to these factors, which give us rain normally, the theorists would add wireless waves. But to make these winds deposit their moisture the wireless waves would have to cool the wind in some way,

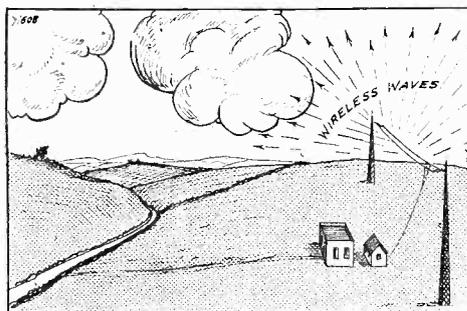
Many people have suggested that the coming of radio is responsible for upsetting our weather conditions, and in this thoughtful article the possible effects of radio on climate are interestingly discussed.

By G. H. DALY.

yet it is more likely that wireless waves far from cooling the air or wind, tend to heat it up slightly.

For example, the electric forces in the waves might cause electrons in the air or clouds to vibrate, this vibration tending to cause a similar movement in the air molecules. Thus, a certain amount of friction could be set up between the elec-

HEATING THE AIR



The writer of this article says that as radio waves are dissipated in the air, they probably tend to heat it to a very slight extent.

trons, and air molecules, and friction, invariably means heat.

Thus, the effect of wireless waves passing through the atmosphere is probably to warm up the latter a little. This increase in temperature would be infinitesimally small, and it is, perhaps, more correct to say that there is a tendency to heating rather than a definite rise in temperature.

As a matter of fact, when we say that sound waves are absorbed or dissipated in the atmosphere, we mean that they have passed away as heat. The same applies to

radio waves which are absorbed in the air. They, too, are lost as heat, and thus warm up the earth to a slight extent.

Therefore, as rain is caused by the cooling of the air, and wireless waves definitely tend to warm up the air, the latter cannot be the cause of our wet weather; this extra warmth will, in fact, tend to make the air retain its rain.

Too Small to Record.

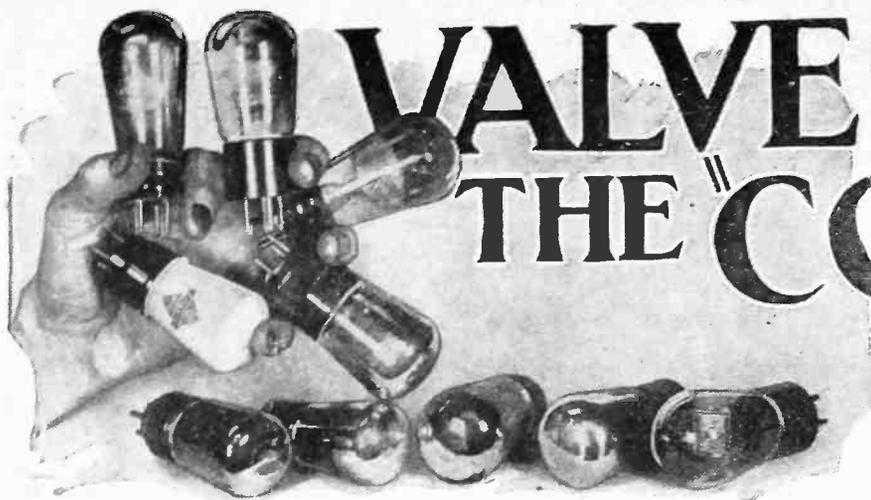
It may be argued that if wireless waves warm up the air there is a greater tendency on the part of the air to pick up more moisture than usual. And when the cooling process does take place more rain will be deposited than would have otherwise been the case. However, the increase in temperature of the air caused by the waves is so extremely minute that their presence in the air cannot possibly have any effect worth mentioning, and even in the close vicinity of a super-high-power station like Rugby or St. Assize, no instrument which we possess is sensitive enough to record the increase in temperature.

All the rays of the spectrum, whether cosmic, heat, light, etc., will tend to heat up the air through which they pass, and it is the heat rays from the sun which are responsible, owing to this heating effect, for the collection of moisture when the air passes over the sea; and it may be said safely that our comparatively long wireless waves, at any rate, have less effect upon our atmosphere than any other ether rays, where rain is concerned.

The Effects of Lightning.

Lightning will, of course, produce rain, but although the lightning flash is nature's method of radiating wireless waves, it is not the wireless waves which cause the rain, but the shock to the constituents of the cloud caused by the lightning flash.

It is possible that some day, as more and more stations are erected having greater and greater power, that it will be necessary to limit both the number and power of wireless stations owing to their effect on the climate; but, as mentioned above, it will be because of too much dry weather rather than rain, which will make this restriction necessary.



VALVES FOR THE "COSMIC"

By K. D. ROGERS.

Choose your valves carefully, for they are vital elements in any set, and even the "Cosmic" cannot give full results unless it is properly "tubed."

IN this short article I want to discuss one of the most vital parts of the wonderful new set being presented to you this month by POPULAR WIRELESS. I refer to the valves, which are beyond question a most important factor in the phenomenal success of the set.

the valves given in the list of accessories and on this page are specially tested examples that we know by experience will give satisfaction.

The resistance in the anode circuit of the detector valve is 100,000 ohms, so that the valve itself should have an A.C. resistance

be helped. Excessive capacity between the valve filament and grid will affect the wave-range of the set, preventing, or tending to prevent, a low minimum being reached, while capacity between other sections of the valve will be likely to upset reaction.

For Short-Wave Work

For short-wave work it is essential that the valve oscillates easily, or very ploppy reaction control and the likelihood of threshold howl will result, two very much to be avoided states of affairs.

Consequently, great care has been exercised in our choice of detector valve so that the maximum efficiency shall be obtained, with the smooth reaction that is so vital to successful short-wave reception.

Picking out a detector valve from all the different makes and types available is no easy job, because although one might imagine that one detector or H.F. or H.L. valve is very much like another, such is not at all the case when it comes to their use in a set of the description of the "Cosmic."

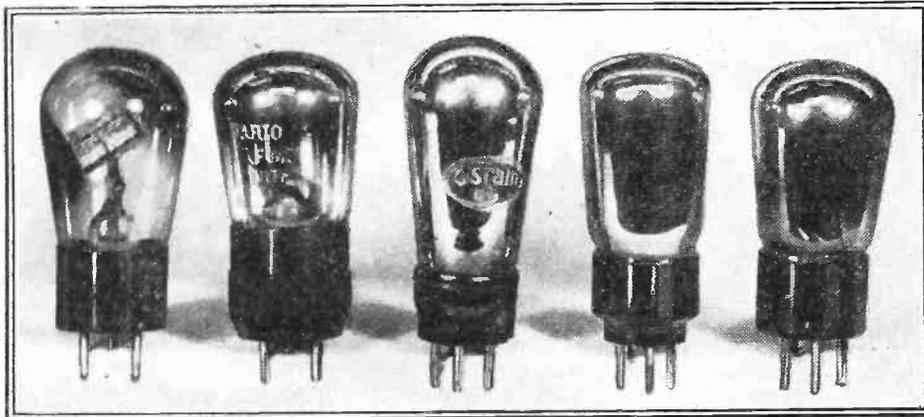
Exactng Tests

Many valves that were tried operated excellently on both the medium and long waves, but were not quite satisfactory on the short waves. This must not be taken as any reflection on the valves, because in this set we are asking a lot of the valve when we expect it to give full satisfaction on all wave-lengths between about 20 and 20,000 metres.

But there are several valves of various makes that will do the job, and it has been our specially interesting task to give them full tests in the actual set.

(Continued on page 1372.)

SOME EXCELLENT TWO-VOLT VALVES—



Some of the valves tried in the original "Cosmic" Three, and recommended as suitable for use in that set. From left to right we have the Tungsram S.P.230, a suitable output valve, the Dario Super power, Osram L.2/B., Lissen L.F.210, and the Six-Sixty 230 S.P.

You might think that as the receiver is of the "straight" variety there would be no necessity to take any particular care over the choice of the valves, but the design of any set calls for care in this regard if the very best is to be got out of it.

The "Cosmic" is not an ordinary receiver by any means, and so it calls for even more careful choice of valves than the normal set. One reason for this, of course, lies in the fact that the set is designed to operate on the very short wave-lengths as well as on medium and long.

The Detector Valve.

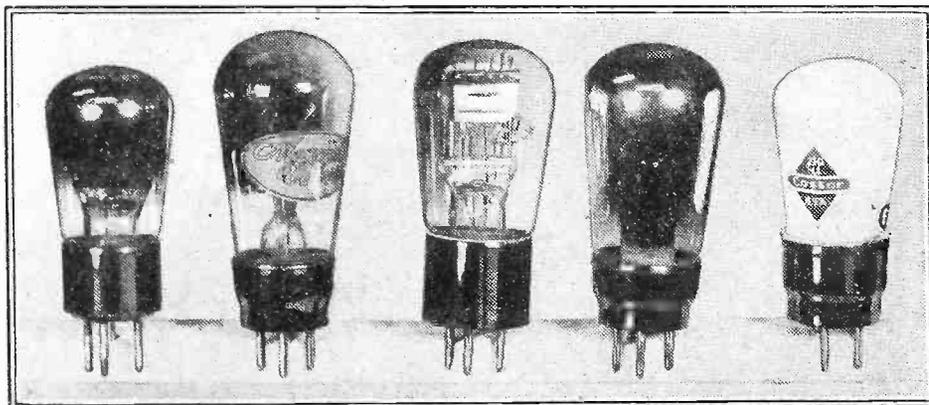
This calls for special care in the choice of the detector valve, otherwise you will run the danger of all sorts of trouble when you are listening on the very high frequencies. This usually takes the form of poor reaction, not infrequently accompanied by such annoying features as threshold howl, the bugbear of all short-wave listeners.

Consequently when the set was designed, very great care was taken to ensure that as long as the correct valves were used no such trouble should be experienced, and

that is only a fraction of this value, and we found for best results the valve must be of the order of 25,000 ohms or so.

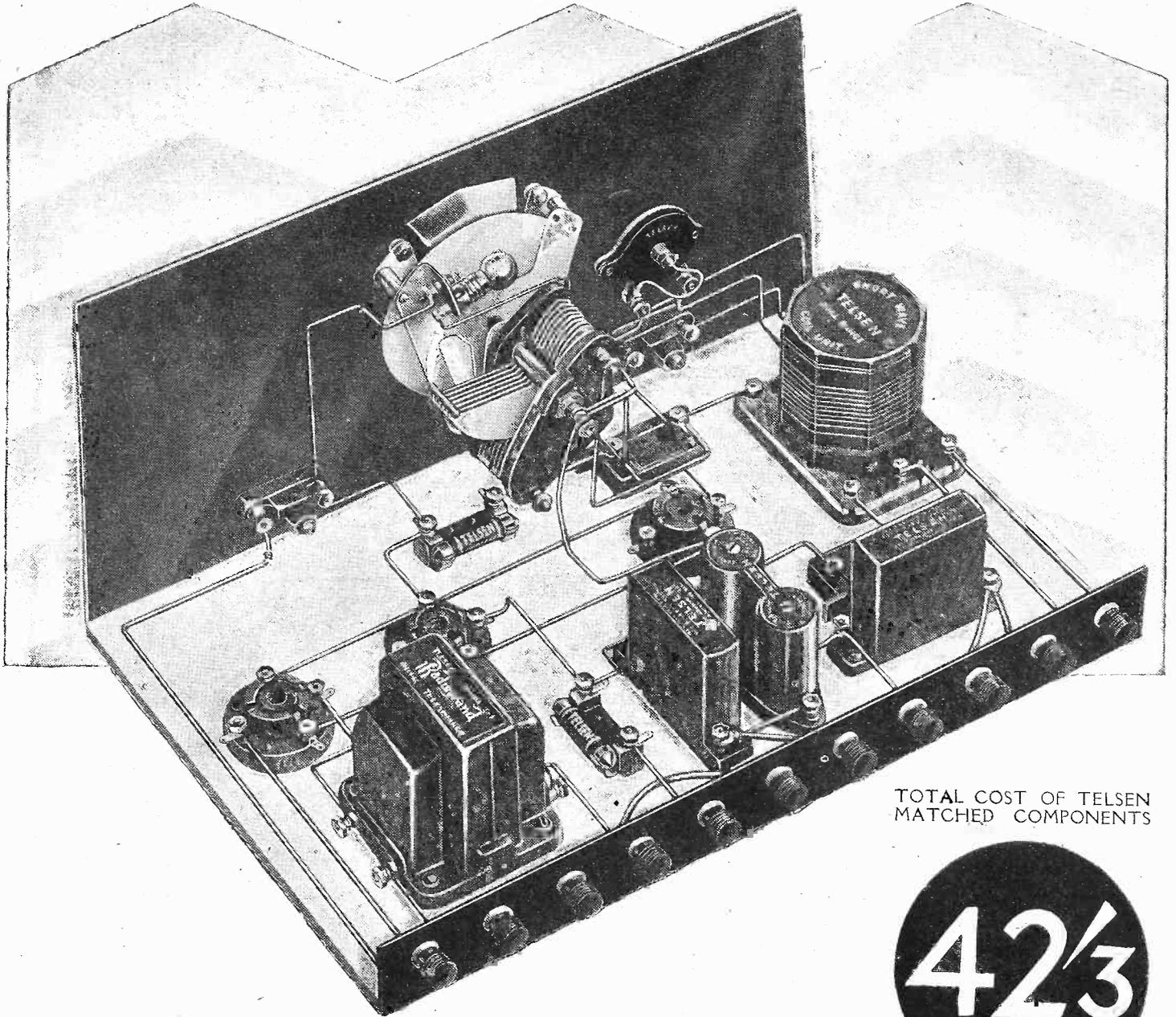
This point is not difficult to arrange, but there is also the question of the inter-electrode capacity of the valve, which naturally must not be any larger than can

—CHOSEN FOR THE "COSMIC" THREE



These are some more makes of valves that have been found suitable. This group contains the Mullard P.M.252, the Marconi L.2/B., Eta B.Y.2010, Mazda H.L.2, and the Cossor H.L.210. These are all 2-volt valves, and have been specially tried in the "Cosmic" circuits.

TELSEN SHORT WAVE THREE



TOTAL COST OF TELSEN
MATCHED COMPONENTS

42¹/₃

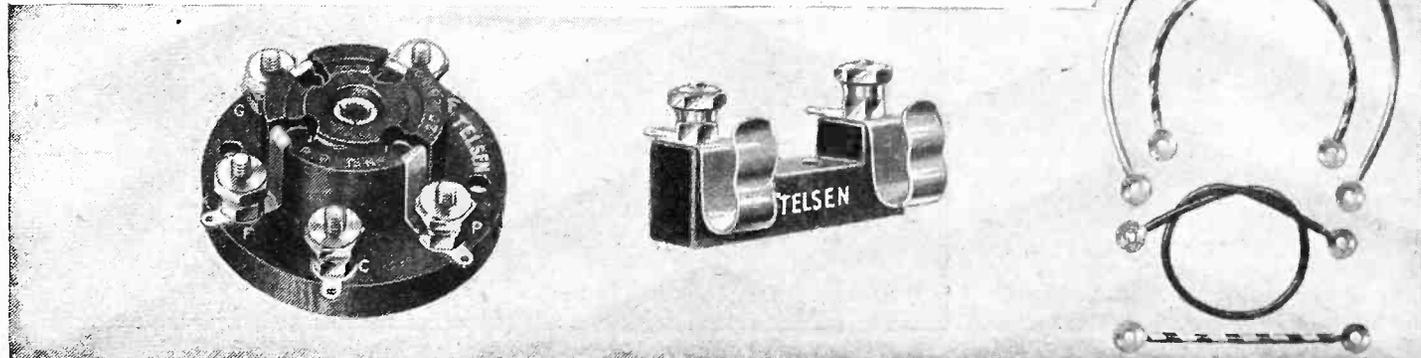
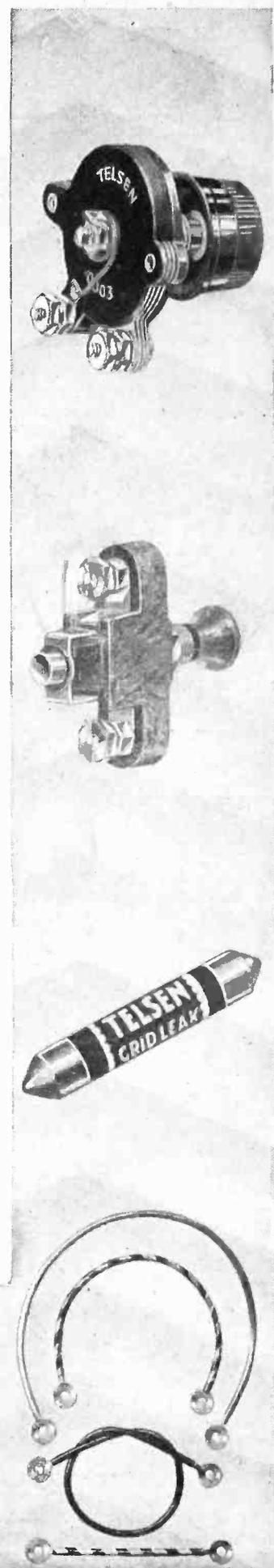
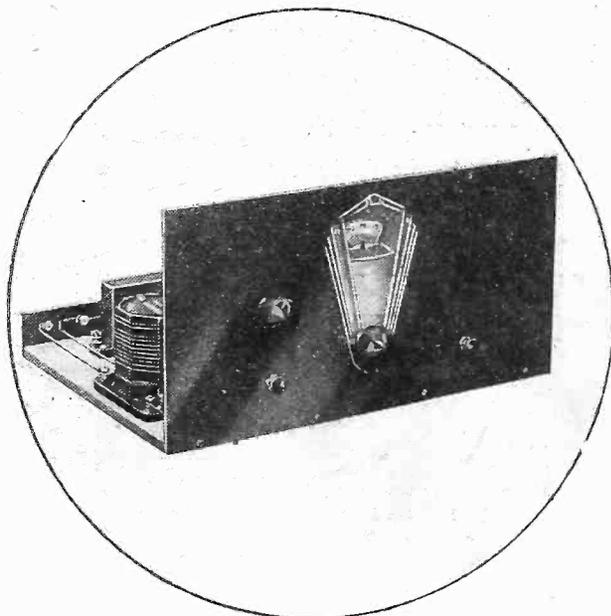
TELSEN

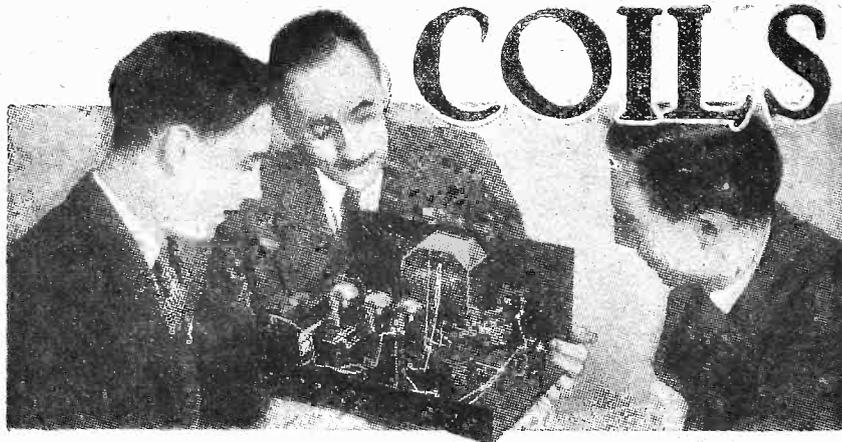
COMPONENTS FOR THE TELSEN SHORT WAVE 3

	s. d.
3 Valve Holders	1 6
1 .0001 Mica Condenser	6
1 .001 Mica Condenser	6
1 Grid Leak, 2 meg.	9
1 Grid Leak, 1 meg.	9 6/2
2 Grid Leak Holders	1 0
1 Short-wave Coil Unit	4 6
1 .00025 Logarithmic Variable Condenser	4 6
1 .0003 Reaction Condenser.	2 0
2 Two-point Switches	2 0
1 "Radiogram Transformer	8 6
1 Binocular H.F. Choke	5 0
1 .01 Mansbridge Type Condenser	1 6
1 Illuminated Disc Drive	4 6
1 1-mfd Mansbridge Type Condenser	2 3
1 50,000-ohm Spaghetti Resistance	1 6
1 25,000-ohm Spaghetti Resistance	1 0

42 3

Full wiring chart, building and operating instructions are included in the new issue of the Telsen Radiomag, price 3d. at your dealer's, or, if you have any difficulty in obtaining a copy, write direct, enclosing 4d. in stamps to "Radiomag," Telsen Electric Company, Limited, Aston, Birmingham.





COILS FOR THE "COSMIC" STAR

By G. T. KELSEY.

ALTHOUGH, as was announced in our coil articles last week, we have co-operated with the manufacturers to the extent of enabling them, where possible, to make use of existing formers for the production of "Cosmic" coils (a procedure which has resulted in cheaper coils all round), the differences in terminal numberings necessarily resulting from such a procedure are not nearly so complicated as might at first be imagined.

By a careful system of grouping, and by close co-operation with the manufacturers concerned, it has been possible to divide all the available "Cosmic" coils into only two classes, which, for convenience, we will refer to as class A and class B.

In Results The Same.

All these coils, it should be pointed out, are identical in so far as working characteristics are concerned, and all of them are, therefore, equally suitable for the fundamental "Cosmic" three described in the last issue, for the "Cosmic" Star, which is described in detail in this issue, or for any of the forthcoming "Cosmic" circuits.

It is only in the actual terminal numberings that differences exist, and since we have been able to group them all into two classes, it all resolves itself into a very straightforward business, much more simple in fact than we had even ventured to hope for when, in the interests of "P.W." readers, we decided to follow this economy policy!

So that when you obtain your coils all that you will have to do is to determine whether the terminals are numbered up to six or up to eight. If your coils fall into the former class, then you wire them in circuit as a class A coil. If, on the other hand, you find that the terminal numbers go up to eight (that does not mean that there are eight terminals to be joined up, because not all of them are used), then you simply adopt the class B wiring.

A Useful Coil Table.

So that every possible element of doubt shall be entirely removed, we have compiled a "Cosmic" coil table which you will find in the Radiatorial columns of this issue, and if you refer to this when wiring your coils in circuit you will find it almost impossible to go wrong.

This table gives terminal equivalents, so that whichever type of coil appears in our published wiring diagram it will be but the work of a few moments to determine the appropriate connections for your particular coil if it happens to be different from the type shown.

There are but three simple exceptions to this general rule. In the case of the Telsen, the Ready Radio and the Sovereign dual-range coils, terminal number seven *must* be connected to terminal number six, which is the one next to it. Otherwise, the connections are exactly the same as for all the other class B coils.

Now a word or two for the benefit of those readers who normally prefer to make the coils themselves.

In the first case, may we make it quite clear that we do not under any circumstances advise you to tackle the dual-range coil yourself. Candidly it is not worth your while, because, apart from all other considerations, the prices are so extremely reasonable that you can buy one for almost the same price as it would cost you to make one yourself.

And with a sectionalised coil of this type it is far from being an easy job to file slots in the ribs in the correct positions, so that you could not hope in any case to produce such a satisfactory coil as is possible under factory conditions.

But this only applies to the dual-range coil, which is the only one for which slotted ribs are necessary. The other coils—that is

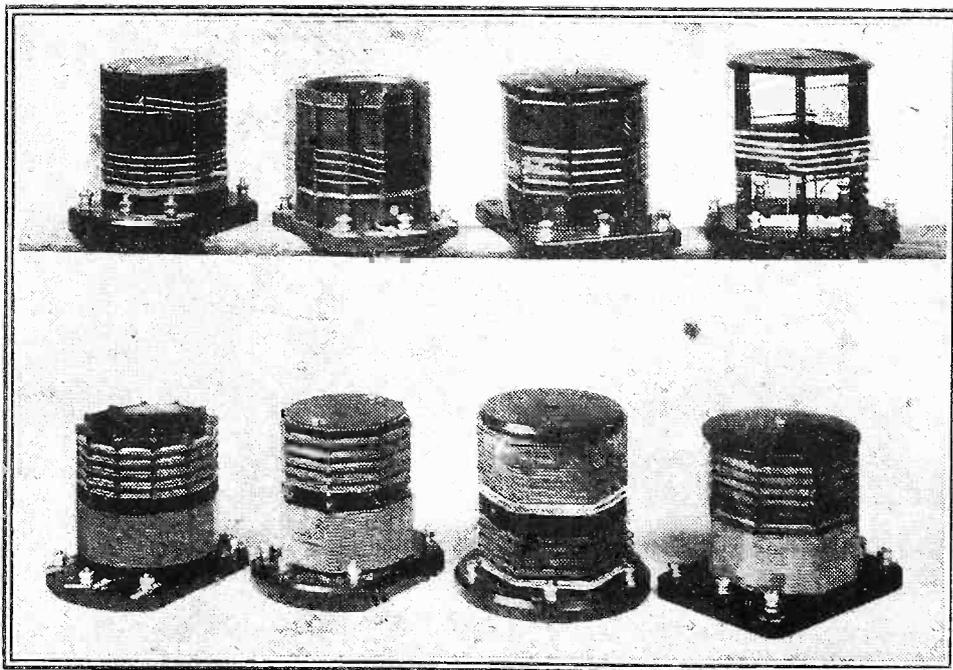
to say, the short-wave unit and the moderator coil—are, as a matter of fact, very simple to make, and if you would prefer to make these yourself there is absolutely nothing to prevent you producing coils every bit as efficient as the commercial ones available.

Details of Construction.

Full details of the short-wave coil, together with an explanatory diagram concerning the connections to the six-terminal base were given in the last issue of "P.W." under the title of "Coils for the Cosmic," and if you follow the instructions given in that article you will not be likely to go very far wrong in the construction of the short-wave unit.

With regard to the moderator coil, this is wound on a standard "P.W." coil quoit, and it consists of 35 turns of number 30 D.S.C. wire with tappings at 21 and 27 turns. Fix one end of the wire to the coil quoit, and wind on 21 turns as a single layer. This point reached, twist a loop in the wire to form a tapping point, wind back over the top of the first layer another six turns, twist another loop, and then complete the winding with a further eight turns.

SOME MORE APPROVED "COSMIC" COILS



There are now ten approved makes of coils from which to choose when you make your "Cosmic." The further selection shown above includes (reading from left to right, top row) Peto-Scott, Wearite, Ready Radio and Tunewell short-wave coils; and below, the Wearite, Peto-Scott, Tunewell and Ready Radio dual-range types.



THE TELSEN RADIOMAG

★ HOW TO BUILD THE TELSEN TRIPLE 3

The current issue of the Telsen Radiomag contains complete instructions, with blue print, so that you can easily and quickly construct the Telsen Triple Three.

This wonder receiver puts every wave-length—long, medium and short—on the one tuning dial, and incorporates all the latest short-wave Telsen matched components. The total cost of the components required is only 52/6.

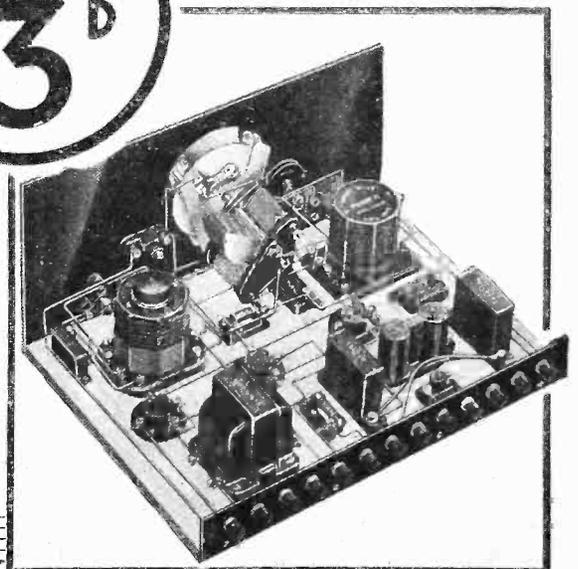
The way to a really all-round up-to-date receiver is made easy through the pages of the Telsen Radiomag. Get your copy to-day—from your usual dealer.

THE CONSTRUCTOR'S OWN MAGAZINE

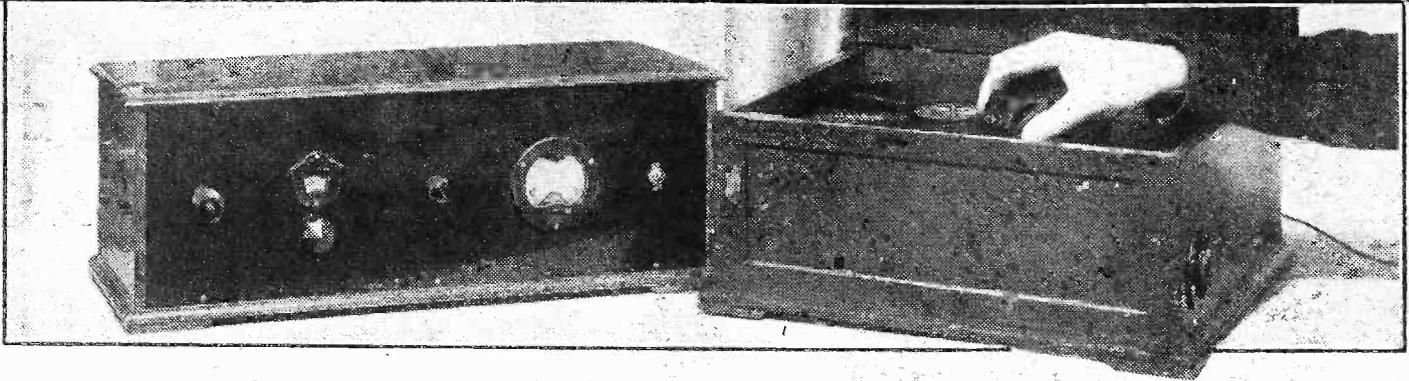
The current issue of the Telsen Radiomag contains 8 blue prints,* 12 pages in two colours, a special supplement on Short-Wave Radio and many useful hints and tips. It is an entirely new edition lavishly designed and beautifully executed—from cover to cover it is packed with information for constructor enthusiasts, both amateur and professional. Ask for your copy at your usual radio dealer's, and if there is any difficulty send 4d. in stamps (to cover postage) to

"RADIOMAG,"

The Telsen Electric Co., Ltd., Aston, Birmingham



RADIOGRAM REMINDERS



THE radio-gramophone is rapidly replacing the acoustic machine as an entertainment provider. But although it enables very much better quality of reproduction, together with the alternative of "fresh" or "canned" programmes, it needs more attention and careful adjustment. Incidentally, it can be completely constructed at home.

Only Three Adjustments.

The acoustic gramophone had three adjustments; speed of motor, needle changing, and volume "control," this latter being limited to two very unsatisfactory methods (judged from present-day standards), using "soft" or "loud" needles, and shutting or opening the venetian blind shutters on the front of the machine.

With different sound-boxes one could get different degrees of reproduction "faithfulness," and there the matter ended.

Contrast this with the present-day radio-gramophone, with its "radio" or "gram" change-over switch, and the variety of loudspeakers, pick-ups, valves, circuit combinations, tone correctors, and so on, from which to choose.

But, in spite of its apparent invariability, enthusiastic gramophiles used to get a great kick out of their experiments with the acoustic machine. They tried sound-box and tone-arm variations, different horn shapes, needles, and so on, and they thoroughly enjoyed themselves.

Much More Flexible.

How much more, though, can the home constructor of the radio-gram get out of his instrument! Everything is changeable, and there are millions of combinations of pick-up, loudspeaker, needle, circuit and valve that he can try. And, what is more, these can be tried gradually and quite easily.

It is with the intention of assisting the owners of radio-gramophones that these notes, which will appear from time to time in POPULAR WIRELESS, are being written.

The choice of valves is a very important part of the design of a radio-gramophone, not only because one can do a great deal in the way of tone correction by using either an ordinary power or a pentode output valve, but also because care has to be taken that the wattage output is sufficient.

That is why most radio-gramophones are all-mains jobs. The reason is to be found not in any disability of battery valves and sets to act satisfactorily as radio-gramo-

An introductory article beginning a new series which will appear from time to time with the object of assisting the home constructor and owner of radio-gram receivers. All kinds of hints and tips calculated to help the reader to get the very best out of his set will be given, together with a list of a few recommended records that have been published during the past month.

phones, but in the fact that most people unconsciously compare the electric model with its acoustic prototype.

If the former is "not so loud" as the latter it is often put down as unsatisfactory, and herein lies the possibility of a

This might appear to be an Irishism, but it is a fact that if you take an electrical reproducer and arrange to let it give the same musical characteristics as the acoustic gramophone, cutting down the bass notes, you can adjust it to sound just as loud as the acoustic machine.

Now replace the bass, leaving the high notes just the same strength, and people will immediately imagine that the volume (though "rounder" and more pleasant) has decreased.

It is largely because of this better balance that the average radio-gramophone sounds less "powerful" than its mechanical cousin, unless it is capable of supplying a large wattage output.

Pentode Possibilities.

That is the reason why the pentode valve is employed in so many of the smaller receivers. It requires but a small input voltage to load it, and provides an astounding output. The average mains indirectly-heated pentode takes about 10-12 volts to load it fully, and its power dissipation is such that an undistorted output save for its harmonic generation, of something like 2.5 watts can be obtained.

This, of course, entails a high-anode wattage consumption, for to get the dissipation of over 7 watts in the anode circuit, at 200-250 volts anode potential, a current of 30 or more milliamperes is required.

Such a current is, however, nothing to the mains user; it is only when H.T. batteries have to be used that one must perforce reduce this consumption.

Mains Valves Better.

Here, then, is the first snag in the battery radio-gram—a forced leak of H.T. power. Secondly, comes the fact that the mutual conductances of the best battery output valves are not as high as in the cases of the best mains output valve, taking a given approximation of anode wattage. Therefore their undistorted output to output dissipation is less.

But you must not run away with the idea that battery radio-grams are no good. They can provide plenty of entertainment. I have merely been trying to show why it is that the mains variety is the more popular, and next time I hope to go into the question of the battery model and to discuss some of the salient features that are necessary to make it a success.

RECOMMENDED RECORDS.

ORCHESTRAL.

Finlandia .. Philadelphia Sym-phony Orchestra. H.M.V. DB1384.

VOCAL.

Paul Robeson .. *The Folks I Used to Know, and My Heart is Where the Mohawk Flows.* H.M.V. B4952.

Cavalcade .. Descriptive Record. H.M.V. C2330.

LIGHT MUSIC.

Gracie Fields .. *Down at Our Charity Bazaar, and Song of the Highway.* H.M.V. B4051.

New Mayfair Orchestra .. *I Was True, and One Little Quarrel.* H.M.V. B6118.

Jack Payne .. *My Song, and That's Why Darkies Were Born.* Col. CB390.

Binnie Hale .. *Who Am I? and You Forgot Your Gloves.* Col. DB698.

real mistake. The acoustic machine puts out a certain amount of sound volume, but because the balance of the sounds is usually poor—a preponderance of the upper musical register being present—it sounds much louder than it really is.



THE TELSEN RADIOMAG

★ HOW TO BUILD THE TELSEN SHORT-WAVE 3

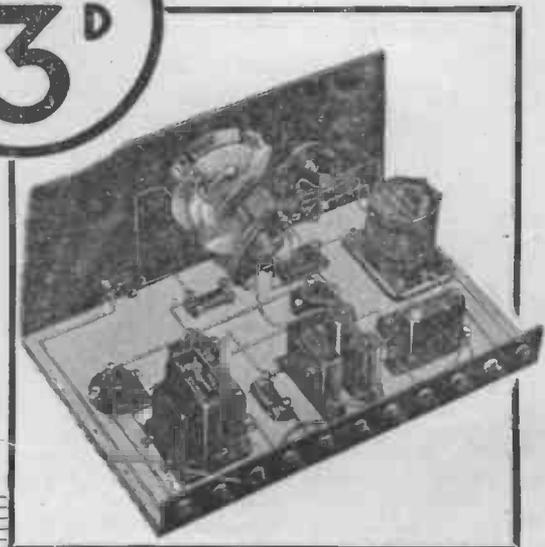
One of the most attractive circuits ever designed by the now-famous Telsen radio engineers, the Short-Wave Three, does honour to the name and fame of Telsen. The total cost of the components required is a mere 42/3, and the current issue of the Telsen Radiomag gives you complete instructions for constructing it yourself, including a blue print. Capable of world-wide reception the Telsen Short-Wave Three is both simple to build and simple to operate—thanks to the incorporation of the Telsen Dual Range Short Wave Coil Unit. See further details in your copy of the Telsen Radiomag—*get your copy to-day.*

THE CONSTRUCTOR'S OWN MAGAZINE

Twelve two-colour pages, eight blue prints,* any number of useful hints and tips—that's just a taste of what this amazing magazine has to offer you. There's a special supplement dealing with Short Waves—written by an expert in a readable, interesting way. And this 60-page magazine—full of information vital to any home constructor, no matter how much or little he knows—is yours for threepence. Ask your usual radio dealer, or send fourpence in stamps to cover postage to:

"RADIOMAG,"
The Telsen Electric Co., Ltd., Aston, Birmingham

60
PAGES
3^d



THE Star model of the "Cosmic" Three was, similarly to the other "Cosmic" set, lent to various prominent firms so that it could be given exhaustive and impartial tests in various parts of the country and under different local conditions.

Asked what he thought of the receiver, an important executive of one of these concerns succinctly said, "I hate it." That was staggering in view of the unanimous praise from other quarters. But we quickly learnt that the remark did not constitute a technical criticism. Far from it!

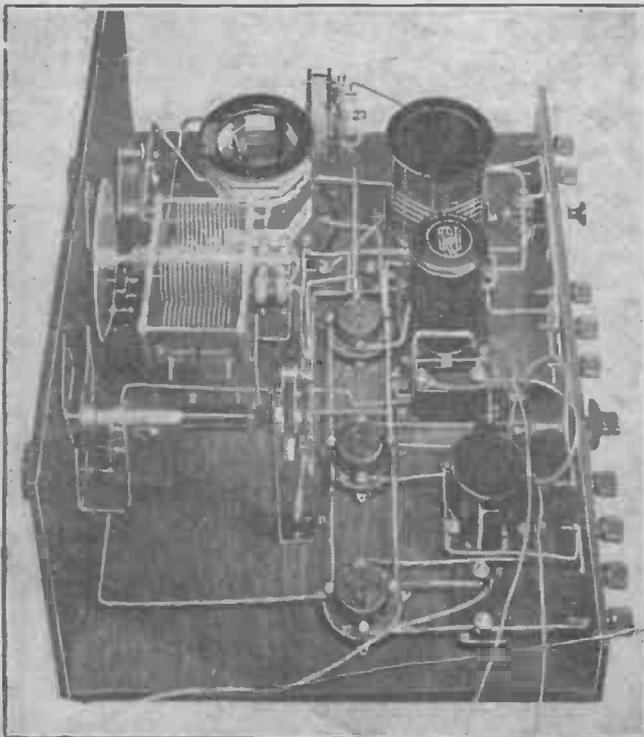
ALTHOUGH THE "COSMIC" STAR IS ESSENTIALLY THE SET FOR THE INEXPERT ECONOMIST, ITS TECHNICAL QUALITIES ALSO MEET THE REQUIREMENTS OF THE MOST CRITICAL "FAN."

"You see," explained our trade friend, "I took the receiver home last week-end, in order to see what I could get on it in the quiet of the evening. I intended merely to devote half an hour or so to a quick run round the dial; I have enough radio during my working hours not to want to keep at it Saturday and Sunday as well. But once I got started on your 'Cosmic' Star I just couldn't keep away from the wretched thing. Never thought much of the short waves before, but now I see 'em as a danger to the leisure hours of tired technicians!"

It Makes You Sit Up!

This quite true incident provides quick corroboration of a statement made in a "P.W." article two or three weeks ago, to the effect that when you have an instrument which can really command the short waves, the fascination of these high fre-

FROM DAVENTRY TO NEW YORK



For the first time, without coil-changing, complicated switching, or expensive apparatus, everyone is able to enjoy complete broadcasting, including the reception of stations from the other side of the world.

quencies is such that they get you right in their grip.

And it is no novelty appeal or passing craze either. "P.W.'s" well-known short-wave experts, G. T. Kelsey and W.L.S., have now been engaged in the pursuit of etheric whispers from the far corners of the earth for years, and yet their colleagues will tell you that there are no signs that their enthusiasm is waning, or that they now find it easier to get to bed at nights than when they first began!

But it has been only comparatively recently that short-waves have really come within the province of the ordinary listener. At one time it was necessary to have very special apparatus and acquire very special skill in order to tune them in at all.

The First Step.

The first step towards the popularisation of the short waves was due to the efforts of Mr. G. T. Kelsey, of the "P.W." Technical Staff, who invented the famous Antipodes Adaptor, with which it is possible to transform any ordinary set into a short-waver. (Its construction was described in POPULAR WIRELESS.)

The idea "caught on" to such an extent that short-wave adaptors are now made and sold in large numbers in practically every country in the world. Mr. Kelsey did not patent the idea (although it would have made a very good and very valuable patent), but freely offered it to the public through "P.W."

You see, the next logical step is in the "Cosmic," where the short waves are

The "COSMIC"



By G. V. DOWDIN

Why Stay in Europe? With the "Cosmic" Star the whole world is very efficient on short waves, it is also extremely effective in previous ex

rendered available without complication or expense. And, of course, it was Mr. Kelsey who designed the short-wave part of this new design as well as contributing valuable criticism and suggestion in regard to the receiver as a whole.

A "Hot" Short-Waver.

The result is that in addition to being a highly efficient receiver of ordinary broadcasting suitable for domestic or "DX" purposes, it is a "hot" short-waver.

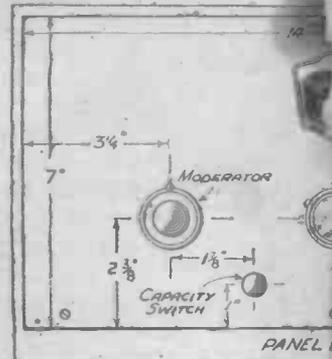
This is particularly the case in the "Cosmic" Star, for it embodies valuable refinements of such a nature that although it is essentially the set for the inexpert

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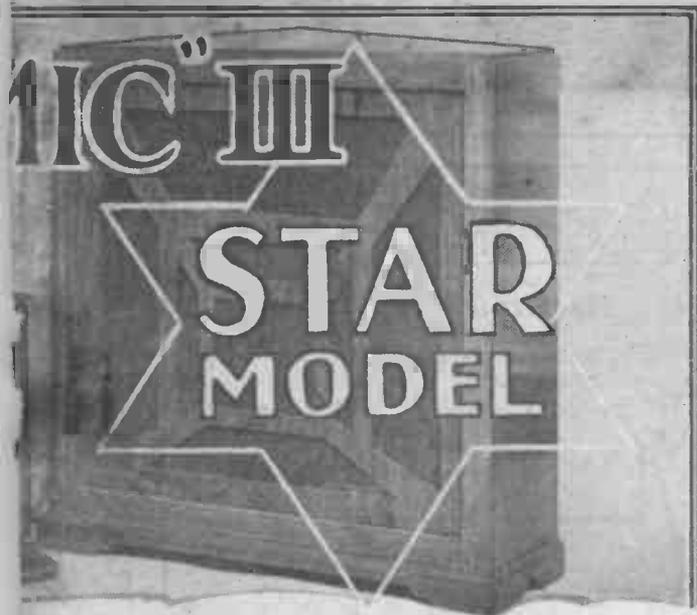
YOUR SHOPPING LIST FOR "P.W."

- 1 Panel 14 in. x 7 in. (Permol, Becol, Goltone, Ready Radio, Peto-Scott, Wearite).
 - 1 Cabinet to fit, with 10-in. baseboard (Pickett, Ready Radio, "Morco," Peto-Scott, Osborn, Camco, Gilbert).
 - 1 Ready Radio Duotune Extender, with disc-drive (or Cyldon, Formo, or Wavemaster Extender with .0005-mfd. fixed condenser).
 - 1 .00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen).
 - 1 .0003-mfd. reaction condenser with slow-motion drive (Ready Radio).
 - 1 .0003-mfd. fixed condenser (T.C.C., Dubilier, Telsen, Sovereign, Lissen, Ferranti, Formo, Graham Farish, Goltone, Igranic).
 - 1 .001-mfd. fixed condenser (T.C.C., etc.).
 - 1 .01 mica fixed condenser (T.C.C., etc.).
 - 1 "Cosmic" dual-range coil (Goltone, Sovereign, Wearite, R.I., Lewcos, Peto-Scott, Ready Radio, Tunewell, Bullphone, or Telsen H.F. transformer).
 - 1 "Cosmic" short-wave coil (Sovereign, etc.).
- NOTE.—The R.I. coils are supplied in pairs on a common base.
- 1 "Moderator" coil (Peto-Scott).
 - 2 Push-pull on-off switch (Goltone, Lotus, Wearite, Igranic, Graham Farish reign).
 - 1 Three-contact push-pull

THE "ALL-WAVER"



THE FINEST "THREE-BAN"



control - handling experience otherwise needed before it is possible easily to "resolve" the needle-sharp short-wave transmissions.

The slow-motion reaction merely comprises gearing for the reaction condenser instead of the normal direct drive. Quite rough adjustments of the control knob result in fractional movements of the condenser vanes, so that it is the simplest possible matter to work the set right up to the very limit of its considerable sensitivity.

Dual Capacity Tuning.

The dual-capacity tuning has a similar effect in regard to tuning. By operating a simple switch the effective capacity of the extenser is reduced to a maximum of .00025 mfd. instead of the normal .0005 mfd., and the stations are twice as easy to handle.

By the way, you will find this arrangement is very useful for facilitating tuning on the lower-wave stations in the medium-wave band, although

extensers having good slow-motion controls, but the Ready Radio one is, at present, at least, the only one to incorporate divided-capacity.

You can obtain something of the same effect by using an ordinary extenser in conjunction with a .0005-mfd. fixed condenser, but it cannot be fully as effective.

However, here are the necessary connections. The wiring for the extenser is the same as in last week's blue print model, with the exception of that lead which joins to the fixed vanes terminal. This lead is

"POPULAR WIRELESS" AGAIN LEADS THE WAY IN ENLARGING THE POTENTIALITIES OF AND SIMPLIFYING HOME RADIO BY PRODUCING A PERFECTED TRI-BAND RECEIVER.

taken instead to the one terminal of a fixed condenser of .0005-mfd. capacity, and it is to the other terminal of this that the fixed vanes terminal of the extenser must be joined.

You then connect an ordinary on-off switch across the fixed condenser, so that it can be shorted in and out of circuit as desired.

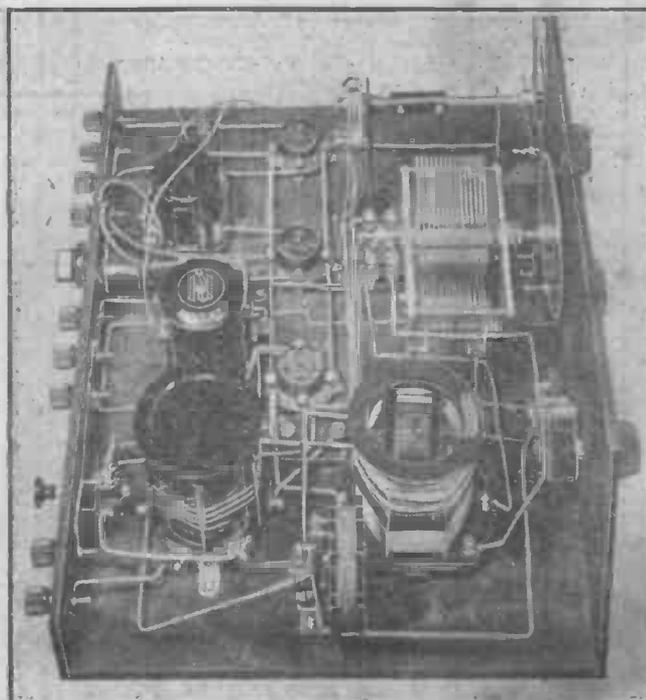
Records As Well!

There is a pick-up switch and sockets on this Star "Cosmic," and you will find that, in conjunction with a good pick-up, excellent electrical reproduction of records is given.

All the standard "Cosmic" qualities are present, and on both long and medium waves exceptional results for such a simple instrument are given.

(Continued on next page.)

FROM MELBOURNE TO MADRID



It is important to note that the "Cosmic" star covers all the wavelengths that are worth covering. It is a really efficient receiver of the short waves, and is equal, if not superior, to any separate instrument designed specifically for only one limited wave-band.

G, Associate I.E.E. of broadcasting is wide open to you. And although the Star for ordinary broadcasting, and you can build and use it without experience.

economist, its technical qualities meet the requirements of the most ardent short-wave "fan."

Indeed, the listener who hitherto has been contented with the reception of only the local stations can now align himself with the most noted hunters of programmes from America and the Antipodes.

And all the time he has the satisfaction of knowing that his "Cosmic" Star can hold its own against all comers merely as a gatherer of "Continental."

The two big features of the "Cosmic" Star are twin-capacity tuning and slow-motion reaction. These render it unnecessary for the beginner to acquire that

that is an incidental application, and its main work is, of course, concerned purely with the short waves.

A good slow-motion tuning control in combination with this capacity-reduction brings short-wave tuning into line with the ordinary operation of a radio receiver, and the two things are found incorporated in the Ready Radio Duotune Extenser.

It is an ingenious component, and in the "Cosmic" Star a vitally useful component.

Indeed, its introduction in the Star model of the "Cosmic" was inevitable. There are other

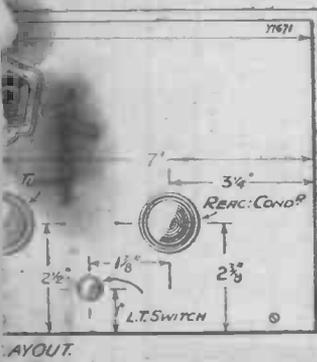
RT
VES
UM
VES
NG
VES
OIL-
GING.

"LATEST AND GREATEST SET

es (Ready Radio, Telsen, Peto-Scott, Colvern, Tunewell, Bulgin, Sove-

- 1 Radio-gram rotary switch (Ready Radic, or S.P.C.O. push-pull types of above makes).
 - 1 H.F. choke (R.I. type FY1, Wearite, Sovereign, Varley, Peto-Scott, Ready Radio, Leweos).
 - 1 L.F. transformer (Lewcos L.F.T.6, Ferranti, Telsen, R.I., Formo, Sovereign, Climax, Varley, Igranic, Atlas, Goltone, Graham Farish).
 - 3 4-pin valve holders (Telsen, Graham Farish, Bulgin, Lotus, Wearite, Clix, Formo, Lissen, Igranic, W.B.).
 - 1 100,000-ohm Spaghettil resistance (Lissen, Bulgin, Sovereign, Leweos, Varley, Peto-Scott, Ready Radio, Telsen, Igranic, Graham Farish, Goltone, Tunewell).
 - 1 2-meg. grid leak and holder (Duu.Ler. Telsen, Ready Radio, Igranic, Loewe Peto-Scott, Ferranti, Varley, Sovereign, Bulgin, Graham Farish).
 - 1 5-meg. grid leak and holder (Dubilier, etc.).
 - 1 Terminal strip 14 in. x 2 in.
 - 9 Terminals (Belling Lee, Igranic, Clix, Eelex).
- Glazite, Laoline, Quickwyre, Jimlinx. Flex, screws, battery-plugs, etc.

"FOR EVERYONE



"D" THREE IN EXISTENCE

THE "COSMIC" III STAR MODEL

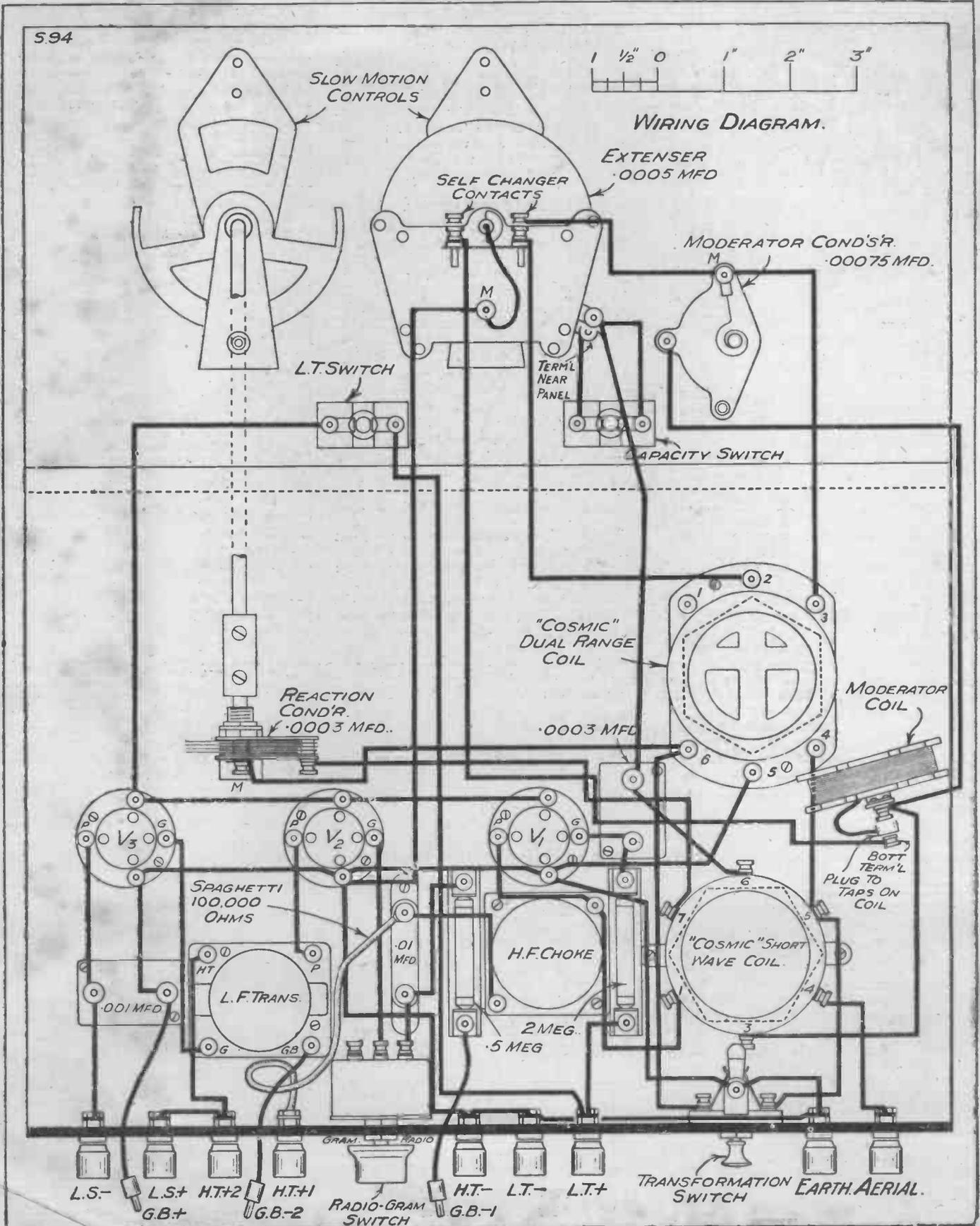
(Continued from previous page.)

So you see the Star is a star in fact

as well as in designation. The refinements are worth-while refinements, and I would urge :1 who can to take advantage of all of them and build the complete Star. The pound or so of additional cost will. unfor-

tunately, prove prohibitive to many, but I can assure all those who are "only just able to scrape it up." that they will not regret making the effort.

(Continued on page 170.)



READY RADIO

IMMEDIATE DISPATCH OF COSMIC STAR BLUE-PRINT KITS

15,000 KITS IN STOCK

20 to 1 Slow Motion
Tuning Control.

20 to 1 Slow Motion
Extended Anti-
capacity Reaction
Control.

R.I. Hypermite Trans-
former chosen for high
quality amplification.

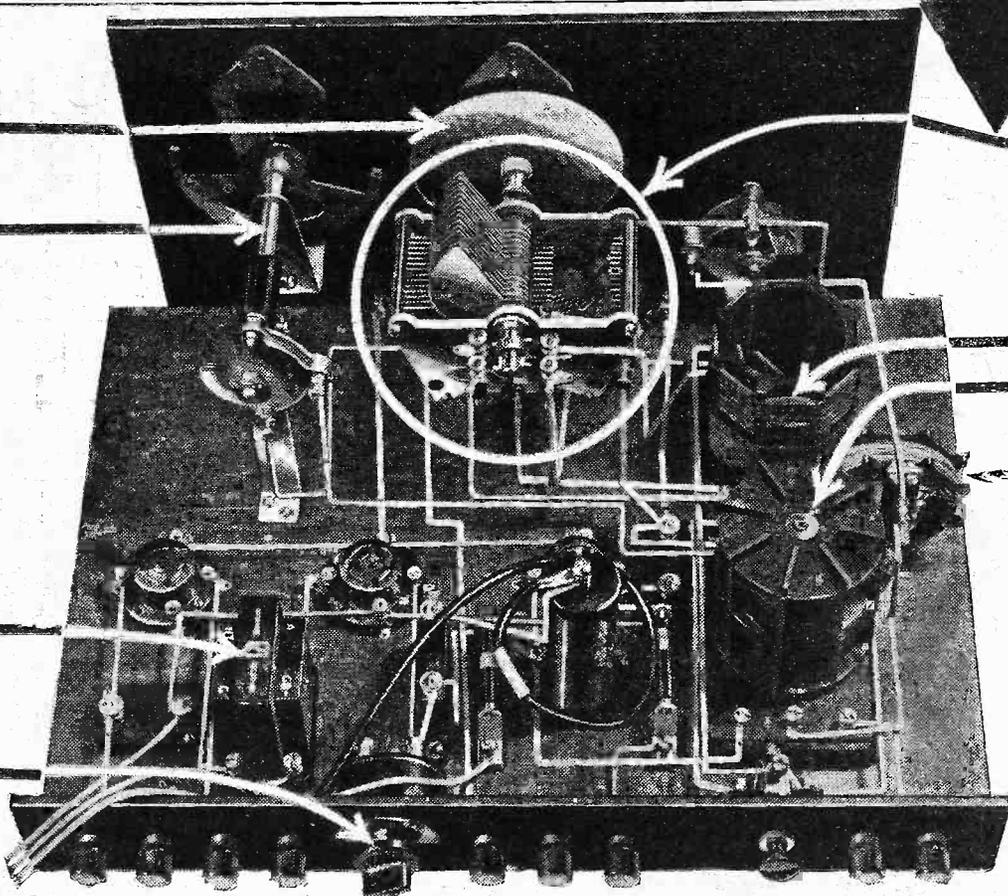
Radio Gram Switch.

The New DUOTUNE
Condenser which com-
bines all the advan-
tages of a .00025 mfd
and a .0005 mfd in one
instrument.

The amazingly efficient
triple-range R. I. Coils
mounted on one base
to facilitate assembly
and wiring and give
greater efficiency.

The new Ready Radio
Moderator Coil wound
strictly to specifica-
tion.

Note particularly
the R. I. ALL-
WAVE Coil Unit
which embodies the
Short, Medium and
Long Wave Coils
on one compact
base. Greater effi-
ciency is obtained and
building and wiring
greatly simplified.



The Ready Radio
"COSMIC" KITS
include complete set of
quality components as
chosen and specified in
the original model
together with PANEL
(READY CUT AND
DRILLED), BASE-
BOARD, JIFFILINX
FOR EASY NON-
SOLDERING wiring.
Every Ready Radio
"COSMIC" KIT is
tested and passed
before dispatch under
the supervision of
G. P. Kendall, B.Sc.

For recommended
accessories see fol-
lowing page.

For Order Forms, See
Page 1371.

READY RADIO COSMIC III ★ KIT 89/6

OR BY EASY PAYMENTS

10/3 down and 9
monthly payments of 10/3

READY RADIO
"COSMIC" STAR
KIT B
(Including Mullard
Valves)

£5 : 17 : 0

OR BY EASY PAYMENTS.

DEPOSIT OF 11/- AND
11 MONTHLY PAY-
MENTS OF 11/-.

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

Grams : Readivad, Blackvil.
Phone : Lee Green 5678.

**THE "COSMIC" III
STAR MCDFL**
(continued from p. e 1368.)

Now the construction of the Star follows on the same general lines as the first model, and so it would only be repetition to deal with it separately, and at length. The coils are identically the same, and these too were described last week. There have been one or two minor alterations in the positions of some of the components in order to meet the new conditions, but a full wiring diagram is given this week to show everything in detail.

**NO SWITCHING FOR
MEDIUM AND LONG
WAVES**

And the operating notes which appear on another page in this issue, also apply to the Star, except that there is, naturally, no mention of that dual-tune extenser switch. But it hardly needs to be mentioned that all you have to do with this is to pull it out when you go over to short waves and push it in when you go back to ordinary waves again.

It is certainly another "knob," but it is one that can make it twice as simple to tune in the short-wavers. After you have experienced its benefits I don't think you will cavil at its presence!

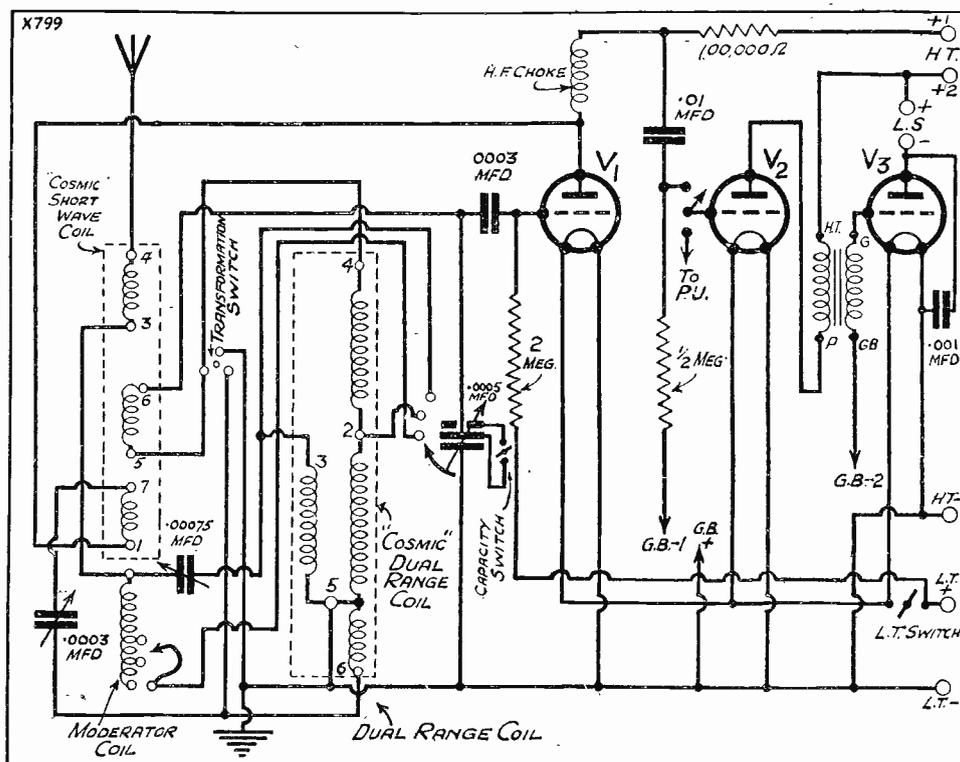
It gives the "Cosmic" short-wave flexibility, and as it already had that to an unusual degree on both other wave-bands

it completes a trinity such as exists in no other receiver yet produced.

Without reference to the interior of the

Thanks to the moderator which changes its functions, but not effects or effectiveness, with the change of wave-band, the high

CIRCUIT ELEMENTS OF VITAL EFFECTIVENESS



Medium-wave coupling through the short-wave coils, and a '00075 variable condenser which controls power and selectivity on long waves, as well as various other original fixtures, contribute to the almost overwhelming attractions of the "Cosmic."

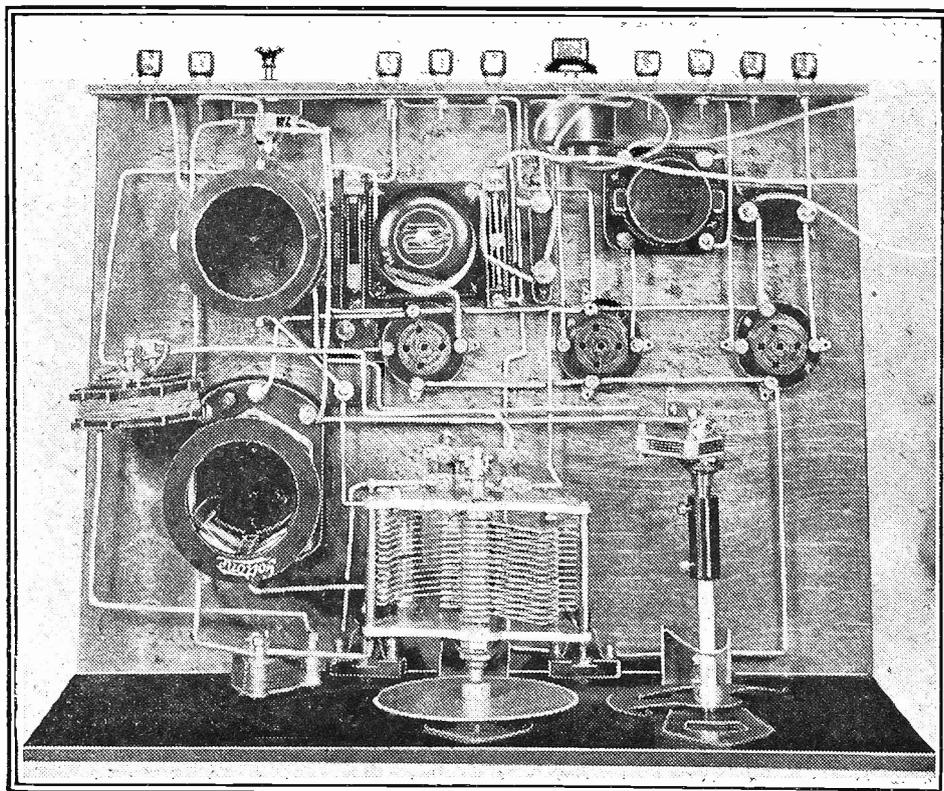
set you have full command over long, medium and short wave-lengths and are able to screw the last ounce out of the set on each of them.

degree of elasticity is achieved without a multiplicity of knobs.

On your initial tryouts you won't get the most out of the "Cosmic" Star, but even what you do get would, I fancy, have fully satisfied the majority of constructors. But as you get to know your "Cosmic," and get into sympathy with its controls, you will be able to do more and more with it.

You need patience and skill to get anything at all out of some high-grade receivers, but the "Cosmic" scores in that not many could fail to achieve "reception repletion" with it right away, while there is yet just that little extra always round the corner

NOTE THESE OPERATING FEATURES



Extenser tuning, slow-motion reaction, divided capacity for simplified short-wave reception and single-dial tuning render the "Cosmic" Star easy and flexible in operation.

**SELECTIVITY AND
POWER UNDER YOUR
CONTROL**

waiting for those who care to find it. I know that all sounds "ballyhoo-ish," but it nevertheless is an absolute fact.

Most ordinary Det.-2 L.F. sets have the one tuning dial and a reaction control. There might be, in addition, a simple selectivity adjustment. And a practised hand can wheedle quite a bit out of such a "hook-up," despite the fact that either on the one or both broadcast bands it is highly probably there is considerable and irretrievable loss.

It is our conviction that the unpractised hand would accomplish more on the "Cosmic" from almost haphazard "knob twiddling" for reasons that have very

(Continued on page 1372.)

READY RADIO

SPECIFIED COMPONENTS FOR THE COSMIC STAR

Build strictly to the published design

Mr. Kendall used the "COSMIC" STAR Receiver as the basis of his research when developing the DUOTUNE Condenser.

	s.	d.
1 Ebonite Panel, 12" x 7", drilled to specification -	4	0
1 Plywood Baseboard, 14" x 10" -	1	0
1 Ebonite Terminal Strip, 14" x 2" -	1	0
2 L.T. Switches -	1	8
1 ReadiRad .00075 Moderator Condenser -	3	6
1 Duotune Extenser -	15	6
1 Slow Motion Disc Drive for above -	3	0
1 ReadiRad .0003 Extended Slow Motion Reaction Condenser with Bracket -	7	0
3 Valve Holders -	1	6
1 R.I. "Cosmic" Dual Coil Unit -	12	6
1 ReadiRad Moderator Coil -	2	6
1 T.C.C. .001 Fixed Condenser, Type "S" -	1	6
1 ReadiRad Standard H.F. Choke -	4	6
1 Lewcos 100,000-ohms Spaghetti Resistance -	1	6
1 ReadiRad Radiogram Switch -	2	9
1 T.C.C. .0003 Fixed Condenser, Type "S" -	1	3
1 ReadiRad Wave Change Switch -	1	6
1 R.I. Hypermite L.F. Transformer -	12	6
1 Grid Leak, 2 megohm and Holder -	1	4
1 T.C.C. .01 Fixed Condenser, Type 40 -	1	9
1 Grid Leak, .5 megohm, and Holder -	1	4
9 Belling-Lee Terminals, Type "R" -	2	3
1 Packet of Jiffilix for wiring -	2	6
3 Belling-Lee Wander Plugs -	6	
Flex, Screws, &c. -	1	2

The Ready Radio "COSMIC" III STAR Kit contains the actual components used by Mr. Kendall for his original "COSMIC" STAR Receiver.

£4 9 6

Any component can be purchased separately.

3 Valves as specified (P.M.2DX, P.M.1LF, P.M.2)	£1 7 6
1 Pertrix Accumulator, Type PXC3	11 0
1 Pertrix 100v. Standard Capacity H.T. Battery	13 0
1 Pertrix 120v. Ultra Capacity H.T. Battery	19 6
1 Pertrix 9v. Grid Bias Battery	1 3
1 R.&A. Speaker Unit, Type 40	16 6

RECOMMENDED EQUIPMENT

1 Blue Spot 66R Unit with Major Chassis	£2 10 0
Ready Radio "Cosmic" Star Radio-Gram Cabinet	£3 7 6
Ready Radio "Cosmic" Star Table Cabinet	£1 10
1 Ready Radio Eliminator (A.C.) with trickle charger, Type B.S.	£5 17 6

See also pages 1369, 1373, 1375.

MAINS SUPPLY

Head Office and Works
EASTNOR HOUSE,
BLACKHEATH, S.E.3.

Phone: Lee Green 5678.
Grams: "ReadiRad Blackhill."

Showrooms:
159, BOROUGH HIGH STREET,
LONDON BRIDGE :: S.E.1.

Phone: Hop 3000.

IMMEDIATE DISPATCH
from **READY RADIO**

CASH or COD ORDER FORM

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

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

EASY PAYMENT ORDER FORM

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

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

for which (a) I enclose (cross out line) £.....
(b) I will pay on delivery (not applicable)

for which I enclose first deposit of £.....

Name.....

Name.....

Address.....

Address.....

THE "COSMIC" THREE STAR.

(Continued from page 1370.)

fully been set out in previous "Cosmic" articles.

But later you are going to be shown how an expert would "Tour the world on a 'Cosmic,'" and from this you will be able to form your own judgment as to the outstanding technical qualities of this new set of ours.

And convincing proof will be forthcoming when you are able to do likewise—which should not be long after you have successfully built a model for yourself.

Those Extra Assets.

The commercial set designer has previously worked on the principle that everyone into whose hands duplicates of his design falls is completely lacking in commonsense and is entirely non-mechanically minded.

On the other hand, there is always the urge for the constructor designer to cater for his old friends—constructors who have acquired no little operating and servicing ability.

It is our opinion that the "Cosmic" points the way towards a new technique in set design—the evolution of apparatus which can give something good in the hands of the "ham-handed" and something exceptionally good when operated by those who set themselves out to acquire facility in "knob-twiddling."

Don't Be Misled.

Don't be misled by the apparent simplicity of the "Cosmic"—there has never before existed a Det.-2 L.F. set so versatile and so flexible, or one in which there was one simple control able to do so much as can that little moderator.

Take note of these definite qualities: (1) Full medium- and long-wave results without separate switching or coil-changing; (2) Full short-wave results complete with reduced tuning-capacity and slow-motion reaction, and freedom from hand-capacity—all without coil-changing or even the necessity of lifting the lid of the set; (3) Very inexpensive, very simple construction, no soldering, no complicated double-throw switches, no screening.

Nothing Else Like It.

Before you have built the set you have only our word for it that it gives exceptional three-band results, but, leaving these aside for a moment, can any one of the few of you readers who have read all the British and foreign radio journals that have been published during the past few years, point to any equivalent design that can claim anything approaching the obvious qualities of the "Cosmic"?

Forgive me for labouring the point, but I do so for the benefit of those sceptics who seem to believe every new "P.W." set is an old one in a new suit!

Admittedly, real novelty as such is absent in some of our designs, but as I have said elsewhere, novelty just for the sake of itself is nothing to be proud of, and a receiver which gives a good reflection of the best current practice in set design, but which has no startling new features, is vastly to be preferred to one full of novelty, but also full of snags.

An Enthusiastic Reception.

The "Cosmic," and particularly the "Star" model, just happens to be an original conception of a snag-free character—hence our enthusiasm!

It isn't a super-het, it isn't a 2-S.G. collector of the heaven's static, it's just a Det.-L.F. which our trade friends lead us to believe is going to influence the commercial set of next year.

And now turn to our advertising columns and see what our advertisers say about it. At the moment of writing I haven't the faintest idea what line they intend to take. But, looking at the "Cosmic" Star that stands on a table in front of me, and

amplification factor of 15.5. It is an excellent valve, and is one of the very best to be found for that particular position in the set.

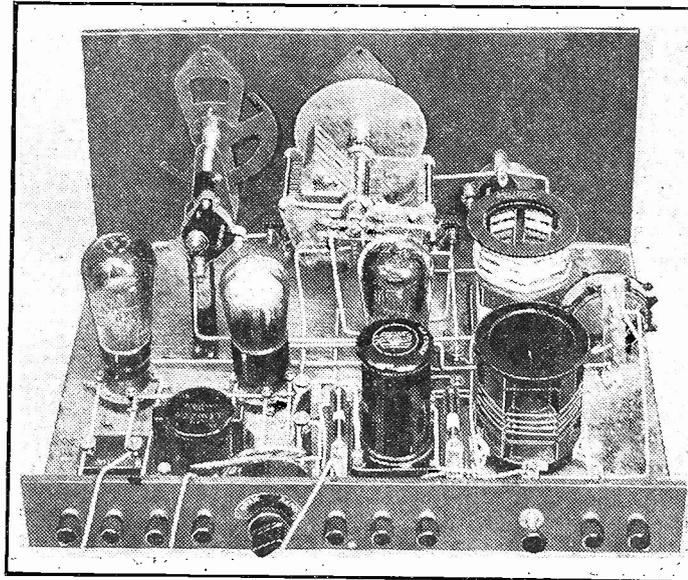
The last valve must carry a fairly large grid swing, and so we must choose it with that in view. I am assuming here that the set is to be used not very far away from the local station. In this event the set will have to deliver quite a large amount of volume, and although a valve of the order of the P.2 would give very good results a larger valve is more satisfactory. We have chosen, therefore, a Cossor 230X.P. as a really good type of output valve.

This will deliver a sufficient output power to operate a moving-coil loudspeaker at a volume in excess of that usually required for ordinary room strength.

Moreover, this valve will enable you to obtain good results from really distant transmissions, for its mutual conductance (or goodness factor) is high, enabling a big output to be obtained from a fairly small input.

The use of the valves, or rather the operation of the set, is being dealt with by someone else, and upon the intelligent use of the set depends the final results you will get from the valves we have just chosen. But you must get your valves right before you can hope to obtain the maximum results from the receiver.

THREE WAVE RANGES—NO COIL CHANGES!



Here the valves and all coils are shown in position, and it will be seen that the latter are few in number and amazingly compact considering the wide wave range which is covered by the "Cosmic" circuit.

Remembering what they have communicated to us subsequently to testing models loaned them for the purpose, I will venture that they will be letting themselves go to some very good effect!

VALVES FOR THE "COSMIC."

(Continued from page 1359.)

The L.F. valves are more easily chosen, for there is no reaction control to worry about. Instead, however, we have to watch our step regarding the impedance of the first L.F. valve, which is in the primary circuit of the L.F. transformer. In other words, we must match the impedance of the valve with that of the transformer primary.

A suitable valve here is the L2/B. which has an impedance of 10,000 ohms and an

thousand each week. When one realises that only a very small percentage of wireless listeners trouble to write to me, one realises, if only to a limited extent, the force of this wireless giant.

His Happiest Memories.

My happiest memories of Savoy Hill will always be linked up with those letters. They have helped me—and my "boys"—far more than the writers themselves can realise. There have been letters of criticism, letters of constructive suggestion, letters of thanks from children, from blind people, and from hospital patients. They have, indeed, shown me what I shall never forget—something of the real quality of human nature.

When it became known recently that I was resigning my post at the B.B.C. I received no fewer than twelve hundred letters in two days. And they are still coming in. Is there anything more I could wish for?

MY FOUR YEARS AT SAVOY HILL

(Continued from page 1335.)

Broadcasting Corporation's staff can have any real idea of the truly enormous responsibilities which any broadcasting artist owes to the public.

I continue to be amazed, for instance, at the growth of my letter bag. I have watched and watched it grow from a score or so letters each day to the amazing number of over a thousand each week. When one realises that only a very small percentage of wireless listeners trouble to write to me, one realises, if only to a limited extent, the force of this wireless giant.

The **READY RADIO** **COSMIC STAR** GRAMOPHONE EQUIPMENT

A Beautiful Cabinet for a Wonderful Set

This is how your "Cosmic" Star will look when fitted in a Ready Radio Cabinet.

The radio-gram cabinet has been specially designed for the "Cosmic" Star. All controls and the terminal strip are easily accessible. The cabinet accommodates the set, speaker, batteries and gramophone equipment, making your "Cosmic" Star an entirely self-contained model which will provide you with radio or gramophone entertainment at the flick of a switch.

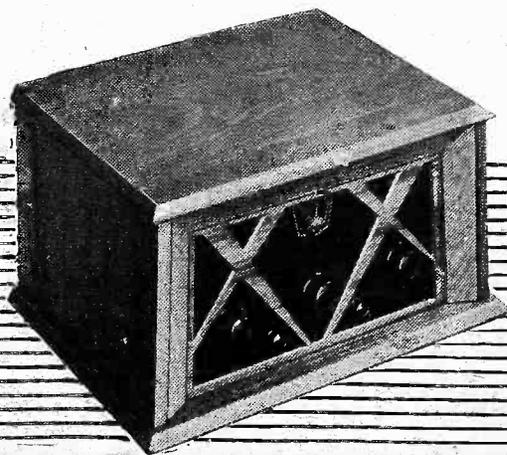
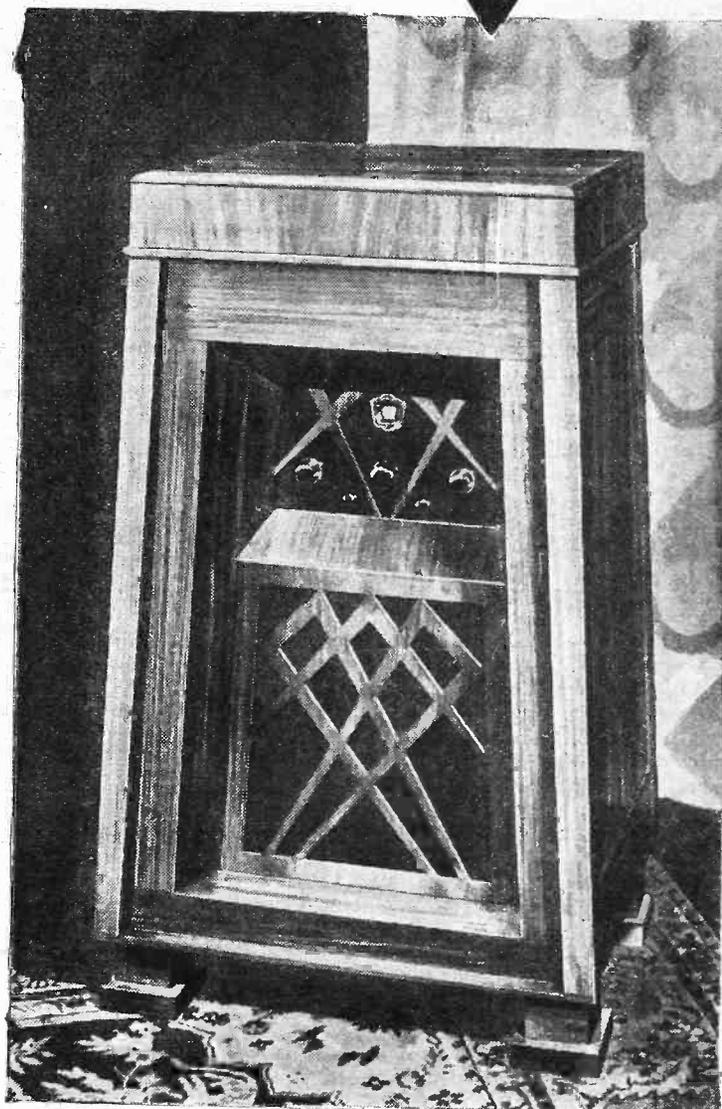
Figured walnut. Best finish throughout. Lift-up lid. Automatic support. Needle cup fitted in motor board.
Size 3' 3" x 22" x 17".

67/6

"Cosmic" Table Model in figured walnut.
Size 17" x 12" x 9". Price

21/-

- | | |
|---|----------------|
| 1 Collaro Gramophone Motor, Type B.30, with Automatic Stop and Unit Plate - - - | £1 13 0 |
| or | |
| 1 Collaro Electric Induction Gramophone Motor - - - | £3 0 0 |
| 1 Ready Radio Pick-Up - - - | £1 7 6 |
| 1 ReadRad .5 Volume Control | 5 9 |

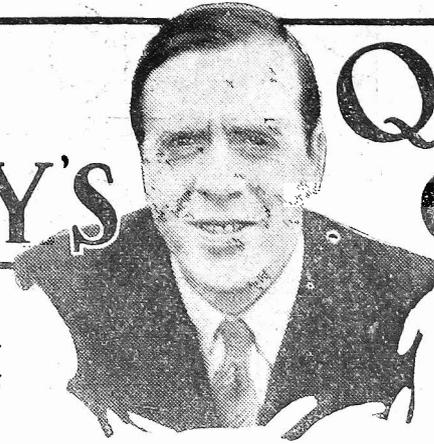


Order Forms on Page 1371

Advt. of Ready Radio Ltd., Eastnor House, Blackheath, S.E.3. Phone: Lee Green 5678. Telegrams: Readirad, Blackvil, London.

Showrooms: 159, Borough High Street, London Bridge, S.E.1. (2 minutes from London Bridge Station).

CAPT. ECKERSLEY'S QUERY CORNER



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

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

Is Ebonite Essential?

D. R. M. (Exeter).—"Why should it be necessary to employ ebonite panels when most components are adequately insulated themselves to prevent leakage between them. Surely wooden panels could always be used?"

Yes, if, in fact, your first statement was true. Are *all* components insulated?

I mean *insulated*. I don't mean mounted on "muckite." But lots of commercial gear—transmitters, receivers, etc.—dispense with ebonite and wood altogether, and use iron and porcelain.

Whatever is done, all that is necessary is to insulate, and ebonite is not the only insulator.

A Composite Screen.

R. P. (Dundee).—"Both aluminium and copper are specified for screening. Would any advantage be gained by using a composite screen of one sheet of copper and one of aluminium riveted together?"

No, I don't think so. I hear that experiments have been done on screening, but I cannot remember what exactly was found to be the best shield.

I remember being struck that it was not the most conducting metal. In any case, I don't think your idea has much to recommend it. An ordinary copper or aluminium screen is perfectly satisfactory for all ordinary radio work.

Coupling of circuits takes place more in the valves than anywhere.

A Pentode Peculiarity.

A. N. (Rookwood).—"Some time ago I obtained a power pentode designed to work at a maximum anode voltage of 300-400 and, although excellent results were obtained, one strange characteristic was noted.

"When the receiver was switched on a blue glow could be seen between the anode and grids of the valve, and as signals were tuned-in this glow fluctuated in brilliancy. For instance, if a loud signal was received, the glow would almost disappear, and after running the set on this station for a few minutes the glow would disappear, and could not be brought back by de-tuning the set or operating the volume control.

"After a few weeks' use the glow completely disappeared, and is never noticed now. The anode current and voltage applied to the valve is exactly the same, and I am somewhat intrigued by this peculiarity. I should be pleased if you could suggest the possible cause of the

I think that probably the glow effect is due to the glass of the valve being covered with a chemical (essential to the particular process of manufacture), and the bombardment of this coated metal by stray electrons.

In some constructions streams of stray electrons escape the filament anode path and are shot out into the body of the valve, and impinge on the glass walls. Some makers put little gauze shields round the end of the grid to prevent this. I don't quite correlate your symptoms with the explanation, however.

Usually a loud signal increases the glow, because more power is taken from the valve and the voltage sweeps are bigger. But there is nothing completely inconsistent in the reverse effect; it's all due to valve construction, and maybe the bigger signals deflected the leaky stream into the anode filament path.

The effect might finally disappear because the chemical got tired; or, of course, you might have had a soft valve—some gas in the valve which has now been absorbed.

If the valve's characteristics require a load of 5,000 ohms for good output without distortion, surely all requirements have been satisfied without primary inductance ever having entered into the matter?"

It's like this (1) A valve must have the correct anode impedance. (2) The secondary of a resistance loaded step-down transformer makes the primary of that transformer look like a resistance *n* times the value of the resistance load. So that you are perfectly right so far.

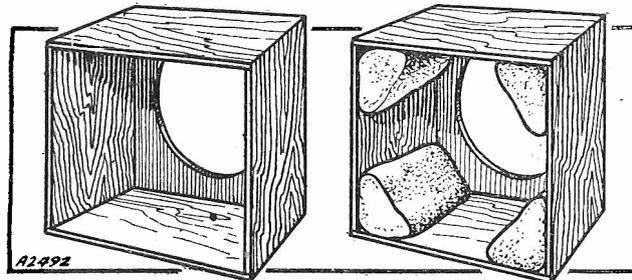
But what of the so-called magnetising current? What of the effective load in the anode circuit when the load is *not* present. This magnetising current must be small, otherwise we waste energy in magnetising the iron. We want all the energy to run from primary to secondary. So it is a good rule to make the no-load impedance 10 times the load impedance, or in your case 50,000 ohms.

This means an inductance (at 50 cycles) of $(2\pi Lf = 50,000)$.

$$L = \frac{50,000}{300} = 167 \text{ henries about.}$$

To say "high" means nothing; to calculate it, everything.

STOPPING CABINET RESONANCE



A tendency for the cabinet to resonate at certain frequencies and thus spoil reproduction can be prevented by packing the inside with slag wool, as explained in Capt. Eckersley's reply to G. T. (Bournemouth).

(A valve-maker would help you more than I can. I am not an expert in valve manufacture.)

A Primary Impedance Point.

W. J. (Cromer).—"When a transformer is employed to connect the loudspeaker to an output valve, it is generally recommended that the transformer primary should possess high inductance.

"Is this a true requisite of the transformer? For instance, if the impedance of a speaker is 500 ohms at all audible frequencies and a transformer of 10 to 1 connects it to an output valve, theory says that a load of 5,000 ohms is thrown by the transformer into the valve's anode circuit.

Resonance from the Case.

G. T. (Bournemouth).—"For purely artistic reasons, I mounted my loudspeaker chassis inside a square box type of cabinet. The results, however, were not very good and the reproduction was boomy. I removed the back of the cabinet, and this to a certain extent solved the trouble.

"Why should putting a back into a loudspeaker cabinet give boomy results?"

Or is there something wrong with my particular cabinet?"

Put your head in a box, and for purely inartistic reasons start talking! You (or your listeners) will thereafter agree that talking in a box doesn't make the voice terribly natural!

The loudspeaker is talking in a box (it talks backwards as much as forwards), and it suffers because it has to set up air waves inside a confined space, and these air waves are reflected all over the place.

Furthermore, the box sides vibrate and give all their characteristic resonances. You can overcome the trouble to some extent by filling the box with slag wool held by netting, or in canvas bags.

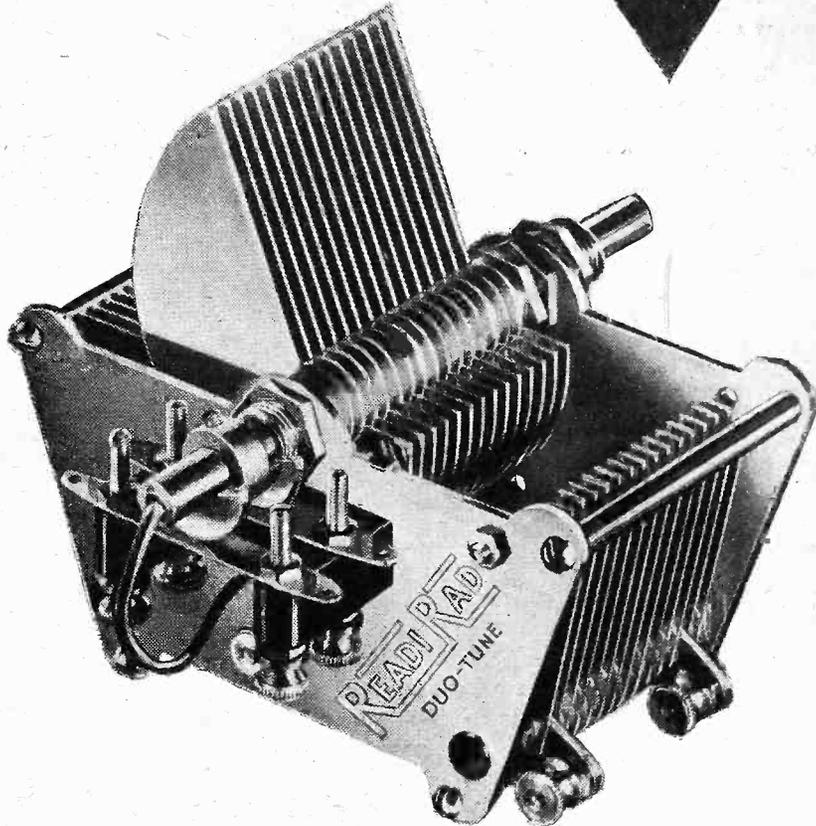
The **READY RADIO** **DUOTUNE** EXTENSER MODEL

Specified
for the
**COSMIC
STAR**

**Sensational
Invention by
G. P. Kendall, B.Sc.**

A new tuning condenser specially designed for all-wave tuning. Combines all the advantages of .00025 and .0005 mfd. condensers in one instrument, and possesses the unique feature of giving efficient tuning over all wavelengths—long, medium and short in one condenser operated by a single knob. It gives the fine control so essential for short-wave reception and automatically switches from medium-to long-wave tuning.

15/6

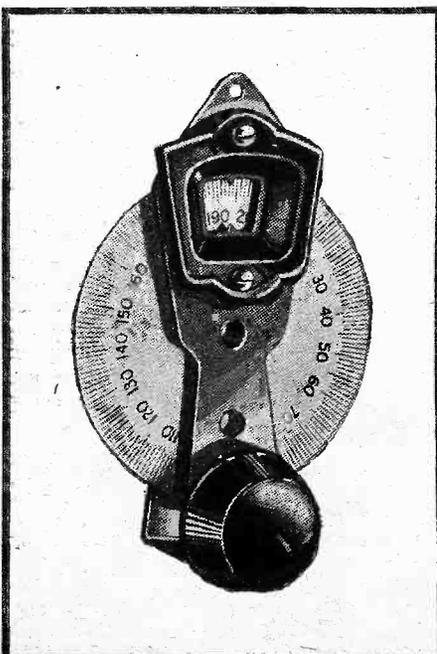


The DUOTUNE Extenser is specified for the "Cosmic" Star. It is equally essential for all other all-wave receivers. Your set is not completely efficient without this absolutely up-to-date component. When used in combination with the Readirad 20 to 1 Slow Motion Disc Drive (shown on the left) it forms a tuning control of the most modern and efficient design. Stations are widely separated and tuning greatly facilitated.

Readirad Slow Motion Extenser Drive—Price 3/-

READY RADIO

Adv. of Ready Radio Ltd., Eastnor House, Blackheath, S.E.3.
Telephone : Lee Green 5678. Telegrams : Readirad, Blackvil, London.



SHOULD POLITICS BE BROADCAST?

Howard Jones interviews a distinguished Parliamentarian who contributes some new thoughts to a subject about which there has been considerable controversy.

THE above is a question which will loom large on the wireless horizon in the near future. Since 1924, when election addresses were first broadcast, public interest in political happenings has increased enormously.

The three political speeches of that year reached about one-third of the total population of Great Britain, but on the B.B.C.'s own admission only *one* was definitely successful from the listeners' standpoint.

In February, 1928, the ban on political controversy in broadcasting was removed. At once there arose a public demand for political broadcasts, and the B.B.C. offered to transmit the Budget Speech from the House of Commons in the following April.

Inter-Party Disputes.

The offer was refused, but the three political parties met to devise "a mutually acceptable plan whereby politics would find a regular place in the programmes." The plan never materialised because the two opposition parties claimed equal rights with the government to the broadcasting rostrum.

Just prior to the General Election of 1929, it was decided, though under strong protest from the Liberals and Socialists, that the government should broadcast four election addresses, and the opposition parties two each.

The speeches created intense interest amongst home and foreign listeners. Subsequently, various attempts to broadcast debates from the House of Commons fell through, due again to inter-party disputes.

Then, at the recent General Election (October, 1931), when political excitement reached a higher peak than ever before, there were six broadcast speeches for the government and four for the opposition. This led to an immediate charge of political influence in the B.B.C. by an opposition leader when Parliament re-assembled.

After Question Time.

There is no doubt that this whole question of political broadcasting is one of extreme delicacy, and the B.B.C. will continue to approach it with the greatest of caution. Two days after the delivery of the King's Speech, I walked into the House of Commons in the hope of obtaining the views of a member who, in ten years, has established a reputation as a wise and steady Parliamentarian. He is Sir Kenyon Vaughan-Morgan, O.B.E., D.L., sitting for East Fulham.

After Question Time, I succeeded in finding him, and for the better part of an hour we sat in a corridor near the Members' Lobby, discussing the *pros* and *cons* of political broadcasting. Sir Kenyon holds some quite definite views.

"Political broadcasts," he said, "open up many difficult and controversial issues.

Much depends on the relationship of the B.B.C. with the government. As I understand things, the British Broadcasting Corporation is *not* a government corporation."

(I reassured him on the point. The B.B.C. is a self-governing corporation under a Royal Charter and Licence, like the Bank of England. Its only relationship to the government is through the Postmaster-General, who is empowered to see that the limits of the charter are observed.)

"I am disposed, therefore, to favour election addresses by the various political parties," Sir Kenyon continued. "Past experience has proved that political talks from authoritative sources foster interest, and keep the public alive to its responsibilities.

"That, of course, is a most important outcome. As for the question of political bias in broadcasting—it seems to me that charges, rightly or wrongly will continue to exist so long as there are party differences.

"But the question of broadcasting political debates from the House opens a wider and still more precarious field of possibility. Frankly, I should be opposed to it. You would need to be scrupulously fair to both government and opposition.

"In other words, you would have to

A DISTINGUISHED RECORD



Sir Kenyon Vaughan-Morgan has a distinguished record as a Parliamentarian. During the war he rose to the rank of Lieutenant-Colonel, and held a number of important administrative posts in the War Office. He has represented the division of East Fulham since 1922.



broadcast *entire debates*, not merely excerpts here and there. It is impossible to size up the merits of argument unless every speech for and against is heard and examined.

Mike in The House.

"Again, I believe the presence of a microphone in the House would be a derogatory influence, and contrary to the best interest of Parliament." Sir Kenyon hastened to assure me that he intended no disrespect towards his colleagues, and added: "Still, I believe there would be a tendency to speak, not for the benefit of the Commons, but for the benefit of wireless listeners. So long as that temptation exists, it seems to present an almost unanswerable argument against broadcasts from the House."

I suggested that in certain exceptional cases—such as the debate on the Sunday Cinemas Bill—public interest might be so great that the broadcasting of a House debate would fulfil a legitimate and popular demand.

Sir Kenyon agreed.

"I daresay in certain cases the demand would be there. But I cannot agree that it would be a wise thing, in such an instance, to fulfil it. My first objection—that of unfairness to one side or the other—would hold good, even supposing that temptation to 'flatter' the microphone were ignored.

A Vital Point.

"You see, to broadcast House of Commons proceedings on rational lines, you would need to broadcast every committee stage of the Bill in question. That, to my mind would be utterly impossible.

"Very often in committee the same arguments for and against are heard time and time again. That is the sort of thing that would definitely kill political broadcasting, and might conceivably damage public interest in the actions of the country's government.

"There is a further and vitally important point in connection with Parliamentary broadcasts. Here in England we are apt to consider wireless only in its national aspect. That is wrong. Wireless is international: it is world-wide. What is broadcast from England can be heard in any other country.

"That is something which must be borne in mind when the subject of politics and wireless is discussed. On certain occasions it may not be to our own national interests to have our debates—especially those connected with international affairs—broadcast for the world's ears."



THE TELSEN RADIOMAG

★ HOW TO BUILD THE TELSEN SHORT-WAVE ADAPTOR

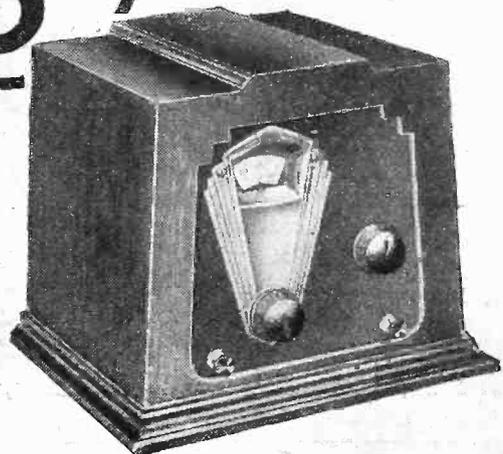
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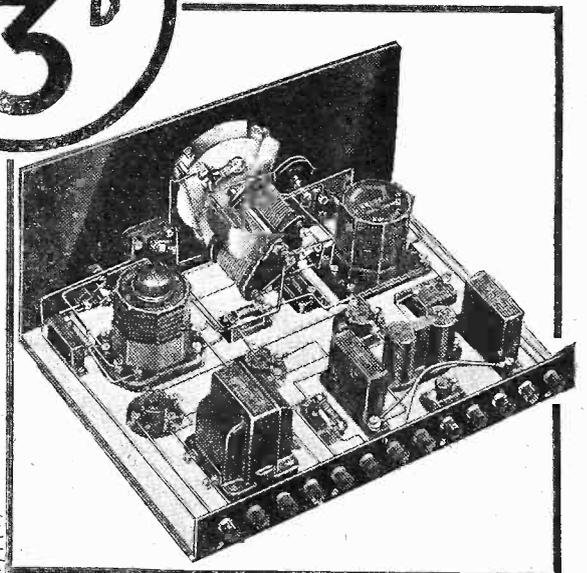
THE CONSTRUCTOR'S OWN MAGAZINE

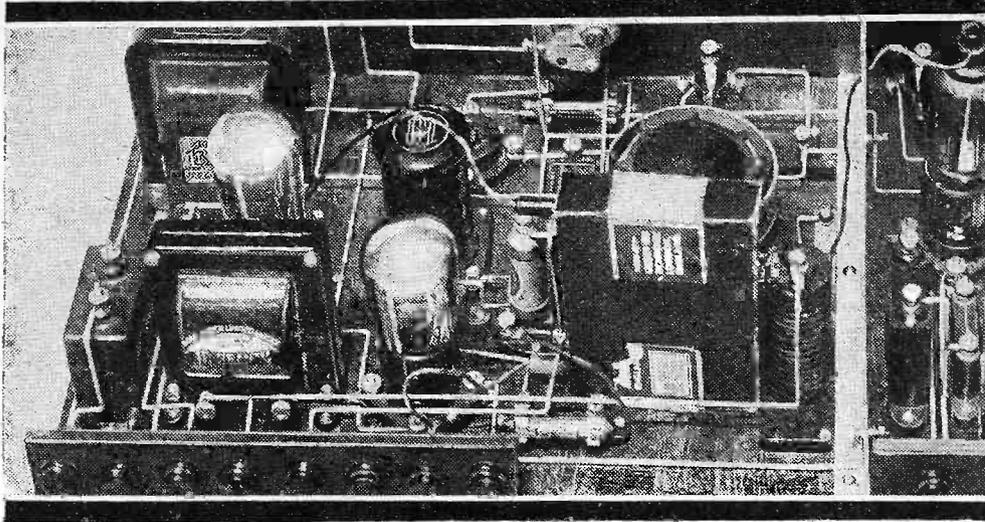
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NEW VALVES IN OLD SETS

THE higher standard of performance of the new sets over those of last year is due in large measure to the advances which have recently been made in valve design. The "figure of merit" of the new valve is, in most cases, "streets ahead" of what it was a year or two ago.

This applies as much to the high-frequency side as to the low. For instance, with a given signal input the latest type of H.F. amplifier will develop twice as much voltage to pass on to the next stage as one of the older type, whilst a new L.F. power amplifier gives double the power output to the speaker.

The High-Tension Supply.

Accordingly, there is a natural desire to attempt to bring an old-fashioned set right up to date by substituting new valves for old. The problem usually arises in connection with battery-driven sets—possibly fitted with a high-tension mains unit—but unfortunately the solution is by no means so simple as it may appear at first sight.

The proper filament voltage and an adequate supply of filament current should not present any trouble. But with a high-tension unit care must be taken to see that it is capable of giving the required voltage when supplying the larger current required by the new valves.

For instance, the mains unit may have been designed to give a "maximum" voltage of 150 on a small output of from 10 to 12 milliamps so that it is perfectly suitable for a Marconi or Osram P.215 valve, which takes only 8.5 milliamps, but not for one of the new P.2 power amplifiers, where the output rises to 19 milliamps. In other words, the new valve has a lower internal resistance, and this, in turn, may "drop" the maximum H.T. voltage from the eliminator to, say, 100 volts, which is, of course, too small for maximum volume with proper reproduction.

A Question of Milliamps.

It is essential, therefore, before changing over to an L.F. power amplifier with greatly-increased current-handling capacity, to make sure that the existing mains unit is able to give a sufficient output in milliamps to meet the increased demand without undue falling-off in voltage.

If you just "swop" old valves for new, you may not get the increase in performance that better characteristics seem to promise. There are certain points, dealt with in this article, which require attention when fitting new valves.

By CARDEN SHIELDS.

As regards grid bias, if this is derived from a battery it can readily be adjusted, but if "free" grid bias is employed the biasing resistance will probably have to be readjusted to give the required value at the new current.

In the case of screened-grid valves the setting of the potentiometer will also need

attention, and if this is also used for volume control, the series resistance (if any) will either require increasing or decreasing to make the maximum correct.

Adjusting S.G. Volts.

A convenient method of ascertaining the correct S.G. voltage is to insert a milliammeter in the plate circuit, and then adjust the potentiometer until the correct anode current is passed, keeping the normal bias on the control grid. It is best to make this adjustment with the set tuned so that no station is coming through.

The question of stability will also require consideration. A valve having a higher "mu" factor may give rise either to instability or distortion, by increasing the feed-back. Of course, some degree of feed-back exists even in an almost

perfect set, but the amount permissible in an inefficient set may easily rise to oscillation point when the "step up" is increased twenty-fold by inserting one or more high-mu valves. In fact, the feed-back may then become equal to, or even exceed the actual signal input.

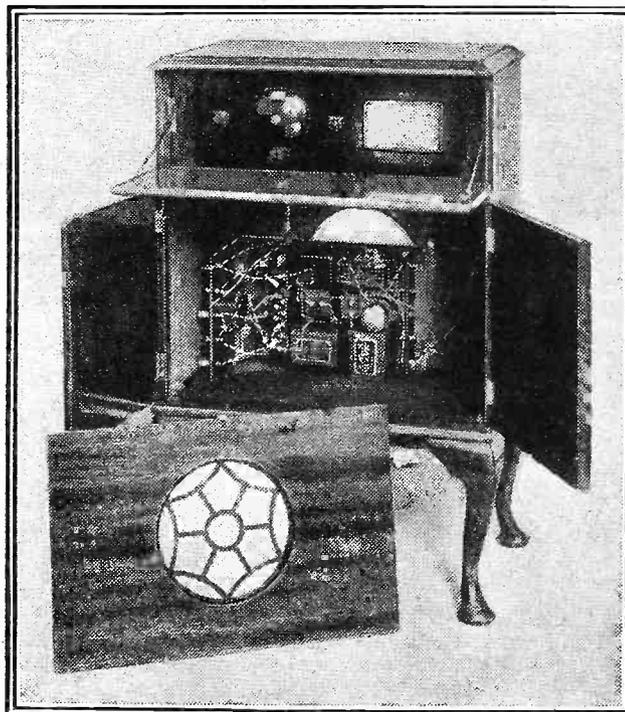
On the L.F. Side.

Dealing with this problem first on the low-frequency side (which will include the detector valve), an attempt is often made to decrease the decoupling resistance so as to maintain the required voltage on the valve. This in itself may introduce further instability unless the by-pass condensers are proportionately increased, since the effective feed-back is determined by the amount of current passing through the battery or supply source.

As shown in the diagram, the output is divided between the condenser, which is of low-impedance, and the high-impedance decoupling resistance R in

(Continued on next page.)

A POINT TO BE WATCHED



It is quite likely that new valves, particularly the output type, will need more high-tension current, and so you must always see that the mains unit in use is capable of supplying the needs. A good, big unit, as shown in this set, is desirable, so that there will be power in hand.

NEW VALVES IN OLD SETS

(Continued from previous page.)

series with the battery or H.T. unit. Obviously the first effect of reducing the value of the resistance, R , will be to increase the current flowing through the H.T. source, and therefore the liability of the set to oscillate. However, this can be remedied by increasing the value of the parallel condenser, C , so that it can by-pass a larger part of the current, and so keep it away from the H.T. supply.

On the high-frequency side, any previous coupling through the valve will be diminished, since the inter-electrode capacity of the new S.G. valves has been reduced practically to zero.

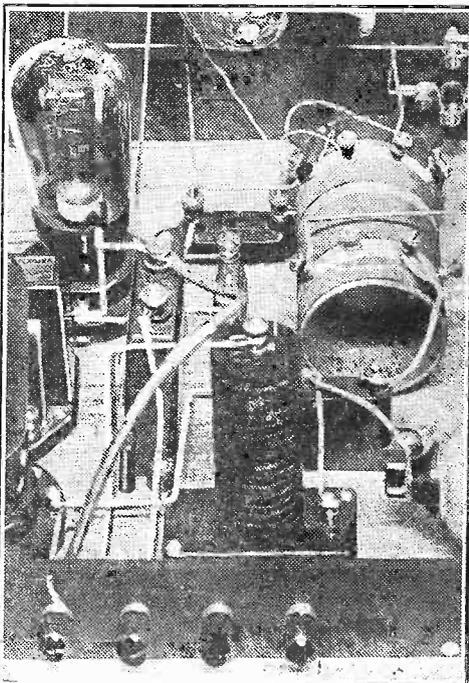
Some steps may, however, have to be taken to compensate for the effect of increased feed-back through the leads, etc. With the older type of valve this merely added a little useful "gain" by reaction, but with the newer valves it may lead to instability, particularly on the lower wavelengths.

The Use of Coil "Pots."

With unscreened coils, or where merely a vertical screen divides the coils, coupling may arise between the electrodes of the valves and the coils, in which case it will be better to place each valve in a separate screening box. In some cases the position of the valves can be altered so as to take advantage of the valve screen to reduce any existing coupling between other circuit components.

A screening-pot for each coil is another effective stabilising means, though it may necessitate re-ganging, as it reduces the coil inductance, especially if the screens are close to the coils. Preferably the sides of the

THAT DE-COUPLING RESISTANCE

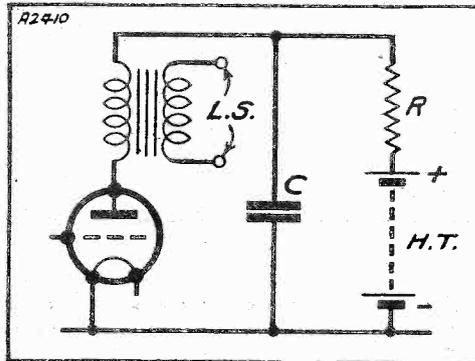


Don't be tempted simply to reduce the value of a de-coupling resistance so as to get a higher voltage on a valve's plate. If you alter only that Spaghetti you may start a whole heap of trouble.

coil should be separated from the screen by an inch in the case of 2-inch diameter coils, i.e. the pots should be 4 inches in diameter. Finally, the leads can be screened from the anode of a screened-grid valve by placing them in systoflex covered with tinfoil, which is then earthed.

It is particularly difficult to replace an old valve by new ones with greatly different characteristics in a neutralised receiver. In the nature of things the existing valves have already been carefully balanced, and

AN IMPORTANT RATIO



The value of R in relation to C is quite important. The lower the resistance of R , the higher the capacity of C should be.

the amount of feed-back is necessarily increased as the mutual conductance is raised. This, of course, will at once give rise to instability.

If the set is perfectly stable in the first place, the use of a valve with slightly improved characteristics may be possible, but anyone attempting to stabilise a 2 H.F. neutrodyne fitted with valves having a mutual conductance of the order 5 m.a. per volt will find it a troublesome task.

"Figure of Merit" Values.

Generally speaking, the most informative thing to know about a valve is its mutual conductance, which is expressed in milliamps per volt, and shows how much current change is produced in the plate circuit (with no external load) when the grid input is altered by one volt.

At the same time, this "figure of merit" varies with different types of valves, so that comparisons can only be made with valves of the same general type and of comparable impedances.

If the impedance of a screened-grid valve is increased, selectivity will in general be improved by the replacement, and most likely, though not necessarily, volume.

Unless band-pass tuning is used, a high impedance value is liable to give rise to cross-modulation, particularly when receiving the local station, since the working characteristic of such a valve is generally short.

Variable-Mu Valves.

The new variable-mu valves provide an ideal volume control because the mutual conductance can be varied by as much as three hundred to one without affecting tuning or upsetting ganging. They cannot, however, be adapted to an old set unless volume control is effected by grid bias, and even here the extensive range of grid-bias variation—usually covering 40 volts—makes a change-over difficult in practice.

AN ACCUMULATOR TERMINAL TIP

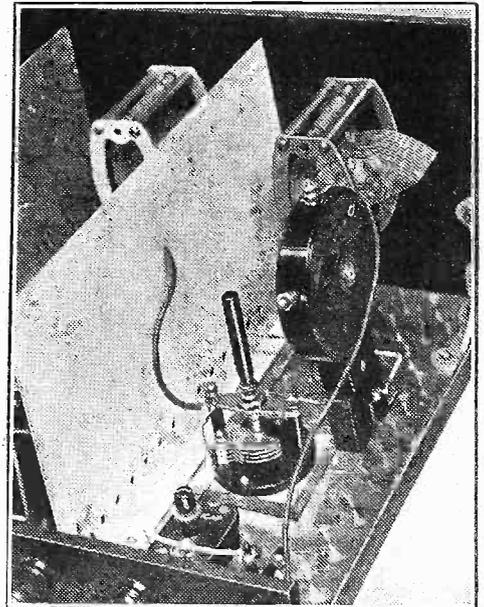
How to keep your accumulators in the best of condition.

MANY readers who are not fortunate enough to possess an all-mains set, but who have to resort to L.T. accumulators for heating the filaments of their valves, have probably at some time in their radio "career" had trouble with corroded accumulator terminals. It most frequently happens when the battery in question is put out to the local charging station for replenishment, where those responsible are too busy to give it that little individual attention that makes all the difference to its condition.

Gassing Too Freely.

The corrosion is caused by the battery being allowed to gas too freely when it is on charge, with the result that a certain amount of acid is blown out over the terminals. A chemical action sets up, and a coating of "sulphate" forms on the metal-work. The longer it is left, the thicker this coating becomes, and in time it may even eat the terminals away completely.

CARE NEEDED HERE



The use of modern valves in old sets of the neutralised type is not too straightforward, and may mean difficulty in obtaining stability.

When a battery gets in this state the terminals should be scraped clean with an old pen-knife, and then polished with a piece of fairly fine emery cloth. When they are thoroughly clean and bright, apply a thin coating of vaseline to all the metal parts. This recipe is very effective indeed, and is always used in all good charging stations. Unfortunately, however, there appear to be very few of these left nowadays.

Use a Damp Rag.

If the terminals are treated in this manner every time the cell comes back from the station, you will have no more trouble. In fact, it is a good plan to wipe the whole of the outside of the accumulator over with a piece of rag damped with water, followed by a dry one. This will remove any stray acid that may be on the outside.



THE TELSEN RADIOMAG

PRACTICAL HINTS & TIPS

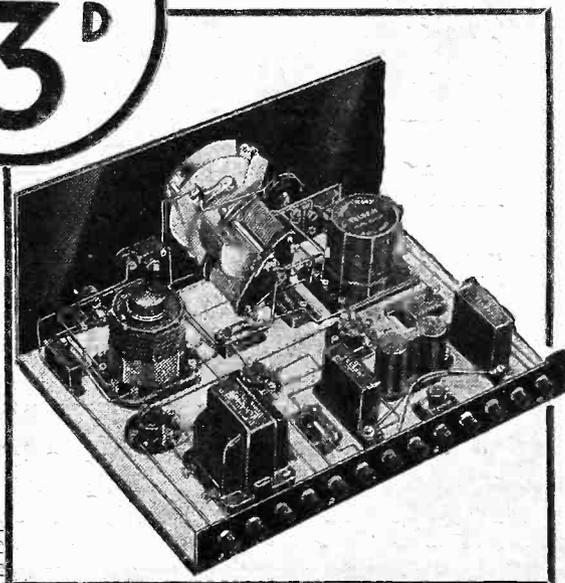
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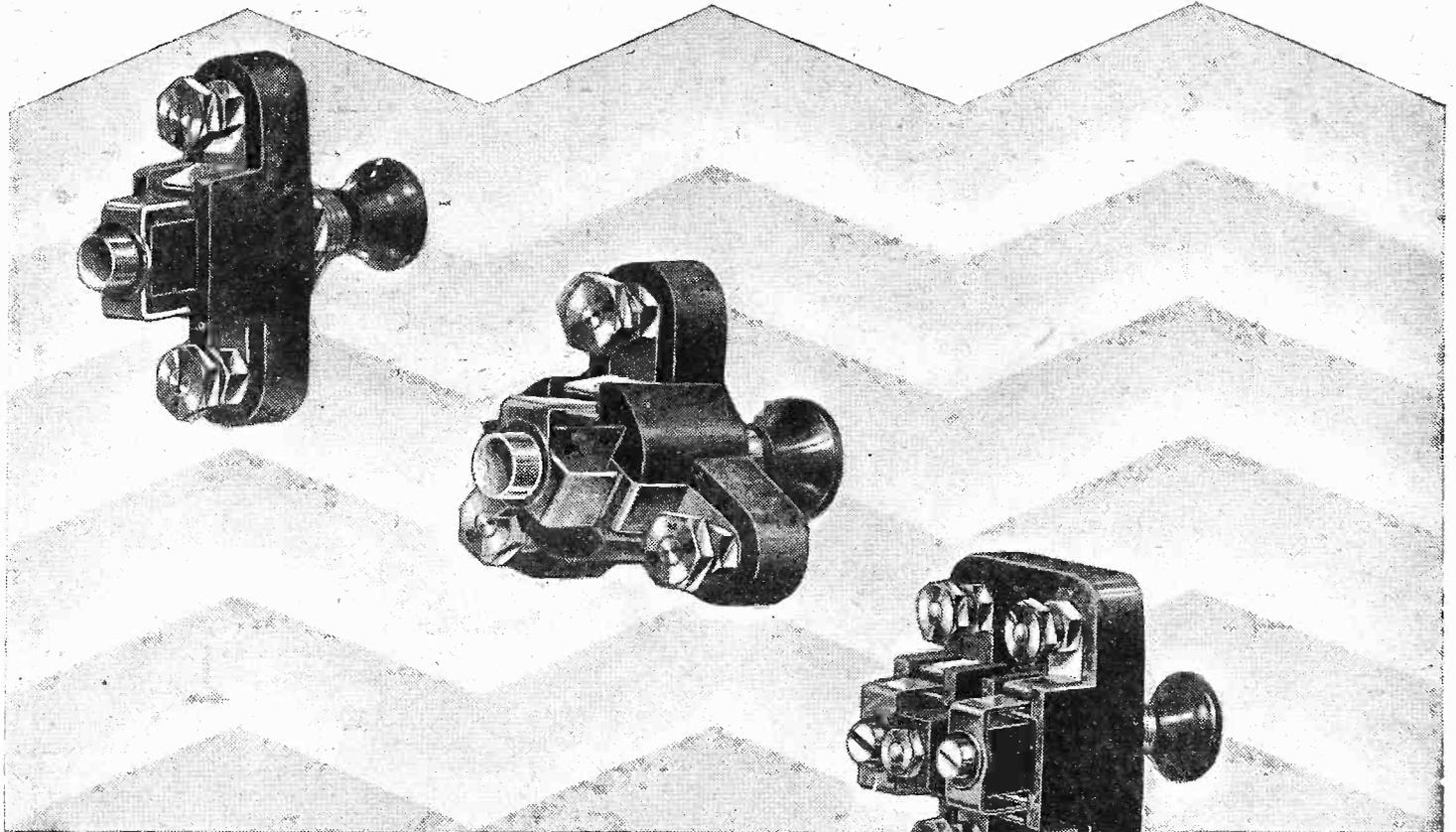
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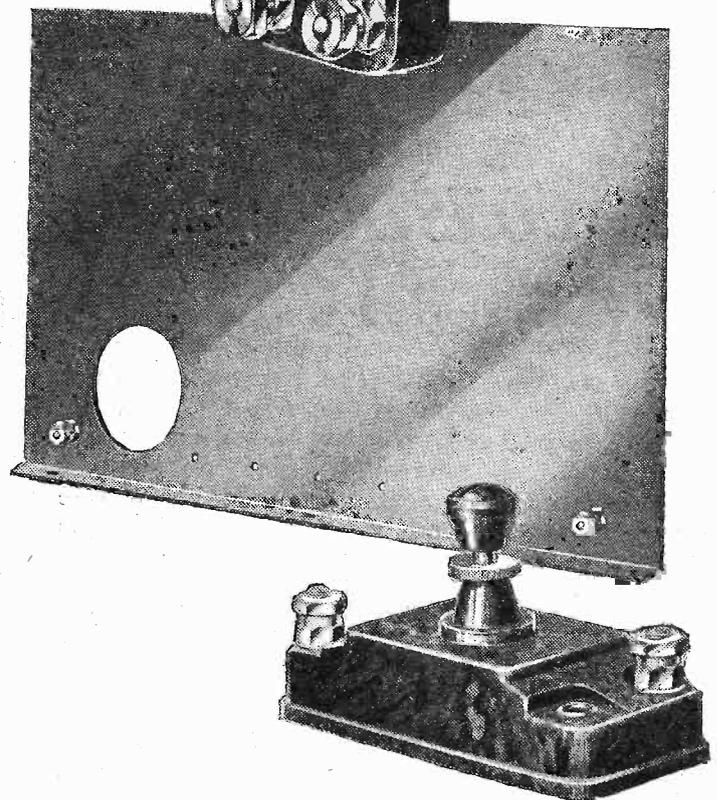
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TELSEN TRIPLE THREE



LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

It has been suggested that "blind" spots, where radio reception is bad, may be caused by radium in the local rocks. The possibilities of this interesting argument are here discussed

By J. F. CORRIGAN, M.Sc., A.I.C.

RADIO AND RADIUM

THERE is apparently little in common between radio and radium, except it be in name. So, at any rate, it would seem on first acquaintance with the matter. But, really, the more we study the many facets and aspects of the science of radio and that of radium, the more we are struck by certain points of connection between them.

Radium continually gives off from itself three different sorts of rays—*alpha*, *beta*, and *gamma* rays. The *alpha* rays of radium, as, no doubt, you are already quite aware, consist of a stream of positively charged particles—in reality, helium atoms—which are shot off from the body of the radium substance.

Miniature "Transmitters."

The *beta* rays of radium comprise negatively charged electrons flung off from the radium material at an amazing speed (something like 100,000 miles per second), whilst the *gamma* rays are really minute waves in the ether, comparable to X-rays, set up by the disrupting radium atoms.

In addition, radium also emits a gaseous radium-like substance—the well-known "radium emanation"—which behaves in many respects as if it were actually radium itself.

It will be seen, in regard to the *gamma* rays, that each atom of radium is, in reality, a veritable miniature transmitting station, for it originates waves in the ether much as the highest-powered broadcaster of modern times does.

The only difference, of course, between the two is that we can control in every detail the transmissions of our own broadcasting stations, while Nature's exceedingly diminutive broadcaster, the minute radium atom, is as yet absolutely uncontrollable by man.

Where Results are Always Bad.

There is, however, one aspect of that tremendously fascinating substance, rather happily called radium, which connects it up to radio in a far more practical manner, and it is this connection between the two that I propose to discuss in these columns for the interest of keen amateur scientists.

Experts in radio transmission have long recognised the existence of poor areas of reception—"blind," or "dead" spots, as

they have been termed. Many of these blind spots in a station's effective area have been accounted for, and, to a greater or less degree eliminated.

Other blind spots, however, have been found to be more mysterious in causation. Consequently, they have proved to be more intractable in their elimination than the others.

On the Rocks.

For quite a number of years the suggestion has been put forward that radium in the rocks or in the soil may have some effect on broadcast transmission and reception, and that this effect may exist unsuspected in areas of mysteriously poor reception.

Radium, as we have seen, gives off *alpha*, *beta*, and *gamma* rays, and also a certain kind of emanation. The air surrounding a mass of radium or its compounds

These electrons collide with the atoms of the air, and, in doing so, they manage to knock other electrons out of the atoms comprising the gases of the air.

Ionised Atoms.

Now, a complete atom of any substance whatever is a perfectly neutral body. When it has one or more electrons knocked out of it, however, it becomes positively charged.

You want to know exactly why this is so? Well, any atom, as you know, consists of a central *positively charged* nucleus with a number of *negatively charged* electrons revolving in orbits round it, just as the planets of the solar system revolve around the sun.

The atom is a neutral body simply because the positive electrical charge on the central nucleus exactly balances the sum of the negative charges on the revolving electrons. When you take one or more electrons away, however, the opposing charges fail to balance each other. Consequently, the atom becomes electrically positive.

An atom in this condition is said to be "ionised." It is not a complete whole. It has had a bit taken away from it, and it has become electrically active. Thus, you will be able to see that a few thousand of these "ionised" atoms existing in a cubic centimetre of air or so will render the volume of air slightly conductable.

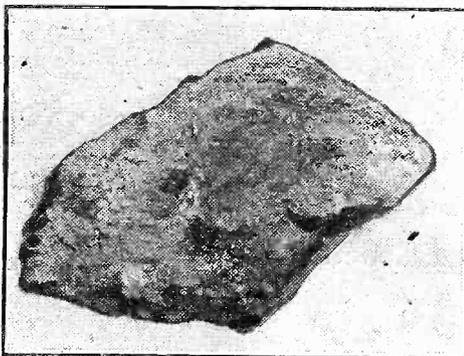
A Classical Experiment.

An experiment which is now almost classical, and which is illustrated on the next page, will make the above explanation of the ionising effect of radium clearer. You have two electroscopes. One contains a small bottle having a very small quantity of radium substance in it. The other electroscopie is free from radium.

The two electroscopes are electrically charged at the same moment. Their leaves diverge, as usual, under the influence of the charges. The leaves, however, of the radium-containing electroscopie soon come together again, the radium rays having ionised the air in the electroscopie, and so rendered it conductable enough for the charge to leak away to earth.

(Continued on page 1386.)

RADIUM ORE

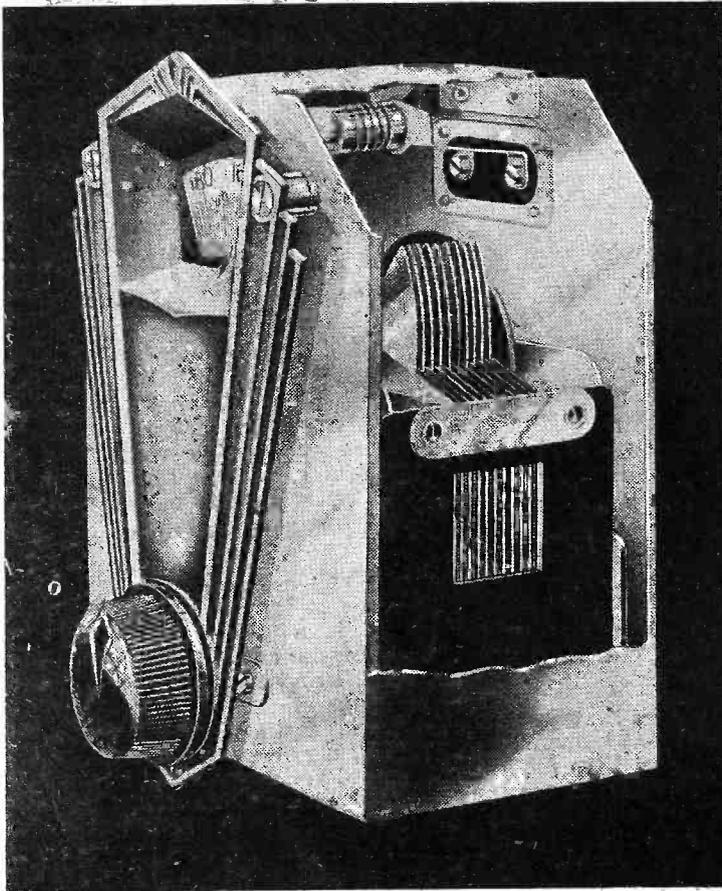


Pitchblende is the name given to radium ore, a large amount of which is to be found in Cornwall. In the above article it is suggested that this may be the reason why this county is such a poor locality for radio reception.

is always in an "ionised" state—that is to say, it is rendered electrically charged, and, therefore, slightly conductable.

The reason for this fact is to be grasped from a consideration of the *beta* rays, those almost incredibly fast-moving streams of negatively charged electrons which radium materials of all kinds continually and unceasingly shoot out around them in all directions.

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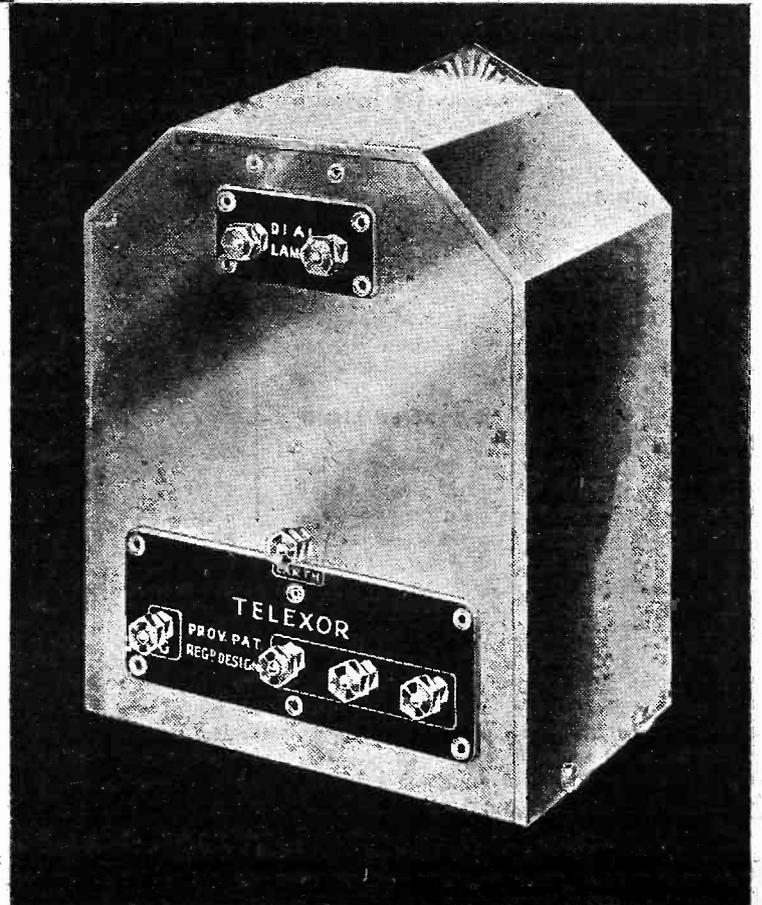
The photograph above shows the inside of the "Telexor," and the photograph alongside shows the back. Full instructions for connecting up are included with every "Telexor."

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AND
PRACTICAL



IN TUNING

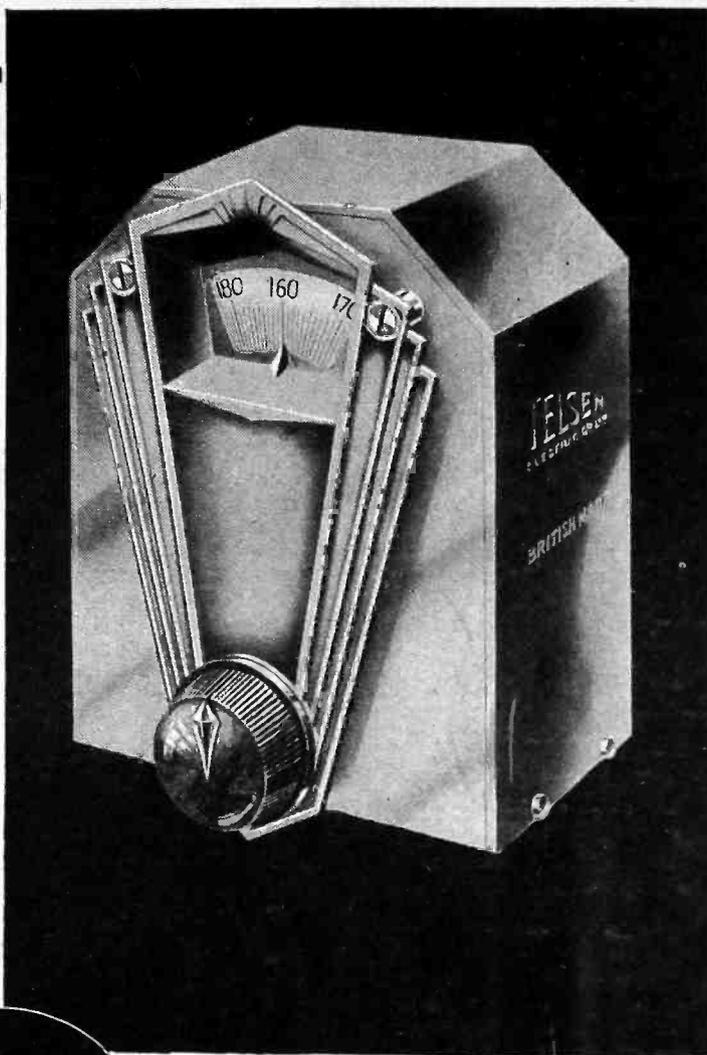
TELSEN

PUTS

**MEDIUM AND
LONG WAVES**

ON

ONE DIAL



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The photograph above shows the front view of the "Telexor"—it can be mounted on panel or base-board as desired. It is amazing value at an astonishingly modest price. It appeals to amateur and expert alike.

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SOLVES ALL YOUR WAVE CHANGE PROBLEMS

RADIO AND RADIUM

(Continued from page 1383.)

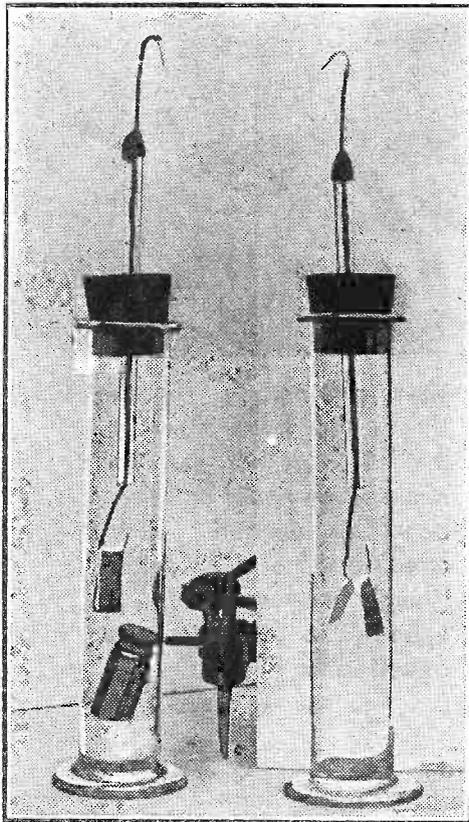
Now, it is pretty well known, I think, that radium is not such a tremendously scarce element as it was once thought to be. Quite a number of masses of rock in the earth's surface contain extremely minute amounts of radium, although, of course, it would not pay to attempt the commercial extraction of this valuable constituent.

In Different Districts.

However, it has been suggested from time to time that the air above these radium-bearing rocks may quite possibly, owing to its slight ionisation, exert influences upon radio waves speeding across that area of land.

Some time ago, measurements of the degree of ionisation of air in various localities were taken by scientists. In the air surrounding Paris, for instance, where the

AN ELECTROSCOPE TEST



This fascinating experiment, which is explained in the accompanying article, demonstrates how radium will effectively neutralise the charge on a gold leaf electroscope.

radium content of the soil is said to be low, or practically nil, a barely appreciable degree of ionisation was detected.

Over Vesuvius, however, in consequence of the active gaseous emanations of the volcano, the air's conductivity was found to be at least twelve times that of the Paris air, while over a number of potassium mines in Alsace, the air conductivity was six or seven times that of the air surrounding the Eiffel Tower in Paris. Here, of course, an explanation is to be seen in the fact that potassium compounds are all very slightly radio-active.

It is, therefore, pretty certain that the air over radium-bearing districts possesses different electrical constants from that existing over non-radium lands. Therefore, if, as we have seen, the electrical conductivity of the air in different districts varies, it is quite possible, and, indeed, more or less certain, that the speed of travel of a radio wave over these areas will be influenced, and that certain bendings or distortions will be introduced into the wave-fronts.

The whole subject of the earth's deposits of radium and their influence, no matter how slight it may be, upon radio transmission and reception is, however, still very much a highly theoretical one.

There seems to be no doubt, however, that the radium-ionisation of the air in various small localities of the world is at the bottom of quite a lot of this "blind spot" business.

I do not happen to know whether there are any particularly intractable blind spots in Cornwall. Radium ore—pitchblende—has been found in fair amount in Cornish districts, and, thus it is quite feasible that these deposits may be influencing reception to an appreciable extent.

I think, however, that, for the majority of us, the connection between radio and radium is likely to remain one of theoretical interest only. Both radio and radium possess remarkable features and properties.

Both of them, too, have proved themselves to be wonder-working forces in the modern world. Perhaps, after all, it may be for the best that the practical connection between radio and radium begins and ends (so far as we know at present) with the matter of "blind spots" in radio's reception areas.

A SIMPLE TESTING UNIT

This useful gadget will solve many of your fault-finding problems.

I HAVE often seen mentioned the "Battery and Headphone" test for continuity, but have never seen it embodied as a practical component, so I am forwarding particulars of the unit I constructed about two years ago. It, together with the battery which was originally placed in position, is still giving good and valued service.

For the benefit of those not familiar with the idea of such a tester, it may be advisable to explain that it works with any pair of 'phones, these being connected in series with a small battery when testing for a break in components or circuits.

Protected Prods.

The battery is kept housed in the box out of harm's way, and when necessary to use 'phones only, it can be cut out simply by shifting the plug connector to a different terminal, as explained below.

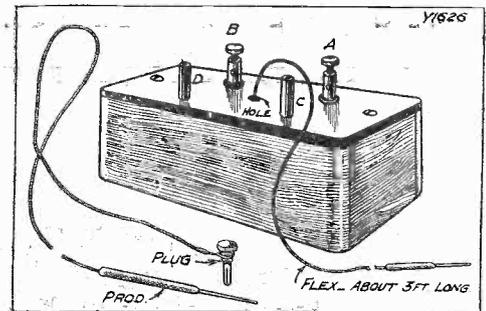
The prods are of the usual testing type, with a flex lead making good connection inside the handle to a metallic spike. This spike pierces insulation of flex leads, etc., if required, and is thus invaluable for quick testing.

It is important that the connection between flex and pointer be covered with an insulating handle, so that misleading

"clicks" are not obtained by accidental contacts made with the fingers.

As shown in the plan, C is connected

READY FOR BUSINESS



The wood case contains a small dry battery, and with a pair of headphones connected to the terminals and the useful testing "spikes," it makes an ideal testing set.

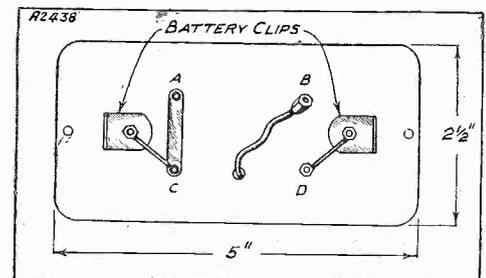
to battery clip and terminal A, and D is joined to the other battery clip.

The panel—in my case, ply-wood—can be of ebonite. A and B are the telephone terminals, whilst C and D are the plug sockets. The strips of springy brass for holding the small battery are secured in position by small countersunk bolts.

The drawing will convey better than words the construction of the unit, which I am sure many fellow-readers will find most useful in many and varied ways.

One prod lead goes to the terminal marked B, whilst the other flex is secured to a plug which can be plugged into either

UNDER THE PANEL



From this drawing you will be able to obtain all the measurements necessary for making the unit. Note the brass clips which make contact with the battery beneath the panel.

C or D socket. If placed in C the battery is cut out, and it forms a convenient arrangement for testing aurally a set stage by stage. Placed in D socket, it throws the battery into circuit and supplies a splendid method of obtaining that double click that brings a jump of joy to our hearts when a suspected component turns out O.K.

A SHORT-WAVE NOTE

Buenos Aires Testing.

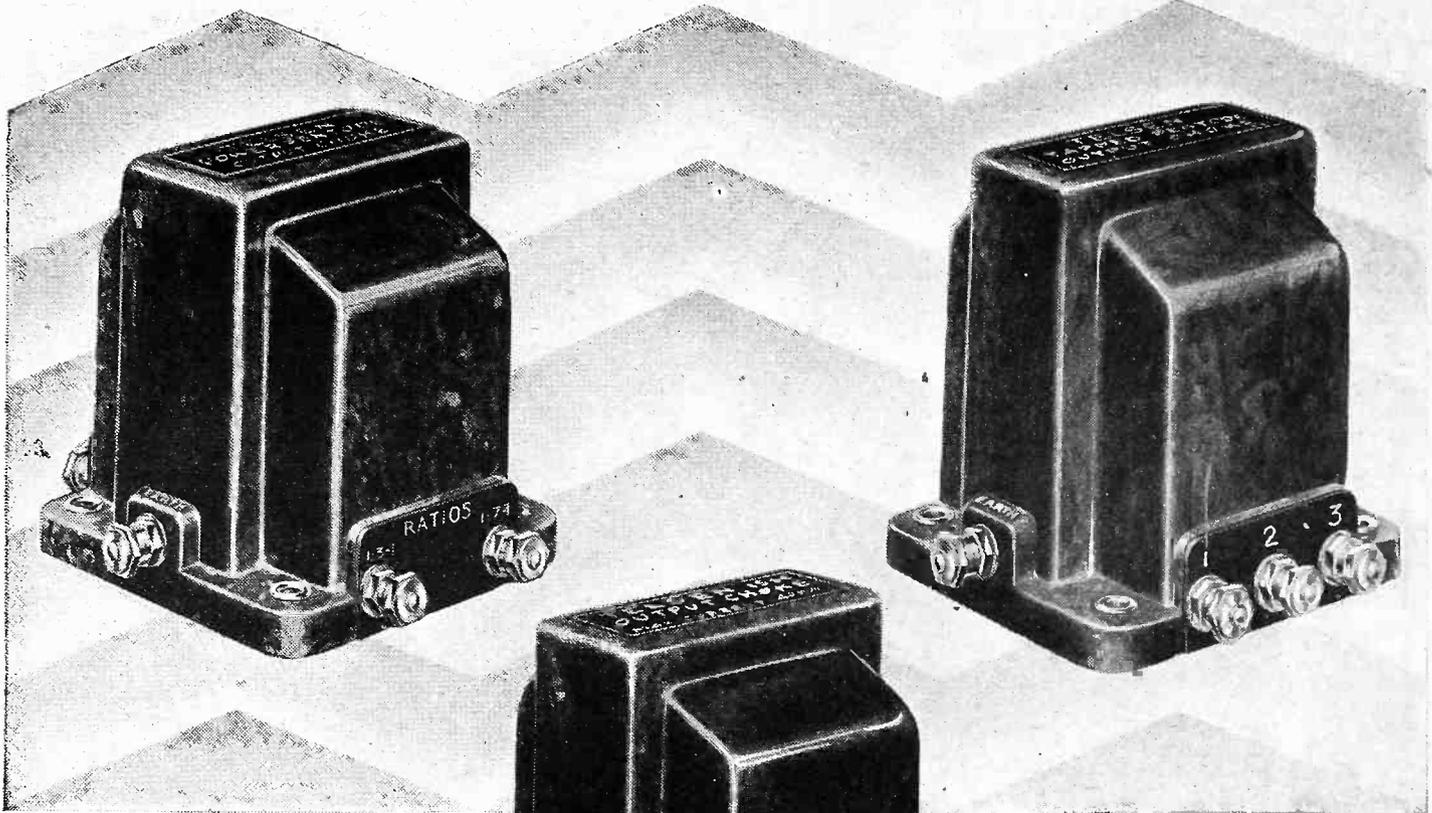
The Editor, POPULAR WIRELESS.

Dear Sir,—Apropos of R.V.L.'s report of broadcast from Buenos Aires, in "Short-Wave Notes," you may be interested to know that this was received, in daylight, at Thornton Heath, quietly, in the loud speaker on a "Magic" Three set, and was being relayed by New York, (I think W 2 X A D), and that in addition to the call-over at the end of the transmission there was one at the start ("Are you ready"?). Announcements were made (apparently from Buenos Aires) in rather high-pitched and rapid English.

Yours faithfully,
H. D.

Thornton Heath, Surrey.

TELSEN OUTPUT CHOKES



TELSEN POWER PENTODE OUTPUT CHOKE

To prevent direct current passing through the loudspeaker and to match the speaker to the pentode valve. Suitable for mains power pentodes carrying currents up to 40 m/A and for correct matching, gives a choice of three ratios, viz.: 1-1, 1'3-1 and 1'7-1. Total D.C. Resistance, 490 ohms PRICE

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Designed for pentodes taking an anode current of not more than 20 m/A. Single tapping provided gives (by reversing) ratios of 1-1, 1'6-1 and 2'5-1, for matching under widely varying conditions. Equally suitable for matching a low impedance speaker with an ordinary power valve. A coupling condenser of 1 mfd. is recommended. Total D.C. Resistance, 490 ohms PRICE

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TELSEN OUTPUT CHOKE

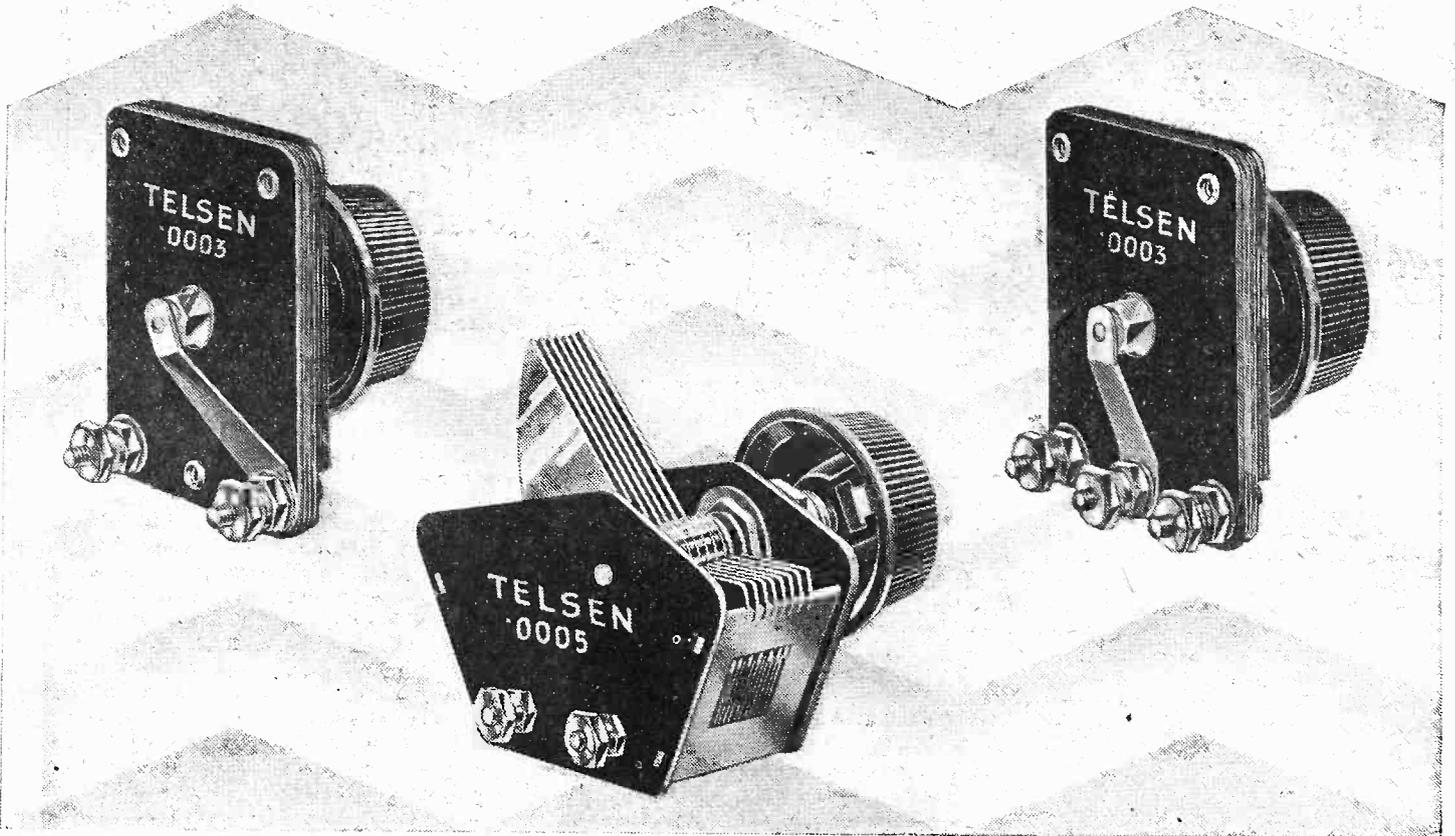
For use as Output Filter with a condenser not less than 1 mfd. Modified to deal with any power or super-power valve taking up to 40 m/A, and the D.C. Resistance has been reduced to 242 ohms. The inductance is now 15 H at 5 m/A and 8 H at 40 m/A — gives a practically level power response down to 50 cycles PRICE

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The Telsens Short-wave Coil adds the Short Waves without coil changing.



TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL



(Beshrew me, if all the characters in this fantasy be not fictitious, saving Will alone!)

LO! I lay a'thinking how all the world do dearly love to meditate upon time past and to yearn for the brave deeds of old; how it were well a Daniel should come to judgment, a Cromwell to the State's helm, a Nelson to keep us the seas, and in like manner. But marry, I am a man of the quill and inkhorn, methinks the most potent of all weapons but man's spirit—or *mind*, and it please ye, good my masters.

Thus turned my thoughts upon the written word and the poverty of estate to which it hath lately sunken, and how sorely we lack a John Knox to indite yet a "Fourth Blast" of his trumpet against this "monstrous regiment of women"—

writers and miasmal scribblers in the modern vein, so beprated and puffed-up by Master Harald Nikelsen, that sleepy talk-monger with courtly drawl and down-talking mannerisms. "Poor fools," quo' he, "I am the Literary Bloke and wisdom dieth with me. I am of the Gang, than which there be none other!"

"All Fools' Day"

Lo, I was in the spirit on All Fools' Day and was present while one, Will Shakespeare, a Warwickshire man singled out by Destiny to write for all time and all space, tarried briefly at Savoy Hill and blessed them therein more than they wotted of. They did entertain an angel (albeit but scurvily!) in the form of erring man.

* * * * *

An entertaining flight of fancy on the part of our old friend—ARIEL.

* * * * *

For the Globe Theatre being barred, against a cleansing—of which (God wot!) it stood in sore need—our Immortal Will was "secured" (quo' the "Radio Times," which listeth not that the stars of Heaven are not as those of Hollywood)—"secured," quotha, as Director of Programmes.

"Our Immortal Will Was 'Secured.'"

Whereupon the stars threw down their spears and watered Heaven with their tears. Never was there such a fall since that portrayed by Master Milton in "Paradise Lost."

A miraculous hush fell upon Savoy Hill that April morning, and men said openly that the light and air partook of a magic quality, which invested the river and the buildings along the marge with the unsubstantiality of a dream. The great office hung upon an Event, even the compilers of the "Radio Times," becoming aware of a sense of shrinkage, as though they and Macaulay were not really the godlings they pretended. Those of the staff who were blessed with humility and imagination stood swallowing their saliva, in a state of pure funk, and of these Honk, the doorkeeper, and Pryde, the floor porter on duty outside the Director's room, were in a critical condition. "I'm all of a tremble," said Honk, "an' I has to see 'Im fust. I wish

I were well out of it." As for poor Pryde, he had to be nailed to his post by unveiled threats of dismissal; so he stood by the fire-extinguisher and shook like one palsied.

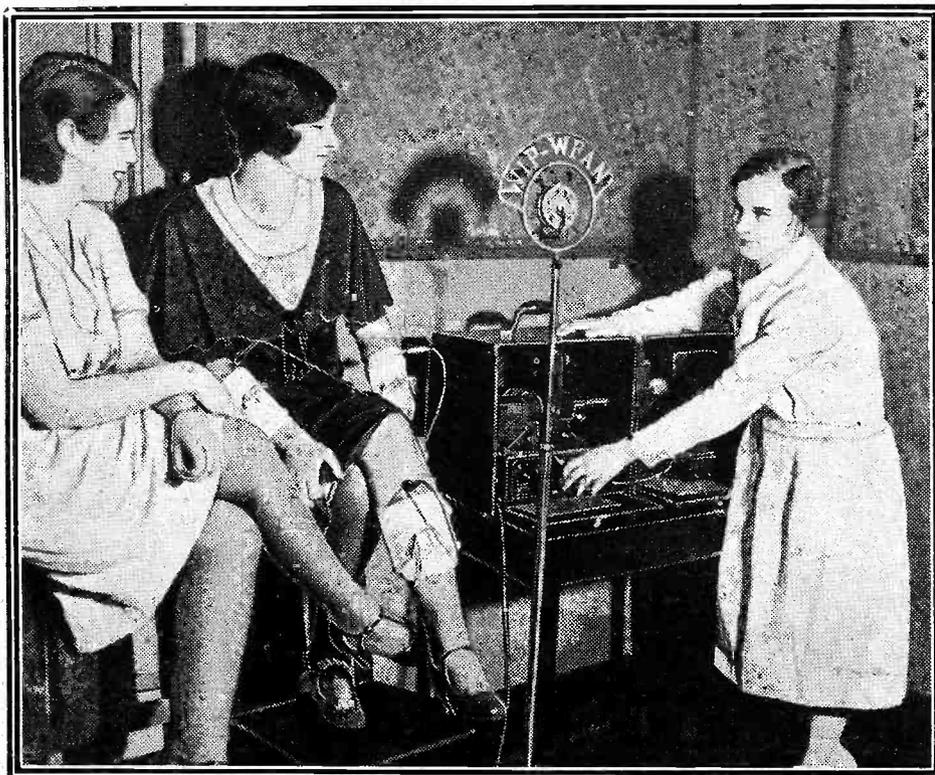
A slight, brown form turned the corner. It was a man clothed in doublet and hose with a narrow ruff of lace round his neck and a feathered, sombre-hued, cap on his head.

"Hamlet"

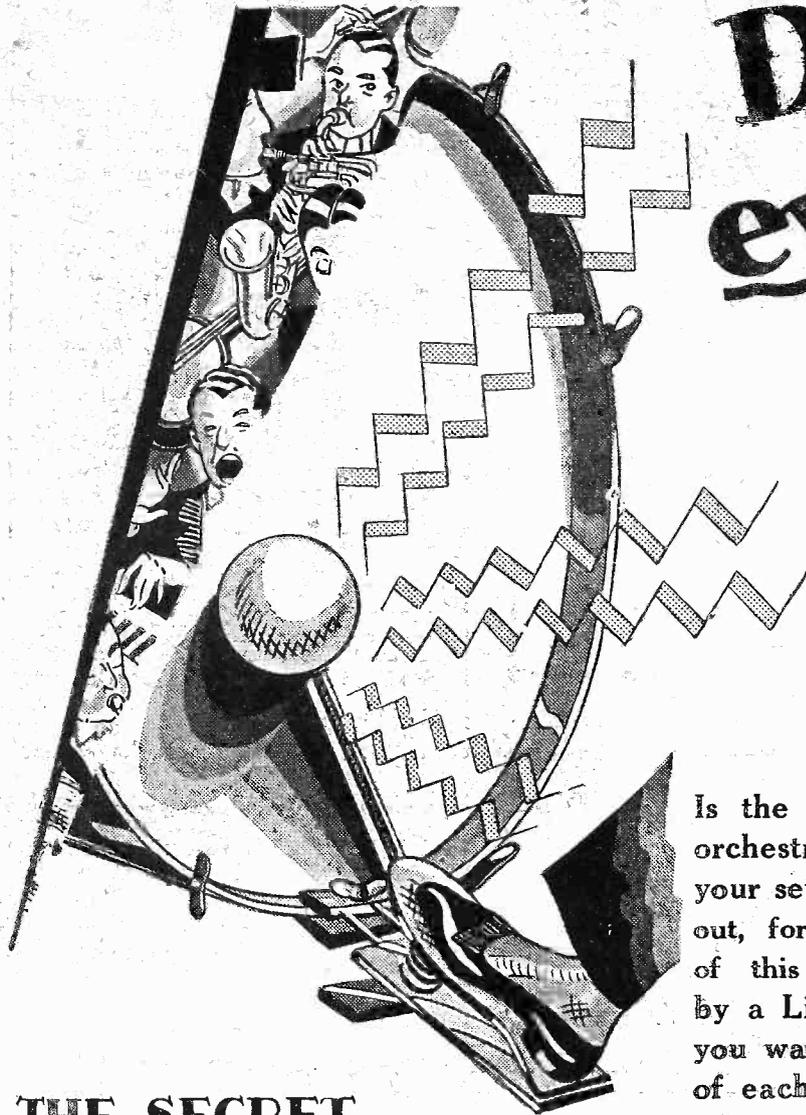
He walked pensively, as though pacing an arbour, hands clasped behind him, head a little bowed. Ever and anon he lifted his head and looked at the bluesky, and then his hands came round and made little signs. It was Will Shakespeare in the hot fit of a new play—"Hamlet" was the name of it, they said.

(Cont'd. on page.)

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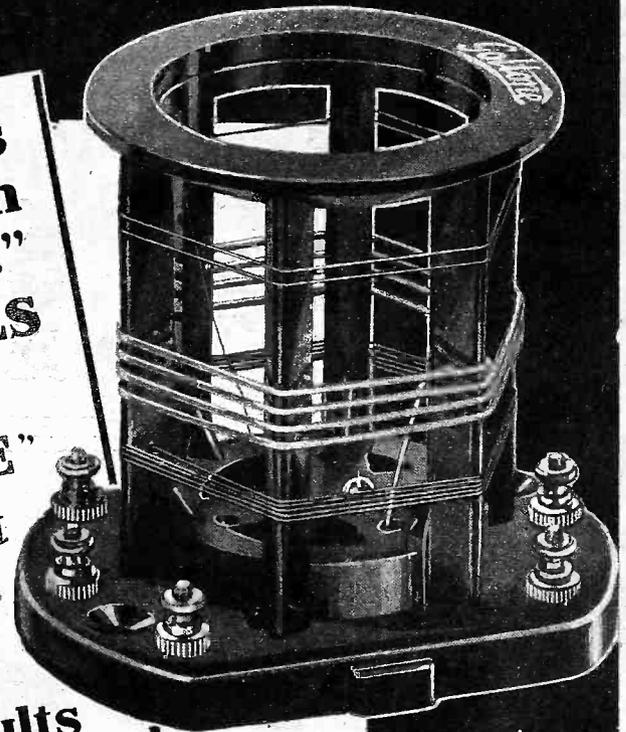
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IF SHAKESPEARE WERE ALIVE

(Continued from page 1389.)

Will walked up the steps to the front door, as he would have walked into Gloriana's own Palace of Greenwich—a man aloof, self-contained, an island of a man. Honk took a scared peep at him and decided that the poet was a homing reveller from the Savoy Hotel. Honk was on the lookout for a poet with a "trilby" hat and long black cloak—a sort of emaciated G. K. Chesterton—and was not informed about the costume of low-class Elizabethans.

"'E's 'ere! Crumbs!"

"Now, sir!" he began in the tone which he keeps for audition-seeking reciters. "You know very well you can't come in 'ere." Then Will looked him full in the eyes, not angrily, not with surprise, just a look such as never was on sea or land, and then—there was no more Honk; only a very abashed proletarian with just enough wit left in him to totter into his telephone-box and warn Pryde that "'E's 'ere! Crumbs!" as Will Shakespeare passed upwards to where glory awaited him.

Pryde, who had been at Mons and was quite at his ease in the presence of the assembled Governors, came upon a glorious young Will, lost amongst broom-holes and ash-lifts at the end of his corridor, a transformed Will, who hummed merrily and snapped his fingers like a Spanish dancer. "He was as pleased as Punch about sunnick," said Pryde later, to the Director-General, who had called for a report, "an' when I says, 'Hallow me to conduck you to your room, Sir William,' all he ses was 'Have at ye again, Ben.' But he come all right, sir—except that he's frightened one of those there young Programme fellers into a fit in Stoodio Four." Verily, Will was pleased, because Hamlet's Soliloquy had suddenly come out right—just as Will was taking his first sight of a modern charlady's button-up boots which their owner had left in the fairway.

By the time he reached his room, Pryde standing at salute, the gay mood had passed. He gave just one look at Pryde, a look full of curiosity, and then he gravely bowed and entered, going at once to the open window from which the river could be seen.

"Methinks One Waits Upon Me"

Pryde hovered over the ornate desk, with its mighty inkstand, battery of telephones and push-buttons, letter baskets, and paper weights, like a high priest at an altar. He tells us that Will sank his elbow wearily upon the sill, his head wearily upon his hand, and appeared to be watching the river traffic. Presently he said, haltingly and half aloud: "The barge she sat in, like a—like—a burnish'd throne, Burn'd on the water: the poop was beaten gold; Purple the sails, and—and—ah—so perfumed that the winds were lovesick with them; the oars—but more anon. Methinks one waits upon me, here in the very nick o' the matter. But that passage will serve! Ay de mi!"

Will turned round sharply, moved to the desk, and sat down. The throne received

its king for an hour! To the waiting Pryde he said:

"Prithee, bring me now the bill."

"Bill, sir? Yessir! What bill, sir?"

"The bill of fare, sweet chuck."

Pryde was thunderstruck. No one had ever mistaken the B.B.C. headquarters for a Corner House!

"Begg'n' your pardon, sir, bein' as I don't rightly happre'end—"

"The bill of fare man," replied Will, exploring the depths of the inkpot with a cautious pen, "that I may see what manner of meat we do set before the public, ere we say, like Timon, 'Uncover, dogs, and lap!'"

Pryde retreated at twice the speed of Mons and sought the Assistant-Director of Programmes, who was sitting crouched in a corner swotting "Julius Cæsar"—in case the new director asked questions.

Said Pryde, amongst other things, "an' he's a settin' there a'talking like the ole bloke in 'Pilgrim's Perogress'; jabbin' at the hink and rattlin' on about

POLICE PROTECTION



Dr. Syngnan Rhee, Provisional President of the Republic of Korea, flanked by detectives during an American broadcast of a speech on the effect of the Japanese occupation of Manchuria. He has received a number of threats from Orientals.

the menu. He's got a dog, or sunnick, called Timon, on 'is lap, though I see nothin' meself. W-won't you go in to him, sir? Ow—wot a day!"

Mr. D'Arcy, Assistant-Director of Programmes, was a brave youth. He walked firmly to his chief's room, knocked, entered, and said—after starting back as though a bee had alighted on his nose, for Will was just running over the Soliloquy, with actions:

"I am your assistant, sir. I understand that you wish to see the day's programmes. Here they are. I shall be happy to give you any information about them."

Will looked gravely at the "Radio Times."

"'Tis monst'rously printed, good sir! Alack, I do stumble amongst these hieroglyphics of Egipta. Make me, I prithee, master of the plain meaning o't."

Mr. D'Arcy accordingly explained the programmes, while Will grew more and more interested, smacking his thigh occasionally and running his fingers through his hair from back to front.

"Ogswoons!" he cried, when Mr. D'Arcy completed his lecture, "'Tis like Mistress Hathaway's best bed quilt, a thing of threads and patches, the whole natheless being of a fair-seeming. Suffer me now to ask ye, young sir, for what day must we prepare a like work?"

"We must begin to fill in the programme for a month hence, sir, some of the items being already fixed long since. May I suggest—"

"But Me No Buts!"

"Good! Beshrew me if I do not begin to warm to the play. I will write me a masque for ten players and the Spirits of Revelry, Love, and Death. I—pens and paper—mm—mm—dedicated to—mm—"

"But, sir, the exigencies of—"

"But thou me no buts! What, this spike a pen? Call yon servitor and bid him bring me a right goose quill, straight, strong, and full of feather. We'll make 'em twelve players—and Ben Jonson shall not lack a part. Fie! Where is the sand? Must I blot my lines?"

Pryde appeared. "Canst conjure up a stoup of sack or canary? Then take order and away."

"Clean batty," sobbed Pryde to an Assistant Poetry Reader whom he met outside. "Now he wants a canary in a sack—to conjure with. Crimey! Wot a day!"

Meantime, Will had begun to write and was worlds away. Mr. D'Arcy, who had seen these phenomenal directors come and go, quietly settled down to his job at Will's elbow. Presently Will looked up.

"Marry, sir, the moon i' the second act troubleth me not a little. For how can a moon have sound?"

"We leave that to the imagination of the listeners, sir, though if it is essential we might give a note to the effect that there is a moon," replied Mr. D'Arcy.

"Meseemeth somewhat strange," said Will; "natheless, 'twill doubtless serve. Now, touching the music—"

"Not our department, sir."

"Ha! More threads and patches, sirrah?"

"No; just organisation, sir."

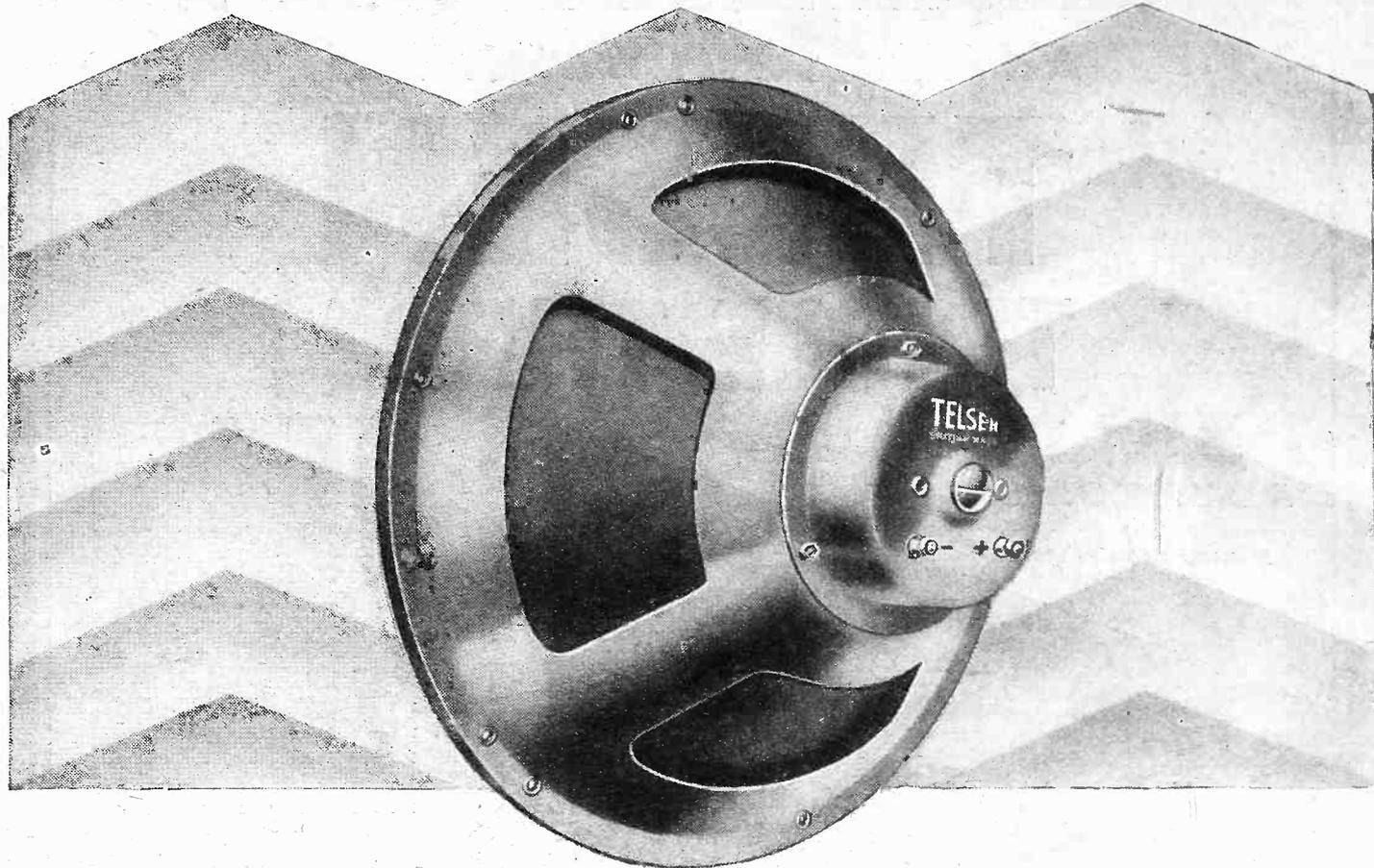
"How Goeth This, Think Ye?"

"Now list! How goeth this, think ye? Mark well—here—where I have—peste! I did forget the Dedication—here, where I have underscored the words 'Great Gloriana' we need a flourish of drums and of hautboys twain. What—obsolete? Thou naughty—but I crave thy indulgence. That 'Prince of Denmark' did somewhat irk me. Methinks I did speak not as myself but some other—elsewhere. Thou'rt a good lad, though I abhor thy hosen. Mind thy task well, so shalt thou prevail. Hola! Without, there! The sack! What manner o' serving-man is this that comes not when Will Shakespeare is a 'drouthy? Well, let him abide. He has seen, perchance, more than his poor wits may compass. I will e'en away to the 'Mermaid' for a draught and to take order with Jonson about those hautboys. Fare thee well, good, youth. Here is my hand."

Mr. D'Arcy, blessed beyond his deserts, took in his own the right hand of William Shakespeare, and then the slight, brown figure drifted quietly from the room and for ever from mortal sight.

(Extract from "Radio Times": "Shakespeare is impossible in the modern theatre.")

TELSEN LOUDSPEAKER

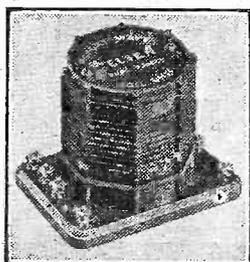


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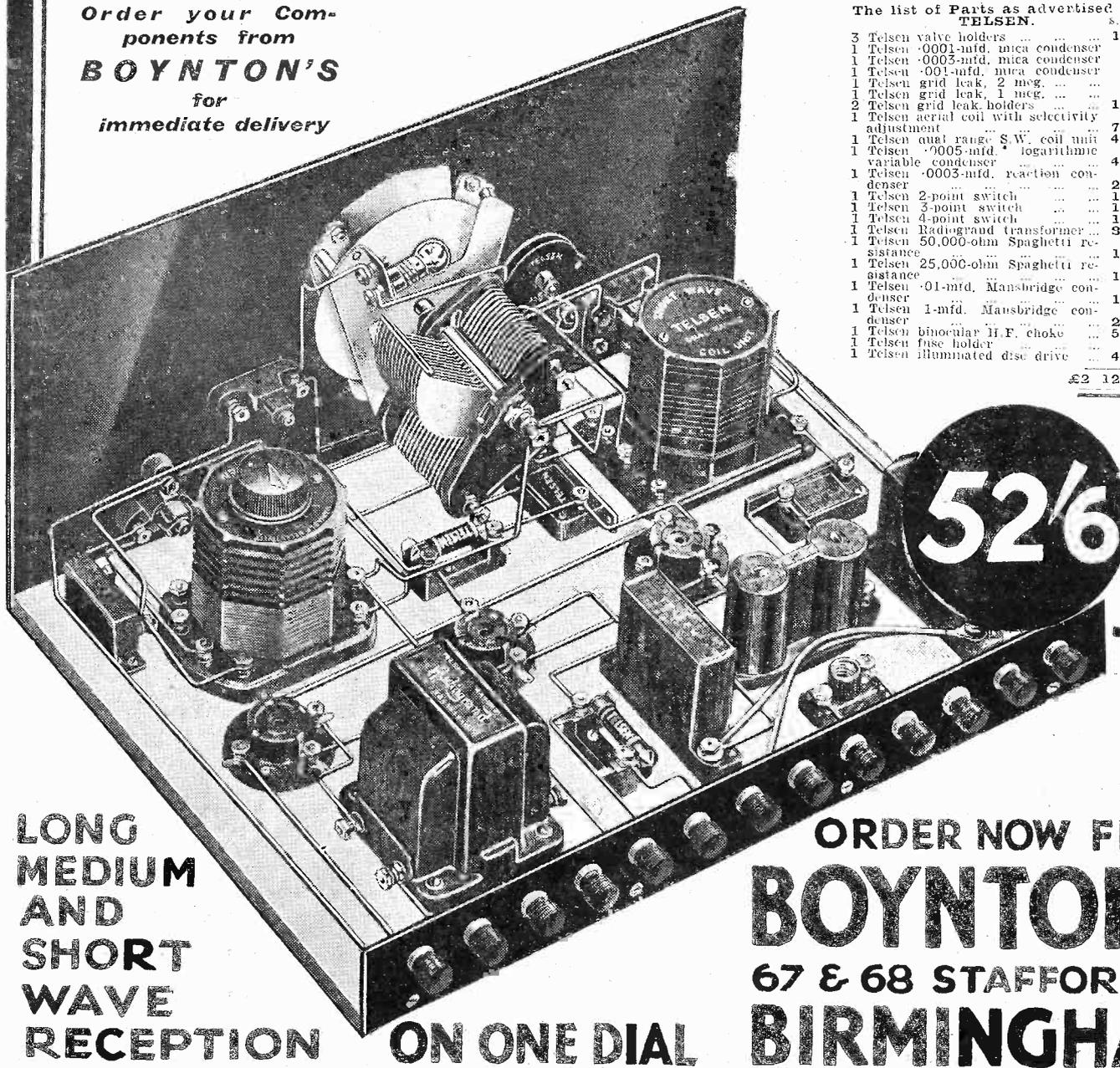
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1 Telsen grid leak, 1 meg.	1	9
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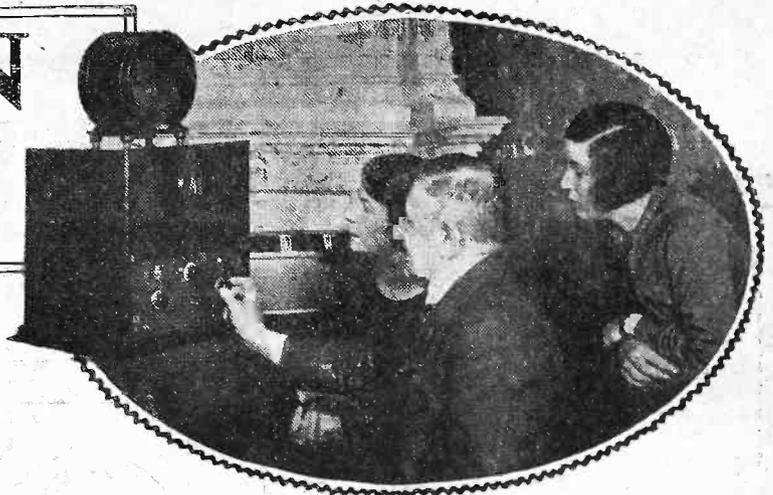
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TELEVISION PROGRESS

By Carden Sheils.



It is not due to lack of research workers and inventors that television is not yet a practical proposition, for there is intense television activity in laboratories all over the world. For instance, in this article you will find the description of a new method of scanning that was recently suggested.

IN ordinary broadcasting the different sounds which go to form connected speech follow one another in sequence, and are received by the ear in the same manner. Of course, with orchestral music several different notes are often merged together to form a chord, but the musically-trained ear is able to distinguish them although they occur simultaneously.

In television the conditions are very different. It is not possible to transmit the different light and shade effects of a picture simultaneously—as one does a chord of

The picture is usually split up into the required number of elements by means of a scanning device.

Mechanical Methods.

This may consist of a single rotating disc having a series of spirally arranged holes, or of two overlapping discs with peripheral slots arranged as shown in Fig. 1. The two slots are inclined to each other as shown more clearly in Fig. 2.

At any given instant the only part of the

picture which can be seen by an observer on the far side of the two discs is the small area marked A where the two slots overlap. Now the disc 2 in Fig. 1 is rotated at such a speed that one of its slots moves downwards from top to bottom of the picture P (shown in dotted lines) in something like one-twelfth of a second.

During that time the disc 1 must rotate

at least 30 times as fast. That is to say, the slot 2 in Fig. 2 is traversed in succession by 30 of the slots marked 1 in the course of its vertical passage across the picture. On each of these 30 occasions the small overlap area A runs horizontally from side to side of the slot 2. The result is that the picture is split up into 30 transverse bands, starting at the top and finishing at the bottom, each band being scanned from side to side by the small "eye" or hole A.

Now, so far as the slowly moving disc 2 is concerned, no particular difficulty arises except that it must cover the whole picture in not more than one-twelfth of a second. But it is a different matter with the second disc 1. To transmit a

picture 3 in. square it must be made to rotate, not 30 times, but 90 times more rapidly than the disc 2, because the elementary areas run 30 to the inch.

There is an obvious limit to the speed at which any disc can be safely and conveniently rotated, and this, in turn, must limit the size of the picture, so long as a purely mechanical scanning-system is used. Furthermore, a similar scanning-system is required at the receiving end, which must be kept synchronised with the one at the transmitter.

Synchronising Problems.

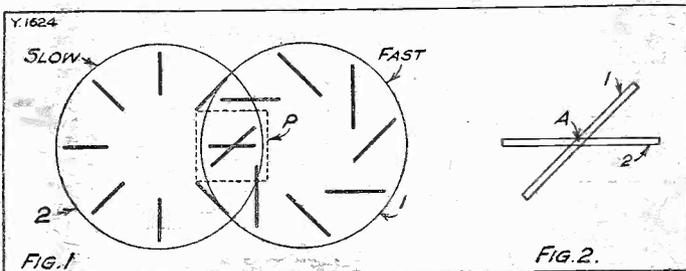
Now, the more rapidly a disc rotates the more difficult it is to coax it back into step should its speed fall away from the proper value. For one thing, the "inertia" of a disc increases with its speed of rotation, so that a greater amount of force is required to control and keep two such discs in strict synchronism.

For this reason many efforts have been made to do away with mechanical scanning altogether and to find a more flexible system which will allow a larger picture to be transmitted, showing greater detail.

Another suggestion which has recently been made is to use, in place of the rapidly moving disc 1 of Fig. 1, a stationary block of quartz, and to control its optical properties so that it is only transparent along one definite line at a time.

(Continued on next page.)

TWO DISCS INSTEAD OF ONE



The scanning scheme illustrated above has several slight advantages over the single disc arrangement. But although the discs rotate at a much slower speed, it still has the disadvantage that it is "mechanical."

music—because the eye is not able to analyse them in this form. All it would see would be a "blur" of grey.

In practice the picture is first divided up into a large number of small areas, and the light "intensity" of each of these small portions is transmitted as a separate "signal," the signals following each other in rapid succession. At the receiving end each separate signal is distributed in sequence, and in its proper position, on a viewing screen.

On Cinematograph Lines.

The speed at which one signal follows another is largely determined by the fact that the whole picture must be repeated at least twelve times a second. Only in this way can the required "cinematographic" effect be secured, where the eye is deceived into seeing the rapidly-dissolving spots of light as a sustained "moving" picture.

For clear definition at least 900 separate signal elements should be projected on each square inch of the viewing screen, so that the larger the picture the greater the number of signals which must be transmitted in each second. Here in a nutshell is the problem to be solved before television pictures can be produced on a large scale.

ANOTHER USE FOR THE "CRYSTAL"

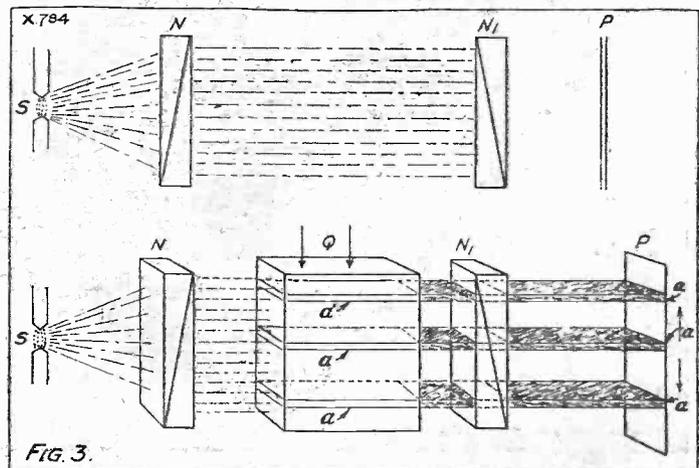


FIG. 3.

The method of scanning shown in diagrammatic form here, is fully explained in the accompanying article. It is claimed to be a tremendous improvement over all mechanical methods, and makes use of a piezo-electric crystal.

TELEVISION PROGRESS

(Continued from previous page.)

Quartz has the peculiar property of rotating the plane of polarised light when it is subjected to pressure. A pair of crossed Nicol prisms (N,N1 Fig. 3) placed at each end of a beam of polarised light will effectually block its passage. But if a piece of quartz Q is placed between the Nicol prisms light from the source S is able to pass to the picture P when pressure is applied to the quartz. The reason is that the quartz "twists" the light so that it is able to pass through the second prism N1.

When a thrust is applied in the direction of the arrow, a "pressure wave" passes through the quartz from top to bottom and opens up in its track a momentary path for the light to pass through the second prism N1, so that the picture P is scanned by a number of beams *a, a* . . . following each other in rapid succession.

Replaces the Disc.

In other words, the pressure wave travelling through the quartz acts in the same way as the rotating disc 1 in Fig. 1.

In order to apply "impulses" to the quartz in regular and rapid succession, it is connected across a tuned high-frequency circuit, which sets up piezo-electric oscillations in the quartz crystal.

Using this arrangement, there is practically no limit to the speed at which the picture can be scanned in one direction.

The same method could, of course, be used for scanning at right angles, i.e. to take the place of the disc 2; but since the speed required in this case is not so great—amounting only to 12 or 15 traverses per second—the simplest plan is to use a mechanically rotating element, as shown in Fig. 4.

Arranging the Quartz.

Here a piece of quartz Q is arranged inside a hollow rotating cylinder M. Rapid impulses are applied to the crystal so that

A FIFTY-FIFTY ARRANGEMENT

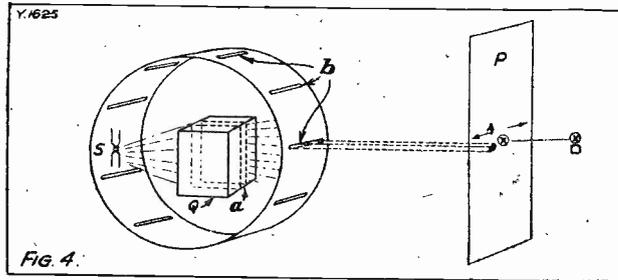


Fig. 4.

This system is a combination of "crystal" and mechanical scanning. The rotating cylinder looks after the horizontal lines, and the "crystal" the vertical lines.

they travel horizontally through it from the front to the back face, opening up parallel transparent "slots" *a, a*, in their passage. Simultaneously, the slots *b, b*, in the cylinder pass over the picture at the rate of twelve or fifteen times a second. The overlap of the mechanical and "optical" slots then forms a scanning "eye" similar to that shown at A in Fig. 1.

"NIGHT-LIGHTS" FOR OUR "BIRD-MEN"



A new invention developed by the Westinghouse Electric people for assisting airmen at night-time. The apparatus at the aerodrome consists of a couple of electrically operated flares, seen here in the ladies' laps, which are controlled by a photo-electric cell. If an incoming night plane pilot wishes to ignite them he simply shines a bright light on to the photo-electric cell below—it would, of course, be located in a recognised position—and the flares are automatically switched on, flooding the ground with light.

CORRESPONDENCE

Some interesting letters (from readers.)

ADVENTURES WITH THE "POP-VOX" FOUR.

The Editor, POPULAR WIRELESS.
Dear Sir,—I have made up your "Pop-Vox" Four, and would like to tell you of my experience, as it may help someone else.

On trying out, I was not satisfied with the volume and performance, but could not find anything wrong. But on the tapping of the P.J.3 coil, where there ought to have been stronger signals (that is, red tap), it was weaker than the other tapping.

This led me to suspect the coil, so I tested out. All appeared perfect, so I tried again; still the same. Again, with 0-3 moving-coil voltmeter, I found a slight varying of reading.

Joints were well-soldered, but the wire on coil was joined to ordinary rubber-covered flex. This, when skinned, always leaves an oxidised surface on the wires, and they were not all cleaned properly before soldering.

Why don't coil-makers use silk-covered flex? I fitted new wire to tappings throughout, and presto! 300 per cent better.

The only trouble now was that it would break into oscillation for no apparent reason. I suspected the condenser, and on testing out with 1½-volt cell and 0-3 meter, found slight flickering between ground and contacts, due to bad contact on cam.

So I disassembled and burnished cam contact face with jewellers' fine file; this cured everything. It is a set now to be proud of.

Bristling with Stations.

Stations bristle at every mark of the dial. I have definitely logged 14 stations on high-wave and 43 low-wave at full loudspeaker strength, using two speakers in series, Blue Spot 66R and Brown Vec. and P.625 last stage (6-volt valves).

Eliminator chokes wound myself, with air-gap on core, with valve and dry eliminator combined in shunt. This is capable of giving 73 milliamps at 200 volts.

There is no hum whatsoever! If you have any complaints in this town of "Pop-Vox" sets, refer them to me and I can show what it can do.

Yours truly,
R. NEALE.

P.S.—Test at low volts for faults, not 200 v. and beware of rubber-flex soldered joints.

101 ON THE "S.Q. STAR."

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the above circuit, which was published a short time ago, I wish to thank you for this very excellent set. At first I experienced slight trouble owing to the oscillator being faulty. This was replaced and I received my 101st station recently.

Of all the sets I have ever built, and I have been following POPULAR WIRELESS circuits since No. 1, I have never built one which was so international.

In the 101 stations received, 27 different countries were visited. Hereunder is a list of the countries and the number of stations received in each:

Germany	13
France	11
Great Britain	9*
Italy	8
Poland	7
Czecho-Slovakia	6
Russia	5
Spain	5
Sweden	5
U.S.A.	4
Holland	3
Finland	3
Belgium	2
Austria	2
Denmark	2
Switzerland	2
Yugo Slavia	2
Norway	2
North Africa	2
Turkey	1
Iceland	1
Ireland	1
Latvia	1
Portugal	1
Roumania	1
Hungary	1
Esthonia	1

101

* Not including the relays on common waves.

Again thanking you for this marvellous circuit, I remain,
Yours faithfully,

59, Hove Road, St. Anne's-on-Sea
GEO. EDWARDS.

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Here is the list of Parts as specified and advertised by **TELSEN.**

	s.	d.
3 Telsen valve holders	1	6
1 Telsen .0001 mfd. mica condenser		6
1 Telsen .0003 mfd. mica condenser		6
1 Telsen .001 mfd. mica condenser		6
1 Telsen grid leak, 2 meg.		9
1 Telsen grid leak, 1 meg.		9
2 Telsen grid leak holders	1	0
1 Telsen aerial coil with selectivity adjustment	7	6
1 Telsen dual-range S.W. coil unit	4	6
1 Telsen .0005 mfd. logarithmic variable condenser	4	6
1 Telsen .0003 mfd. reaction condenser	2	0
1 Telsen 2-point switch	1	0
1 Telsen 3-point switch	1	3
1 Telsen 4-point switch	1	6
1 Telsen Radiogrand transformer	8	6
1 Telsen 50,000-ohm Spaghetti resistance	1	6
1 Telsen 25,000-ohm Spaghetti resistance	1	0
1 Telsen .01 mfd. Mansbridge condenser	7	6
1 Telsen 1 mfd. Mansbridge condenser	2	3
1 Telsen binocular H.F. choke	5	0
1 Telsen fuse holder		6
1 Telsen illuminated disc drive	4	6

£2 12 6

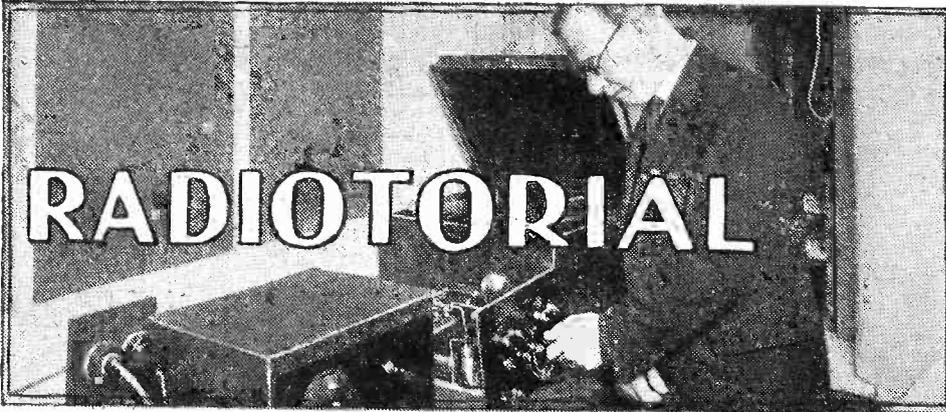


52/6

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

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

A DUAL-RANGE COIL IN "MAGIC" THREE.

M. J. B. (Rotherham).—"I was very interested in a recent reply in 'P.W.' in which you gave Telsen dual-range coil connections for the 'Magic' Three, but I have been told that the makers recommend a .0003 condenser should be connected in cases where medium-wave interference is troublesome,

when operating on the long waves. Could you tell me the connections for this extra .0003 condenser?"

In such cases it is a good plan to use a .0003 fixed condenser as suggested, and all that is necessary is to connect it across terminals 4 and 7 on the coil unit. That is to say, one of the terminals of the extra condenser goes to terminal 4 on the unit, and the other to terminal 7.

INCREASING SELECTIVITY.

O. N. (High Barnet).—"Could you give me some hints on adjusting the selectivity of the Dual Ranger?"

For ordinary purposes the selectivity control on

the panel is sufficient, especially when you are dealing with a distant station which you wish to receive clear of some other transmitter on a not very adjacent wavelength. But for districts like High Barnet, where a powerful local station is in the immediate neighbourhood, it may be necessary to alter the tapings on the P.J.3 coil.

The A tapping gives maximum volume and minimum selectivity, so to increase the selectivity the tapping should be removed from the A tapping and attached to one of the other points. When experimenting with these taps the selectivity control should be set at its maximum capacity setting (moving vanes all in), otherwise a true comparison between the various tapings will be impossible.

When the correct tapping has been found, selectivity control can be adjusted as necessary. The tapping clip has no effect on the long waves and should be left in position. For this wave-band the wave-change switch knobs are pushed towards the panel and the knob of the selectivity control is rotated so that the moving vanes make contact with the fixed vanes.

(Continued on page 1400.)

IS YOUR SET GOING WELL?

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

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

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

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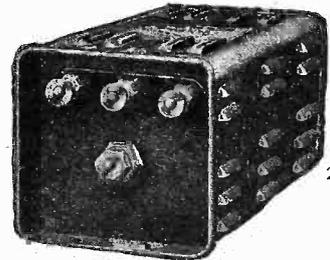
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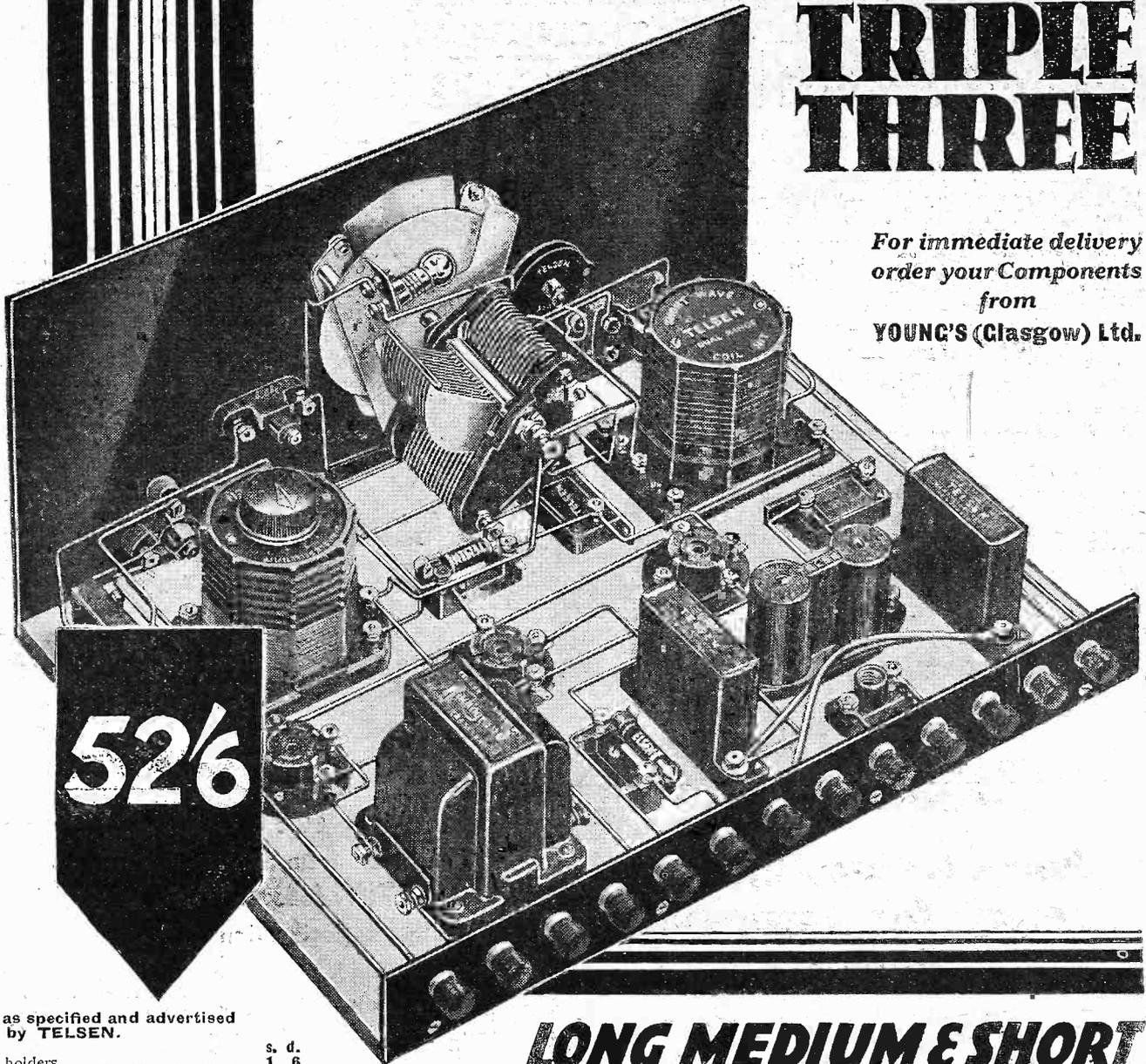
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1 Telsen .0003-mfd. mica condenser	1	6
1 Telsen .001-mfd. mica condenser	1	6
1 Telsen grid leak, 2 meg.	1	9
1 Telsen grid leak, 1 meg.	1	9
2 Telsen grid-leak holders	1	0
1 Telsen aerial coil with selectivity adjustment	7	6
1 Telsen dual range S.W. coil unit	4	6
1 Telsen .0005-mfd. logarithmic variable condenser	4	6
1 Telsen .0003-mfd. reaction condenser	2	0
1 Telsen 2-point switch	1	0
1 Telsen 3-point switch	1	3
1 Telsen 4-point switch	1	6
1 Telsen Radiogrand transformer	8	6
1 Telsen 50,000 ohm Spaghetti resistance	1	6
1 Telsen 25,000 ohm Spaghetti resistance	1	0
1 Telsen .01-mfd. Mansbridge condenser	1	6
1 Telsen 1-mfd. Mansbridge condenser	2	3
1 Telsen binocular H.F. choke	5	0
1 Telsen fuse holder	2	6
1 Telsen illuminated disc drive	4	0

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1398.)

This cuts the condenser out of circuit and tuning is carried on the same as before, but it may be advisable to adjust the knob of the .002-mfd. compression condenser, so that the effect of this increases selectivity. Screwing down the knob increases capacity and also increases selectivity and freedom from break-through. Although there is a 30 and a 60-turn tap on the long-wave coil, for all normal purposes the 60-turn tap will give best volume.

The 30-turn tap is required only in special cases, but it may be used where exceptional selectivity is needed.

BACK NUMBERS OF "P.W."

Back numbers of "Popular Wireless" which are still in print can be obtained from your newsagent or direct from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4. Price 4d. per copy.

CHECKING THE WAVE RANGE.

C. B. C. (Aston, Birmingham).—"Back in the autumn, W. L. S. gave us details of a wave-meter for short waves, which did not use a valve or anything like that, but only a tuning coil and condenser. Could you repeat the details, as now I want to make it I cannot find them?"

The details were of a simple absorption type wave-meter, which consists of a good variable condenser of about .0001-mfd. capacity and short-wave coils. All you need is a small box for mounting the condenser, with a coil holder behind it, wiring the moving vanes of the condenser to one side of the coil holder and the fixed vanes to the other side.

If you make one coil of three turns, one of six turns and one of ten, all of about two and a half inches in diameter, you will cover the whole useful range of short waves.

The arrangement can be calibrated by tuning to known short-wave stations with the set oscillating, placing the wave-meter near enough to the set to give the familiar "plop" as you adjust it to the exact wave-length. Make careful note of as many readings as you can in this way, and when you have a sufficient number you can draw the usual calibration

curve showing the exact relation between wave-lengths and dial degrees.

DISTORTION FROM S.G. VALVE?

"PUZZLED" (Faversham, near Reading).—"I am using a three-valver, screened-grid, detector and low-frequency (transformer). It was a very pleasing set, both for long distance and quality, and I was particularly proud of the latter (moving-coil speaker).

"By accident I found I could make the set quite a lot more sensitive if I dropped the

screened-grid voltage a little. Originally the S.G. was connected only to a bypass condenser (the other terminal on which went to earth) and direct to the H.T. + 1 terminal.

"At first I tried connecting an old volume control to this lead, with the result that when at its maximum the set was much more sensitive. Having another of the same kind, I fitted this in series as well, to obtain still further control.

I get very excellent results with this arrangement on distant stations, and the sensitivity is surprising. But I find that the arrangement seems to have spoilt quality. There is a harshness about reproduction which I never got before, and I am wondering what I can do to overcome this?"

The proper conditions of working for an S.G. valve are sometimes rather easily upset, and you appear to be causing distortion merely by dropping the volts to the screen.

You do not state the value of your bypass condenser, and perhaps if this were larger the effect would not be so pronounced; but we think you will possibly find that even with a larger (good quality) condenser here the resistances used are still introducing distortion on account of the too-large voltage drop across them.

FINDING THE IMPEDANCE.

"INTERESTED" (Henham).—"Having been lucky enough to pick up a good milliammeter reading from 0 to 5 milliamps, I have been having a good deal of fun with the instrument, checking up my knowledge of Ohm's Law. So far as I can tell from low voltages and high resistances, it is pretty accurate, and having exhausted the various tricks I can carry out on simple apparatus, I am now wondering if I can measure the impedance of my detector valve with it.

"For instance, when connected in the plate circuit of a valve, which is operating with low-tension and high-tension in the ordinary way,

(Continued on page 1402.)

TECHNICAL TWISTERS

No. 101.—DIELECTRICS.

CAN YOU FILL IN THE MISSING LETTERS?

A dielectric is the substance that fills the space between the opposite plates of a condenser. It is always an

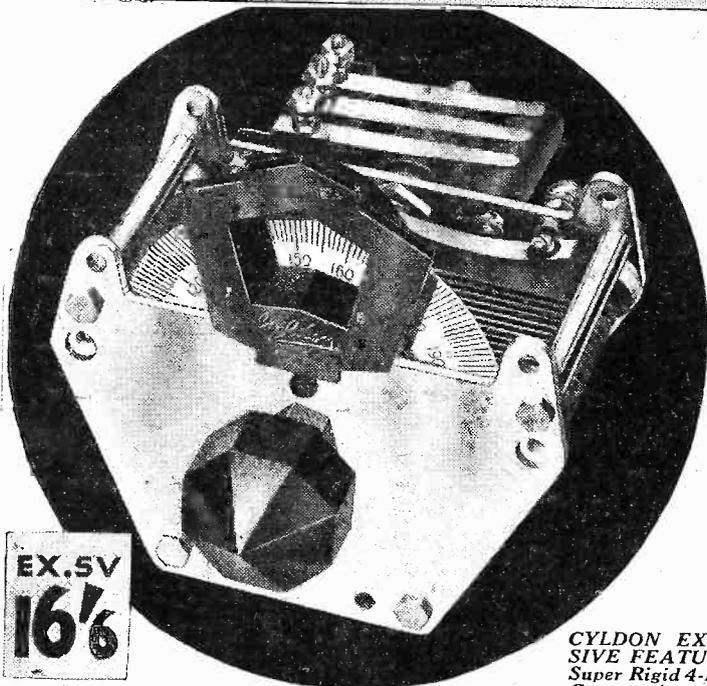
In the ordinary variable tuning condenser the dielectric is

In fixed condensers the dielectric is usually or waxed

The nature of the dielectric affects the of the condenser; and so does its thickness, which, of course, is the distance separating opposing plates.

Last week's missing words (in order) were: Switches. Ganged. Tuning. Loss. Trimmers.

COSMIC III IT HAD TO BE CYLDON



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We wish to emphasise to our readers that UNLESS better results are obtained than from your existing Aerial, your money will be instantly refunded without question.

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Now comes a new and better Aerial, equal to to-day's conditions—the new ELECTRON SCREEN AERIAL.

A mast is no longer necessary. In its place is a scientifically constructed metal frame mounted on stout wooden supports. This gives better reception than ever before possible.

A few minutes only to fix—to your chimney stack or side of the house (or attached to existing mast)—it may also be suspended in the loft or attic. Each outfit is supplied with four large galvanised nails for easy fixing and with four rubber buffers to ensure perfect insulation. No brackets, lead-in tubes or insulators needed.

All good dealers stock the Screen Aerial, or send direct to makers (postage 9d.). REMEMBER, if you are not satisfied with results your money will be refunded instantly.

For your lead-in always use:—

SUPERIAL—75 ft.—2/6
100ft.—3/6. 50ft.—1/9. 25ft.—1/-

**EASY TO FIX & STAYS FIXED FOREVER!
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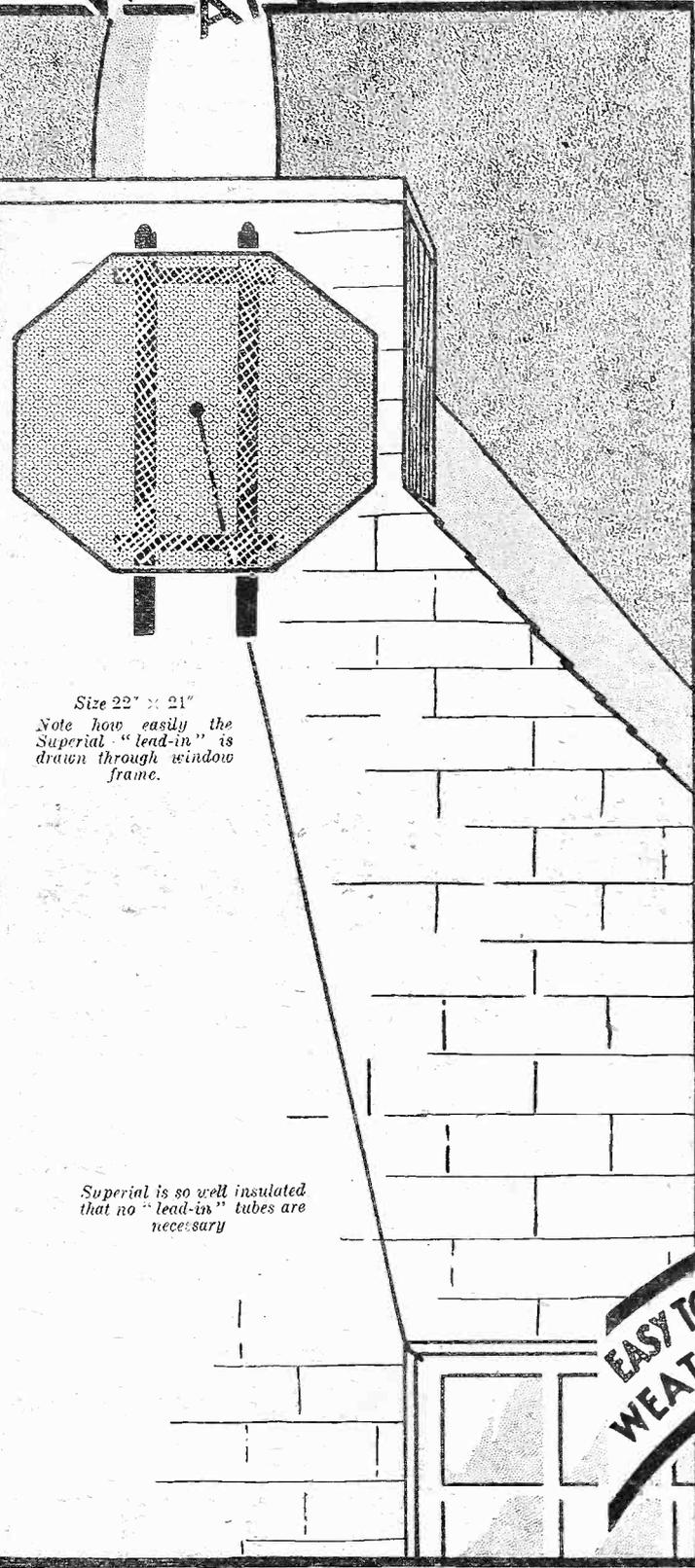
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1400.)

but with no signals on the grid, the milliammeter shows a certain reading, say two milliamps. If I take this as the current, and the H.T. voltage as the E.M.F., do I get the impedance of the valve by applying the usual Ohm's Law? If not, how can it be arrived at?

You can apply Ohm's Law in such a case, to find the resistance in circuit, but what you are then getting is not what we call the impedance of the valve but its D.C. resistance. It is interesting to know the D.C. resistance of various valves, and you can work it out exactly as stated by Ohm's Law.

Although this D.C. resistance tells you how the valve behaves under static conditions, the important thing to know about it is its behaviour under working or dynamic conditions, and at such times the valve is handling alternating or changing current. What is called its impedance, or its internal resistance, can be found by noticing not as for D.C. resistance, the values of plate voltage and plate current, but the values between changes in plate voltage and changes in plate current.

Suppose, for instance, that you had a valve which normally takes $4\frac{1}{2}$ negative grid bias with 90 volts on the plate. Its average impedance will be found by noting the change in plate voltage divided by the plate-current change.

Thus if you increase the voltage on the plate to 100, you will find that the normal plate current of,

say, 2 milliamps has gone up a little, and you must note the exact milliammeter reading at the new figure. Suppose it is 3 milliamps.

Try the effect of a corresponding decrease, and ascertain the exact current when only 80 volts are applied to the plate. We will suppose that the milliammeter now shows a reading of 1 milliamp.

With these figures before you you will note that a change from 100 to 80 volts produces a change in milliamps from 3 to 1. What you have to do is to divide the 20 volts by these 2 milliamps.

The answer is 10,000 ohms, and this is the average plate resistance between the values named.

This is the method of measuring a valve's internal resistance or impedance.

THE "P.W." "COSMIC COIL" GUIDE. DUAL-RANGE COILS.

***CLASS A COILS.** TERMINAL No. 2 is equivalent to TERMINAL No. 3
TERMINAL No. 3 is equivalent to TERMINAL No. 1
TERMINAL No. 4 is equivalent to TERMINAL No. 8
TERMINAL No. 5 is equivalent to TERMINAL No. 6
TERMINAL No. 6 is equivalent to TERMINAL No. 5
(Terminal No. 1 is not used in this class of coil)

***CLASS B COILS.** TERMINAL No. 3
TERMINAL No. 1
TERMINAL No. 8
TERMINAL No. 6
TERMINAL No. 5
(Terminal No. 4 is not used in this class of coil)

SHORT-WAVE COILS.

***CLASS A COILS.** TERMINAL No. 1 is equivalent to TERMINAL No. 4
TERMINAL No. 2 is equivalent to TERMINAL No. 3
TERMINAL No. 3 is equivalent to TERMINAL No. 1
TERMINAL No. 4 is equivalent to TERMINAL No. 7
TERMINAL No. 5 is equivalent to TERMINAL No. 6
TERMINAL No. 6 is equivalent to TERMINAL No. 5

***NOTE.**—Class A Coils have their terminals numbered from 1 to 6.

Class B Coils have their terminals numbered from 1 to 8.

"P.W." PANEL, No. 59. WAVEBANDS.

Wireless communication is carried out on a very large number of wave-lengths, and for convenience these are grouped into sections called wave-bands.

Thus a wave-band is merely a number of adjacent wave-lengths.

For instance, any coil tuned by a variable condenser will cover a number of wave-lengths and can be said to tune over a wave-band.

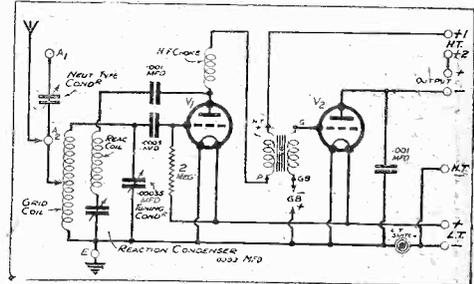
For ordinary classification the three commonly-accepted wave-bands are long waves (over 1,000 metres); medium or ordinary waves (from about 250 to about 600 metres), and short waves, the latter including wave-lengths below 100 metres.

THE ECKERSLEY TUNER.

J. W. (RINGWOOD Hants).—"As I get as much pleasure out of the actual making of my coils as I do from the operation, I should be glad if you would give me details for making up an Eckersley Tuner—not in full, but sufficient detail to follow, and stating direction of winding, spacing, etc."

Apart from the two coil formers and the necessary wire you will need an aluminium screen measuring 6 $\frac{1}{2}$ in. high by 7 in. long, one terminal strip to fit

MISSING LINKS, No. 28 A SHORT-WAVE TWO.



Here is the complete circuit of the short-waver, from which it will be seen that the three components omitted last week were all condensers—one for optional use in the aerial circuit, one in the reaction circuit, and one connected to the plate of V_2 .

across the end of one coil, and another terminal strip which will be supported lengthwise along the other coil. This strip will need to be about 5 $\frac{1}{2}$ in. long, while the other can be fitted to or be supported on the end of the coil former, the maximum diameter of which is 3 in.

Both of the coils should be supported strongly at a distance of not less than $\frac{1}{4}$ in. away from the screen, and their axes should be at right angles. Three terminals will be required on the short terminal strip, five on the long strip, and in addition you will

(Continued on page 1404.)

IMITATION

TELSEN COMPONENTS

We are receiving a considerable number of complaints regarding components which we find, on examination, are not of our make. Certain firms making large displays of our goods are latterly introducing a percentage of the manufactures of other firms into their windows, in some cases even standing the substitute components on our cartons and putting the word "TELSEN" in very large letters on the price-tickets, followed by the word "type" in minute characters.

We shall be glad to hear from any members of the public who have purchased goods believing them to be genuine "TELSEN" make and have found, upon closer examination, that they are inferior substitutes.

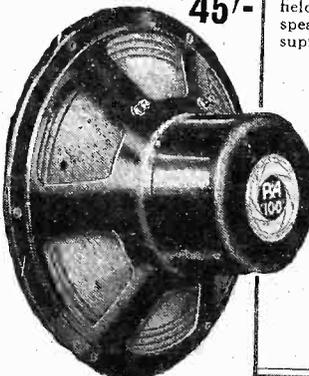
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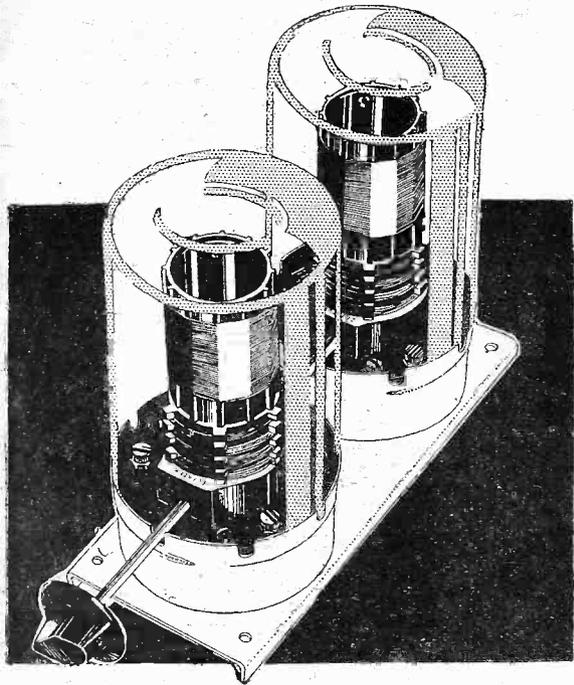
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TYPE ST300 - - - - - per pair **12/-**

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1402.)

need a 100,000-ohm non-inductance resistance of small diameter.

This will be mounted through a hole in the screen, and provision for contacts should be made at the ends, soldering not being recommended because it is liable to injure the resistance unless the work is carried out under factory conditions.

The First Assembly.

Probably the best way for the amateur to go to work is to prepare the parts without any windings at first. Then, when all is ready for final assembly, the windings can be put on the prepared formers, without the danger of injuring the delicate winding which would be present if any of the other constructional phases were left till after the wire was on.

The actual construction of the unit would take a long time to describe in detail, but we do not think you will find it very difficult if you get some good photographs of the coil unit in front of you, noting how the various parts are locked rigidly together. On no account decrease the spacing between the coil former and the aluminium screen to less than three quarters of an inch, as this is the very minimum for good results.

Remember, too, that the windings themselves will have to be in open spaces, and not in close proximity to any metal fittings which may be necessary to support the coil.

When you are convinced that the actual mechanics of the job are O.K., and that all the parts can be firmly fixed to the screen (which itself should have some provision for screwing to the baseboard), you can unmount the formers and wind the coils. As stated, two 3-in. diameter Paxolin formers are used, one of 4½ in. in length and the other 5½, these being designated respectively the aerial and grid sections.

On the aerial coil you must wind 40 turns of No. 24-gauge D.S.C. wire, anchoring this to the former in the usual way and leaving long ends for fixing off. This winding should be started about half an inch from one end of the coil, and when it is finished off, a 1-in. space must be left before commencing the long-wave winding.

This must consist of 110 turns of No. 36 D.S.C. wire, and should be wound in the same direction to the medium-wave winding. Like the other coils, it will come approximately half an inch from the end of the former.

Winding the Grid Coil.

Before dealing with the final connections of the ends, etc., we will describe the other or grid coil.

There are three windings on this section, and the reaction winding is split into two sections, one of which is placed at each end of the former. It is, perhaps, best to put this winding on last, and therefore to commence with the medium-wave winding of No. 24 D.S.C., which begins about ¼ inch from one end of the former, and consists of 48 turns.

From the end of this another space of 1 in. is left, as before, the long-wave winding then being placed on.

This consists of 150 turns of No. 36 D.S.C. wound in the same direction to the medium-wave winding.

Care must be taken with the reaction winding, which

goes on last. It is split into two sections, that near to the medium-wave winding (thick wire) comprising 18 turns of No. 36 wire, arranged so that there is a spacing of ¼ in. between the reaction and grid windings.

At the other end of the coil former no space is left between the long-wave winding and its adjacent reaction winding, which will consist of 50 turns of the No. 36-gauge wire. Each section of the reaction coil is wound in the same direction as the adjacent grid wiring.

The Connections.

Now for the connections. Arrange the screen in front of you with the aerial coil on the left with its medium-wave winding underneath. On the other side of the screen will be the grid coil, and this should be placed so that as you look at the coil the nearest winding is the long-wave reaction, next the long-wave winding, next the 1-in. space, next the medium-wave winding, and finally with a quarter of an inch separating them, the medium-wave reaction section.

On the left-hand coil the nearest terminal should be marked S; the middle terminal E, and the further terminal A. On the five-terminal strip the terminals are arranged in the following order, nearest S; next, S; middle, E; next, G; furthest terminal R.

The connections when the coils are in the positions named are as follow:

Aerial Coil. Bottom of the long-wave winding and bottom of the medium-wave winding to S. Top of the long-wave winding to E. Top of the medium-wave winding to A. A also goes to one side of the 100,000-ohms resistance.

Grid Coil. Nearer end of the long-wave reaction and nearer end of the short-wave reaction coils to S (first terminal). Second S terminal goes to the far end of the long-wave grid-winding and to the far end of the medium-wave winding.

The E terminal goes to the vacant end of the long-wave grid winding, and to the vacant end of the long-wave reaction winding. The nearer end of the medium-wave grid winding goes to the G terminal, which is also joined to the other end of the non-inductive resistance which passes through the hole in the screen.

The final connection is from the far end of the medium-wave reaction to the last terminal R. This completes the connections:

GRID-BIAS LEADS OF THE "COSMIC" THREE.

Near the end of last week's article it was stated: "Two flexible leads . . . with grid-bias plugs on their ends complete the wiring." This should have read *three* flexible leads, not two—namely, one G.B. +, G.B. - 1 and G.B. - 2.

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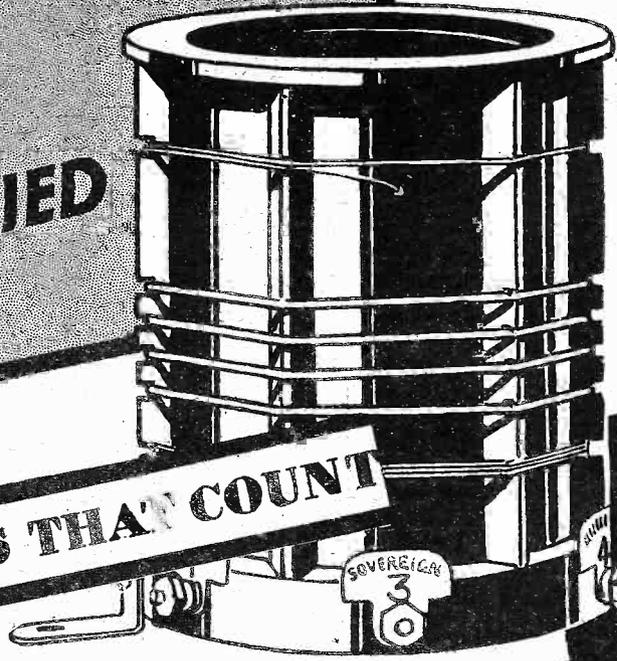
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ON DEMONSTRATION

“THE MOST IMPORTANT REFINEMENT IS CONCERNED WITH THE SHORT-WAVE SIDE OF THE SET”

“Popular Wireless,” 13th Feb., Page 1281.

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THE SOVEREIGN
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100% EFFICIENT

IT'S THE COILS THAT COUNT

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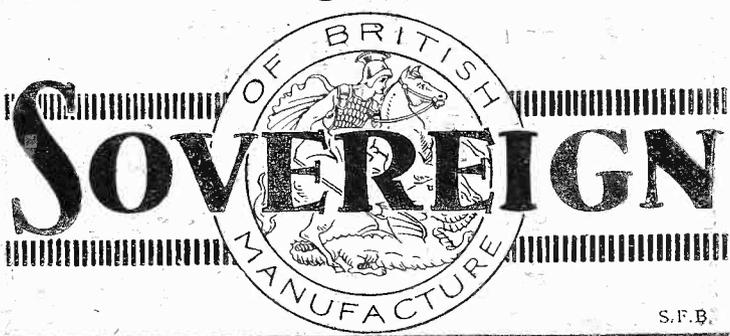
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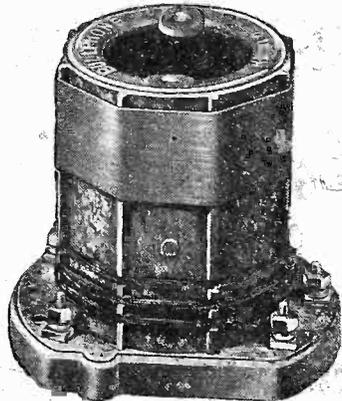
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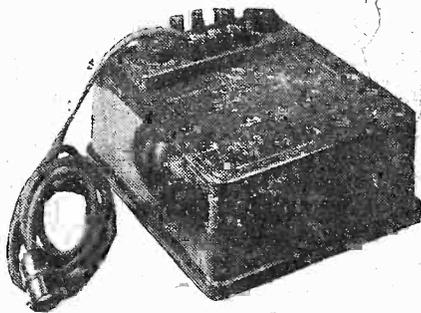
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20 m.a. output
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Three Fixed
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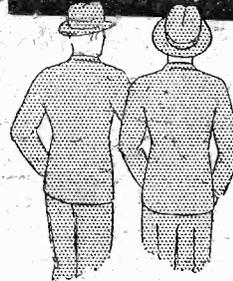
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" Three point switch	1		6
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See Pages 1331-1333

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"Better than wire wound." All values from 300 ohms to 5 meg-ohms. 1/6 Each

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THE READY RADIO "COSMIC" STAR KIT

OUR old friends Ready Radio, Ltd. are concentrating upon the supply of the "Star" model of the "Cosmic" Three, for they apparently believe that a very large number indeed of constructors will prefer to pay the additional cost for the sake of the worth-while refinements included.

We are of the same opinion. Then why, some reader may ask, was the "P.W." blue print model not the "Star"? The answer to that is simple and two-fold. In the first place it is our experience that great though the number is who purchase complete kits, there is an even larger number of constructors who use old panels and old components, or as many of the latter as possible, either to run up "try-out" hook-ups of new sets or to fashion new sets for serious use.

For this army of enthusiasts the "P.W." "Cosmic" Three is the ideal simplification of original qualities, upon which as many of the further refinements can be

LOOK OUT FOR "P.W." NEXT WEEK

Don't fail to order your next week's number of "P.W.," which will be an unusually interesting issue, containing a long fascinating article on

TOURING THE WORLD ON THE "COSMIC"

NEXT WEEK'S

Avoid Disappointment and Order Now **POPULAR WIRELESS** On Thursday Usual Price

lavished as the enthusiast desires or can afford. Further, from the point of view of a medium-and-long-wave broadcast set it is in the nature of a "last word" of its kind, and the "Star" short-wave improvements would not be fully exploited by those who regard the short waves as a secondary consideration and who do not want to buy operating ease.

But for those who want to forget old gear and make a fresh start, or for those who have not yet tasted the joys of radio at all, there is nothing they could do better than go for the "Star." And by far the best way of doing that is to purchase a complete kit of parts.

The advantages of this procedure are plain. All the proper parts are collected together for you, and at no extra cost the panel is drilled. Moreover, a free blue print is generously provided for every reader of "P.W." this week by Messrs. Ready Radio. (In a number of these, by the way, the H.T. — sign accidentally appears as a +.)

We have examined one of the "Cosmic" Star kits and find it satisfactory in all respects. "P.W." readers can undoubtedly order them by post with the fullest confidence of obtaining complete satisfaction.

THE LISTENER'S NOTEBOOK

(Continued from page 1336.)

I quite agree with the correspondent who asks for the dance records first (I refer to the Friday lunch-time broadcast). As the recital doesn't begin till 1.30 p.m., many people can only listen to the first half of the programme. They have to be back again at work by 2 p.m., and "Light Wines" are a better preparation for the afternoon's work than those of the Opus No. 6 variety. Christopher Stone would do well to bear this in mind on future Fridays.

I was asked recently why it is that the monologue rarely finds a place in our broadcast programmes. The inquiry came from a man who had a passion for this type of entertainment. The reason isn't far to seek. The monologue, it seems to me, can only be a success if we see the artiste himself. We must see his varying expressions, particularly his eyes, and the way he reacts to the different circumstances arising from the story. In short, the perfect monologist must be a perfect actor.

Don't you always look forward to the Commodore Theatre Orchestra? I do. It is so reliable. Its numbers are always so

tuneful, and it can do the rhythmical stuff, too. It seems to be such a well-balanced and well-rehearsed band, with soloists much above the average. Hard work will get good results, of course, and there is no doubt that Joseph Muscant and his band deserve the popularity they enjoy at the moment. As another broadcast critic has said: "A concert by the Commodore Theatre Orchestra would make a pleasant change from the usual Sunday evening concert." The Park Lane Orchestra under Albert Sandler, and Tom Jones from the Grand, Eastbourne, are very attractive, of course, but they have had a good run for their money, and they don't vary their programmes very much from week to week.

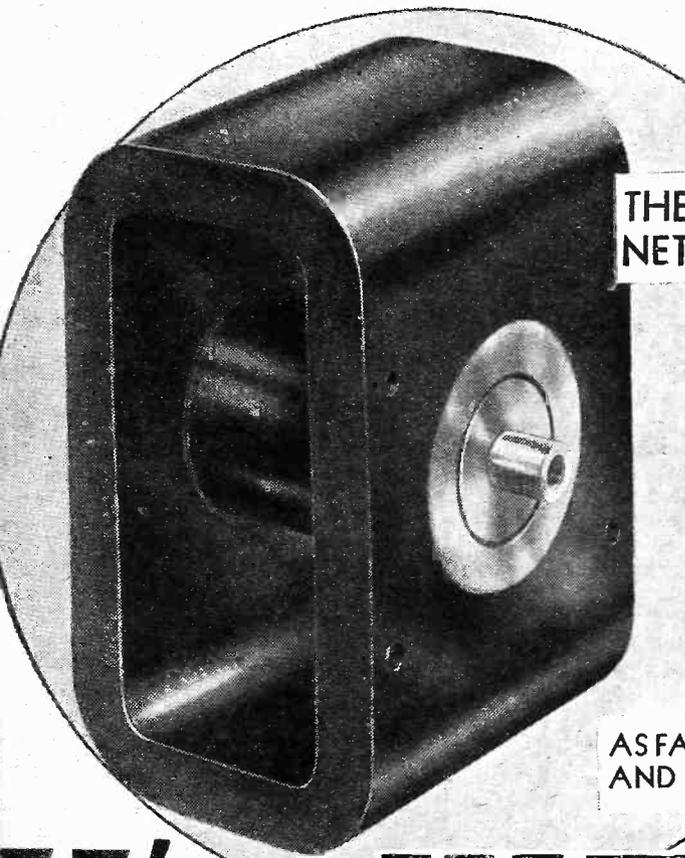
I wish I could say I enjoyed Vaudeville as much as these orchestral concerts. Frankly, I think the majority of the B.B.C. vaudeville artistes bad—rank bad, in fact. Their humour is so feeble, their crooning singing worse, and that eternal syncopated rattling of jazz tunes on a long-suffering piano sometimes nearly drives one crazy.

As in most things, there are exceptions to the rule, and the real music-hall or
(Continued on page 1410.)

PERFORMANCE

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SCORE NEW SPEAKER
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S.F.B.

THE LISTENER'S NOTEBOOK

(Continued from page 1408.)

musical-comedy artists can get it over sometimes. Even so, may I remind one famous comedienne that I am getting rather tired of Ali Baba and his Camel, and like that poor over-worked animal, I, too, shall get the hump if it goes on much longer.

* * *

Most of the so-called humorists who have sprung up since the birth of the B.B.C. cannot, and never will, in my opinion, "get it over." Never is a long time perhaps, but they haven't strong enough personalities. It requires the personality of, say a Tommy Handley or a Leonard Henry to do that. If wireless vaudeville is to be saved from what seems certain death, more artists of this calibre must be found.

TECHNICAL NOTES

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

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

"Tone-Control."

PEOPLE often confuse tone-control with volume-control, or speak of the two more or less indiscriminately. There are quite a number of simple dodges for volume-control, and two or three fairly straightforward ways for tone-control, volume-control being as a rule a simpler matter than tone-control.

Perhaps it might be useful, before going further, to explain, for the benefit of those of you who may be new to radio, the exact difference between these two types of control. Volume-control simply means adjusting (reducing) the volume to any desired amount.

For instance, the simplest form of volume-control would be an adjustable resistance shunted across the loudspeaker terminals. This shunts off part of the current supplied to the speaker and thereby diminishes the loudness of the reproduction.

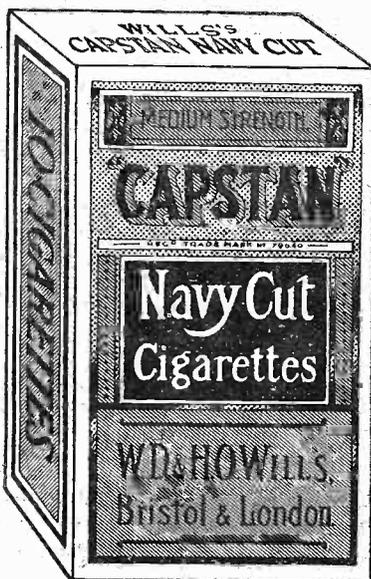
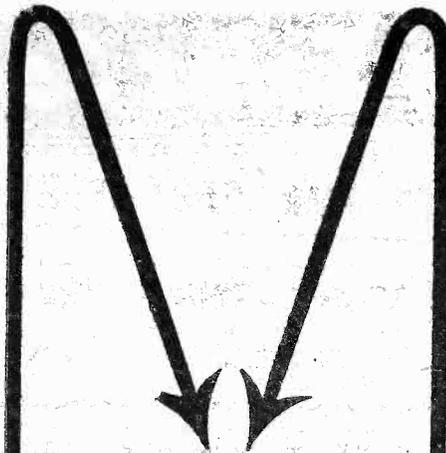
It does not, however, differentiate between high notes and low notes; it reduces them all without regard to their frequency. Perhaps I should say, in passing, that this statement is not absolutely accurate, but it is near enough for the present explanation.

Frequency Suppression.

Now, the tone-control is quite a different thing, and consists in modifying one particular part of the frequency-range in relation to another. For instance, suppose our tone-control is designed to suppress or reduce the higher frequencies, then in the result, although the total volume will be somewhat reduced, the lower or bass frequencies will stand out more prominently and the result will be as though we had increased the bass.

Nearly all tone-control devices have the effect of reducing some part of the audio-frequency range. If the tone-control is

(Continued on next page.)



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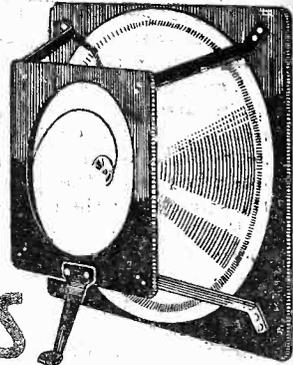
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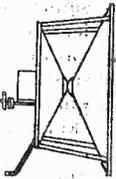
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12-INCH MODEL 8/- 14-INCH MODEL 9/-
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With 12- or 14-inch models pedestal leg supplied

Order Now: or write for details

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1932

Radio Catalogue

135 Pages. 1,000 Illustrations of Sets & Components

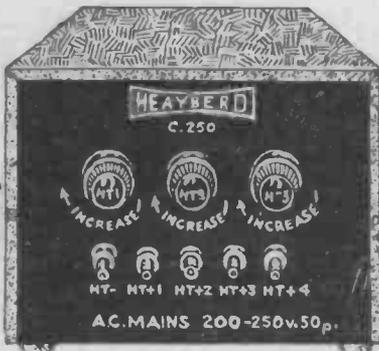
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Write your name and address in the margin and post in unsealed envelope to:—

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BANKRUPT BARGAINS.—List free, with 3-v. diagram. "Cosmic 3" kit, 45/-; "S.T.300" kit, 45/-; Any kit supplied. Cabinets (Oak), 14" x 7", 8/-; Panels, 2/6; .0005, 2/6; Transformers from 3/3; Differentials from 1/6; Fixed, 5d; Leaks, 7d; 1-mid., 1/8; 2-mid., 2/-; Wavemaster, .0005 S.M., 5/-; Others, 4/-; Dual coils, with switch, 4/-; S.M. dials from 1/2; D.C. Eliminators, 16/6; A.C. 46/-; Sets, 3-v., from 37/6; Speaker units, 4-pole B.A., adj. magnets, 7/6; Others from 4/-; 3-v. kits, with oak cabinet, 32/6; 2-v., 24/-; Speaker kits from 10/6. Modern parts taken in part exchange. Get my price first. Money back if unsatisfied.—**BUTLIN, 143B, PRESTON RD., BRIGHTON.**

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TECHNICAL NOTES

(Continued from previous page.)

with a screened-grid valve. I will short-circuit the story by telling you at once that the cause of the trouble was a disconnection in the cap of the valve, and, on examining the valve, the cap came off.

A "Dud" Valve.

What he actually found was that the set refused to work, or rather it worked in a sense, but refused to give results. It was a comparatively simple matter to make certain that the different stages were working all right, except the screened-grid stage.

This appeared to be perfectly in order. The filament was intact and the connection to the cap was perfectly satisfactory, although the actual voltage was rather higher than it should have been.

At any rate, all the usual preliminary tests were applied, and it seemed rather baffling, until eventually he took out the screened-grid valve in order to examine it thoroughly. It was then that he found the cap loose and a disconnection inside.

I have heard of one or two cases of this kind, so evidently it is not so rare as one might think. If you have any mysterious trouble with a screened-grid valve, which is apparently O.K. in other respects but will not operate, the above is a point to keep in mind.

Spaghetti Resistances.

Spaghetti resistances of different values often come in handy for all kinds of purposes, and in this connection I have a useful little tip from a reader of these notes which I think may be worth passing on to you. The letter puts it so clearly that I think I cannot do better than give you the hint in my correspondent's own words.

He says: "I happened to have on hand an old 250,000-ohms-wire-wound resistance which had become broken and put on one side in the junk-box. Happening to come across it the other day I idly pulled off the end-caps and found that this particular resistance was wound on a central flexible core in the same way as a spaghetti and rolled into a hank and tied with cotton."

"As I was looking at it, the idea struck me that several spaghetti resistances could be made from it and, after carefully removing the binding cotton, I stretched it out to its full length.

"I next cut it into five equal lengths, and by testing, soon found the section in which the break had occurred; this I scrapped and was left with four resistances each of approximately 50,000 ohms. Two of these I put aside as they were and then cut up the other two, one into two pieces and the other into three.

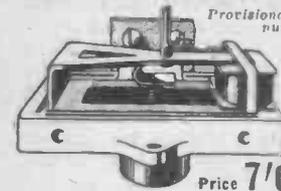
"Soldering tags were clipped and lightly sweated on the ends of each piece and a length of Systoflex slipped on, and thus I

(Continued on next page.)

How far greater magnetic effect is obtained in the PURETONE

You will find that usually in loud-speaker units the pole piece merely rests on the magnet. In the case of the Puretone, instead of the pole piece just resting on the magnet, it is pressed against the end, so that the whole surface is acting, giving at least 20 per cent. increase of magnetic efficiency, and thus far greater sensitivity. The armature is of a tapered special steel strip, with a part stamped out; at one end the strip is bent at right angles and is clamped by a rectangular magnet against a cast base. A "ring" magnet is employed and is recessed in the main body of the unit, which consists of a solid casting of aluminium.

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COSMIC THREE

SEE PAGE 1319

BEFORE YOU BUILD

Advt.

TECHNICAL NOTES

(Continued from previous page.)

had seven Spaghetti resistances: two of 50,000 ohms, two of 25,000 ohms, and three of approximately 16,000 ohms.

Current Capacity.

"Of course one must be careful how these are used, since for high resistances (as this originally was) extremely fine wire is used with a very small current-carrying capacity, which cannot be safely used in L.F. stages. They are, however, just the thing for decoupling H.F. stages, as I have proved, and also for small sets where only small power is going through, and provided that they are handled gently there is no reason why they should not last as long as the commercial and more sturdy version."

What Do You Know About This ?

Amongst my various other letters this week I have an inquiry from one reader who refers to a "discovery" which he describes as follows: "If a wire connected to the grid of a valve is allowed to trail in the groove of a gramophone record, signals from the record will be produced in the anode circuit."

He says "I expect you remember something of the sort. I may not have the details exactly right, but would be glad of further information." With regard to this, I can only say that it is new to me and I certainly do not seem to know anything about it.

The nearest approach to it I can think of is the ordinary gramophone pick-up in which a "wire" (in the shape of the needle) trails in the groove of the record whilst signals are ultimately reproduced, but all this is via the electro-magnetic effects produced in the pick-up by the mechanical movement of the "wire." If any reader can give me the information asked for, I shall be very interested to have it.

Wave-traps.

A wave-trap is not always an unmixed blessing. Sometimes it will cure poor selectivity, but sometimes it seems to have no effect except to make the tuning of the set more complicated—by adding another knob.

In cases where the wave-trap is disappointing, it is generally because it is either badly designed or not wound for the proper wave-length, that is, the wave-length necessary for cutting out the interfering station. Sometimes also, a wave-trap may be perfectly good in itself, but it may not be the particular type adaptable to your case.

Bear in mind that in most cases a wave-trap or rejector will have a definite effect upon the aerial tuning. This factor must be considered in its bearing on the aerial side of the receiver.

For instance, supposing there are two separate tuned circuits tuned by a ganged condenser with one knob control, if the wave-trap is not properly adjusted it will put the aerial part of the set entirely out of tune. Inasmuch as the aerial and H.F. stages will not then be properly ganged, it means that signal strength will be more or less seriously impaired.

Readjust the Ganging.

It is quite a common thing for the ganging to need readjusting when a wave-trap is put

(Continued on next page.)

BAULK THE LEAK THIEF

Lively 'O' Air-spaced H.T. Accumulators definitely end electrical leakage

If you use an old-fashioned, smooth-top H.T. Accumulator you are harbouring a menace to your pocket and to your Set. Electrical leakage can sneak along smooth top H.T. Accumulators continuously whether you are using them or not.

In Lively 'O' H.T. Accumulators each cell is separated from its neighbour by an air-gap. These air-gaps form an impassable barrier to electrical leakage. They definitely prevent waste. As a result Lively 'O' H.T. Accumulators need less recharging—they cost less to use and they supply your Set with the smooth abundance of H.T. current that is vital to good reception. Ask your Dealer to show you the Lively 'O.'



Above you see how the current can creep along the smooth unbroken top of the old-type H.T. Accumulator. Compare with the separate air-spaced cells of the Lively 'O' (right). Note also that additional means are now provided for using ordinary wander plugs for tappings.

MADE IN TWO SIZES:

Type HT	
Standard 10 volt Unit (2,750 Milliamps)	5/6
Each	
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MADE BY
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TUNEWELL Coils and Components are famous for their efficiency and are constantly being used for the leading sets. The TUNEWELL Coils made specially for the "Cosmic" III are wound exactly to specification and have been tested and approved by the "P.W." Technical Staff. Use them in your "Cosmic" III and get the best out of this fine new set. Use also the two TUNEWELL Switches—one 3-point and one 2-point—and the 100,000 ohms spaghetti resistance, also recommended for the "Cosmic" III. TUNEWELL products are subjected to the most exacting tests for efficiency, and constructors who use them are assured of super results. The cost in every case is as low as possible consistent with the high standard of quality obtained.

for the "Cosmic" III

● TUNEWELL base-fitting Coils—one Dual Range and one Short-Wave—specially made for the "Cosmic" III.

per **8'6** pair.

(Dual-Range Coil **4'9**
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● TUNEWELL Super Switches. Beautifully finished, best Bakelite moulding, phosphor bronze springs, ensuring perfect contact, plated finish.

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3-point Switches **1/3** each.

● TUNEWELL Wire-wound spaghetti resistance, 100,000 ohms.
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The TUNEWELL Eckersley Tuner for all the new Eckersley Sets. Tested and approved, **15/6**.

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TUNEWELL "S.T. 300" Coils. Wound on new low-loss formers. Tested and approved. Price **9/6** per pair (Aerial and Anode).

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TUNEWELL

TECHNICAL NOTES

(Continued from previous page.)

in. This, however, is a comparatively simple matter with a home-constructed set, whilst in the case of a manufactured receiver there is usually a trimmer which adjusts the ganging of one of the circuits.

What I have just said above depends a good deal upon the wave-trap or rejector itself and the amount of readjustment of the circuit which is rendered necessary depends very much upon the trap; there are now a good many wave-traps on the market which are very well designed and which really have little effect upon the tuning of the set, whilst in addition to improving the selectivity they often actually increase signal strength as well, especially on a particular wave-length range.

Different wave-traps are wound for different wave-length ranges, and it is very desirable that you should make up your mind which particular station or stations you want to cut out before you go to buy your wave-trap.

Ferranti Rejector.

With most rejector types, such as the Ferranti rejector, all you have to do is to operate the central knob until you have brought down the strength of the interfering station to a minimum, and then turn to the tuning control of the set and readjust this. The readjustment of the tuning will quite possibly bring in the station again to some extent, and then the knob of the wave-trap must be still further adjusted.

For the benefit of those who may be hesitating about using a wave-trap, its operation is perfectly simple, and not unlike the simultaneous adjustment of the tuning and reaction controls, where the movement of the one generally means a corresponding readjustment of the other.

Some types of wave-trap are adapted for connecting across the aerial and earth terminals of the set, instead of in the aerial lead, but the adjustment is practically the same. The interfering station should be tuned in until it is at its loudest, and then the wave-trap should be adjusted until the interfering station is reduced to the minimum.

A slight movement of the tuning knob of the receiver will probably bring the interfering station back again slightly, and then the wave-trap must be still further adjusted until the minimum position is reached again.

Watch the Strength.

Before leaving this point, I should like to emphasise the importance of keeping an eye on the ganging, where ganged condensers are used in the H.F. part of the set. It is more than probable that some slight readjustment of the ganging will be made necessary owing to the use of a wave-trap.

(Continued on next page.)

COSMIC THREE STAR

We do not recommend substitutes.

See page 1321

"MORCO" CABINETS FOR THE COSMIC III

The "METROPOLIS" CABINET No. 1102.

In medium colour Fumed Oak finish with Ebonised feet and well-designed vignette. Baseboard supplied. **PRICE 10/-**



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Adot. of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.

TECHNICAL NOTES

(Continued from previous page.)

If, therefore, after making all the usual adjustments, you find that, although you get selectivity, you are not getting signal strength up to expectations, take a look at the ganged stages, and it is practically certain that you will find that a little attention there will do the trick.

Atmospherics.

Atmospherics are not, as a rule, very troublesome in this country; so, as long as we confine ourselves to B.B.C. stations, we do not require to take any particular precautions against true atmospherics. When it comes to long-distance reception, however, and especially in the summer-time, atmospherics can be very troublesome.

One of the simplest ways to get over this trouble is to reduce the efficiency of the aerial system. It sounds rather a queer way of doing things, but often the remedy is better than the disease. If you use a much smaller tuning coil, you can still tune to the desired wave-length by using a correspondingly larger capacity to tune it.

In those cases where an H.F. transformer is used, with aperiodic aerial tuning, all you have to do is to use a much smaller number of turns on the secondary of the transformer. I have sometimes had good results by reducing the number of turns to about one-third, and also by connecting a small fixed condenser across the transformer secondary.

The capacity of this condenser depends, of course, on circumstances, but .0002 is an average value. The tuning is then carried out by means of the variable condenser and, owing to the parallel capacity, the atmospheric interference is greatly minimised.

A simple variation of this method is to connect a high resistance between the aerial and earth terminals of the set, trying various values of the resistance until you get a value which cuts down the atmospheric interference without diminishing too greatly the signal strength. The resistance may conveniently be mounted in an ordinary resistance-holder.

Valve Specifications.

Lots of people, on buying a new valve, just take it out of the carton, throw away all the technical data and instruction sheets which are packed with it, and proceed to use the valve according to their own ideas. Now this is very foolish, because the manufacturers have gone to a lot of trouble to design the valve for particular purposes, and to draw up the data and specifications set out on the sheets which they supply with the valve.

It is time well spent to study these sheets carefully, and to make sure that, as far as possible, you use the valve according to the specification. This applies particularly to anode and grid volts, and, needless to say, to filament voltage, although in the latter respect you are hardly likely to go wrong, since the valve will be either a 2, 4 or 6-volter.

The most usual type of curve supplied with a valve is the one showing the relationship—that is, the static relationship—between anode-current and grid-volts.

(Continued on next page.)

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The response curve (above) speaks for itself; note particularly that the base amplitude present in every record is compensated.

A practical demonstration will reveal remarkable fidelity of reproduction with minimum needle scratch. Ask your dealer to arrange for you to hear this fine unit.

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You can charge your friend's battery with your own at no extra cost. Will do up to four 2-volts at one time in 8 hours.

Cost of running negligible. Trial 7 days given. 55/-

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(Radio Dept. 46), 21-22, Great Sutton St., LONDON, E.C.1



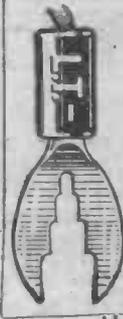
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CLIX

Improves any receiver ...

Required for the
"COSMIC" THREE





PANEL
TERMINAL
3d.

"VICEGRIP"
WANDER
PLUG
1½d.

SPADE
TERMINAL 2d.

From all Dealers. Folder "P" on request.

TECHNICAL NOTES

(Continued from previous page.)

I say "static" because the curve in question can be obtained simply by means of the necessary high-tension and grid-bias batteries without the valve being used in a set at all.

The curve will show that, as the negative grid-voltage is increased, the anode current diminishes until there comes a point at which the anode current reaches zero. If the valve is being used as an amplifier, it is necessary to avoid grid current, and this means that a negative voltage must be applied to the grid. If the valve amplifier is used in conditions where grid-current flows, distortion will be introduced.

Special Uses of "S.G.'s."

There has lately been a good deal of interest taken in the efficiency of the screen-grid valve as a detector. In using an S.G. valve in this way there are numbers of points which you want to keep carefully in mind.

The lead which previously went to the anode of the detector (the ordinary three-electrode detector) now goes to the cap of the screen-grid, whilst the socket which was previously the anode socket connects to the screen.

If you were using the valve as an H.F. amplifier you would use, perhaps, 70 or 80 volts on the screen, but when using the valve as a detector, this screen voltage must be very much lower—about 30 volts is a round figure.

The voltage on the screen is conveniently obtained by means of a potentiometer and sometimes this is made of a couple of spaghetti resistances, one from the H.T. positive to the screen and the other from the screen to earth.

There is a potential drop along the whole of these two series resistances and the ratio of the first to the second gives the ratio in which the total voltage is divided by the screen-grid connection.

For instance, if the resistance from H.T. to screen is twice as much as that from screen to earth, then the screen is connected at a point two-thirds of the way from the H.T. plus to earth, if you like to have it the other way round, a point one-third of the way up from zero towards the H.T. maximum. Consequently it will be at a voltage above earth of one-third of the H.T. voltage, whatever that may be.

R.C. Coupling.

Resistance-capacity coupling is preferable to transformer-coupling with a screen-grid valve used as a detector, owing to the relatively high impedance of the valve. If R.C. coupling is used, an anode resistance of 100,000 to 150,000 ohms is generally suitable with a coupling condenser of about 0.005 or somewhat less.

Some very useful hints in connection with the practical use of an S.G. detector were given in an article by W. L. S. in "P.W." a little while back.

YOU CAN TAKE IT FROM ME!



That the New
Electradix
Sale List will
Save You
Pounds.



CATALOGUE
EVERYTHING
ELECTRICAL.
Electradix Radios
WE SUPPLY THE WORLD
WITH ALL THE LATEST
ELECTRICAL
REQUIREMENTS
218 UPPER THAMES STREET

It is full of Bargains of Aerials, Batteries, Buzzers, Condensers, Cable, Cabinets, Chokes, Coils, Chargers, Dynamos and Motors, Ebonite and Pax., Engines, Lamps, Neons, Microphones, Mains parts, Meters, Receivers, Spark Coils, Telephones, Valves, Wavemeters, Wire, Wheatstone and Capacity Bridges, etc., etc.

Special Bargain this week. Multi-range Panel, 0-5 mil-ammeter, flush nickel 2½ in. dial moving coil, knife needle reads 1-10 m.a. on 50 divs. With extra shunts for 50, 100, 150, and 250 m.a. Brand new, 22/6 the set.

Send addressed envelope for our Sale List of Electrical bargains.

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Cheapest PERFECT Contact

Lectro Linx, Ltd., 254 Vauxhall Bridge Road S.W.1

FAMOUS CRAFTSMANSHIP

FOR YOUR SET OR RADIO-GRAM. Piano tone and style brings a thrill no words can convey.

(3,000 delighted clients.)
DIRECT from makers.
APPROVAL 7 days FREE.
35% to £15. Cash or EASY PAYMENTS. Photographs FREE.
PICKETS, Radio-Furniture Makers (P.W.), Albion Rd., Bexleyheath, Kent.

MIRROR LIKE

Specified for The "COSMIC" III.

Use PERMCO, the modern Ebonite guaranteed never to spoil your set by discolouring. Black, Mahogany or Walnut finishes, perfect mirror polish, highest insulation, easy to cut and drill and costing only 4/6 for 7" x 18" panel. Ask your dealer or write to us for list. Any panel size cut.

BRITISH HARD RUBBER CO., Ltd.,
PONDERS END MIDDLESEX

S.T. 300 SCREEN & BASE PLATE

Pure Copper, tinned to prevent tarnishing. Screen .024" thick. Base Plate .007" thick. Guaranteed to S.T. Specification.

The Two 2/3 Post Free.

MILTON MANUFACTURING CO.,
MILTON STREET, COVENTRY.

COSMIC THREE

THE AUTHOR USED THESE PARTS

See page 1317

Advt.

No more spoilt programmes



STEL

Station Eliminator

Send only 1/- Postal Order to STEL Products, Dept. A, 1A, Swan Mews, Stockwell, S.W.9.

REMEMBER! "POPULAR WIRELESS" has the largest sale of any WEEKLY WIRELESS JOURNAL.

CUT OUT DISTORTION

from your reproduction.

If your Cone Loudspeaker chatters and buzzes in protest every time a loud passage comes along—it needs a

TONAX

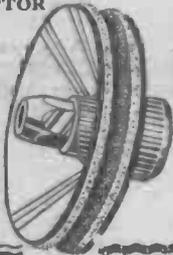
IMPROVED CONE ADAPTOR

Tonax—easily fitted into any type of cone speaker using any unit—cleans up production: vastly improves tone and volume by cutting out all "chatter" and rattle.

Single Cone Type - 1/-
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Ask for the 1932 model.
From all dealers or direct, Post 20.

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The Pilot has the last word.

TELSEN TRIPLE THREE now supplied as

PILOT AUTHOR KIT



CONTENTS OF KIT

Here is the list of Parts as specified and advertised by TELSEN and included in the PILOT SEALED KIT for the TELSEN TRIPLE THREE.

USE THIS LIST WHEN ORDERING SEPARATE ITEMS for CASH or C.O.D.

	s.	d.
3 Telsen valve holders	1	6
1 Telsen .0001-mfd. mica condenser	6	6
1 Telsen .0003-mfd. mica condenser	6	6
1 Telsen .001-mfd. mica condenser	6	6
1 Telsen grid leak, 2-meg.	9	9
1 Telsen grid leak, 1-meg.	9	9
2 Telsen grid leak holders	1	0
1 Telsen aerial coil with selectivity adjustment	7	6
1 Telsen dual-range S.W. coil unit	4	6
1 Telsen .0005-mfd. logarithmic variable condenser	4	6
1 Telsen .0003-mfd. reaction condenser	2	0
1 Telsen 2-point switch	1	0
1 Telsen 3-point switch	1	3
1 Telsen 4-point switch	1	6
1 Telsen Radiogrand transformer	8	6
1 Telsen 50,000-ohm Spaghetti resistance	1	6
1 Telsen 25,000-ohm Spaghetti resistance	1	0
1 Telsen .01-mfd. Mansbridge condenser	1	6
1 Telsen 1-mfd. Mansbridge condenser	2	3
1 Telsen binocular H.F. choke	5	0
1 Telsen fuse holder	6	6
1 Telsen illuminated disc drive	4	6
BASIC KIT	52	6

EXTRA COMPONENTS FOR FULL KIT

1 14" x 7" Oak Panel, Polished, drilled and cut for escutcheon	2	0
1 14" x 1 1/2" Ebonite Terminal Strip, ready drilled	1	0
1 14" x 9" Ply Baseboard, stencilled, showing correct position for all components	1	0
13 Engraved Insulated Terminals	3	3
Flex. Wire and Screws	1	6
	8	9

PILOT-TELSEN SEALED FULL KIT

Complete, as illustrated, comprising Basic Kit as advertised by Telsen, with Panel, Baseboard, Terminal Strip, Wire, Screws and Flex as above. **CASH** or **C.O.D.** **55/-** or 8 monthly payments of **7/6**

5 EXCLUSIVE POINTS OF PILOT-TELSEN AUTHOR KITS

- Exactly as specified by Telsen.
- Drilled Oak Panel ready for assembly.
- Drilled Ebonite Terminal Strips.
- Stencilled Baseboard showing correct position of all components.
- Blueprint and full instructions. Also copy Telsen Radio-Mag.

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CASH OR C.O.D.

52/6

Basic Kit less Panel, Baseboard, Terminal Strip, wires and screws.

EASY WAY

Basic Kits as advertised by TELSEN: 7 monthly payments of **8/3**

SOLE DISTRIBUTORS of PILOT-TELSEN KITS and Stockists for full range of Telsen components. AVAILABLE TO THE TRADE AT STANDARD DISCOUNTS.

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Messrs: Peto-Scott Co. Ltd. 77, City Road, London, E.C.1

Dear Sirs, Please send me **CASH/C.O.D./H.P.**
TELSEN TRIPLE THREE IN PILOT SEALED CARTON **£2-12-6**
TELSEN TRIPLE THREE
FULL KIT IN PILOT SEALED CARTON **£2-15-0**
for which I enclose £ s. d.
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Name _____
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THE DUX AUDIRAD CHOKE

WHAT AUDIRAD IS The "DUX" Audirad is an entirely new form of choke capable of dealing with Low Frequencies and High Frequencies which an ordinary choke cannot do.

WHAT THE "DUX" AUDIRAD DOES

Its difference from ordinary L.F. chokes is that it incorporates an H.F. "stopping" device which effectively bars H.F. currents that normally would be passed by the self capacity of the ordinary L.F. choke and cause hum or other H.F. interference in mains and battery-driven receivers.

FOR MAINS UNITS AND SETS

In mains circuits it is an extremely efficient smoothing or output filtering device for A.C. or D.C. sets and reduces the passage of unwanted H.F. impulses to an absolute minimum.

FOR BATTERY-DRIVEN SETS

The Audirad gives a super output filter service and is highly satisfactory for practically all receivers and amplifiers. It ensures an unusual freedom from unwanted current fluctuations and consequently gives better speaker performance.

SMALL SIZE—BIG VALUE

The "DUX" Audirad is smaller than many ordinary chokes and much less in price and, whether used for mains or battery sets, constitutes the best value obtainable.

ASK FOR THE "DUX" AUDIRAD LEAFLET which includes diagrams and technical information. Your dealer will supply.



PRICE
8/9

L.F. Inductance	25 Henries
H.F. Inductance of H.F. Stopper	10,000 micro-henries
Maximum D.C. Current	50 m.a.
Overall dimensions	2 ins. x 2½ ins. x 2½ ins.
Weight	15 ozs.
List No. D.Y. 31.	

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Popular Wireless

Every Thursday
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INCORPORATING "WIRELESS"

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In
this
issue

Complete specification of the READY RADIO COSMIC ★ RADIO-GRAM

See
pages
1449, 1451
1453, 1455

H.L.2

METALISED



LOOK FOR
"EDDY" IN
YOUR
DEALER'S
WINDOW



Further evidence of the supremacy of the new range of 2-volt Mazda valves is here in the metalised H.L.2. Extreme sensitivity joins with absolute stability, and its high amplification coupled with a comparatively low impedance renders it particularly efficient as a leaky grid detector or intermediate L.F. amplifier. The steep slope of the H.L.2 also makes it suitable for use as an anode bend detector.

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

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VALVES

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BIG
ACHIEVEMENT
IN THE NEW
MAZDA
2-VOLT
RANGE

MAZDA 2-VOLT RANGE

H.210	-	8/6	P.240	-	13/6
★ H.2	-	8/6	PEN.230	-	20/0
H.L.210	-	8/6	PEN.220	-	20/0
★ H.L.2	-	8/6	PEN.220A	-	20/0
★ L.2	-	8/6	S.G.215	-	20/0
P.220	-	10/6	★ S.215A	-	20/0
P.220A	-	13/6	★ S.215B	-	20/0

★ METALISED



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RADIO DIVISION:
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Buy Your Radio this NEW EASIWAY

6/- Down

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Balance in 11 monthly payments of 5/2.
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P.W. 27-32

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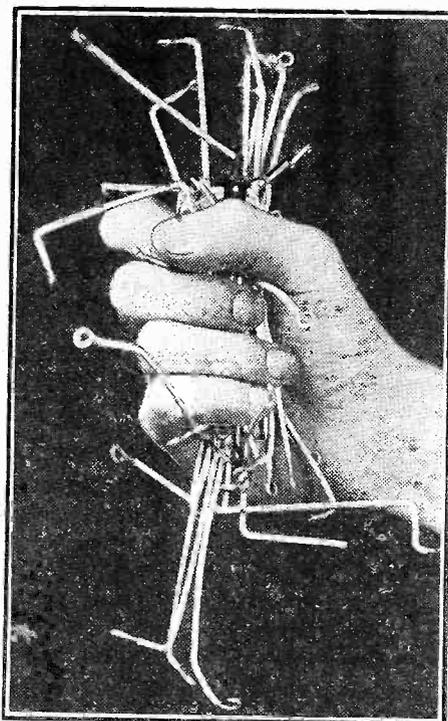
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THE
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By Victor King

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AN H.T. UNIT
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Here is an example of constructional simplicity—every wire in the famous S.T. 300, even to the G.B. leads!

In the March Issue—

John Scott-Taggart, F.Inst.P., writes

MORE ABOUT THE S.T.300

The Heart of the
Modern Set

By
John Scott-Taggart
F. Inst. P.

All about
THE MAN
BEHIND THE
VAUDEVILLE

MAKING
RADIO
READABLE

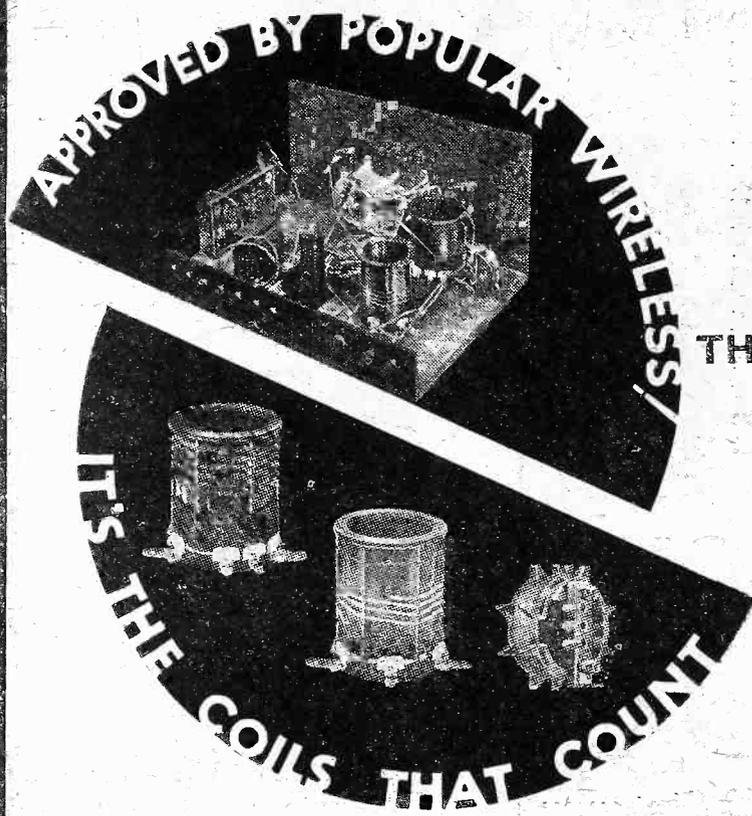
By
Herbert K. Simpson

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WIRELESS CONSTRUCTOR

YOUR COSMIC III A SOVEREIGN SET



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THIS IS THE SOVEREIGN KIT

- Bakelite Panel, 14 in. x 7 in., ready drilled.
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- "Cosmic" Dual Range Coil.
- "Cosmic" Short-Wave Coil.
- *00075-mfd. solid dielectric Variable Condenser.
- *0003-mfd. Reaction Condenser.
- Push-pull on-off Switch.
- 3-point Push-pull Switch.
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- .2-meg. Grid Leak.
- .5-meg. Grid Leak.
- 3 Valve Holders.
- H.F. Choke.
- L.F. Transformer.
- 9 Indicating Terminals.
- 100,000-ohms Spaghetti Resistances.
- Terminal Strip.
- G.B. Battery Clip.
- Sleeving and Connecting Wire.

SOVEREIGN IS SPECIFIED IN BOTH "COSMIC" SETS—THIS IS YOUR GUARANTEE

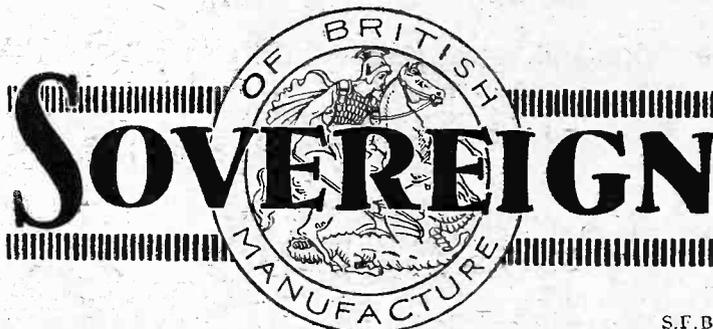
Sovereign "COSMIC" Short-Wave Coil (specified in original "COSMIC" III STAR)	4/-
Sovereign 100,000-ohms Spaghetti Resistance (specified in original "Cosmic" III)	1/3
Sovereign "COSMIC" Dual-Range Coil (officially approved for both "Cosmic" Sets)	5/-
Sovereign Moderator Coil (officially approved for both "Cosmic" Sets)	2/6
Sovereign *00075-mfd. solid dielectric Condenser for tuning the Moderator Unit	3/-
Sovereign *0003-mfd. Reaction Condenser	2/6

If you have difficulty in obtaining Sovereign Components, use no others but send direct (also for Sovereign Catalogue) to:—

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52/54, ROSEBERY AVENUE, LONDON, E.C.1.
Telephone Clerkenwell 2788/9.

SOVEREIGN "COSMIC" KIT IN SOVEREIGN CARTON

52/6



This Might Happen in YOUR Home—

WHAT WOULD YOU DO?

A BROKEN arm or leg—a bad cut or food poisoning—would you know what to do? Do you know the elements of first aid and home nursing? You *should* know. Every day lives and limbs are saved by someone who can act quickly and do the right thing at the right time. THE CONCISE HOME DOCTOR is

A BOOK TO MAKE and KEEP YOU FIT

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Simple Remedies, Dietetics, Mothercraft, First Aid, Sex Education, Home Nursing, Care of Animals, Domestic Hygiene, Health Exercises, Sex Hygiene, Anatomy, Beauty Culture, Health Problems at All Ages.

Parts 1 & 2 **6 D.**
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Each.



At all Newsagents and Bookstalls.



A Quality Standard Ensuring Perfect Reception
and Unequaled Long-Life Economy!

THE in-built quality of Pertrix Dry Batteries and Accumulators combined with craftsmanship in manufacture definitely assures finer, farther and more pleasing reception. To change to Pertrix is to enjoy a new experience—an experience of **BETTER** wireless, smooth, silent power combined with a **LONGER LIFE** which means a new economy.

Instal Pertrix to-day and **KNOW** how good and how economical *your* set can become. Of all good Radio Dealers.

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BRITANNIA BATTERIES LIMITED.

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Batteries for Central Stations
Batteries for Country House Lighting
Emergency and Stand-by Lighting
Batteries for Theatres, Cinemas, Hospitals, etc.
Batteries for the Starting and Lighting, and Ignition of Motor Cars, Motor Cycles, Buses and Coaches
Batteries for Electric Vehicles, Trucks, Locomotives, Ships and Yachts
The only Nickel-Iron Batteries on sale in Britain that are entirely made in this Country.

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SUPER LIFE
DRY BATTERIES
ACCUMULATORS

BRITANNIA BATTERIES LIMITED,

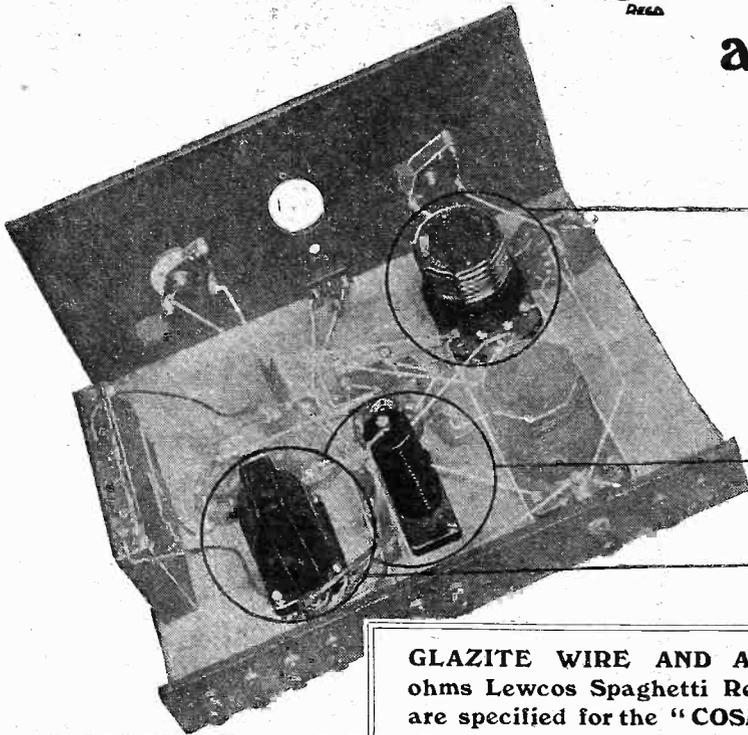
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KIT "A"

This is the Kit of Parts actually used and specified by "P.W." Technical Experts.

Author's Kit, less valves and cabinet.

CASH or C.O.D. 70/-

EASYWAY:

12 monthly payments of **6/5**

Valves as specified, £1:10:6
Cabinet, 17/6.

KIT "B"

Author's Kit, with valves but less cabinet.

CASH or C.O.D. £5:0:6

EASYWAY:

12 monthly payments of **9/3**

KIT "C"

Author's Kit, complete with valves and cabinet.

CASH or C.O.D. £5:18:0

EASYWAY:

12 monthly payments of **10/10**

1	Baseboard, 10" deep	s. d.	1 0
1	Peto-Scott Panel, 14" x 7", ready drilled		4 6
1	Cyldon Extenser, Type Ex.5V		16 6
1	Telsen "Cosmic" Dual-Range Coil		5 6
1	Telsen "Cosmic" Short-Wave Coil		4 6
1	Ready-Radio .00075-mfd. Condenser		3 6
1	Ready-Radio .0003 Condenser		3 6
1	Golfone Push-pull "On-off" Switch		1 7
1	Ready-Radio 3-point Push-pull Switch		1 6
1	Peto-Scott Moderator Coil Unit		2 6
1	Dubilier .0003 Fixed Condenser, Type 610		1 8
1	T.C.C. .01-mfd. Mica Condenser		3 0
1	Lissen Grid-leak Holder		1 0
1	Lissen 2-meg. Grid Leak		1 0
1	Graham Farish .5-meg. Grid Leak		1 0
1	Graham Farish Grid Leak Holder		1 6
3	Lotus Valve holders, Type THK		1 8
1	Lewcos H.F. Choke, Type II		6 0
1	R.I. Dux L.F. Transformer, medium ratio		6 9
9	Belling-Lee Indicating Terminals, Type R		2 3
1	Sovereign 100,000-ohm Spaghetti Resistance		1 3
1	Peto-Scott Terminal Strip, ready drilled		1 3
1	Bulgian Grid-bias Battery Clip, No. 1		6
1	Connecting Wire, Flex, Sorews, and 3 G.B. Plugs		6
10 ft.	Glazed Connecting Wire		6

KIT-BITS Selected C.O.D. Lines. You pay the postman — we pay post charges.

1	CYLDON Extenser, with disc drive slow motion, Type Ex.5	16 6
1	Set of "Cosmic" Coils, comprising Dual Range, Short Wave and Moderator Coils	12 6
1	Set of Specified Valves	£1 10 6
1	Cabinet as specified	17 6

COSMIC III STAR

This is the Kit of Parts actually used and specified by "P.W." Technical Experts.

KIT "A"

Author's Kit, less valves and cabinet.

CASH or C.O.D. 87/6

EASYWAY:

12 monthly payments of **8/-**

Valves as specified, £1:10:6
Cabinet, 17/6.

1	Panel, 14 in. x 7 in. READY DRILLED AND SLOTTED FOR PANEL CONTROLS	s. d.	4 6
1	Baseboard, 10 in.		1 0
1	Ready Radio Duotune Extenser		18 6
1	Ready Radio .00075-mfd. vari. condenser		3 6
1	Ready Radio .0003-mfd. reaction condenser with slow-motion drive		7 0
1	T.C.C. .0003-mfd. fixed condenser		1 3
1	T.C.C. .001-mfd. fixed condenser		1 6
1	T.C.C. .01-mfd. mica fixed condenser		3 0
1	Golfone "Cosmic" dual range coil		5 6
1	Sovereign "Cosmic" short-wave coil		4 0
1	Peto-Scott moderator coil		2 6
2	Ready Radio push-pull "on-off" switches		1 8
1	Ready Radio 3-contact push-pull switch		1 6
1	Ready Radio radio-gram rotary switch		2 9
1	R.I. type FY H.F. choke		7 6
1	Lewcos L.F.T.6 L.F. transformer		10 0
3	Telsen 4-pin valve holders		1 6
1	Lissen 100,000-ohm Spaghetti resistance		1 9
1	Dubilier 2-meg. grid leak and holder		2 9
1	Dubilier .5-meg. grid leak and holder		2 9
1	Terminal strip, 14 in. x 2 in., ready-drilled		1 3
9	Belling-Lee terminals		2 3
10 ft.	Glazed Connecting Wire		6
3	Battery plugs, screws, flex, etc.		6

KIT-BITS Selected C.O.D. Lines. You pay the postman — we pay post charges.

1	ReadyRad Duotune Extenser	18 6
1	Set of Cosmic Coils as specified	12 0
1	Set of specified Valves	£1 10 6
1	Cabinet — to specification	17 6

KIT "B"

Author's Kit, with valves but less cabinet.

CASH or C.O.D. £5:18:0

EASYWAY:

12 monthly payments of **10/10**

KIT "C"

Author's Kit, complete with valves and cabinet.

CASH or C.O.D. £6:15:6

EASYWAY:

12 monthly payments of **12/5**

FINISHED INSTRUMENT

Factory wired and assembled from specified components. Broadcast tested. Complete with valves and cabinet and including royalties.

CASH or C.O.D. 7 GNS.
or 21/- down and 11 monthly payments of 12/6.

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Drydex 120 v. H.T. Battery - 24 -
(Triple Capacity Type)
Drydex 9 v. G.B. Battery - 1 -
Exide 2 v. 30 60 L.T. Accumulator, 11 -
Blue Spot 100 U. Unit and Chassis, £1-19-6

FINISHED INSTRUMENT

Factory wired and assembled from specified components. Broadcast tested. Complete with valves and cabinet and including royalties.

CASH or C.O.D. £8:0:0
or 25/- down and 11 monthly payments of 13/6

Any parts supplied separately. If order value over 10/- sent Carriage Paid, or C.O.D. Post charges paid.

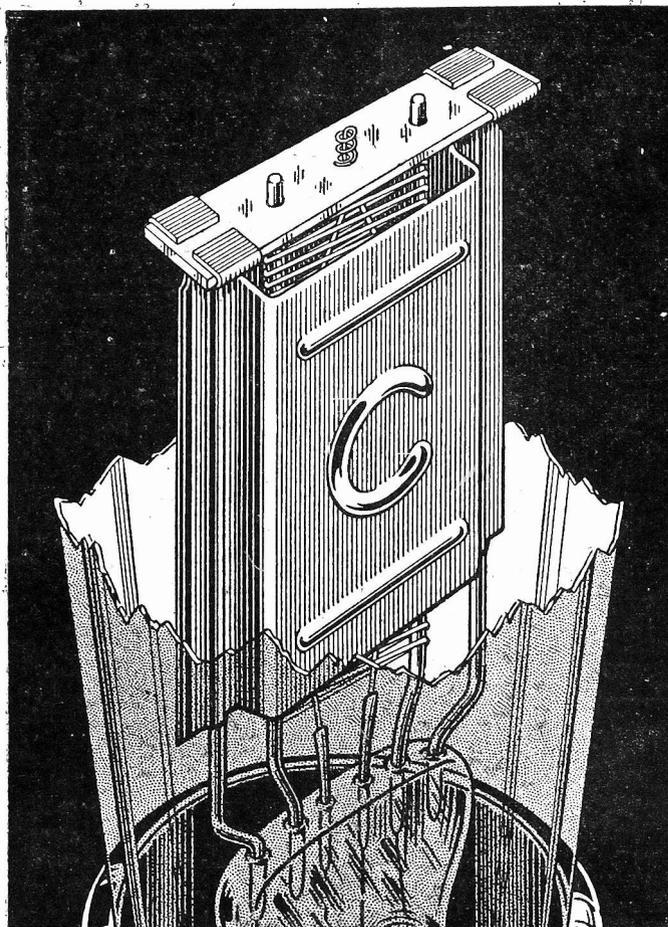
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Cossor Valves for
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27th Feb.—"Cosmic Three Star," 210 DET,
 210 L.F., 220 P., or 230 X.P.
 13th Feb.—"Cosmic Three," 210 DET,
 210 L.F., 220 P.
 30th Jan.—"Eckersley Two," *210 H.F.,
 220 P.
 23rd Jan.—"P.V.J. One," *210 H.F.
 8th Jan. and 2nd Jan.—"Eckersley Three,"
 *210 H.F., 210 L.F., 220 P.
 26th Dec.—"Full Range Two," 210 H.F.,
 220 P.-A.
 19th Dec.—"Volume Three," 210 DET,
 210 L.F., 220 P.
 5th Dec.—"S.Q. Star," 210 D.G., 220 S.G.,
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In the assembly of every Cossor Valve, the elements are rigidly secured in

absolute life-long alignment by the mica bridge as shown above. In some types, four, and in others, two bridges are used. No variation is possible—either during or after manufacture. Therefore a remarkably consistent performance is ensured throughout the life of the valve.

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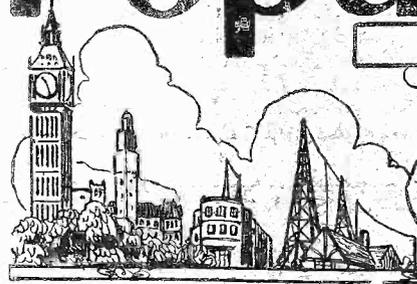
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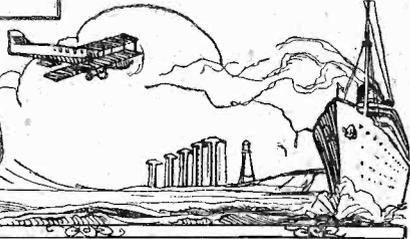
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"SIGN, PLEASE"
 ARIEL'S LATEST
 INDIAN NEWS
 RADIO ADS.

RADIO NOTES & NEWS

MODES FOR MOBSMEN
 VANS AND VANS
 GRAMMY NEWS
 TRY AGAIN

A Sense of Proportion.

SOME of the radio-grams now on the market are only fit for prairies or concert halls, and ought to be sold only to the proprietors of such places. My neighbour, who eight years ago had a crystal set, has worked up steadily, a valve at a time, until, last year, we were able to set our clocks by his time-signal.

But last month he must have been promoted or left a legacy, for there arrived at his house—my lady-folk saw it all, as they see everything—a radio-gram about the size of a cottage piano, so that now, if I am on London Reg., I am "jammed" by his Daventry Nat.—through the wall!

Sign, Please.

TALKING of that reminds me that I had a letter from a man up north who, on the strength of his being an experimenter of many years standing, is often consulted by dealers and others on the subjects of purchase and repairs of radio sets. Out of this there often arises the necessity of writing to the makers of a set—but, says he, "on how many of the name plates attached to receivers will you find the name and address of the makers?"

I presume that he means, "Darned few!" Bad business! Reason inconceivable. Manufacturers, please note.

"Ariel's" Latest "Grouse."

I DID not mean to use any more of "P.W.'s" useful space in trying to induce the B.B.C. to "cut the cackle" in the "Radio Times," and give us a straight plan of the programmes. But there is evidence of so much strong feeling in connection with this point that I think it worth while to spring one more par. on the subject.

What people appear to want is a plainly printed week's programme. Most of us would pay twopence for that alone. Thus the B.B.C. would save money by cutting out the special articles, leaders, extracts from encyclopædias, etc., and the fearful pages of listeners' letters, above all!

The International Short-Wave Radio League.

ALF MANN, of Middlesbro—now again in London, on a job—tells me that he has written to the I.S.W.R.L. re

spirit of "P.W."—and am "behind the arras"—like the rat in "Hamlet."

Indian Radio News.

IT is gratifying to learn that the closure of the broadcasting stations at Calcutta and Bombay, which was to have occurred last November, has been indefinitely postponed. They are, however, still bogging over the question of who shall run the business. Surely statesmanship, at this time, should answer, "The State,"

and so take over the means of spreading enlightenment and true culture.

The Indian people are not savages, and are open to intelligent argument. Let the Government of India spend a few lakhs of rupees on propaganda, and tell the Indian agitators "where they get off the bus."

I should like to see "Willingdon is willing" the motto of Indian broadcasting.

Radio Ads. Creeping Nearer.

THE big publicity station in Luxembourg is almost ready, and some time in April we may hear this 200 kw. monster being put through its paces on 217.4 metres.

What its effect on "listening" in Europe may be remains to be discovered, but its influence on the use of B.B.C. programmes by B.B.C. subscribers may be very profound, considering the increasing numbers who forsake Great Britain on Sundays and hearken unto Radio-Paris.

Telephoning to Australia.

BEHIND the switchboard which "puts you through," to New York, Rio, Buenos Aires, Australia, South Africa, or Java, is the mind of Mr. B. L. Barnett,

(Continued on next page.)

BEGINNING THE BUILDING OF A BIG BROADCASTER



Working in the Somerset fields, near Watchet, these men are commencing the construction of Britain's West Regional Twin Broadcasting Station, that will do for the West what Moorside Edge has done for radio listeners in the North. Before this giant gets going the B.B.C. will open the Scottish Regional, now nearly finished at Falkirk.

K.C.'s complaint (see page 1200, February 6th). He explains that he is not an official, but only a member, and that he has so far found the League and all its works to be "above board."

I have no doubt that his confidence is justified. But the receipt of money should always be promptly acknowledged, either by form, or in the shape of "the goods." I await Southport's reply.

With reference to Alf. Mann's human desire to meet "Ariel"—sorry! I am the

NOTES—NEWS—AND INTERVIEWS (Continued)

of Cambridge, a mathematical scholar and Civil Servant of the first class, twice mentioned in despatches in the Great War, and awarded an M.C. for gallantry in the field.

The Post Office and the public are lucky to have the services of this type of man. He is the moving spirit behind "overseas telephones," and a watch-dog of British interests in the great war of communications—which is fiercer than the general public realises.

The New Advertising.

AT the Willesden Police Court recently a copper said that a crook threw a five-valver at him. Either the cop was exaggerating or the crook was a



blooming Samson! But consider! What gorgeous publicity opens out of this!

We have passed beyond the stage when firms advertised that their sets could be

mangled by hippos, roasted in lime-kilns, submerged in boiling cocktails, or left for six months in the Monkey House, all without impairing the efficiency of the sets. Now, no doubt, we shall have "The Flighty Five downs, Scotland Yard's Heaviest Sergeant," or "Warranted to Knock the Stuffing Out of Carnera."

Modes for Mobmen.

A "TRADE" paper naïvely states, "Radio raiders have now taken to wearing bowler hats." What is *de rigueur* for radio robbery then? No doubt the trader would be happier to know that the gentleman who takes their portables away is correctly clad for the occasion. There is an eternal fitness of things! I suggest that it would not be "playing the game" to pinch a portable whilst wearing plus fours and a fireman's helmet. And no gentleman would dream, I trust, of making off with a "console" seven-valver unless he were in full evening dress, *avec* a De Reske and a spot of Anzora!

Vans and Vans and Plain Vans.

THE P.O. Van has already won notoriety by bluffing the British conscience into paying some thousands of quids into the Treasury in the shape of licence fees.

But my, fellow leg-puller, "Beachcomber," has wind of a counter-attack by a "pirate" van which is dogging the G.P.O. van and warning "pirates"—by radio—of its

approach. He believes that the crafty Post Office is equipping vans to detect the van which is dogging their van!

It is believed that plans are maturing for the equipment of a "pirate" van to



detect the van that is detecting the van that is detecting the van that is kidding us that it is detecting "pirates." *Ad infinitum.*

Does This Mean YOU?

NEW members are wanted by the Thornton Heath and District Radio Society, particulars of which may be got from the Hon. Sec., Mr. C. H. Piper, 77, Torrington Road, Thornton Heath, S.E. My recent appeal on behalf of this society brought four new members, but still more will be heartily welcomed. Meetings are held on Tuesdays, 8.15 p.m., at St. Paul's Hall, Norfolk Road, Thornton Heath, and the

SHORT WAVES.

"Mystery Hiss in a Set," runs a headline in the "Daily Herald."
Well, you can't blame it for not thinking much of the programmes.

We hear of a lady who visited the Observatory at Greenwich the other day and was much astonished to learn that the Astronomer-Royal found it necessary to regulate his clocks by observing the stars, when it was easy to get the time signal on the wireless.—"Punch."

"The latest blessing of science is a wireless typewriter which comes from Detroit," we read.

Our typist thinks it must be lovely to live in America.

These physical culture exercises by wireless are all very well, but what happens if we're all tied up in knots and the B.E.C. announce: "The instructor has been suddenly taken ill, but he hopes to resume his lesson next week?"

They say that chewing-gum manufacturers in the States are now checking the output of the machines by making the chewing-gum act as the dielectric in a condenser! Any inequality in the gum is instantly shown up on a wireless receiving set connected to the chewing-gum-producing machine.

Well!

"What is it that puts the 'ire' in wireless?" asks a correspondent.

Sorry, the story is too long to tell.

THANKSGIVING!

Mummie's shut the door at last; Mummie's really gone.
Now she's in the drawing-room; she's turned the wireless on.

Johnny won that pillow fight (I fell and banged my head),
So next we played a little game of "bouncing on the bed."

Then, after we had cleared away the feathers off the floor
And sewn the pillow up again, we bounced a little more.

That Opera made a lot of noise—ooh! lots more noise than us—
But glad we've got a wireless now; it saves a lot of fuss!—"Evening Standard."

syllabus includes evenings "sponsored" by leading gramophone and radio companies. Also, the society's Seventh Annual Dinner-Dance is fixed for March 16th, at the Greyhound Hotel, Croydon, tickets 6s. 6d. each.

Request to Transmitters.

A. H. B. (Stamford Hill, N.16) is anxious that amateur transmitters when sending in Morse should transmit as slowly as possible so that people who read slowly can catch the call-signals. A rather naïve

request, as transmitters will readily appreciate, but I pass it on in faith.

A. H. B.'s other suggestion, for which we thank him, is noted, and his DX notes have been passed to W. L. S. (Glad to hear that having dropped "P.W." for some time he finds that he needs us after all. May we live up to all such testimonials!)

"Grammy" News.

THE gramophone industry is not sleeping a wink these days, owing to its efforts to compete with radio. An official of the H.M.V. firm said recently that he estimated that there are gramophones in from 2 to 2½ million homes in these islands—a public which needs some real man-sized brain-waves to content, I should say.



At this particular meeting—the Publicity Club of London—he demonstrated a robot in the form of a commissionaire who, by means of a record, talked about itself, the speech coming from its mouth very cleverly. But what I want is the "complete symphony" machine, self-winding, self-changing, at a price likely to be within a journalist's means.

Let's Try Again.

MY plea on behalf of the "Short-Wave Listening Station," organised by Mr. John E. Rendle, 28, Sandford Road, Bromley, Kent (vide "P.W.", January 23rd), though it brought a number of enquiries has not succeeded in finding men willing to constitute their receivers as sub-stations in Scotland, the Midlands, and the West Country.

Now, come on! Give this fellow a break, some of you scientific-minded amateurs, and drop him a line asking for details; you may thus find your hobby turned into a definite channel and your interest in it increased. Thanks!

The Human Brain is Marvellous.

DO you know, I've reely and trooly had a letter from a chap in Somerset, in which the writer suggests that wireless would be useful in time of war! I rubbed my eyes, pinched myself brutally on both arms, and looked up the date when I read his letter. Wild springboks would not drag from me the initials or home village of this master-thinker.

But I'll have to get down into Somerset again, this year I hope, and tell the natives how several wireless messages were sent between 1914 and 1918, each of which proved most useful to both sides! Evving 'elp me! Where's that dole?



ARIEL:

BROADCASTING and the FAR EAST CONFLICT



A RUSHED report from Tokyo at the commencement of hostilities told me that the engineers of JOAK, the chief Tokyo broadcasting station, were giving a *running commentary* on the fighting. On checking this up I found that, as I expected, this American realism was not being brought into play.

What had happened was that Mr. K. Iwahara, the President of the Nippon Hoso Kyokai (Broadcasting Corporation of Japan) had sent two reporters out to act as eye-witnesses, and they cabled messages practically every hour from a point of vantage in sight of the Chinese frontier. JOAK temporarily suspended its midday lectures and normal news bulletins and gave every day a schedule of approximately six hours, devoted entirely to the eye-witnesses' account of the warfare.

Special Propaganda Talks.

When the novelty was beginning to wear off, then the three stations in Tokyo, acting under orders from the local Communications Bureau, gave out special talks with anti-Chinese propaganda.

It is important to correct the prevalent impression that Japanese broadcasting is a makeshift affair. In Tokyo alone there are three stations. Two of these were built by British engineers (one, in fact, by Marconi's) and one by a Japanese firm known as Annaka. The principal station devoting full time to Chino-Japanese war bulletins is JOAK, which is a 10-kilowatt working on 375 metres.

Another 10-kilowatt works 30 metres lower, and the 1-kilowatt outfit built by the Annaka concern is kept in reserve and works on 375 metres when JOAK has closed down.

At other chief towns, Osaka and Nagoya, are similar stations to the 375-metre broadcaster in Tokyo. These are JOBK and JOCK respectively. Working off the same circuit are five crystal-controlled relays. The Japanese Broadcasting Corporation has the sole use

A Special Correspondent gives "P.W." some topical and exclusive information about the happenings at the chief Tokyo station of the Nippon Hoso Kyokai (Japanese Broadcasting Corporation) at the start of the hostilities.

of a main cable running the full length of the chief island, and also of a submarine cable running across to the island of Chosen.

An Efficient S.B. System.

This comprehensive S.B. system is now being used solely for the war-time broadcasts, and until all ill-feeling is over the cables are running with anti-Chinese propaganda.

All the main stations work from about 9.30 in the morning till 9 o'clock at night. While the excitement is tense, the stations

has to be obtained from the local Communications Bureau to get a time extension.

Their closing down at about 9.30 is 2 p.m. British Summer Time to us, and the call "JOAK" is given in English, owners of long-distance sets may like to try their luck!

The opening call before each of the war-time bulletins is "Kochirawa Tokyo hoso kyoku de arimasu. Donotamo ohaho gozaimasu," and the closing down is "Donotamo oyasuminasai."

In the ordinary programmes news is provided at midday by a leading Tokyo newspaper, and by local newspapers near the other chief stations at Osaka, Nagoya and so on, and at about 7 o'clock in the evening by a chief Japanese Agency for all stations.

Under Government Control.

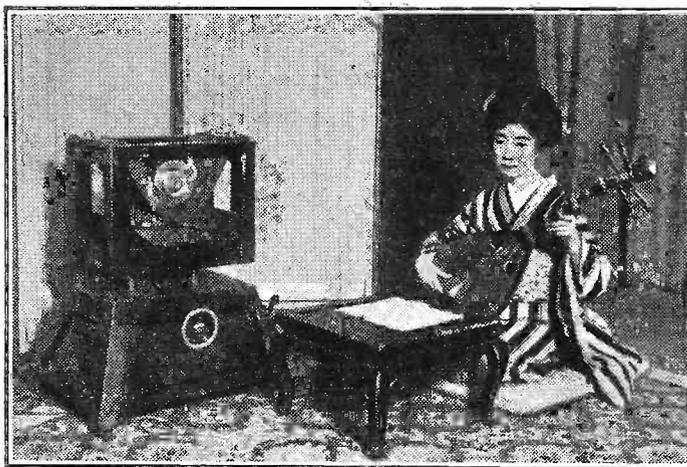
The Japanese Broadcasting Corporation is under Government control and is working in very much the same way as our B.B.C.

does, by Royal Charter. During hostilities the Government officials have stepped in and have ordered all news to be given through the Tokyo Agency and, of course, it is heavily censored.

Mr. Yokoyama, the chief of the Research and Testing Laboratories of the Japanese Broadcasting Corporation, has been entrusted with special work in producing sets for war-time use, in case matters get really serious. Incidentally, Japan makes a lot of its own radio apparatus, including valves, and so there is no possibility of the fair land of Nippon running short of radio supplies!

A J.B.C. official, questioned over the matter of wartime bulletins, said that there are now about 700,000 licensed listeners in the whole country and as families are large, on the average there are probably five million listeners. In most of the country there are 24 per cent valve sets and 76 per cent crystal sets. In Tokyo, owing to the need for selectivity, (Continued on next page.)

GETTING DOWN TO IT!



As the Japanese like to sit on low divans, or on cushions placed on the floor, their microphones are arranged on very short stands, as shown in this typical scene in the Nagoya studio.

are often working up till 10 or 11 o'clock at night.

This is extraordinary, because in the ordinary way all broadcasting must stop at 9.30 in the evening, and a special permit

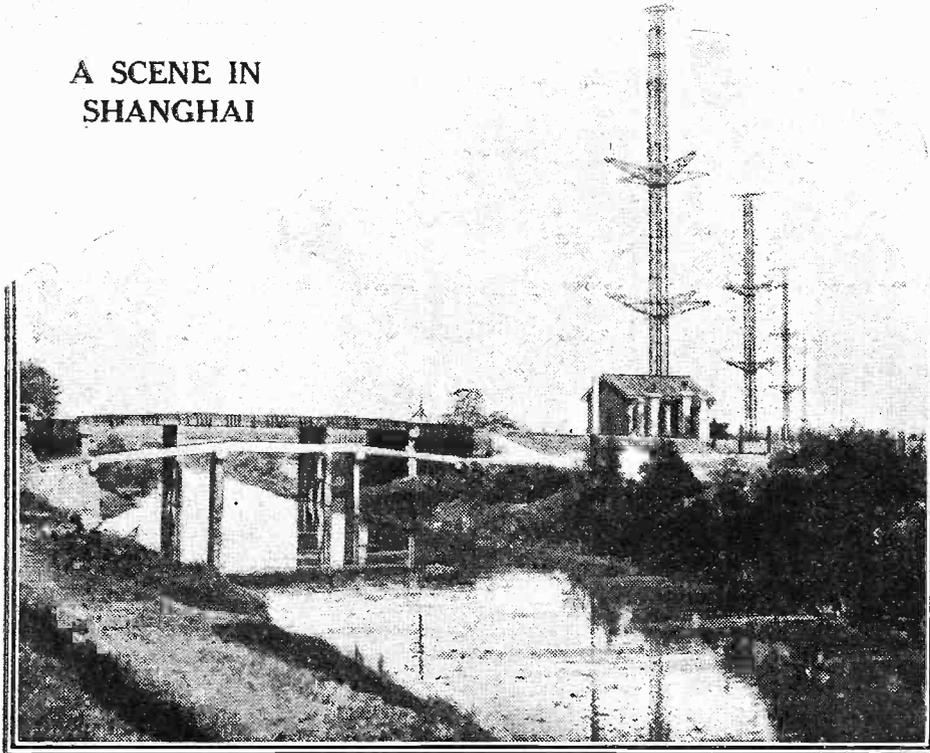
BROADCASTING & THE FAR EAST CONFLICT
(Continued from previous page.)

most of the listeners are valve users. The present wartime experience is teaching the J.B.C. officials how helpful their chain of stations is in disseminating propaganda.

I hear that for the time being the daily three-quarter-of-an-hour lessons devoted to teaching English are temporarily suspended, but that is probably only because of the war bulletins, and not because of any political feeling on one side or the other.

Mr. Kamino, one of the officials of the Kyokai concern, was at Savoy Hill a year or so ago, and it is owing to his influence that the Japanese concern has instituted

A SCENE IN SHANGHAI



This is the Chinese Government's Shanghai station, which links that city with San Francisco. Note the pagoda-like appearance of the masts, which were designed to be in harmony with a Chinese landscape.

regular talks and news bulletins, now of so vital importance in the hostilities.

Convincing Eastern Minds.

He was very impressed with the B.B.C. S.O.S. and news service, and he was one of the enthusiasts who set out to convince Eastern minds that broadcasting in Japan could be used for other reasons than giving programmes of music of the Samisen, Koto and Biwa, the three quaint instruments which you see in almost any view of performers squatting on the floor of a Japanese studio.

I should add that young Japanese recruits are still training on the two most popular games in the country, Sumo, a national sport, and American baseball. The J.O.A.K. station gives outside broadcasts once a week of both these games from stadiums in the capital. This is the one relief which Japanese listeners are getting at present in the welter of talks and war-time propaganda.

POINTS FROM LISTENERS' LETTERS
The "S.Q." Star—A Volume Controlling Tip—Power Valve Hum.

THE "S. Q." STAR.

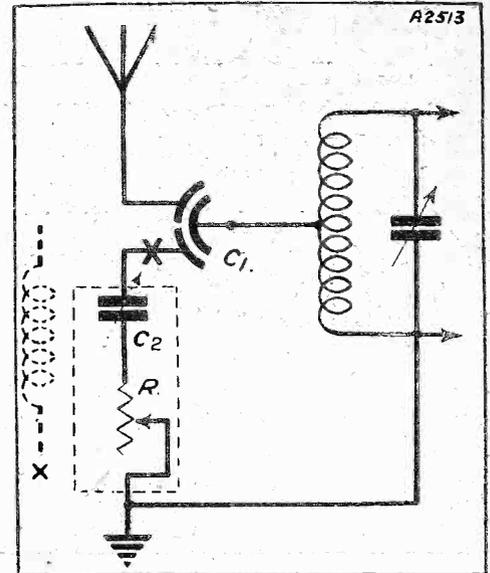
The Editor, POPULAR WIRELESS.

Dear Sir,—May I commend a little of your valuable space to congratulate you on a fine set of yours I have just completed, to wit, the "Super-Quad" Star?

Apart from one or two minor alterations, such as the addition of a Mazda pentode in the output stage, tone-corrected and choke-filtered by a Tunewell pentode output choke, also a large ratio L.F. transformer, I have stuck rigidly to your own specifications.

During a preliminary run out last evening countless stations were logged, seemingly anything going at the time. The only serious case of interference was between Warsaw and Eiffel Tower. Most of these stations came over at gratifying strength.

A DIFFERENTIAL INPUT



This diagram shows the connections for pre-detector volume control, recommended by Mr. Jefferies for ease of construction and operation.

construction and operation, may be of interest to some readers.

It is actually a differential condenser working as a capacitive potential divider, being suitably loaded by a dummy aerial in order to prevent any disturbances of the tuning of the set. The essential parts are a differential condenser '00015-microfarad max., a pre-set condenser '0005-microfarad max., and a 10-ohm wire-wound rheostat, assuming that the aerial is of fairly normal dimensions, i.e. about 25 ft. long and 25 ft. high. The importance of the rheostat being wire wound is due to the fact that it will usually provide, as well as resistance, the necessary amount of inductance.

Connections are as follows: Moving plates of the differential condenser to aerial terminal on the tuning coil, one set of fixed plates to the aerial, and the other set to one terminal of the pre-set condenser. The other terminal of this goes to the fixed terminal of the rheostat, the moving arm of which is connected to earth.

To operate, tune in a fairly strong signal on about 400 metres, say the Midland Regional station when in London, with the moving plates of the differential fully enmeshed with the aerial plates. Then turn down towards other plates, and adjust both the rheostat and the pre-set condenser until tuning is brought back to normal; the signal will, of course, be somewhat weaker. These adjustments should be refined upon a station on a shorter wave-length, when they will hold for all bands. In the event of the rheostat having insufficient inductance, a suitable coil may be made by winding about a yard of stiff wire round one's forefinger; its inductance can be adjusted by pulling out or squeezing in the windings. The coil should be put in place of the wire joining the pre-set condenser to the differential.

I have tried this on a number of sets, including one with ganged tuning, and have found that it operates as well as can be desired. Incidentally, the differential should be one with a very narrow gap between the two sets of fixed plates.

Hoping that this will solve somebody's difficulties.

Yours faithfully,

LIONEL JEFFERIES.

P.S.—Enclosed please find a diagram of connections, in case you would like to reproduce same. Wembley.

POWER VALVE HUM.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to the query of B. D. (Weybridge) regarding power valve hum under the heading "Capt. Eckersley's Query Corner," in your issue dated January 23rd, may I point out another possible source of hum which apparently escaped Captain Eckersley's notice.

Should the new super-power valve—and it is generally recognised that the latest modern types do—be taking more anode current than the one it replaced, then it is possibly overloading the smoothing chokes in the mains unit (and maybe the rectifier itself), thus allowing insufficient smoothing and causing the hum.

With best wishes for 1932.

Yours faithfully,
GILBERT W. DAVEY.

Kenton, Middlesex.

The set is being run from a Tannoy G.B. 1 H.T. eliminator with a rated output of 15 M.A. at 150 volts, which give adequate current for the set. Background is perfectly silent, not the slightest trace of hum being present.

The set is a delight to handle, the dial readings varying only slightly. I find the rather flat tuning of the right-hand dial a decided asset, as one is able to concentrate more easily on the critical tuning of the left-hand readings.

I (in the past) have built the "Titan" 3, the "Comet" 4, and the "P.W." 4, all of which have enjoyed considerable popularity amongst your readers, but for real quality I have to hand it to the "S. Q." Star, the circuit of which, when first published, struck me as being very ingenious, but at the same time simple; always a recommendation, to my mind.

In closing allow me to thank you once more for an astounding set, which I am sure will bring me many enjoyable programmes, until I again get the urge to build something else.

With best of luck and fortune to "P.W."

Yours faithfully,

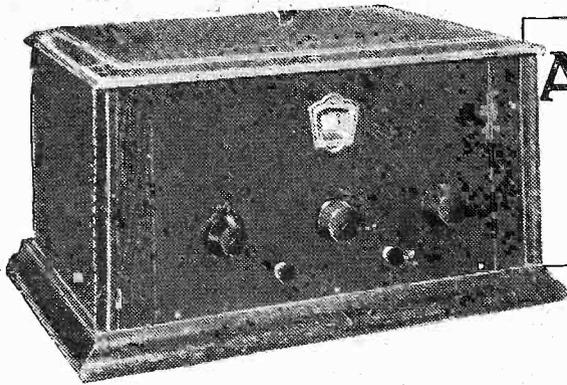
FRED S. PATTON.

Putney, S.W.15.

A VOLUME-CONTROLLING TIP

The Editor, POPULAR WIRELESS.

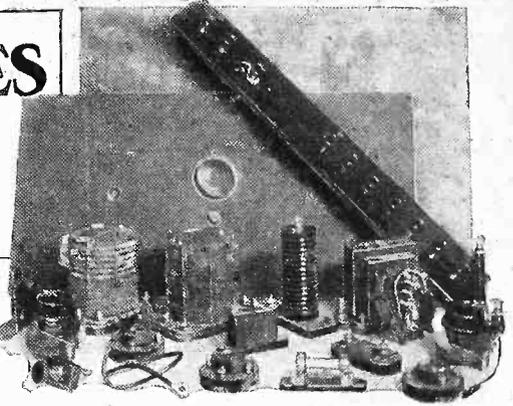
Dear Sir,—A form of pre-detection volume control which does not upset tuning, and has the combined merits of cheapness, effectiveness, and ease of both



ACCESSORIES FOR THE "COSMIC"

By G. T. KELSEY.

Your "Cosmic" deserves good accessories, though these need not prove expensive, as this helpful article shows.



POSSIBLY the first thing that will strike you about the heading at the top of this page is the need for a special article all on its own, so to speak, to deal with the accessories for the "Cosmic."

Well, the fact of the matter is that however successful the set design in itself may be, it is not much good for anyone to

possibly, the performance of this set on the really distant stations is a matter very largely dependent upon short-wave conditions, the choice and use of the correct accessories has unquestionably been an important contributory factor to its astonishing performance when conditions have been satisfactory.

satisfactorily as our original models have done.

For convenient reference it will probably be best for us to deal with the "Cosmic" accessories under the four distinct headings of valves, batteries, loudspeakers (with which are included headphones) and, for those who are building the Star model, pick-ups.

In connection with valves for the "Cosmic," Mr. Rogers, who is "P.W.'s" valve expert, made a contribution to the last issue in which he went very fully into the question of suitable types, so that it is hardly necessary to go over that ground again.

The Important Detector Valve.

What we are more concerned with in the present article is the question of suitable makes, although, of course, in dealing with this side of the question, it will be necessary to make brief references to types.

For the first stage, that is to say, the detector, we have used a Mazda H.L.2 in our tests. The choice of a valve for this key position is, of course, an important matter, because not only has it to perform efficiently on the ordinary broadcast and long-wave frequencies, it must also put up an equally good show on the ultra-short waves.

In our tests with this particular valve, we have found it easily possible to obtain wonderfully smooth reaction control on all waves from 20 to 2,000 metres, and that is

(Continued on next page.)

THESE ARE THE PARTS FOR THE "COSMIC" THREE STAR MODEL

- 1 Panel, 14 in. x 7 in. (Permeol, Becol, Goltone, Ready Radio, Peto-Scott, Wearite).
- 1 Cabinet to fit with 10-in. baseboard (Pickett, Ready Radio, "Morco," Peto-Scott, Osborn, Camco, Gilbert).
- 1 Ready Radio Duotune Extenser, with disc drive, or Cydon, Formo, or Wavemaster Extenser, with .0005-mfd. fixed condenser.
- 1 .00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen, Polar).
- 1 .0003-mfd. reaction condenser with slow-motion drive (Ready Radio).
- 1 .0003-mfd. fixed condenser (T.C.C., Dubilier, Telsen, Sovereign, Lissen, Ferranti, Formo, Graham Farish, Goltone, Igranic).
- 1 .001-mfd. fixed condenser (T.C.C., etc.).
- 1 .01 mica fixed condenser (T.C.C., etc.).
- 1 "Cosmic" dual-range coil (Goltone, Sovereign, Wearite, R.I., Lewcos, Peto-Scott, Ready Radio, Tunewell, Bullphone, or Telsen H.F. transformer).
- 1 "Cosmic" short-wave coil (Sovereign, etc.).

NOTE.—The R.I. coils are supplied in pairs on a common base.

- 1 "Moderator" coil (Peto-Scott).
- 2 Push-pull on-off switches (Ready Radio, Telsen, Goltone, Lotus, Wearite, Peto-Scott, Colvern,

- Igranic, Graham Farish, Tunewell, Bulgin, Sovereign).
- 1 Three-contact push-pull switch (Ready Radio, etc.).
- 1 Radio-gram rotary switch (Ready Radio or S.P.C.O. push-pull types of above makes).
- 1 H.F. choke (R.I. type FY1, Wearite, Sovereign, Varley, Peto-Scott, Ready Radio, Lewcos).
- 1 L.F. transformer (Lewcos L.F.T.6, Ferranti, Telsen, R.I., Formo, Sovereign, Climax, Varley, Igranic, Atlas, Goltone, Graham Farish).
- 3 4-pin valve holders (Telsen, Graham Farish, Bulgin, Lotus, Wearite, Clix, Formo, Lissen, Igranic, W.B.).
- 1 100,000-ohm Spaghetti resistance (Lissen, Bulgin, Sovereign, Lewcos, Varley, Peto-Scott, Ready Radio, Telsen, Igranic, Graham Farish, Goltone, Tunewell).
- 1 2-meg. grid leak and holder (Dubilier, Telsen, Ready Radio, Igranic, Loewe, Peto-Scott, Ferranti, Varley, Sovereign, Bulgin, Graham Farish).
- 1 5-meg. grid leak and holder (Dubilier, etc.).
- 1 Terminal strip, 14 in. x 2 in.
- 9 Terminals (Belling-Lee, Igranic, Clix, Eelex, Glazite, Lacoline, Quickwyre, Jiffilix, Flex, screws, battery plugs, etc.

attempt to duplicate our wonderful results from such a "hot-stuff" circuit as this one is, unless careful attention has been given to the question of accessories.

The use of the correct accessories is, after all, a matter almost as important as the actual circuit itself, and we on "P.W." are so very keen about this great new set—and believe us, had you heard it, you would emphatically agree that we have every reason to be!—that we desire to leave absolutely no stone unturned in our endeavours to enable every single "Cosmic-ite" to obtain results as gratifying as ours have been.

Many Countries Heard.

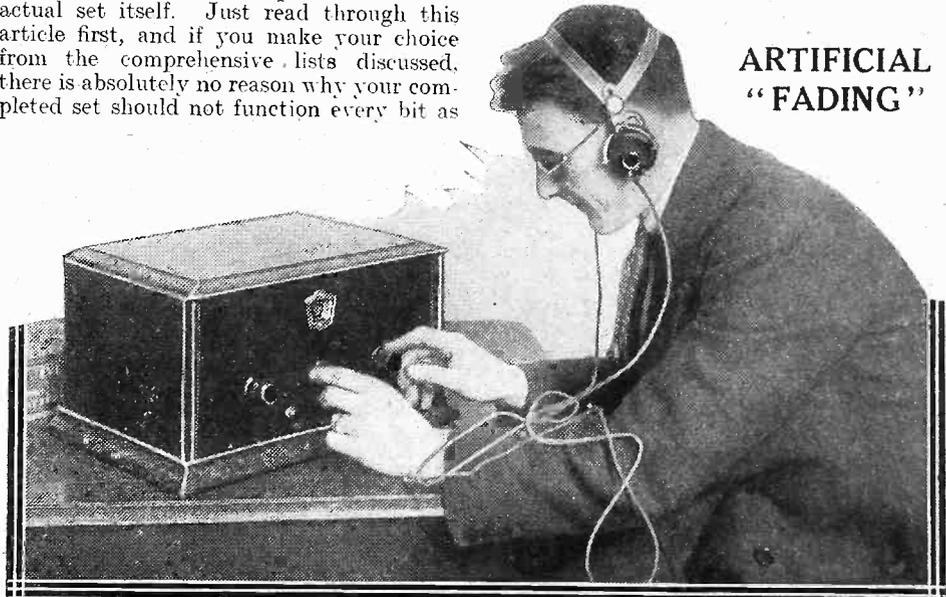
The fact that the "Cosmic"—in addition to its outstanding broadcast and long-wave performance—is called upon to deal with tiny signals emanating from sources thousands of miles away, renders it all the more vital that every single part extraneous to the actual set itself should be pulling its weight and working in perfect harmony with the fundamental design.

That is where we feel that we can assist you.

We have heard stations from all over the place—we have heard America, Canada, South Africa, Portugal, Russia—yes, and dozens of others as well, and although,

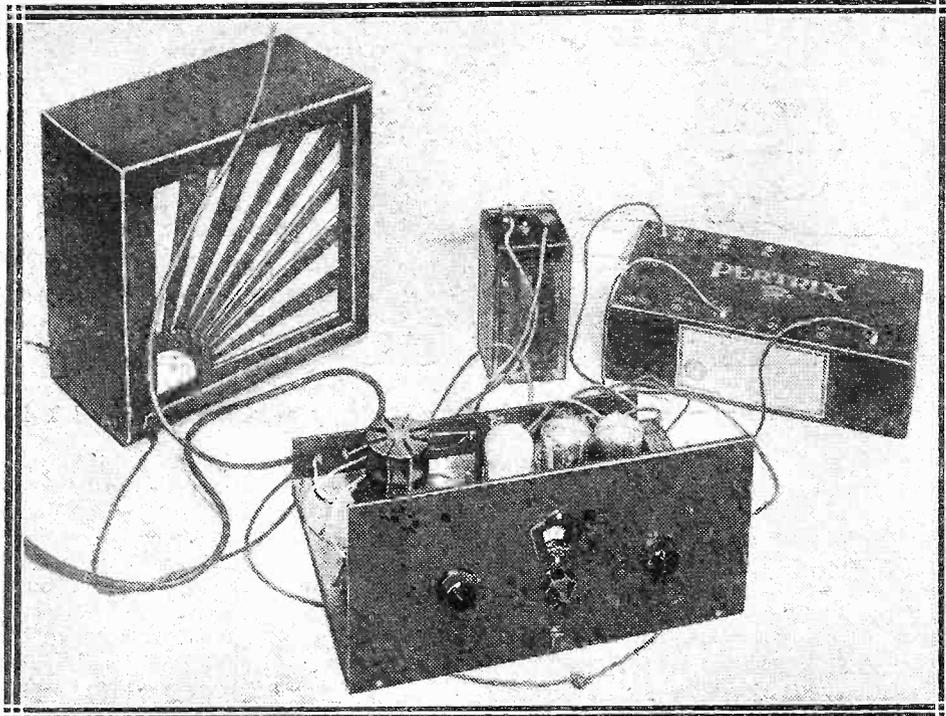
So when you come to choosing the accessories for Your "Cosmic," go about it in the same thorough way that you would when choosing the components for the actual set itself. Just read through this article first, and if you make your choice from the comprehensive lists discussed, there is absolutely no reason why your completed set should not function every bit as

ARTIFICIAL "FADING"



Artificial "fading" effects are very often produced through having the 'phone leads bunched together and resting on part of the body. So when you use 'phones in conjunction with your "Cosmic" for distant short-wave reception, try to avoid the sort of thing illustrated above, and put the 'phone leads as far away from your body as you can.

PLEASE DON'T DO IT!



This is an excellent example of the way in which all manner of undesirable instability troubles can be produced. Never pass the loudspeaker leads under the set's baseboard, and keep them as far away from the aerial end of the set as is reasonably possible.

ACCESSORIES FOR
THE "COSMIC"

(Continued from previous page.)

why it is so very suitable for use in the detector position of the "Cosmic." It is important to remember that not any ordinary detector or H.F. valve will answer in the first stage of the "Cosmic" because of the triple rôle that it is called upon to fulfil.

In the second position, which is the first L.F. stage, there are quite a number of excellent valves from which you can make your choice. We have tried with equally satisfactory results the Marconi L.2.B., the Cossor 210 det., the Mazda L.210, the Osram L.2B., the Eta B.Y. 2010, the Tungram L.G.210, the Mullard P.M. 2DX., the Six-Sixty 210D., the Dario Bivolt Super Detector, and the Lissen L.210.

The choice of a valve for the last position will depend to some extent upon the capacity of the H.T. battery that you intend to buy.

For Standard Size Batteries.

If you are in the habit of using an H.T. battery of the standard type, then for economical working it is not advisable for the set's total anode current to exceed ten milliamperes. In these circumstances, therefore, you would be well advised to stick to the small power type of output valve such as the Cossor 215P. or 220P., the Mullard P.M.2, or P.M.2A., the Osram P.215 or L.P.2, the Six-Sixty S.S.220P., the Marconi L.P.2 or P.215, the Eta B.W. 602, the Mazda P.220, the Lissen P.220, the Tungram P.215, or the Dario Super-Power Bivolt. (This particular valve, although designated as super-power, has characteristics very similar to the types mentioned above.

It should be understood that the figure of 10 milliamps given in the preceding paragraph as being the maximum economical discharge rate for the standard-capacity types of H.T. batteries does not necessarily apply in every case. Some will be higher, some will be lower, but the round figure of 10 milliamps is about the average figure arrived at after consideration of several different makes.

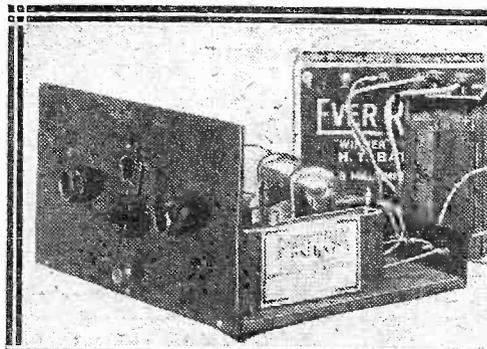
Just as a matter of interest in passing, it may be mentioned that the recommended discharge rate varies in different makes between eight and twelve milliamps.

Large Undistorted Output.

To revert to the question of output valves, if you do decide upon the standard capacity type of H.T. battery which, as a matter of fact, will be suitable in most cases for all normal domestic requirements, then be sure to choose your output valve from one of those which we have just mentioned.

For those of you who require a large undistorted output from the "Cosmic," then it will be advisable—we might almost say absolutely necessary—to go in for one of

A "PING-PONG" POINT



Always strive to avoid facing the loudspeaker towards the set if the two are in close proximity, otherwise the sound-waves impinge upon the valves and are liable to produce annoying "Ping-Pong" noises.

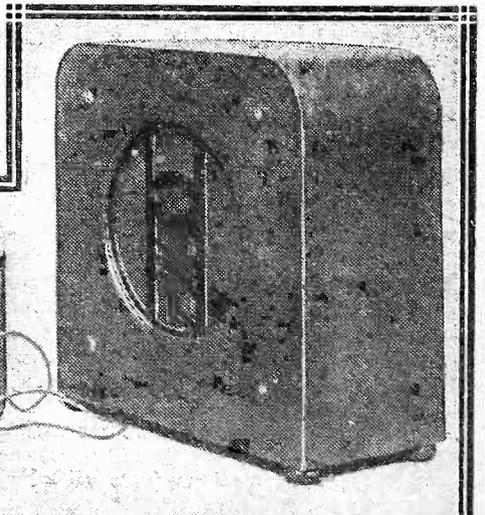
FOR THE ORIGINAL "COSMIC"
YOU REQUIRE

- 1 Panel, 14 in. x 7 in. (Permeol, Peto-Scott, Beool, Wearite, Ready Radio, Goltone).
- 1 Cabinet to fit with 16-in. baseboard (Pickett, Camco, Peto-Scott, Gilbert, Osborn, "Morco," Ready Radio.)
- 1 Extensior with vernier drive (Cylidon, Formo, Wavemaster).
- 1 "Cosmic" Dual-Range Coil (Telsen H.F. transformer, Sovereign, Goltone, Wearite, Lewcos, R.I., Ready Radio, Peto-Scott, Tunewell, Bullphone).
- 1 "Cosmic," short-wave coil (Telsen, etc.). Note—The above coils can also be obtained as a complete unit from R.I. Ltd.
- 1 .00075-mfd. solid dielectric variable condenser (Ready Radio, Telsen, Polar).
- 1 .0003-mfd. reaction condenser (Ready Radio, Telsen, Cylidon, Polar, J.B., Lissen, Graham Farish, Wavemaster, Ormond, Formo).
- 1 Push-pull on-off switch (Goltone, Ready Radio, Telsen, Tunewell, Peto-Scott, B.igin, Wearite).
- 1 Three-point push-pull switch (Ready Radio, etc.).
- 1 Moderator coil unit (Peto-Scott).
- 1 .0003-mfd. fixed condenser (Dubilier type 610, T.C.C., Telsen, Ready Radio, Lissen, Sovereign, Goltone, Graham Farish, Ferranti, Igranic, Watmel).
- 1 .01-mfd. mica condenser (T.C.C., Dubilier, Lissen).
- 1 Grid-leak holder (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Ferranti, Graham Farish).
- 1 2-meg. grid leak (Lissen, Telsen, Ready Radio, Dubilier, Bulgin, Watmel, Ferranti, Varley, Loewe, Igranic).
- 1 5-meg. grid leak and holder, (Graham Farish, Ohmite, etc.).
- 3 Valve holders (Lotus type VHK, Telsen, Wearite, Igranic, Lissen, Bulgin, Clix, Graham Farish, Formo, W.B.).
- 1 H.F. choke (Lewcos type 11, Telsen Binocular, Ready Radio, Wearite, R.I.).
- 1 L.F. transformer, medium ratio (R.I. Dux, Telsen, Varley, Igranic, Goltone, Lissen, Lotus, Lewcos, Climax, Graham Farish, Formo, Sovereign, Atlas, Ferranti).
- 9 Indicating terminals (Belling-Lee, Igranic, Clix, Eelex).
- 1 100,000-ohm spaghetti resistance (Sovereign, Varley, Lewcos, Bulgin, Peto-Scott, Telsen, Ready Radio, Igranic, Graham Farish, Lissen, Tunewell).
- 1 Terminal strip, 14 in. x 2 in.
- Grid-bias battery clip (Bulgin).
- Battery Plugs, etc. (Clix, Belling-Lee, Eelex, Igranic).
- Glazite, Lacoline, Quickwyre, Jiffilinx.
- Flex, screws, etc.

the triple-capacity types of H.T. batteries, for you will then be able to get what you want by using a valve of the super-power type in the output stage.

A figure somewhere between twenty and twenty-five milliamps seems to be about the average maximum discharge current for these triple-capacity types of batteries, and allowing for the detector and first

(Continued on next page.)



RECORDS VIA THE "COSMIC"

ACCESSORIES FOR THE "COSMIC"

(Continued from previous page.)

L.F. valves, there are quite a number of large output valves that you could use in the last stage of the "Cosmic" without exceeding this figure.

There is the Marconi P.240, the Cossor 230X.P., the Mazda P.240, the Eta B.W.303, the Tungram S.P.230, the Osram P.240, the Mullard P.M.252, the Six-Sixty S.S.230.S.P., the Dario Hyper-Power Bivolt and the Lissen P.X.240, all of which are excellent super-power valves.

Universal Popular.

All the various types of valves that we have mentioned as being suitable for the "Cosmic" are, of course, of the 2-volt class. That is because 2-volt valves nowadays seem to be almost universally popular. Very few people still cling to the 4 and 6-volt types, although perhaps we ought to point out that they are equally suitable for use in the "Cosmic."

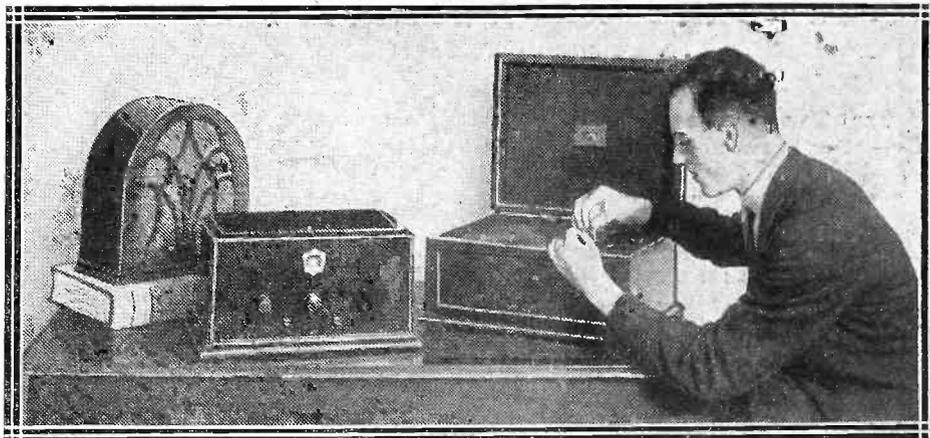
Our consideration of valves for the "Cosmic" very logically leads us to the question of suitable batteries by which to work them.

In this connection, as three batteries—or rather, to be more precise, two batteries and an accumulator—are required, it would probably be as well for us to deal with each item separately.

First of all, then, a word or two about accumulators.

There are six makes that we can recommend as being thoroughly reliable, and therefore eminently suitable for the "Cosmic," and they are Exide, Pertrix, Ever Ready, G.E.C., Ediswan and Lissen. If you make your choice from among those makes you cannot go very far wrong.

But before leaving this question of accumulators, may we give a word or two of advice regarding the question of capacity, or, in less technical language, the number of hours that an accumulator of a certain size may be expected to last on one charge when used in conjunction with the "Cosmic."



Those of you who build the 'Star' model will no doubt be using it in conjunction with a pick-up at some time or other. If the pick-up selected has an earthing terminal or lead it should be joined to the earth terminal of your "Cosmic." Readers will recognise the H.M.V. electric turntable in the above picture.

In order to do this, we must first of all strike some sort of average figure for the filament consumption of the "Cosmic" when used in conjunction with valves of the types mentioned above, and assuming one of the small power types of valves in the output stage, we can reckon on the total consumption being somewhere in the neighbourhood of .4 of an ampere.

Capacity of Accumulator.

To take round figures, and thereby to rate our calculation conservatively, let us regard the total consumption as being half an ampere. Well, if you want your battery to last 60 hours on one charge, then it will be necessary to purchase an accumulator with a 30 ampere-hour actual capacity. For 40 hours on one charge, then you will want a 20 ampere-hour actual capacity accumulator, and so on.

In other words, you just total up the filament currents of the valves you intend to use and divide the answer into the actual (not the intermittent) capacity of the accumulator. The result gives you approximately the number of hours that it will last on one charge.

You will notice that we say "approximately"!

That is because the method we have given above for arriving at the useful life of the accumulator on one charge is based purely on theoretical considerations.

In practice, as a matter of fact, the useful life is almost invariably less than the theoretical aspect would have us believe, for a number of reasons which are too lengthy to be dealt with in this article.

Nevertheless, by making this very simple calculation, you will be able to get a very good idea of the sort of service that you can reasonably expect from the accumulator you finally select.

To turn now to the question of H.T. batteries, we have pre-

viously referred to this matter in so far as the type of battery is concerned when discussing the valve for the output stage. The best type for your purpose will depend upon whether you use a small power or a super-power valve.

So that under this heading it is only really necessary for us now to mention the makes that we have found by experience to be entirely satisfactory, and these include the Pertrix, the Ever Ready, the Lissen, the Magnet, the Ediswan, the Drydex, and the Marconiphone.

The size of grid-bias battery that you will require again depends upon the type of valve that you decide to use in the last stage of your "Cosmic." If it is to be one of the small power types, then a 9-volt unit will in almost every case be adequate.

If, on the other hand, you go in for one of the larger valves, then you will want an 18-volt battery.

The Grid-Bias Battery.

With regard to makes, you will find that the firms mentioned in connection with H.T. batteries also produce G.B. batteries, and if you make your choice from this list you cannot go very far wrong.

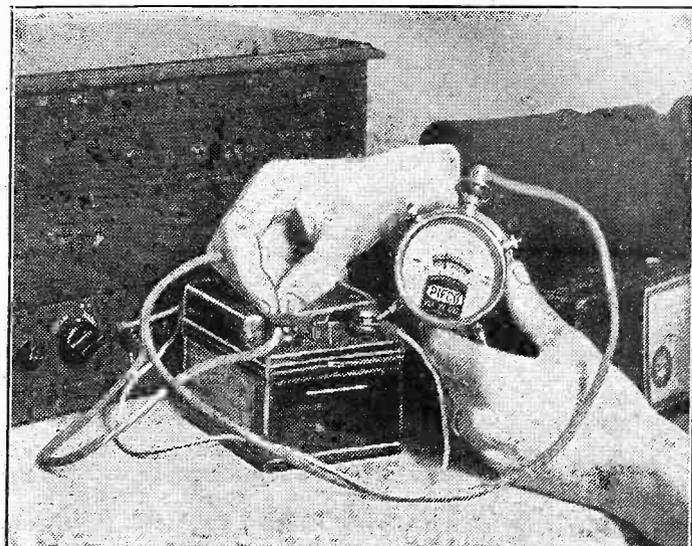
The third heading in our list of accessories for the "Cosmic" concerns loudspeakers, with which we include headphones for those who are keen to search round for the very distant stations on short-waves.

Under this heading there is almost an endless variety of makes and types from which to make your selection, and although we are going to give a list of makes which we consider to be particularly suitable for this set, it is not our intention to say too much in this connection, for what we might consider to be particularly good in the way of loudspeakers, you might— Well, it is, after all, very much a case for individual opinion, isn't it?

Anyhow, it seems to us that the most important thing to be settled first of all is the type of loudspeaker that you intend to use. Your choice will then be narrowed down very considerably, and when you have reached that stage where you are undecided between two or three different makes—well, if you take our advice, you will take a walk round to the nearest reputable radio dealer and make your final selection by comparison under actual working conditions.

That, in our opinion, is by far the best way to choose a loudspeaker, for the question of (Continued on page 147C.)

THE TELL-TALE TEST



One of those handy little three-in-one meters such as the Pico or Wates will prove invaluable for keeping your batteries up to scratch. Always test the L.T. and H.T. with the set switched on.

NOTES FROM THE MIDLANDS

By OUR CORRESPONDENT.

The New Empire Station—A Broadcasting House for Birmingham?
—“Big Brum”—Provincial Station Rivalry—A Behind the Scenes Talkie.

THE building of the new Empire short-wave station is the first of the B.B.C.'s big Daventry jobs to be tackled. This station will be erected at Daventry, and the long-wave transmitter there will be modernised (though this long-overdue improvement of 5 X X is not likely to be carried out just yet). The Midland Regional transmitter, 5 G B, is also to be rebuilt, but it will be removed from Daventry to a new site, possibly nearer Birmingham.

A Change of Plan.

The extensions to the Midland Regional offices and studios, in Birmingham, are now well in hand. A statement has been widely circulated that plans were drawn up for a new “Broadcasting House” to be built in Birmingham, similar to the new premises provided in recent years at Manchester and Edinburgh, and that at the last moment the project was banned on the grounds of economy, and the present less expensive scheme of altering and extending the existing premises was substituted.

I have asked the B.B.C. for its comment on this report. It did not deny it, but stated: “The B.B.C. is developing its Midland Regional headquarters at Birmingham as rapidly as is consistent with requirements and resources.”

New engineering equipment of the most up-to-date kind was recently installed in the control-room. This equipment brings Birmingham in line with Manchester, Edinburgh and London as regards efficient programme control mechanism.

The change-over from the old apparatus to the new, involving the connection of hundreds of wires, had to be carried out on a Sunday, and occupied 12 hours continuously. Fifty-seven different programme circuits had to be transferred from the old switchboard to the new one, and some of them were in use at the time. The change-over was carried out without a hitch.

Those Landline Links.

To this “Line Termination Bay” (using B.B.C. phraseology) come the landlines which link the Birmingham studios to the Midland Regional transmitter and to London and other B.B.C. centres, as well as the local lines to various Birmingham cinemas, halls, etc., from which outside broadcasts are regularly taken. (Between 70 and 80 O.B.'s are carried out from Birmingham every month.)

Birmingham is connected by underground landline to London via Daventry. After 5.45 p.m. each day the Post Office also provides landlines via Gloucester to Swansea, Cardiff, and Plymouth.

Another interesting job recently carried out by the Birmingham engineers was the installation of a new microphone in the clock tower of the Birmingham Art Gallery. There was a very ancient “mike” in the tower, by which the chimes of “Big Brum,” the big bell in the tower, were occasionally broadcast, but now that a

Reisz mike (encased in a waterproof sponge bag) has been provided, “Big Brum” is likely to be heard on the air, both more often and with a less cracked tone than it suffered at the hands of the old “mike.”

“Big Brum” weighs nearly four tons and rings out Birmingham's standard time. The old “mike” was fixed near the bell, but after many tests in different positions, the Reisz microphone has been hung right at the top of the tower, above the bell. This is the highest point in Birmingham.

The broadcasts from the studio at the Birmingham Repertory Theatre are attracting wide attention. The manager of the theatre, Mr. Emile Littler, is a “live wire,” and by persuading the B.B.C. to cooperate in the equipment of this theatre

“GLORIA'S” MICROPHONE MOMENT!



Gloria Swanson caught by the camera during her first broadcast, which she recently made over the American chain of stations operated by the National Broadcasting Company.

studio, he has secured publicity of enormous value for his theatre. I wonder how many seats at the “Rep.” have been booked as a direct result of hearing a relay from the theatre's studio?

On the other hand, the Midland Regional programme has undoubtedly benefited by

NEXT WEEK
SHORT-WAVES ON YOUR
“COSMIC”
AND
SELECTIVITY AND POWER ON
YOUR “COSMIC”

the artistry of the performances, and by the excellent material that Mr. Littler has been able to provide. The broadcasting of a scene from “The Barretts of Wimpole Street” was, for instance, something of a “scoop” for the Midland Regional station.

Rivalry between the provincial stations and London is all to the good. I hope that it will grow keener. Nothing could have a more salutary effect on the programme chiefs in London than a relentless determination by the provincial stations to achieve “scoops,” just as one newspaper rivals another in the race for supremacy.

It was enterprising of the Midland Regional station to arrange with a gramophone company for Midland listeners to hear a new record, made only a few days previously by Fred Elizalde and Christopher Stone, before it was issued to the public.

Some Quick Work.

Special advance impressions were made and rushed to Birmingham. This record was broadcast during a record concert arranged by Mr. Robert Tredinnick, of the Midland Regional staff. Gramophone recitals are to be given more often in the Midland Regional programme than hitherto. The next will be on March 2nd.

I hear that when Mr. Jack Cooper was recently transferred to London from Birmingham, where he has been Midland Regional announcer for five years, the move was carried out at five days' notice. Mr. Cooper was also “Jacko” of the Children's Hour. The studio staff gave him a silver cigarette case on his departure.

I learn that Mr. Charles Brewer, who is widely known as the producer of those light entertainments which are so popular with Midland listeners, is on the look-out for comedians, and lyrics for light songs, so here is an opportunity for authors. Mr. Brewer has a specially nice taste for skits, and I understand that in the “Nine Thirty Novelties” revue on March 18th there will be a skit on the Irish Sweepstake.

Easter Programmes.

The suggested relay at Easter of a concert by the Hallé Orchestra during its visit to Nottingham is “off.”

The Hallé Orchestra is looked upon as North Regional talent, and is therefore not touched by the Midland Region. A massed band concert will be relayed from the Mountford Hall, Leicester, on March 5th.

A film company has been in touch with the B.B.C. with a view to making a “talkie” behind the scenes at the Midland Regional station.

Birmingham will be featured in the “Midland Towns” series of programmes on March 21st. The programme will include an outside broadcast from Bingley Hall, items by the Midland Studio Orchestra, a recital on gramophone records by music-hall artistes who are natives of Birmingham, and a speech by the Lord Mayor.



ALL ABOUT BROADCASTING HOUSE

By *The Chief Engineer of the B.B.C. Mr Noel Ashbridge*
B.Sc. Lond. AMICE

DURING the past year or so the activities of the B.B.C. Research Department have been deeply involved in work which, although highly important, is not, strictly speaking, research at all, being more in the nature of design, with a strong research flavour. This refers to the many and varied problems in connection with the new transmitting station and the new headquarters and studios in London, as well as miscellaneous developments all over the country.

A Useful Indication.

From some points of view this intense expansion of technical equipment is inclined to retard the kind of research which aims at making use of some new principle, or new application of an old principle. On the other hand there is no doubt that the constant necessity of having to make something new work correctly, without unlimited time to do it in, has the effect of indicating where the need for improvement really lies.

Nevertheless, sometimes it does lead to too frequent compromises, and this is certainly not desirable. When there are sufficient funds, research is best separated from experimental design, but during periods of rapid development it is inevitable that all, or nearly all, the staff should be employed on the more urgent problems.

Two Categories.

In considering the future possibilities of broadcasting from the technical point of view we can divide research into two categories. First there are problems concerned with improvements to existing methods, and, secondly, there is the investigation of new methods altogether.

Reviewing the work in hand, there seems to be considerable activity in both categories, and it will be interesting to run through the chain of apparatus used for broadcasting and see what possibilities there are of change in each link.

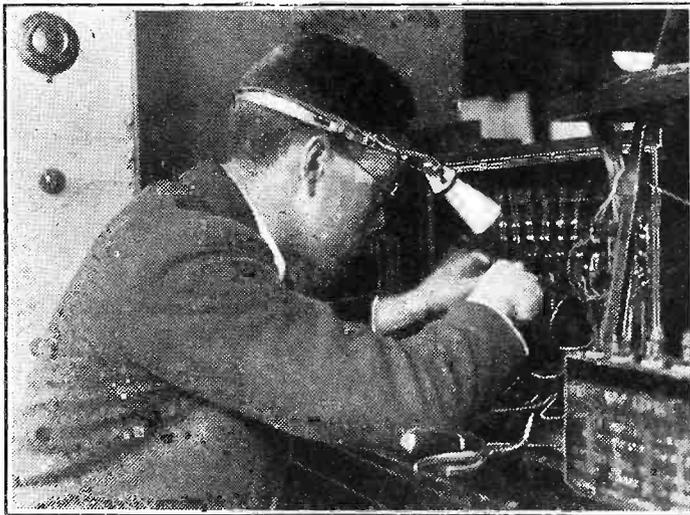
Since it is beyond the power of engineers to improve artistes, the first thing we come to is the studio, and here there are certainly very considerable possibilities. The whole

In this article Mr. Noel Ashbridge continues his fascinating account of the arrangements made under his direction to equip the B.B.C.'s new headquarters as the finest home of broadcasting in the world.

question of studio acoustics is just emerging from the purely empirical stage, and it is only during the last year or two that we have been making definite measurements of such quantities as reverberation period, frequency absorption characteristics of materials, etc.

We have reached a stage now where we

LIGHT ON A DARK SUBJECT



A B.B.C. engineer, with an electric light fixed to his forehead to free his hands for manipulating the wires and tools.

think we can fix the correct reverberation time for a studio of a given size and intended for a definite purpose, and we also think that we know what shape the reverberation curve should have when plotted against frequency.

Moreover, we have scheduled the properties of a very considerable number of materials which can be used in the finishing and decorating of a studio. It would be rash, however, to assume in the present stage of development that the reverberation characteristics can be fixed for ever.

They are dependent to some extent on

the microphone, which may also change, although this change would probably be very gradual. Again, there is considerable difference of opinion as between our ideas and those abroad, although we seem to agree quite well in this respect with American practice. However, in studios, more than anything else with which we are concerned, one feels that the farther one goes the more there is to be done. It is probable that this, the microphone end, is where the greatest change will take place during the next ten years.

Development of the Microphone.

Next we come to the microphone itself and here it seems at first sight as though development is rather slow. The carbon type microphone, which we still use more than any other, has held the field for the last six or seven years, which is very greatly to the credit of the original designer, Dr. E. Reisz, and Captain Round, who introduced several improvements.

At present we are using both this type and the condenser type. There is another microphone in use in Germany which depends on electro-magnetic induction, and in this respect reverts back to the Marconi-Sykes microphone, which was in use here before the Marconi-Reisz.

Special Amplifiers.

Recently the B.B.C. has done a good deal of work in connection with the development of special amplifiers for condenser microphones, as well as examining the possibilities of baffles and correction circuits.

There is still plenty of room for improvement in microphones, but I think that development is likely to be slow because the conditions which have to be fulfilled are somewhat conflicting. Perhaps, however, improvement will come more by the use of a large number of microphones, in such a way as to get over the difficulties of "balance," that is to say the relative amount of sound picked up from the various performers in a studio.

This is probably the greatest difficulty in connection with studio technique at the present time. It has already been suggested

(Continued on next page.)

ALL ABOUT BROADCASTING HOUSE

(Continued from previous page.)

that one day special music may be written, taking advantage of the fact that each instrument might theoretically be provided with its own microphone. This, however, is venturing on very dangerous ground. Music has existed for centuries, and is far from being governed merely by scientific facts or discoveries.

The next link in the chain is, of course, the amplifiers of various kinds—"microphone," "line," etc. These are already very highly developed, and although improvements may be made from the manufacturing and economic point of view, it is very doubtful whether one can visualise in the near future improvements which will be obvious to the listener.

Adjusting Volume.

The same remarks may almost be applied to the transmitter itself, since it is an established fact that a transmitter can be made to give very little distortion indeed. However, there is one serious limitation in connection with transmitters, but which also includes receivers, and that is the fact that the ratio of minimum to maximum sound intensity which is produced in the studio cannot be reproduced in the room of a listener.

This means that somewhere in the chain, adjustments of the volumes have to be made continuously during most performances, otherwise the music would practically disappear at certain times below the background noise of static interference, etc., and at others would blast, in other words, overload the transmitter and receiver.

The Human Factor.

I think we may fairly assume that someone will ultimately devise a method by which this adjustment can be done scientifically and automatically, even if it remains impossible to reproduce the extremes of sound intensity. At present, of course, we have to rely on the human element in the shape of hand control by musicians, who, by a knowledge of the music, can anticipate what is coming.

It was stated above that comparatively little improvement can be expected in the transmitter itself. This, of course, does not include those improvements in the engineering side, which may not reveal themselves to a listener. This refers particularly to the appalling inefficiency, from the power point of view, of practically all broadcasting transmitters.

Thus, a high quality transmitter radiates only about one-fifth to one-sixth of the power supplied to it, and the better the quality it sends out the lower the efficiency has to be. This is a problem which we have considered for some time past, but

it is not of so much interest to the listener as it is to the B.B.C., who have to pay for the power consumed.

Leaving the transmitter itself, we come to the aerials, and at this stage it is convenient to say something about the question of wavelengths. Almost everyone who is interested in the technical side of broadcasting knows that development is very seriously restricted by the fewness of the number of channels, or, in other words, the wavelengths, which are available.

Those Seven-Metre Tests.

Moreover, there is a limitation to the number of additional channels which may ever be allotted to broadcasting, if we consider merely those wavelength bands which are in use at present. It is for this reason that the B.B.C. is embarking on experiments on ultra-short wavelengths (6-8 metres approximately), merely to see

When considering this question of wavelength channels and distribution generally, we must not forget the future possibilities in connection with aerials, assuming the use of the existing wave-bands. If someone could devise a radiating system which sent out practically no waves at an angle to the horizontal, it would seem that the effective range of a transmitter on the medium wave-band would be very materially increased.

Increasing Service Area.

It would not, so far as one can see, do away with the difficulty of mutual interference between transmitters in different countries. However, if one could increase the service area by extending the range at which fading is troublesome, it would become a really sound proposition to use powers of 100 kw. or more on the medium wavelengths.

Of course, this would mean that a far greater area could be covered by a single channel. A great deal has been done in Europe and in America on this question of angular radiation, but no one has yet adopted as a regular working proposition an antenna system which is obviously better than an aerial on more or less conventional lines, such as a plain half-wave radiator.

Television Broadcasts.

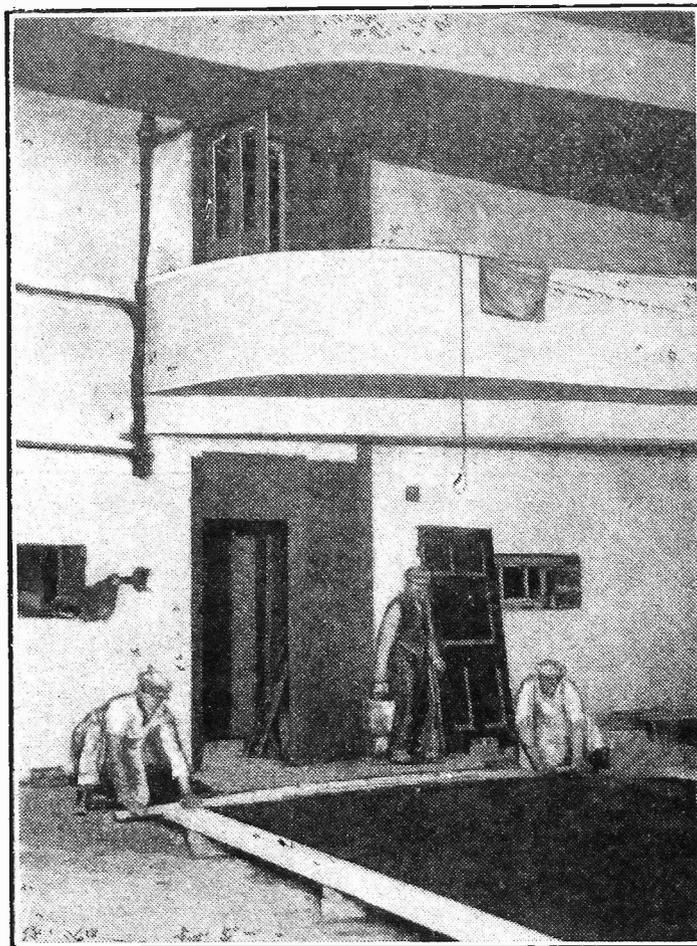
After leaving the aerial we are bound to use a medium which, although it changes its properties somewhat from year to year and season to season, is quite definitely and hopelessly outside our control. I do not propose to talk about the possibilities of improvements in receivers and loudspeakers. Here the rate of growth during the last year or two has been phenomenal, from the point of view of producing a sound article at a reasonable price.

Lastly, we come to the question as to whether anything other than music or speech is likely to be radiated. There is one obvious possibility, and that is television. It seems almost certain that television will become an accepted feature of everyday broadcasting one day.

A Comparison.

However, it would be very rash indeed to try and predict when that day will come, but perhaps we can get some measure of the time required for development if we compare the quality of reproduction of music as broadcast eight years ago, with the quality of television as broadcast to-day, either in Europe or in the United States. It must, however, always be borne in mind that an arduous beginning has to be made with all ambitious developments.

GETTING READY FOR THE BIG FLIT



These workmen are engaged in cementing the floor of one of the Broadcasting House studios, ready for the transfer of staff and service from Savoy Hill.

whether anything can be done to lessen the difficulty by this means.

Future Aerial Developments.

There is no question of existing wave-bands being abandoned, because it is already certain that the ultra-short wavelengths cannot compete with the much longer ones. Nevertheless, there is a possibility of development in this direction, although here again it will not be rapid. Before the experiments even start, it is known that there are difficulties, but the interest lies in the fact that the difficulties are not even greater.

POPULAR WIRELESS

is the paper
that made

WIRELESS POPULAR

MORE EFFICIENT VALVES

MORE STATIONS FROM THIS LIVELY DETECTOR

If you want to liven up your tuning—if you want extra range, greater sensitivity—get this Lissen Detector Valve for your set. You will find its lively responsiveness bringing in the foreigners like magic. Match it up to a well-built set and work it in harness with other suitable Lissen Valves and you will be amazed at the results you get, the distance - searching you can do. Ask for Lissen H.L.210.

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Replace your power valve with a Lissen Power Pentode. Immediately you will notice a tremendous step-up in volume on all stations. Where before you got a whisper you will now get fine full loud-speaker strength, and your local station will give you a torrent of pure sound. No need to alter the wiring of your receiver at all. Simply plug-in the Lissen Power Pentode Valve. It only takes 7 m/A of H.T. current, and can therefore be run off ordinary batteries, Ask for Lissen P.T.225.

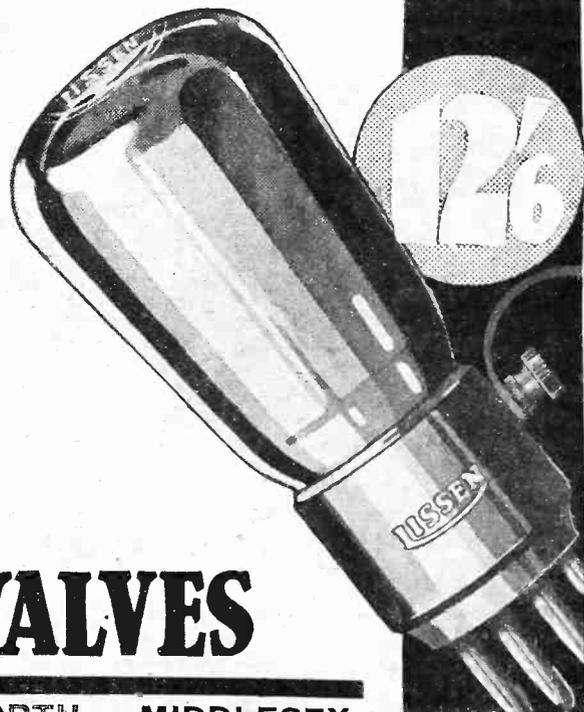
PRICE

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The BEST BRITISH VALVES

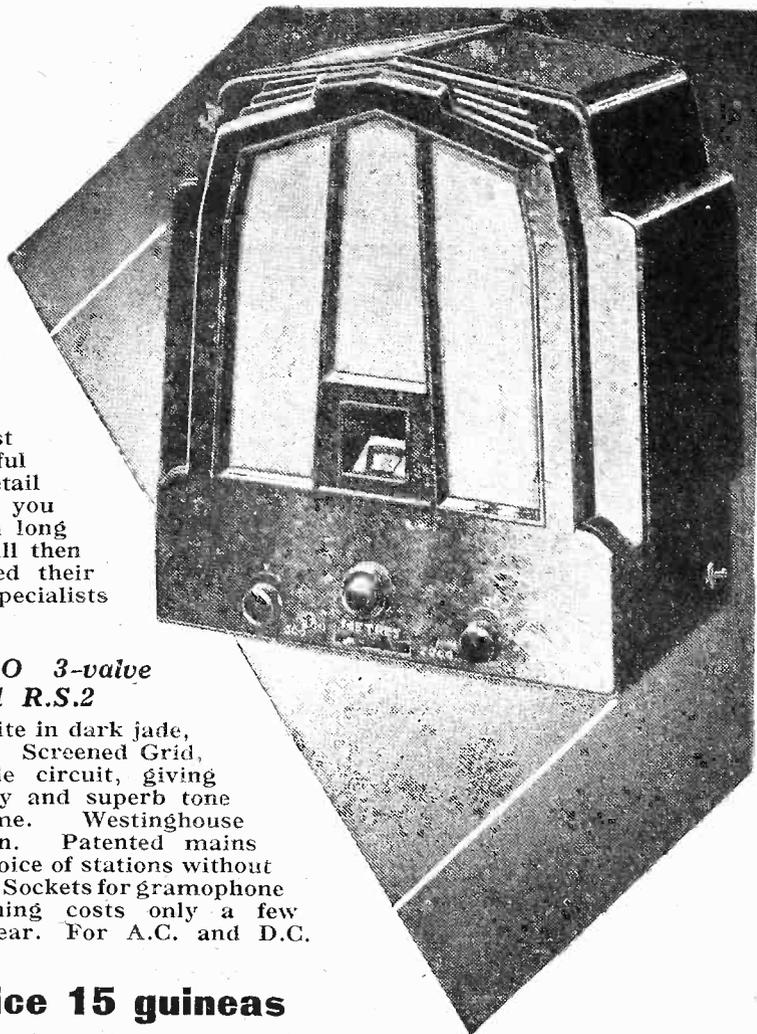
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More than meets the eye

You will be attracted by the appearance of the EKCO 3-valve Consolette. You will appreciate the ease of tuning with the single control, the convenience of the dial calibrated in wave-lengths and the selectivity and volume control. You will be charmed by the rich beauty of tone of the built-in speaker.

Then look inside. Examine the robust and sturdy construction, the careful workmanship, the attention to detail which are responsible for giving you such splendid reception and such long and lasting satisfaction. You will then understand why EKCO attained their high reputation as leading specialists in British All-Electric Radio.



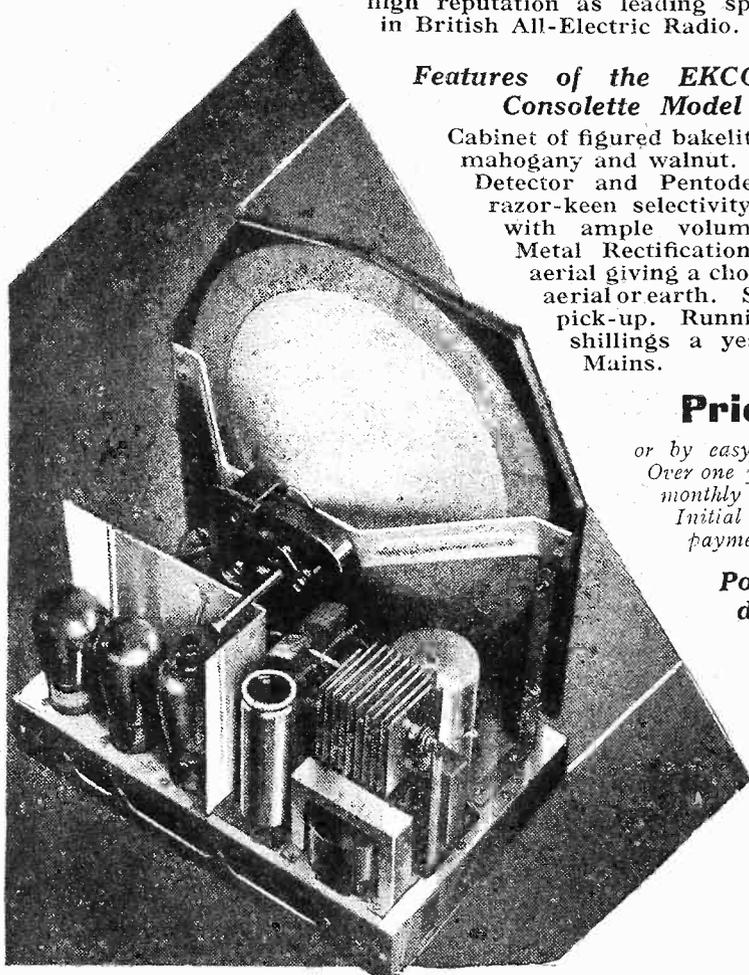
Features of the EKCO 3-valve Consolette Model R.S.2

Cabinet of figured bakelite in dark jade, mahogany and walnut. Screened Grid, Detector and Pentode circuit, giving razor-keen selectivity and superb tone with ample volume. Westinghouse Metal Rectification. Patented mains aerial giving a choice of stations without aerial or earth. Sockets for gramophone pick-up. Running costs only a few shillings a year. For A.C. and D.C. Mains.

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or by easy payments over one or two years.
 Over one year: Initial payment of 20/- and 11 monthly payments of 30/-. Over two years: Initial payment of 30/- and 23 monthly payments of 15/-.

Post coupon now for full illustrated details and ask your radio dealer for a demonstration.



To E. K. COLE, Ltd. Dept. A4, Ekco Works, Southend-on-Sea.
 Please send me details of Ekco All-Electric Radio.

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ON THE OTHER SIDE

A TALK with a GERMAN LISTENER

"ICH mochté ein paar Kofferempfänger anschén," said my Berliner friend, with whom I went to buy a new portable

"Zu dienen," replied the shop assistant. I stood by, puzzled.

"There are things I shall never be able to understand about wireless in your country," I said. "One is why you have such long names for simple radio gadgets. Another is why there are so many broadcasting corporations, all with long names, each running dozens of stations—"

Those Compound Words!

"Long names, yes; but useful words," said my acquaintance, amused. "We just run short words together, making more expressive long ones! What was it I just said? Kofferempfänger? Empfänger means 'receive.' Koffer a 'case.' Therefore Kofferempfänger, which puzzles you, means only 'suitcase set,' or portable.

"Fernempfänger means 'long-distance-getting set,' ferne meaning 'distance.' Netzempfänger means 'mains-set,' too. Anlage is just the ordinary word for 'set' or 'kit.' Gut! Easy!"

"I believe you," I said. "But what about these multitudinous broadcasting companies?"

"Das weisz ich schon auswendig," he replied, and as we trudged home to his flat, he continued. "We have ten broadcasting corporations, some of which are popularly known by abbreviations of their long Deutsche names: 'Norag,' for instance, which stands for Nordischer Rundfunk. Some of these compound words are even too much for us, you see!"

"Tell me the worst, and the longest."

"The ten corporations are the Funkstunde A.G. Berlin, the Ostmarken Rundfunk, Deutsche Welle, Schlesische Funkstunde A.G., Mitteldeutscher Rundfunk A.G., the Nordischer Rundfunk A.G. (Norag), Westdeutscher Rundfunk A.G., Südwestdeutscher Rundfunk, A.G., Süddeutscher Rundfunk A.G., and the Bayerischer Rundfunk A.G.

Simultaneous Broadcasts.

"You'd better stop for a breath!"

"Each of these corporations controls several stations, the stations in each group being mostly connected by land-line and giving the same programme. That accounts

Who makes forcible comparison between B.B.C. and German programmes, and explains many things which puzzle British listeners to German programmes.

for the fact, on which I know many of you British listeners remark, that so many German stations seem to be giving the same programmes.

"Just to make matters more difficult, several of the Corporations maintain relay stations which work on 'common' wave-lengths. For instance, the Funkstunde

"The Schleswig district is covered by only two stations, Breslau and Gleiwitz, run by the Schlesische concern. Leipzig and the middle part of the country has its broadcasting controlled by the Mitteldeutscher which, of course, means 'Middle Germany,' and is actually known as Mirag, in the same way as Nordischer (North Germany) is contracted to Norag. Mirag owns Leipzig and Dresden, while Norag owns five stations, Hamburg, Bremen, Hanover, Kiel and Flensburg.

The Controlling Concern.

"West Deutscher, contracted to 'Werag' in ordinary amateur's parlance, controls Cologne, Langenberg, Munster and Aachen (Aix-la-Chapelle). Frankfurt and Kassel are run by the South-West concern, Muhlacker and Freiburg by the South Germany, and Munich, Augsburg, Nurnberg, and Kaiserslauten by the Bayerischer A.G."

"This is getting complicated," I remarked.

"Never mind. Those are the whole ten. All these Corporations are controlled by the Reichs Rundfunk A.G., which really means Imperial Radio Co. This is the concern behind the scenes, as it were, which has financial control of all stations. The Imperial people have 51 per cent of the shares in each of the local Companies.

"The German Post Office has a financial interest—roughly 51 per cent again—in the Imperial Company, so that the German Postal Service runs broadcasting in a very much more direct way than your Post Office runs the B.B.C.

"This idea was started a few years ago by the Post Office in conjunction with concerns publishing various radio magazines, and it is this assembly which forms the Reichsfunk, the Imperial concern. Its main office is here in Berlin."

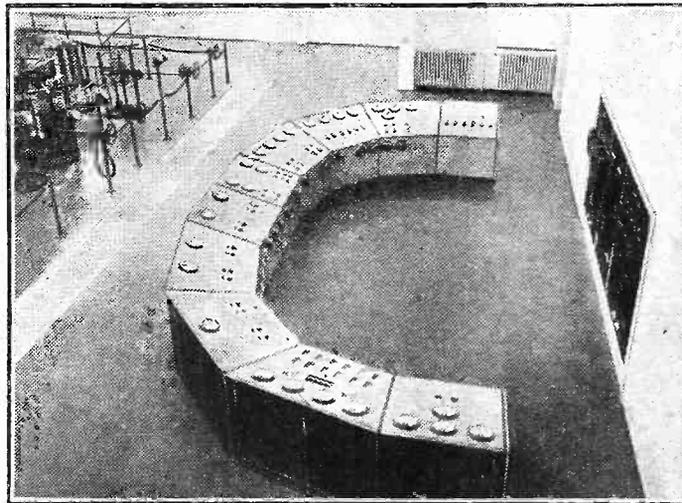
Too Many Talks.

I changed the subject to programmes, and remarked that there appear to be far too many talks.

"Our broadcasting is subject to much more red tape than we gather—from the papers—it is in England," he explained. "Talks and certain other items have to be censored, and the censorship is very strict. Cultural and artistic programmes, of which

(Continued on next page.)

THE "HORSESHOE" OF HEILSBERG



The control desk at the Heilsberg station is arranged on a "horse-shoe" plan so that the engineers can see at a glance what the instruments are showing. Heilsberg works on a wave-length of 276.5 metres and uses 69 kw.

A.G. Berlin runs Berlin (E), Stettin and Magdeburg, all on the same wave-length of 233.6 metres.

"These are spaced out, of course, so that the effect is to get a wide service area for the Berlin Funkstunde programmes. I believe these three stations have crystal control, and they seem to get more success with their wave-length 'commoning' than does your B.B.C. with its tuning-fork controlled relay stations.

"The Ostmarken covers the East part of the country and runs Konigsberg and Heilsberg. The long-wave Koenigswusterhausen is controlled by the Deutsche Welle, but 'Koenigs' does commercial work, apart from broadcasting.

AMERICA FIRST TIME!

Some readers' results, including an amazing "Eckersley" Three performance.

AMERICA FIRST TIME ON THE "ECKERSLEY" THREE.

The Editor, POPULAR WIRELESS.
Dear Sir,—I am just writing to say how pleased I am with the "P.W." "Eckersley" Three.

I completed this at 1.30 a.m. Saturday, January 3rd, and decided to try it out immediately, hoping to test it on one of the Spanish stations. At 1.45 a.m., I picked up a carrier which resolved into a dance band. The strength was fairly good on the loud speaker. Imagine my surprise when the announcer said that it was Station W T I C (Hartford, Connecticut). Five degrees higher I found another station coming through at good L.S. strength. This was W B Z (Springfield). These were the first stations received on it.

The set proved to be excellent on both high and medium waves, volume and selectivity being amazing considering the set was only Det.-2.L.F.

I trust that many others will have built this fine set.

By the way, while receiving the American stations I had the aerial semi-variable condenser shorted.

Wishing your paper continued success.

Yours faithfully,

P. H. DUTTON.

Skegness, Lincs.

THE "ECONOMY" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thank you for your kind attention in the past. I think the sets which you design and the "P.W." are excellent. I always recommend the "P.W." as a good paper for the amateur and the professional. My "Economy" Three gives excellent reception, and it surprises most people. It possesses knife-edge selectivity. In this region it is considered quite a feat to separate Stuttgart from the London Regional, but I can do it quite easily. Thanking you for a good circuit.

Yours respectfully,

E. WICKS.

Wotton-u-Edge, Glos.

"MY S.G. FOUR" IN MALAYA.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know how "My S.G. Four" has performed.

Firstly, I am a complete novice at this game, and this is the first set I have attempted to make. To start with I had a certain amount of difficulty in collecting the various parts.

They were eventually collected from three separate shops, and for the most part correspond with your specifications; but I had to substitute wire resistances for the Spaghetthis in three cases as these were not

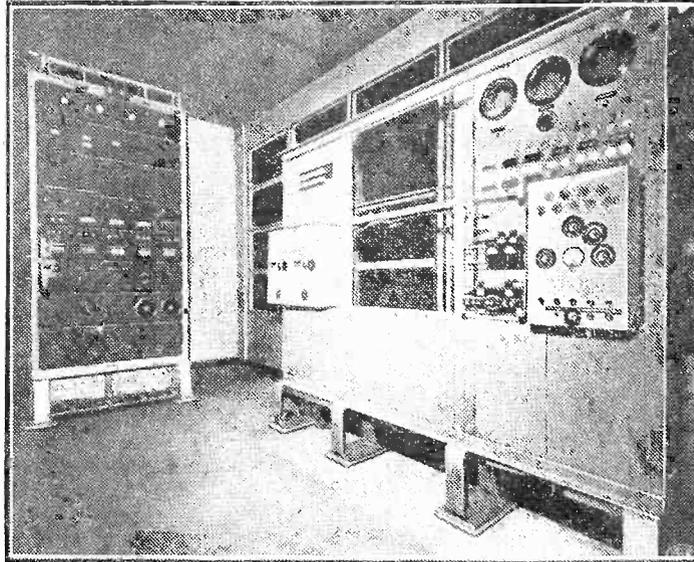
available. I could not get a .002, so coupled up two .002's in parallel.

The values of two of the condensers are not quite the same as yours, but are probably near enough. Not being very expert, it took me about four evenings to complete.

On the evening I completed the set I was very anxious to test it, so very hurriedly fixed up an indoor aerial made of a 35-ft. length of thin picture wire and an earth of the same stuff, and coupled up to a screw-driver driven into my cement floor. I had about half an hour's difficulty owing to a loose coupling of one of the coil holders and the fixing of the pre-set condensers.

After this everything went perfectly smoothly, figuratively and literally, for there was no trace of

IN A GERMAN REGIONAL STATION



Some of the amplifying apparatus and checking instruments at Heisberg, one of Germany's Regional stations.

atmospherics which are so noticeable in this country. In a little over an hour I had logged: Saigon, Medan, Bangkok, Bandoeng, Moscow, Zeesen and Rome!

There was ample volume on the loudspeaker to fill a large room, and speech was very plain. Tuning is easy and not too critical. I am exceedingly pleased with it and offer you my heartiest congratulations.

I am now about to fix up a proper aerial and earth which may give me even better results. Very many thanks.

Yours faithfully,

J. A. KINDALL.

Batang Malaya.

Drahtloser Dienst, Inc., which corresponds to an amalgamation of your Reuters, Press Association, and so on.

The News Bulletins.

"You may notice that at the start of every main news bulletin the announcer gives a warning to newspapers and Agencies against copying this news!

As a matter of fact, there is very little infringement of copyright because the news services are tied to a greater extent than they are in England and they are not controlled by the Press.

"The Drahtloser also supplies the news bulletin."

"But there is too much talk," I said.

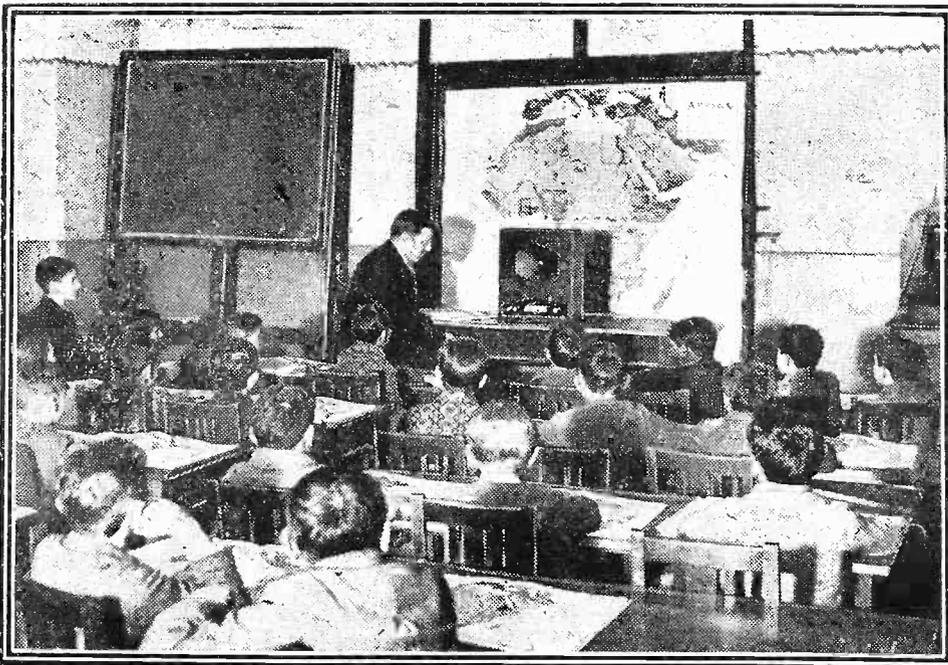
"Es ist fuerchtbar," he agreed. "Although most stations open early—Breslau starts at 5.30 a.m., on two days out of the week, the first part of the morning programme being made up largely of talks to housewives, and of gramophone records.

CRYSTAL-SET REMINDERS

There is no need to continually tune and retune a crystal set to select one of two Regional programmes, as a small extra condenser with switch is very easily arranged, and, once set, requires no further adjustment but a mere throw of the switch to change-over.

Although it is often recommended that the aerial be shortened to add selectivity, this applies chiefly to valve sets, and should not be tried with a crystal set until other methods have proved fruitless.

RADIO AS AN AID TO "THE THREE R's"



Vienna is very interested in radio as a school teacher, and this photograph shows an experimental transmission of this kind in progress there.

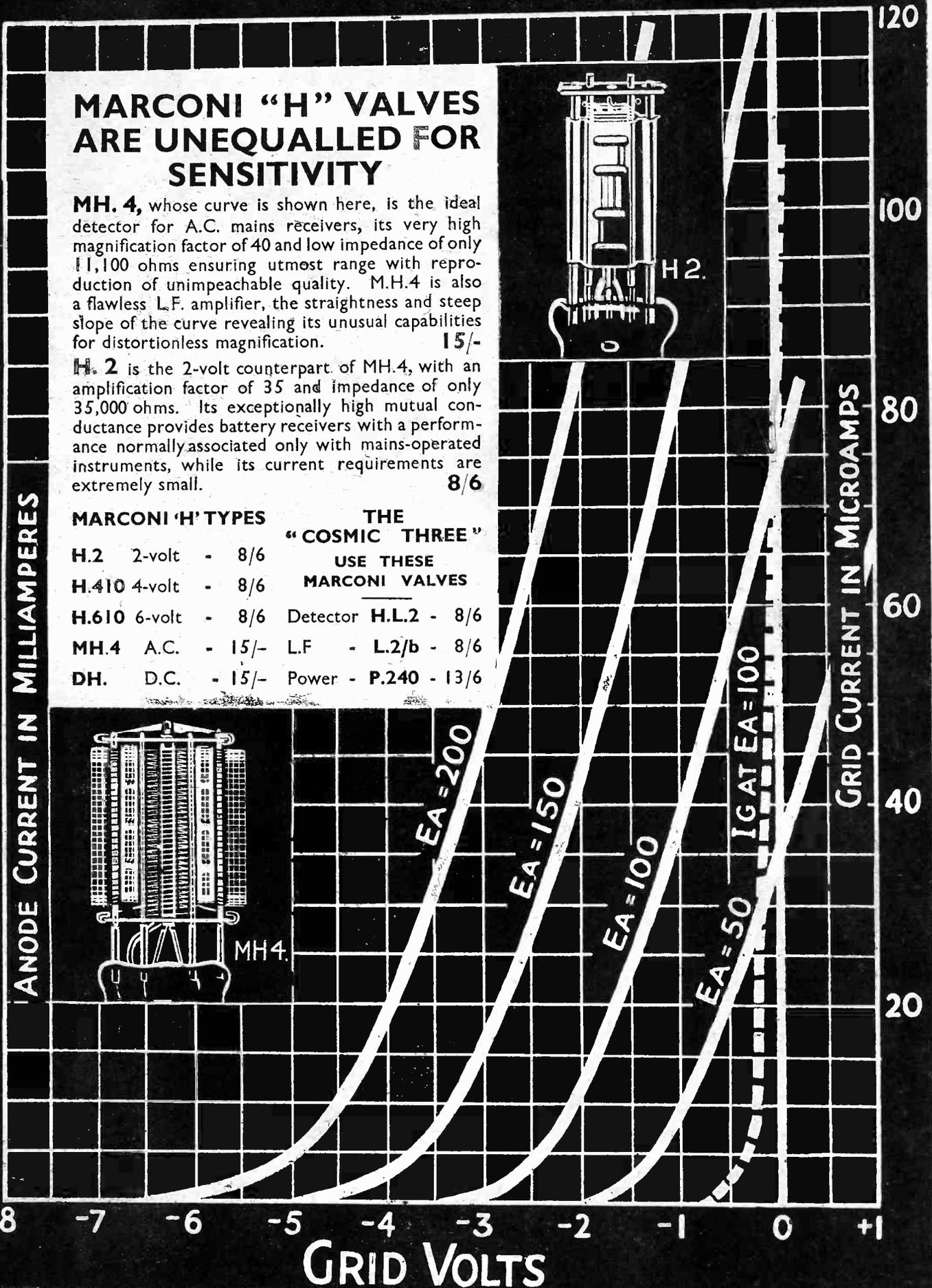
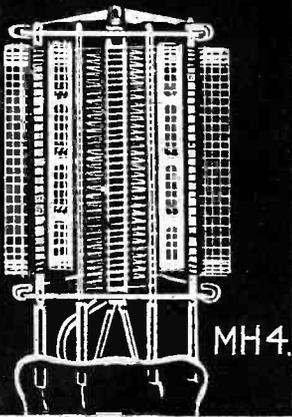
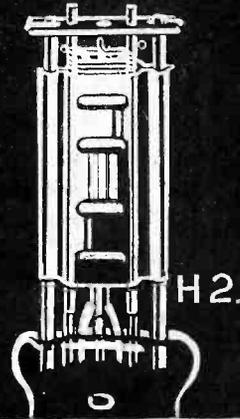
MARCONI "H" VALVES ARE UNEQUALLED FOR SENSITIVITY

MH. 4, whose curve is shown here, is the ideal detector for A.C. mains receivers, its very high magnification factor of 40 and low impedance of only 11,100 ohms ensuring utmost range with reproduction of unimpeachable quality. M.H.4 is also a flawless L.F. amplifier, the straightness and steep slope of the curve revealing its unusual capabilities for distortionless magnification. **15/-**

H. 2 is the 2-volt counterpart of M.H.4, with an amplification factor of 35 and impedance of only 35,000 ohms. Its exceptionally high mutual conductance provides battery receivers with a performance normally associated only with mains-operated instruments, while its current requirements are extremely small. **8/6**

MARCONI 'H' TYPES

H.2	2-volt	-	8/6	THE "COSMIC THREE" USE THESE MARCONI VALVES Detector H.L.2 - 8/6 L.F. - L.2/b - 8/6 Power - P.240 - 13/6
H.410	4-volt	-	8/6	
H.610	6-volt	-	8/6	
MH.4	A.C.	-	15/-	
DH.	D.C.	-	15/-	

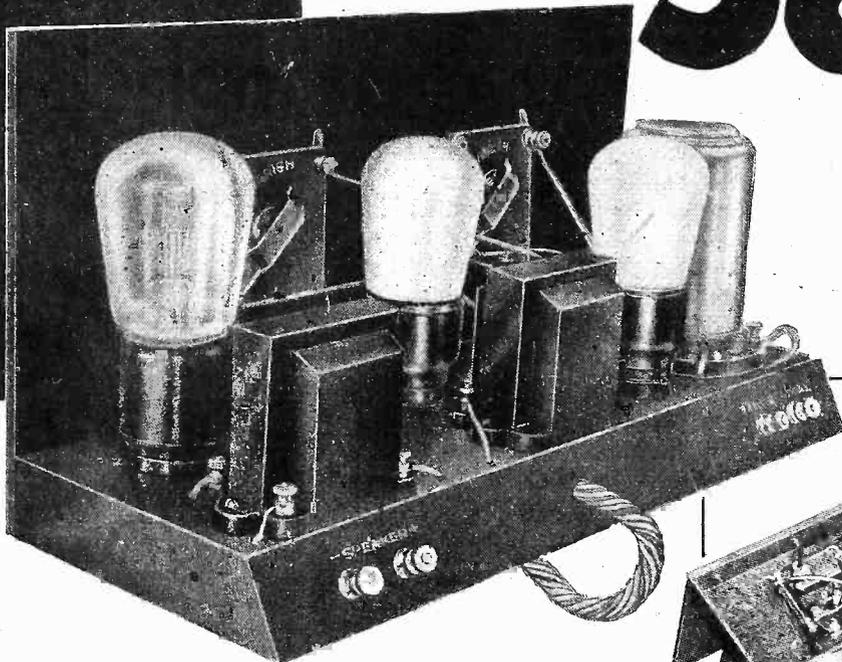


NEW

**in design
and low
in price**

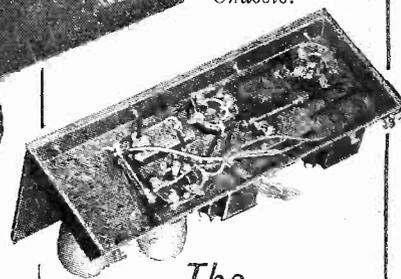
**build it
and listen
to-night**

With the production of this revolutionary receiver, Graham Farish—makers of famous Radio Components for 11 years—enter the Kit-set field. The "AMAZING 3" (amazing in more ways than one) incorporates Graham Farish components exclusively, built around a specially-designed dual-wave coil of remarkable efficiency. All-British and Continental reception over the entire waveband becomes a commonplace!



All-British

Underneath of Chassis.



*The
ONLY KIT with:*

- A specially designed SCREENED COIL.
- A Moulded BAKE-LITE PANEL, with scale readings and indications in relief and fixing holes drilled.
- A Moulded BAKE-LITE well CHASSIS, with position for each component outlined in relief and fixing holes drilled.
- The majority of wires concealed beneath chassis.
- A factory-built appearance when finished.

Single-knob tuning. No soldering.

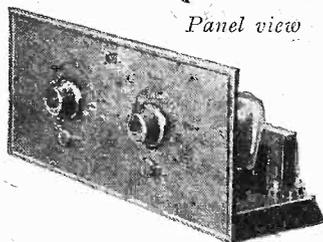
Spanner and Screwdriver—the only tools required—provided with each Kit.

Each Kit packed in attractive Orange and Black Container.

SOLD EVERYWHERE

Selectivity is far above the average for a set of the "straight three" type! Regional station separation is as defined as that of any set costing many times the price! As for assembly—every Component "falls in place"! Your dealer has the "AMAZING 3" in stock now. Ask him for the FREE Constructional Folder—or use the coupon below. You can assemble the Kit to-night in 60 minutes!

Panel view



The GRAHAM FARISH "AMAZING 3" SCREENED COIL

*Emergency
Coupon!*

In case of difficulty send this coupon for FREE Constructional Folder to GRAHAM FARISH LIMITED, Bromley, Kent.

Name

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Use a Graham Farish Speaker for best results from your "AMAZING 3."



**ENSURE
DELIVERY.**

**POST
NOW!**

RADIO SETS OF THE FUTURE

By Capt. P. P. ECKERSLEY, M.I.E.E.

In this trenchant review our Chief Radio Consultant, who was responsible for Britain's Regional Scheme of Broadcasting, examines and criticises the latest trends of receiver design.

His viewpoint is a vitally interesting one, and some of his conclusions are distinctly surprising!



I MUST say the "ideal" solution of the problem to produce selectivity with quality, with ease of adjustment, looks like defeating us all! Of course, a solution will sort of grow upon us, but I feel, though I may be wrong, that it won't spring upon us in a burst of novelty.

A Comparison!

Wireless set design will evolve similarly to motor-car design. After all, the motor-car is probably the most unscientific product that practical engineering, fighting to meet popular demand, has ever produced.

Look at it like this. You want flexibility, so you use what is essentially a constant speed engine and ask the unskilled user to manipulate complicated gears; you want smooth running, so you use an explosion to drive you along, and put the engine in front of you instead of behind; you want safety, so you carry several gallons of highly inflammable material on a vehicle shod with tyres which, on many roads, have a coefficient of friction so small that the least misjudgment on the part of the usually untrained driver will result in collision and/or overturning of the vehicle and fire!

A motor-car is, nevertheless, both useful and practical, and gives a large number of persons a great deal of pleasure. The motor-car balances its inefficiencies in such a way as to become efficient for its purpose.

The wireless set will probably develop along similar lines. To my way of thinking, the Americans have evolved by far the best designs to solve the selectivity, quality problem, because they have seen through a great deal of theoretical difficulty to evolve what the *user* wants, not what the technicians think he ought to have. The Americans think nothing of using, say ten valves, and using them all thoroughly wastefully.

Aiming at Efficiency.

We seem to think that because a high-frequency valve has a theoretical magnification of 200 we ought to try and realise this value in practice. If we only thought to get (say) a mag. of 4 per valve and used 3 valves we should get (about) the theoretical mag. of one super-efficient valve.

And if we used tuned circuits in each of these stages the mis-matching of the ganged

condensers won't greatly matter, and the *shape* of the response curve will approximate more nearly to an ideal than any we have to-day.

Then, again, some dear theorist realises that two circuits reactively coupled produce a double-humped resonance-curve. So we cry "band-pass."

Calculation shows that it is practically impossible to get selectivity for modern needs using just two circuits reactively coupled. Practice shows that the slightest mis-matching of condensers throws all

theory to the winds; practice shows that there is nearly always some asymmetry in the response curves and that one may easily double-hump the modulation up to 100 per cent or more.

It's so typically shortsighted to try out these "pin-balanced-on-their-end" ideas and not get down to the robust common sense of the game.

But, and it is a very big but, how can the sensible designer do what he wants to when the price of performance of valves is what it is? I do not think anyone will dispute the fact that the really multi-ganged valve-coupled tuned circuits give a robust solution to the problem. The sort of solution which says "hang efficiency! I want stability and common sense and ease of handling."

High Prices Responsible.

We are driven to try to get everything out of one stage because one stage is all we can afford. Not only that, but these super-efficient valves never stay put and are never alike.

The method of assessing royalties is a great hindrance to design, but again it is quite true that it's difficult to see how to arrange it elsehow and the royalties greatly reduced. I believe we are waiting for nothing other than for the valve manufacturers to reduce their prices and produce a low-efficiency stable high-frequency valve to make a complete revolution in receiver design technique.

Even then a little close thinking must be done so that the band width of response tends to keep constant over the full tuning range. Already the Americans have solutions for this. I do not know whether they are successful. I only know that every American set I have tested is extraordinarily good on the H.F. side.

"Those 'Doooble Doompers.'"

Contra-wise, the quality they give does not approach our better designs. Our low-frequency technique is, on the whole, very good; our loudspeakers are more pleasing than most of those "doooble doompers" called moving-coil speakers fitted in the hideous cabinets of most Yankee sets.

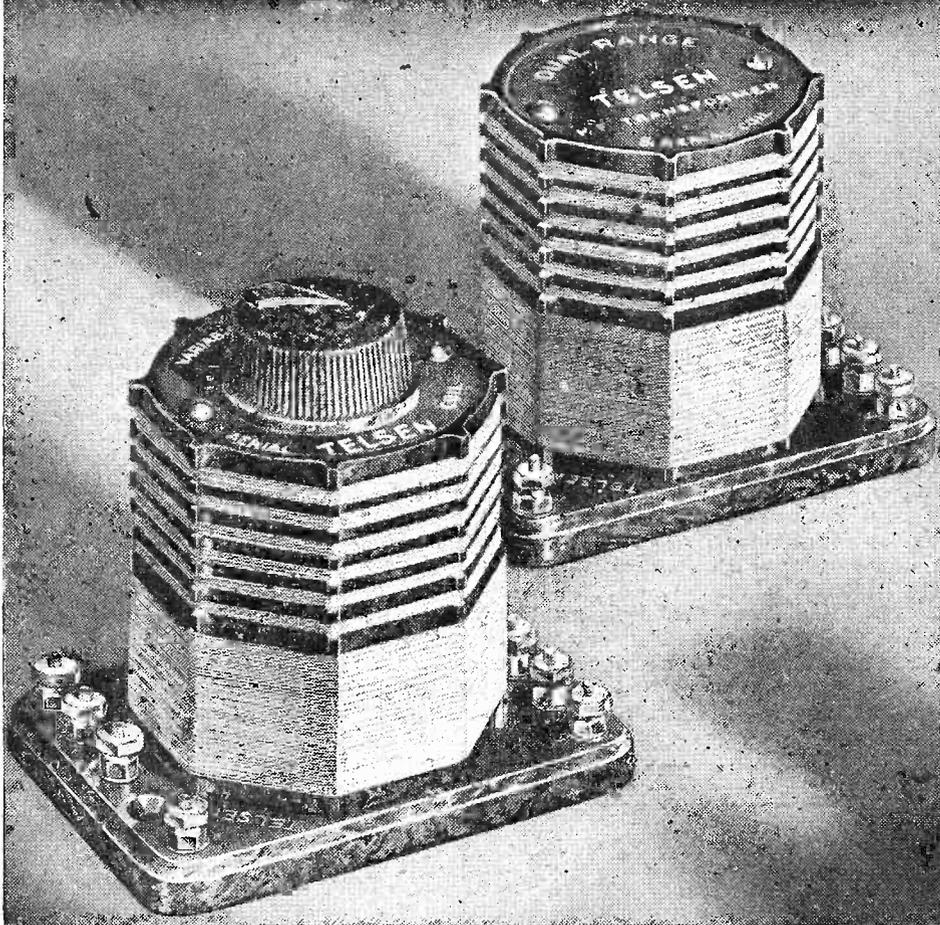
Pity we cannot get a set combining the best of both techniques. I will welcome, and so will you, the first reasonably-priced set which goes in for multi-stage H.F. and gangs it all up robustly.

AN OLD TIMER!



This grandfather clock, which recently chimed by radio all over America, once chimed in the New Year for George Washington.

SELECTIVITY



TELSEN DUAL RANGE AERIAL COIL, Price 7/6

H. F. TRANSFORMER & AERIAL COIL, Price 5/6

COMBINED DUAL RANGE SHORT WAVE COIL UNIT
Price 4/6

PUSH-PULL SWITCHES
(Prov. Pat. No. 14125/31).

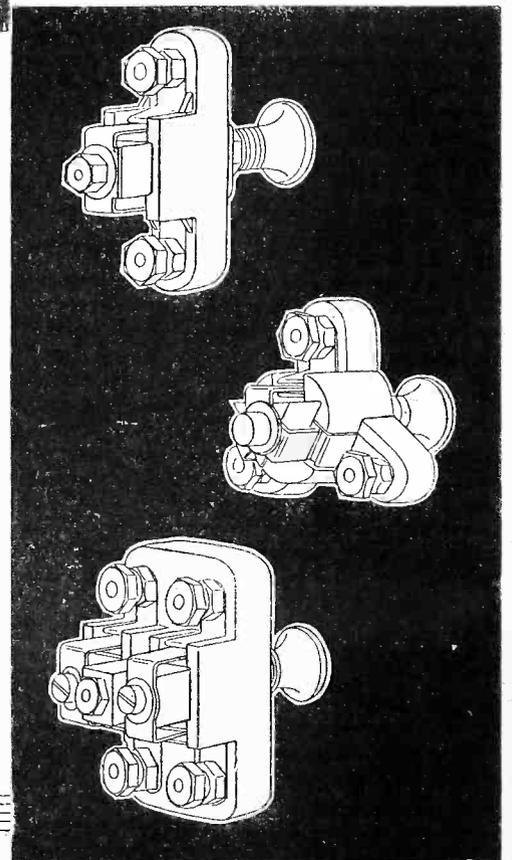
Two-point - - Price 1/-

Three-point - - Price 1/3

Four-point (2 pole) Price 1/6

TELSEN

THE SECRET OF PERFECT
RADIO RECEPTION

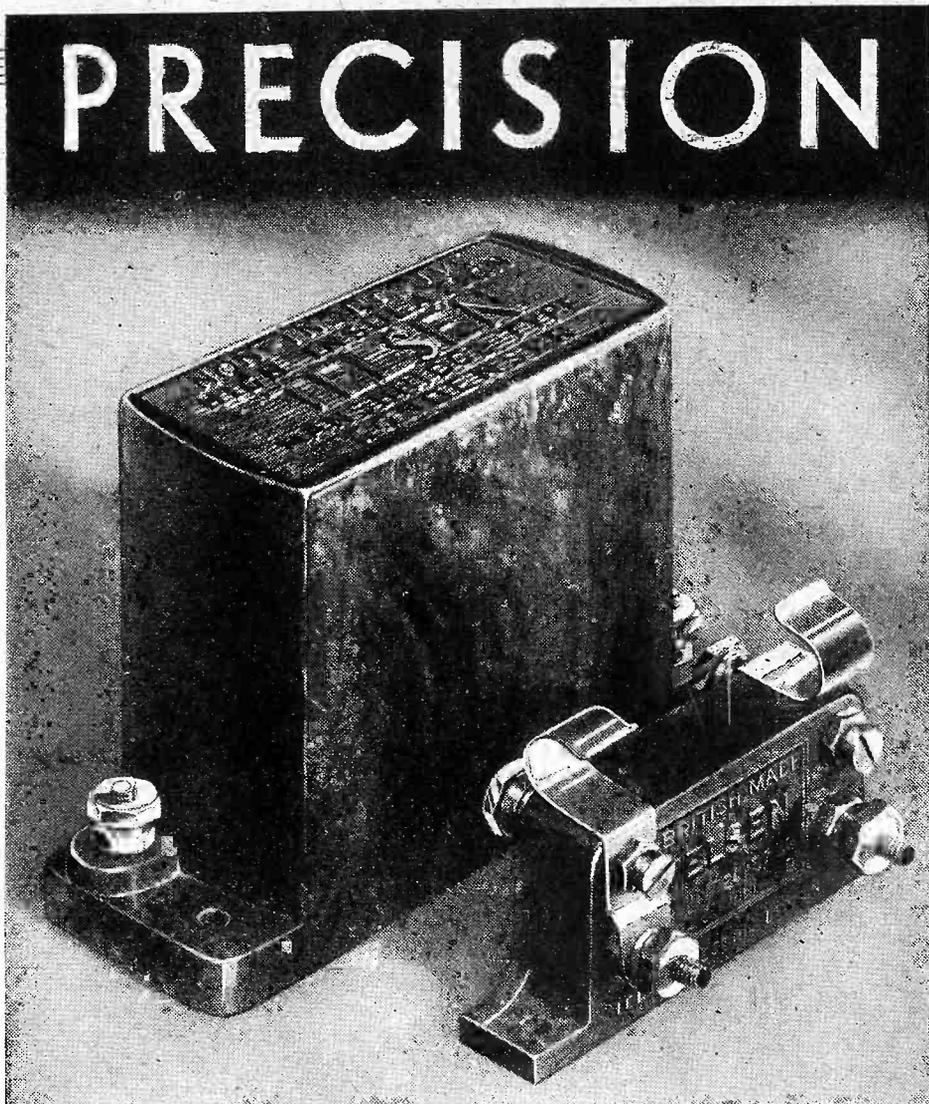


PRECISION

TELSEN MANS-
BRIDGE TYPE
CONDENSERS
from 1/6

FIXED CONDENSERS (Prov. Pat. No. 20287/30)
Price 6d.

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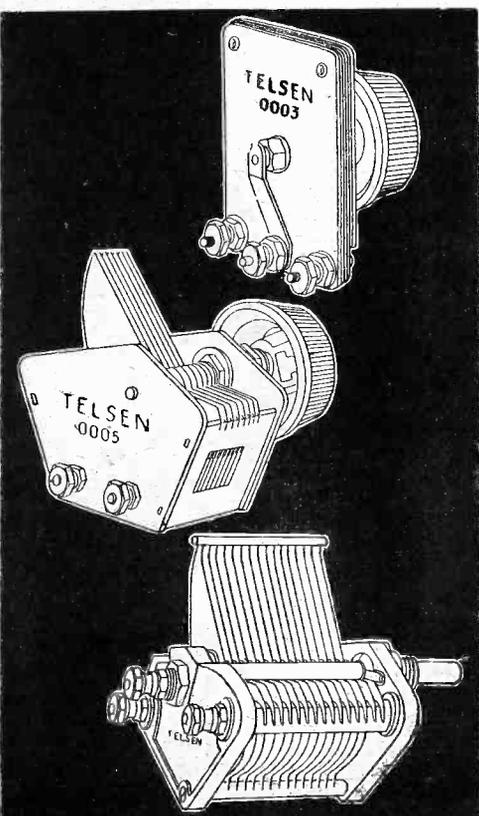


LOGARITHMIC VARIABLE
CONDENSER in capacities
'0005, '00035, '00025,
Price 4/6

DIFFERENTIAL, REACTION
AND TUNING CONDENSERS in all capacities,
Prices from 2/-

TELSEN

100% BRITISH
RADIO COMPONENTS



THE MIRROR OF THE B.B.C.

By O.H.M.

SIR THOMAS BEECHAM AND THE B.B.C.

STUDIO OPERA AGAIN?—DEADLOCK ABOUT SUNDAY PROGRAMMES—SIR JOHN REITH'S POSITION—Etc., Etc.

THERE have been wild statements about Sir Thomas Beecham organising a new "revolt" against the B.B.C. on behalf of independent orchestral organisations.

It has also been rumoured that Sir Thomas has no intention of carrying out the arrangement to conduct the B.B.C. Orchestra in a special Delius programme for which rehearsals have already started. The truth is that Sir Thomas is not a party to any "revolt" against broadcasting.

He has been hastening the rehearsal arrangement for the Delius programme in order that he may go to America and get through his dozen concerts as guest conductor and return in time for the Delius performance in London.

It is true, I believe, that he will receive £500 per concert for the American engagement. When he conducts the Delius concert for the B.B.C., he will be appearing for the first time in Studio No. 10.

Studio Opera Again?

The contraction of the activities of a Covent Garden Syndicate has revived discussion of the comparative merit of truncated studio opera on which the B.B.C. specialised until about two years ago.

Apparently, there is evidence that a considerable body of listeners still misses studio opera, which it prefers to the relayed opera of concert-hall production. It is not surprising therefore that those people at Savoy Hill who believe in the superiority of studio adaptation should take advantage of what may well become a favourable opportunity to secure a reversal to the former policy.

Deadlock About Sunday Programmes.

The Sunday programme policy of the B.B.C. remains exactly as it was. There is no sign of any relaxation of the cardinal principles, namely, no transmission out of harmony with conventional Christian practice, no transmissions during normal hours of church services, and no entertainment alternative to religious broadcasts. The B.B.C. adheres firmly to this policy, and I see no prospect of change.

Sir John Reith's Position.

There is another crop of rumours about Sir John Reith leaving the B.B.C. for a big job in commerce. These are untrue. I believe Sir John Reith has dedicated himself to broadcasting just as his father dedicated himself to religious work.

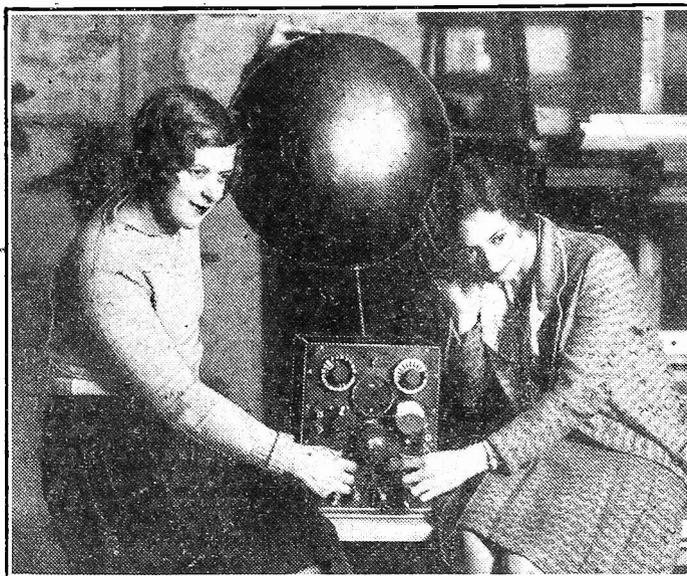
Musical Features.

No fewer than four musical productions are now under preparation. One, an operetta by C. Denis Freeman and Mark Lubbock, whose piece "The King Can Do No Wrong" was broadcast last year, will be heard on Friday and Saturday, March 11th and 12th, with Violet Loraine in the leading part. Later on comes an adaptation by Henrick Ege of Strauss's light opera, "Der Zigennerbaron" ("The Gipsy Baron"), and another Holt Marvell-George Posford production called "Facing the Music," which

is a story of how a prince attempts to introduce jazz as the national music of a Central European kingdom. I hear also that Dennis Arundell is adapting Reynaldo Hahn's "Brummell" for production later on by John Watt.

Some weeks ago I mentioned, apropos of Jack Hylton's broadcast for American listeners, that there was every likelihood of his famous band giving a show for British listeners. It is doing so on Wednesday, March 2nd, when for an hour they are to play in the big No. 10 Studio on the south side of Waterloo Bridge at 10 p.m. The

ONCE THE WORLD'S MOST FAMOUS SET!



These young ladies persuaded Lee de Forest—"The Man Who Put the Grid in the Valve"—to let them listen-in on his historic first receiver, which still works! It is one of radio's most remarkable relics, and was the first set to use a 3-electrode valve.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

A CORRESPONDENT writes (among other things): "... of course, being indoors so much, in consequence of the wintry weather, we have made good use of the wireless. It has been a strange mixture, rubbish predominating."

Does It Worry You?

This isn't the verdict of a disgruntled man, nor one of limited tastes. On the contrary, he is a professional man, who knows the British public, and particularly what the public wants; at least, so I have always thought him to be. Consequently, I am set wondering whether or no our programmes do need a drastic overhauling, or whether it is that certain irritating features (of which my correspondent also

broadcast is in the series of concerts by leading dance orchestras, and with plenty of accommodation available in the studio the audience is likely to be on the large side. The fee will not be exceptional, as wrongly stated elsewhere.

Look Out For These!

A rare feast of outstanding musical items meets the eye in the programmes for the next few weeks. First of all is a concert to be conducted by Sir Henry Wood on Sunday evening, February 28th, in which Prokofiev's Scythian Suite, "Ala et Lolly" is down for performance, maybe as a preliminary to a forthcoming B.B.C. Symphony Concert, at which it is hoped the composer himself will appear as soloist in his Third Pianoforte Concerto. Prokofiev is a Russian, but has lived at various times in Japan, England, America and Paris, and now has his home near the famous Bavarian village of Oberammergau.

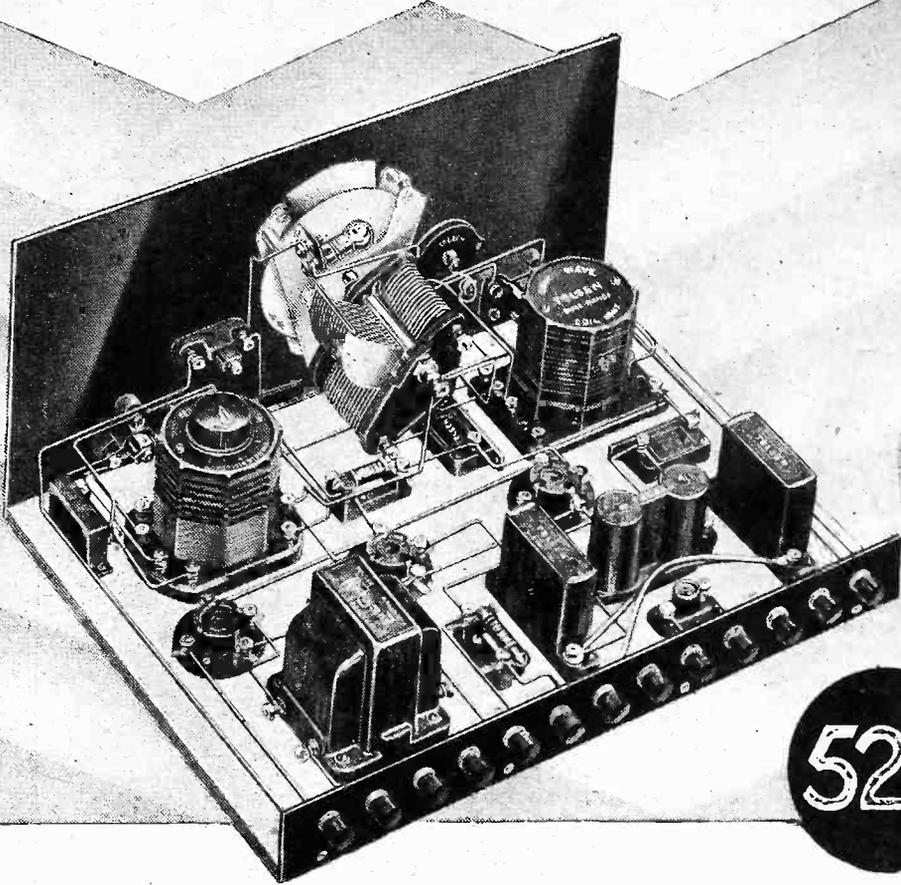
Thursday, March 3rd, brings a studio performance, under Stanford Robinson, of Handel's Oratorio "Israel in Egypt," with Isobel Baillie and Parry Jones as the soloists. While on the following day comes the fifth of the present series of concerts of Contemporary Music, which contains Bela Bartok's "First Suite for Orchestra," Music from the Mimodrame, "The Amazing Mandarin" and "Rhapsody for Pianoforte and Orchestra," in which the composer will appear as the soloist. "The Amazing Mandarin" was written as a musical drama in 1921 and, after very mixed receptions was made into a suite, in which form it will be heard on March 4th.

complains) are being allowed to spoil what would otherwise be attractive items.

Let me explain what I mean. Have you noticed the rivalry which exists between certain speakers to show what a wonderful number of correspondents they have, who never fail to write and thank them? Even Mr. Mais has fallen for this, while as for Christopher Stone—well! it costs us a record each time. Of course, you may say that this sort of thing doesn't worry you. But it irritates me, and I can imagine it irritates a good many other listeners.

It irritates particularly after being forced to listen to a recital of what now is the
(Continued on page 1468.)

TELSEN TRIPLE THREE

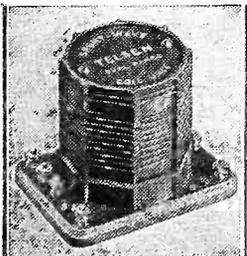


52/6

ALL THE STATIONS YOU'VE WANTED TO GET WITH A SET YOU CAN EASILY BUILD

The Telsen Triple Three is designed to operate on three wavebands—the usual two broadcast bands and the short wave band. The only addition to the controls is one extra wave change switch which throws the set over to the short wave bands. All the world on one receiver—America, Canada, Australia, Russia and the Far East, etc., at your command. Build it yourself—full instructions and blueprint in the new edition of the Telsen Radiomag, 3d. from your usual dealer, or send 4d. in stamps to "RADIOMAG" THE TELSEN ELECTRIC CO. LTD. ASTON, BIRMINGHAM.

The Telsen Short-wave Coil adds the Short Waves without coil changing



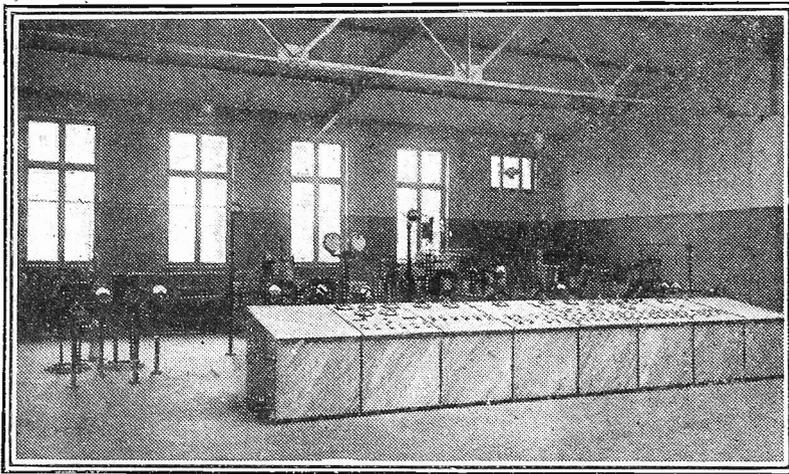
LIST OF COMPONENTS.

	s.	d.
3 Valve holders	1	6
1 .0001-mfd. mica condenser	6	
1 .0005-mfd. mica condenser	6	
1 .001-mfd. mica condenser	8	
1 Grid leak, 2-meg.	9	
1 Grid leak, 1-meg.	9	
2 Grid leak holders	1	0
1 Aerial coil, with selectivity adjustment	7	6
1 Dual range S.W. coil unit	4	6
1 .0005-mfd. logarithmic variable condenser	4	6
1 .0003-mfd. reaction condenser	2	0
1 2-point switch	1	0
1 3-point switch	1	3
1 4-point switch	1	8
1 Radiogrand transformer	8	6
1 50,000-ohm Spaghetti resistance	1	6
1 25,000-ohm Spaghetti resistance	1	0
1 .01-mfd. Mansbridge condenser	1	6
1 1-mfd. Mansbridge condenser	2	3
1 Binocular I.F. choke	5	0
1 Fuse holder	4	6
1 Illuminated disc drive	4	6
	52	6

TELSEN TRIPLE THREE

LONG, MEDIUM AND SHORT WAVE RECEPTION ON ONE DIAL

"ACHTUNG! HIER KONIGSWUSTERHAUSEN."



A German sixty-kilowatt station, working on 1635 metres, which you should be able easily to tune-in on your "Cosmic."

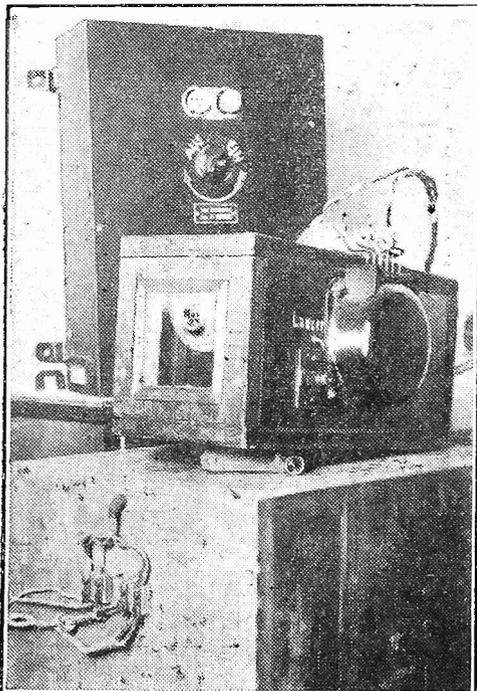
THERE are a few prosaic people who claim that distant-station listening is fascinating only for its novelty, and that, inevitably, all radio enthusiasts eventually develop into "local station" listeners.

But we have overwhelming proof that this is not in fact the case. In the first place one has one's own personal experience to prove most convincingly that the lure of "DX" does not dim with the years, but actually increases with a growing acquaintanceship with foreign stations.

Pick Your Programmes.

Merely from the utilitarian point of view, foreign stations have great value, for there are often very dull periods or complete breaks in our own British programmes, especially on Sundays, and during these a little light music from abroad is indeed a pleasant relief.

EASILY IDENTIFIED



Konigswusterhausen has a metronome interval signal (240 beats per minute). The metronome is kept locked in the bottom lead box, and the microphone can just be seen through the glass side of the box on top.

ping" on other nations, and hearing the characteristic gutturals issuing from the heart of Germany, tango from Spain, the musical diction of lady announcers at work in Italy, nasalities from France and Yankee from the U.S., etc., etc., etc.

And on the top of all this there is a

THE "COSMIC" THREE IS THE MOST FLEXIBLE SET OF ITS KIND EVER PRODUCED. IT PROVIDES FOR FULL-POWER RESULTS ON THREE WAVE-BANDS.

sense of power given you by an ability to control a responsive machine!

Now, in regard to this last, don't any of you absolute beginners let your expert friends mislead you into thinking that a real skill in "knob twiddling" can be achieved only after years of practice, or that some inherent mechanical quality is necessary for its successful attainment.

Providing you apply method, and a determination to learn exactly what each control does, it should not take you longer than a few evenings to acquire sufficient "knack" to collect as big a bag of stations as the most skilful and experienced of operators.

More Stations Than Minutes!

You won't be as speedy in making the adjustments—that is all. But the ability to rush round a bunch of programmes in a matter of seconds instead of minutes is not in itself much to be proud of.

It is much pleasanter to take things slowly and linger awhile on each station—if you do not do so, you will hardly be able to judge as to its qualities and potentialities.

Collecting big lists of "stations identified" and listening to none is, in my opinion, crazy radio. Leisurely roaming around the dial, and sitting back and enjoying the results, making pause as the fancy dictates; that is my idea of worthwhile "DX."

In the course of tests with a "Cosmic" I once tuned-in twenty European stations at full loudspeaker strength in the space of

TOURING THE WITH THE "COS"

By G. V. DOWDING, Associate I.E.E.

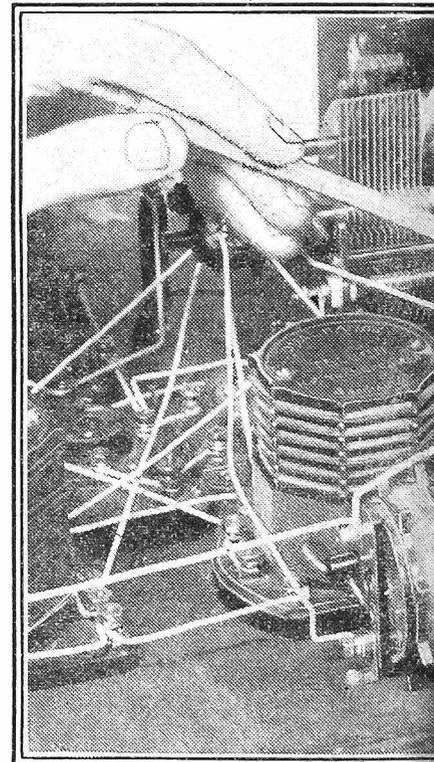
You can operate your "Cosmic" haphazardly and get a good, or even better, results than with any equivalent receiver. But if you set yourself the pleasant task of acquiring a good "Cosmic technique," the number of stations you will be able to tune-in will astonish you.

Additionally, there is the interest and fascination of "eavesdrop-

something under fifteen minutes, but I can assure you there was much more "kick" in spending two successive periods of five minutes each listening to a couple of American stations on the short waves!

However, you will have your own individual opinions as to the relative values

"MODERATE" AND



The Moderator condenser, with which you adjust

of these two particular examples of "ether fish"!

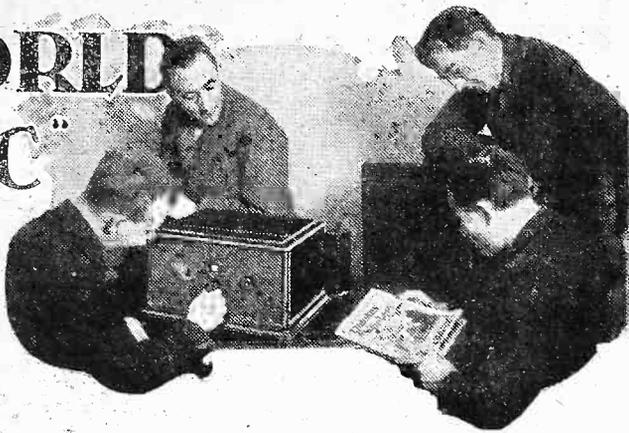
In regard to the handling of the "Cosmic," it is quite obvious that this receiver is not an instrument with which it is necessary to supply elaborate operating instructions.

Getting the Last Ounce.

There is only the one tuning dial, a reaction control and that moderator knob to adjust, so most of you will be able to "drive it straight away yourselves." And, as has been said before, there is no reason why you should not get better results than with any equivalent set, and every reason why

SHORT WAVES—MEDIUM WAVES—LONG WA

ORLD
IC



you should, even though you do not take the slight trouble needed to squeeze the "Cosmic" to its considerable limits.

But for the benefit of those who do want to be able to whack up the last degree of reception efficiency, and surprise themselves and all their friends, I am going to give

rupted by callers, and we are, in fact, facing a couple of hours of journeyings through the ether, visiting foreign countries in the spirit. It will cost us practically nothing, and there will be no irksome restrictions.

First of all, I must make a quick survey of the set itself. Aerial and earth and

SELECTIVITY AND POWER ARE UNDER YOUR CONTROL WITH THE "COSMIC" WATCH "P.W." FOR IMPORTANT OPERATING HINTS.

loudspeaker are correctly connected to their respective terminals and the valves are inserted in their right valve-holders.

The plus two H.T. lead goes to, say, the 120 volt socket on the H.T. battery, for that second L.F. valve needs the greatest H.T. voltage we have at our disposal up to about 120 volts. The G.B. minus two lead needs to be connected with the fifteen or so volts grid bias battery socket—we place it in accordance with the instructions drawn up by the valve maker.

G.B. and H.T.

G.B. minus one, on the other hand, requires only three or so volts. I must make sure the positive G.B. plug is inserted in the positive socket of the G.B. battery.

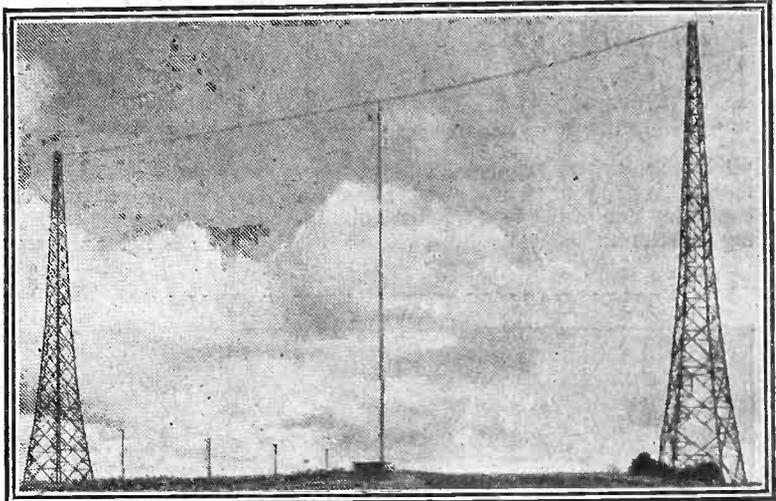
The other H.T. plug serves the detector valve, and 80 is the upper limit for the H.T. volts of this. I might try something lower later on.

H.T. negative is joined up, and that completes our preliminary run over, and the magic moment has arrived. We are ready to begin our journeyings.

We will start with Europe. That means medium and long waves, so the little switch at the back of the set, which I can just reach without getting up, is pushed in. If ours is a "Cosmic Star," the capacity switch on the front of the panel must be pulled out.

There is still the moderator plug to attend to before we can commence our "searching." This is located inside the set, and does not require constant re-adjust-

"SUDFUNK! STUTTGART BEGINNT JETZT . . ."



The Muhlacker-Stuttgart station. If you can get him clear of the London Regional you will be accomplishing no mean feat.

ment, after we have discovered which one of the three tappings gives best results.

But we shall have to have the lid of the set raised during the beginning of this trial run so that we can try first the one and then another of the tappings.

Setting the Reaction.

However, this "semi-fixed" adjustment concerns only the medium waves—0/100 on the extender. I pull out the filament switch and turn the reaction knob right round to its minimum position.

It is vital that at the very beginning I should know which is the minimum and which the maximum of the reaction control. A crude way of quickly determining this is to rotate it as far round the one way as possible, and then vary the tuning control through twenty or thirty degrees.

If there is a succession of squeals of varying strength which rise and fall in

(Continued on next page.)

TURIN'S "NIGHTINGALE"



Turin's interval signal is the song of the nightingale from a musical box. A special article on "Finding Those Foreigners," in which interval signals and similar indications are described, will appear in an early issue of "P.W."

TATIONS SEPARATE!



ame and selectivity on both medium and long

minute operating details. I feel I can now quite safely do that without giving a wrong impression of the "Cosmic"—if a single "P.W." reader, after perusing the following words, writes and says, "—but it seems tricky to handle," I shall feel like casting my typewriter into the nearby Thames!

The Preliminary Adjustments.

Now, I want you to pretend you are sitting by my side. Before us and within comfortable reach is a "Cosmic" connected to an outdoor aerial of fair dimensions. The time is eight o'clock p.m., the house is moderately quiet, we won't be inter-

—THREE WAVE-RANGES—NO COIL CHANGES

TOURING THE WORLD WITH THE "COSMIC"

(Continued from previous page.)

pitch, you are oscillating and causing interference with your neighbours' radio reception. You confirm that you are obtaining maximum reaction by twisting the

reaction, for this coincides with maximum capacity on the reaction condenser. This is given when the spindle is rotated clockwise. I say spindle advisedly, for where there is gearing (slow-motion) between the actual knob you handle and the vanes of the condenser, there may be a reversal of movement—twist the knob clockwise and the vanes go not clockwise but anti-clockwise.

This is not an invariable rule, but you can quickly discover whether or not your particular geared condenser follows it.

The next step to take in methodical set operation, is to locate at least two stations, powerful ones you are sure you can very quickly tune-in at any time.

Get to know the dial positions and comparative strengths of these stations, because you can then employ them as standards. By being firmly impressed with their relative strengths you have a guide as to whether the set is up to scratch at any future date, and by knowing their dial positions and wavelengths you will make search for particular

60 degrees on the dial, and so I slowly turn the extenser backwards and forwards through five or six degrees each side of that reading.

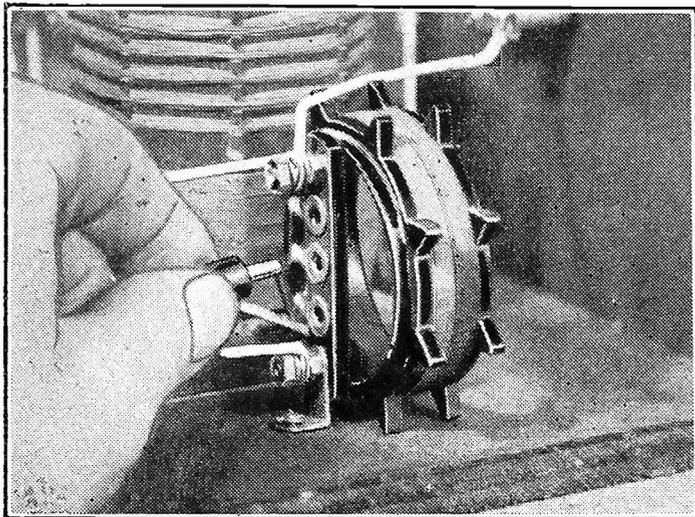
There should be no need for reaction to locate this station, though I won't mind applying just a little if absolutely necessary. Ah! There he is—exactly where I thought he would be.

For Maximum Volume.

I then make sure that reaction is at minimum, and carefully juggle the extenser dial until I have the exact tuning—that point where the station is at its loudest.

And now for the moderator. I twist the little moderator knob. A great increase of

YOU CAN MATCH ANY AERIAL



Adjusting the Moderator coil plug for one hundred per cent results on a particular aerial and earth. See paragraph No. 3 below, and also in the "Tuning" guide on the next page.

reaction knob as far round in the opposite direction as it will go.

Varying the tuning now should not result in squeals.

BEFORE SWITCHING ON YOUR "COSMIC."

1. Inspect the interior, finally check the wiring, and make sure all terminals are tightly screwed up.
2. Check the exterior connections and see if they are correctly made. Take them in this order: (A) Aerial and earth. (B) L.T. pos. and neg. (accumulator); negative on battery must go to negative L.T. terminal on set. (C) H.T. plus two terminal to maximum voltage socket on H.T. battery, H.T. plus one to about 80 volts or lower (40 volts may be better, especially for short waves). (D) H.T. negative. (E) Grid bias—very important that G.B. battery is joined up correctly—G.B. negative two plug to a higher point than G.B. negative one, etc. (F) Loud-speaker.
3. Ascertain that Moderator coil plug is inserted in one of the sockets—start with the central one.
4. See that valves are in their right holders and fit snugly.
5. Check position of short-wave transformation switch at back of set—push in for ordinary waves, pull out for short waves. (With the "Cosmic" Star the "capacity switch" on front panel should be pulled out for ordinary waves, pushed in for short waves; and there is the position of the pick-up switch to be checked.)

But there is no necessity to take such drastic action in order to identify maximum

it much easier to foreigners.

Londoners cannot do better than employ London National 261 metres, London

Regional 356 metres, and North Regional 479 metres. And as this imaginary test of ours is in London, these are the stations I am going to commence our "journeys" with.

I am not dismayed when on switching on, and with reaction at minimum, there is (1) an apparent lack of selectivity, and the two Londoners swamp in together, or (2) it is difficult to locate one or the other.

First Blood.

I am going to take the London Regional first of all, and to avoid confusion I glance at the printed programme in order to ascertain what he and the others are transmitting. This will save much time, especially if the items are distinctive, such as an organ recital from one, variety from another and symphony from the third.

I expect to find the Regional round about

NEXT WEEK

YOUR "COSMIC" ON SHORT WAVES

and full details of a novel long-distance test for "Cosmic" owners.

volume results at a point near its upper limit of travel—nearly hard round to the right.

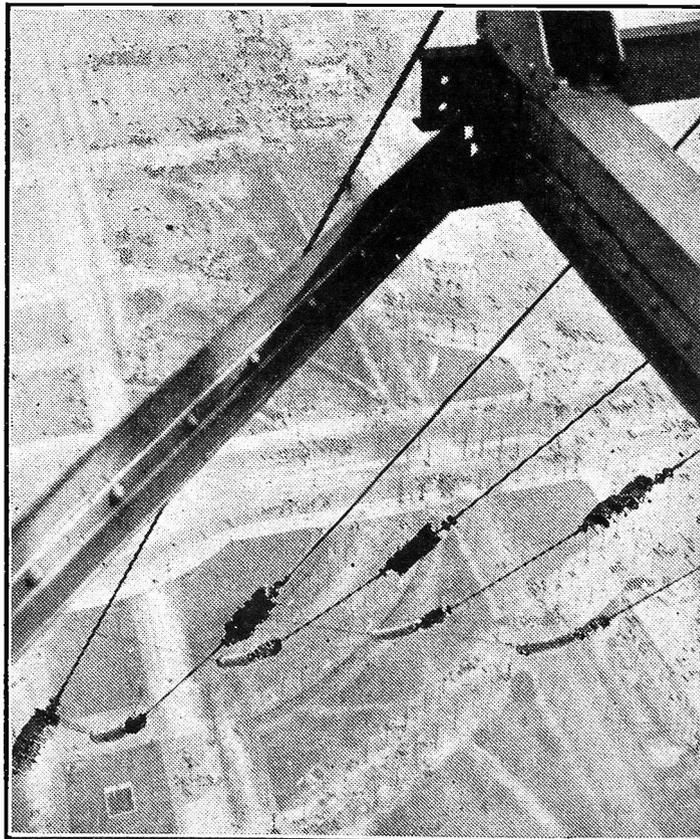
(My one aim at present is to note maximum volume positions, and I don't worry about selectivity.)

Now I try the London National. I reduce the moderator control roughly 30 degrees (for this follows the stations round the extenser dial) and then slowly sweep the extenser control downwards until at, say, 28 degrees the National programme is heard.

I carefully note this and the Regional dial readings for future reference. Greatest

(Continued on page 1450.)

EASILY HEARD ON A "COSMIC"



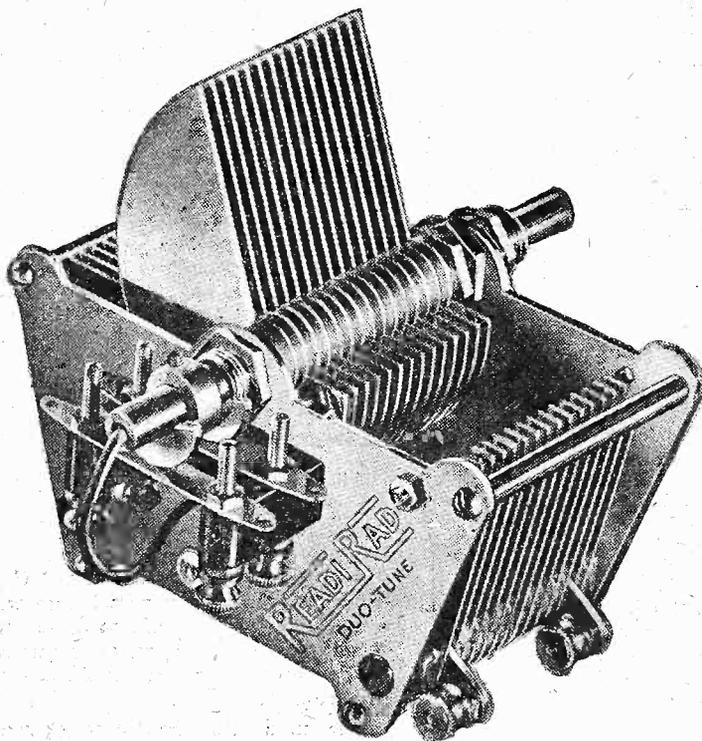
Paris, as seen from the Eiffel Tower. Both the Eiffel Tower and Radio-Paris stations transmit good concerts on Sundays, but it is the latter which provides the more popular programmes.

The **READY RADIO** **DUOTUNE** EXTENSER MODEL



"No one need now build a separate Short-wave Set" says H. L. Price

the famous Short-Wave Experimenter



The "Cosmic" Star covers all wavelengths with maximum efficiency on each waveband. Not only can you tune in British and Continental Stations on the medium and high wavelengths, but at the flick of a switch you can go down to the ultra-short wavelengths as used by stations in all parts of the World. Single-knob tuning—no coil changing—everything designed to make reception easy. Wonderfully sensitive and selective—delightful quality. Until you build the ALL-WAVE "Cosmic" Star you are missing half the thrills of radio.

Full-Size Blue Print of the "Cosmic" Star

FREE Send four 1½d. stamps for a copy of Kendall's Book entitled "10 Hows for Modern Radio Constructors" and we will include a "Cosmic" Star blue print free.

This new condenser is an important feature of the "Cosmic" Star. Acts as a .0005-mfd. condenser for medium and long wave-tuning and automatically switches from medium to long-wave tuning.

At the flick of a switch it becomes a .00025-mfd. condenser for short-wave work. Combines all the advantages of two highly efficient condensers in one instrument.

DUOTUNE - 15/6

Readirad 20 to 1 Slow-Motion Disc Drive 3/-



Head Office and Works:

EASTNOR HOUSE, BLACKHEATH, S.E.3.

Phone: Lee Green 5678.

Grams: "Readirad, Blackoil."

COUPON

To: Ready Radio Ltd., Eastnor House, Blackheath, S.E.3

I enclose four 1½d. stamps. Please send me copy of Mr. Kendall's book, price 6d., and free full-size blue print of "Cosmic" Star.

Name.....

Address.....

P.W. 27.2.31.

TOURING THE WORLD WITH THE "COSMIC"
(Continued from page 1448.)

volume from the moderator adjustment will now be seen to be about the centre of the travel of the moderator knob.

This is confirmation that I am using too high a moderator tapping, so I alter this until, after readjusting the moderator condenser, I find that greatest volume from the London National programme is achieved when the moderator control is nearly right round in the anti-clockwise direction, but still has a little further to go.

Had the Regional been loudest with the

NEXT WEEK

SELECTIVITY AND POWER ON YOUR "COSMIC"

moderator condenser "well down" towards the limit of its rotation anti-clockwise, and the London National kept increasing in strength but never quite got to its maximum, even when it was turned hard over in the same direction, I should have known that I was using a too-high moderator coil tapping.

Now we should be able to tune-in the North Regional quite comfortably. First of all give the moderator a twist so that it is all but hard over in the clockwise direction, and then sweep the extenser up to 90 or so.

It may be necessary to apply some reaction for this station. But at no time is there any need to juggle with three controls simultaneously. You set the moderator roughly where you think it should be, and then do all the "searching" with the tuning and reaction controls.

That is why I want you to note roughly where greatest volume for the various wave-lengths lies with the moderator control. Fix about three rough settings of this; say somewhere central for all searching between 320 and 420 metres, and a maximum and a minimum position for wave-lengths above and below this.

Systematic Searching.

I will illustrate this in detail. I am going to have a shot at Brussels Number 2, which works on 338 metres. Obviously the moderator knob needs to be about half-way round.

Now I slowly rotate the extenser downwards from the reading at which the London Regional (356 m.) comes in, while I carefully bring up the reaction until the set "breathes" and is in its most sensitive condition.

Being practised in the art, I know that as the tuning is reduced so I must ease off the reaction slightly in order to maintain this sensitive "threshold" of reaction. (I would have to make coincident increases in reaction if we were tuning up the scale.)

So, simultaneously easing off the reaction ever so gradually, and slowly tuning downwards (deliberate and slow is how we go all the time in "searching") I run through Strasbourg on 345 metres, ignore his gutturals, until I run into an announcer saying something in Flemish!

Well, here we are, Brussels Number Two. But he is being jammed by the London

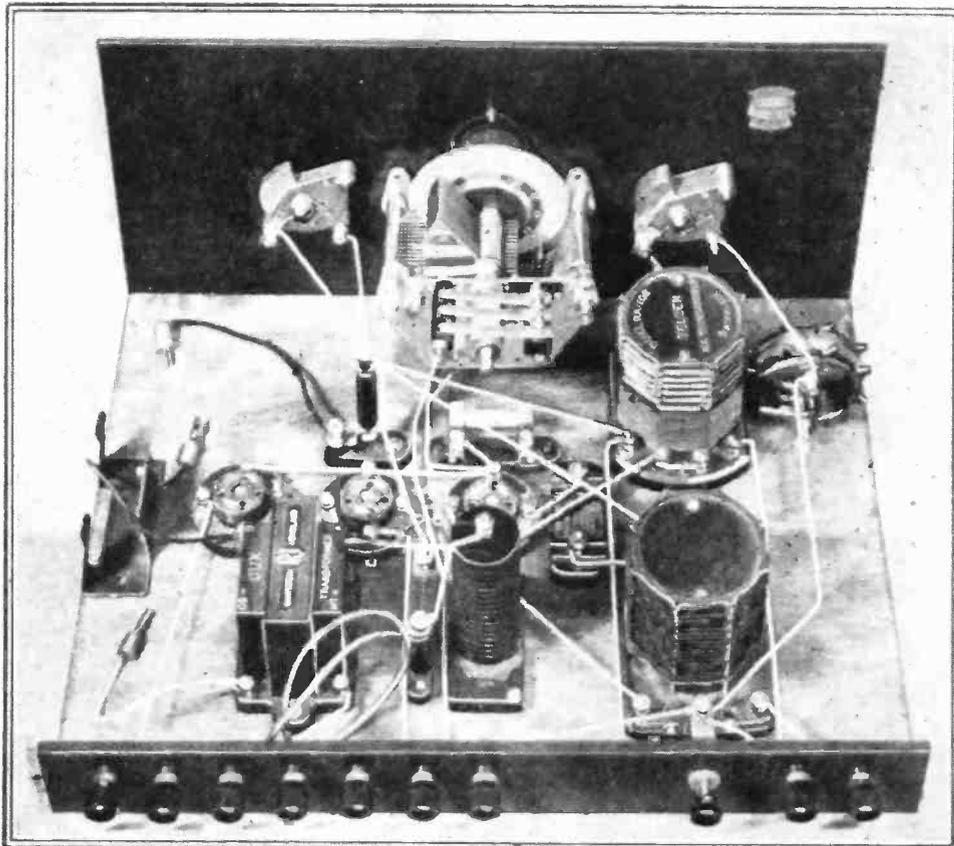
Regional, whose music you have been hearing all the time. Right, then we must try a new moderator adjustment. I will experiment by twisting the moderator a little in different directions.

After each new moderator adjustment I delicately readjust the reaction and tuning until all trace of interference disappears. But you will notice I endeavour to retain something of Brussels all the time while I experiment with the moderator control.

"COSMIC" TUNING.

1. There is no switching for medium and long waves; these come in on 0-100 and 101-200 extenser dial readings respectively.
2. Short waves can be tuned in on either set of readings (when S.W. switch is operated) but best results usually obtain between 101 and 200.
3. Set the moderator coil plug so that stations at each end of the medium-wave band can be brought to full strength by adjusting moderator condenser to minimum and maximum settings.
4. Moderator condenser settings change for medium-wave stations, but not necessarily for long waves.
5. Moderator condenser can be roughly set on medium waves for bottom, medium, or top tuning dial positions.
6. Critical searching is accomplished with only the extenser and reaction adjustments.
7. Increase selectivity by varying moderator condenser (in either direction for medium waves and anti-clockwise for long waves).

NO SWITCHING FOR ORDINARY BROADCASTING



The wave-range change from medium to long waves, and vice-versa, is automatically carried out by the extenser. And by operating the little switch on the back terminal strip the set is immediately transformed into a short-waver.

All this takes me a matter of but a few seconds and you too will quickly get the "knack" if you go about the job methodically.

And now let us see what our "Cosmic" is like on the long-waves before we start compiling "logs" of medium waves. To go over to the long waves, all we have to do is to turn the extenser dial round until it shows 0-200 readings.

The moderator has now changed its nature. And we keep it hard round clockwise for greatest power and round the other way for greatest selectivity.

You will probably find that you can always enjoy the greatest power except for one or two of the stations such as Radio Paris, which are check by jowl with Daventry 5 X X. However, you can subdue 5 X X by a moderator adjustment.

It is true there might be a "break through" of medium stations on the lower readings, and that would call for a moderator adjustment. But in general, the moderator is not used quite as much on the long waves as on the medium waves.

Having noted the dial reading of Daventry 5 X X, for which a little reaction may or may not be needed, we have now got the "feel" of the "Cosmic" on medium and long waves and can start in earnest—but look at the time! We've been so interested in getting ourselves in "tune" with the "Cosmic" that we shall have to postpone our "journeying" in Europe and turn to the Americas and Antipodes and investigate the short-wavers!

And I am going to leave it to Mr. Kelsey to tell you all about these next week.

Build to the EXACT Blue Print Specification

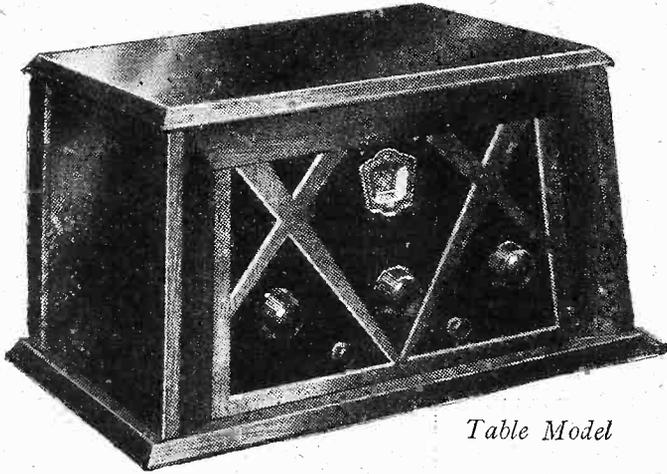


Table Model



The Ready Radio Kit contains every component exactly as specified on the "Cosmic" Star Blue Print. Baseboard is included together with panel, ready cut and drilled. Jiffilinx are supplied for easy non-soldering wiring as well as all necessary screws, nuts, flex, etc. By purchasing the Ready Radio "Cosmic" Star Kit you have everything you need to build exactly to specification.

LIST OF PARTS as shown on Blue Print

	s.	d.
1 Ebonite Panel, 12" x 7", drilled to specification -	4	0
1 Plywood Baseboard, 14" x 10" -	1	0
1 Ebonite Terminal Strip, 14" x 2" -	1	0
2 L.T. Switches -	1	8
1 ReadiRad .00075 Moderator Condenser -	3	6
1 Duotune Extensor -	15	6
1 Slow-Motion Disc Drive for above -	3	0
1 ReadiRad .0003 Extended Slow-Motion Reaction Condenser with Bracket -	7	0
3 Valve Holders -	1	6
1 R.I. "Cosmic" Dual Coil Unit -	12	6
1 ReadiRad Moderator Coil -	2	6
1 T.C.C. .001 Fixed Condenser, Type "S" -	1	6
1 ReadiRad Standard H.F. Choke -	4	6
1 Lewcos 100,000-ohms Spaghetti Resistance -	1	6
1 ReadiRad Radiogram Switch -	2	9
1 T.C.C. .0003 Fixed Condenser, Type "S" -	1	3
1 ReadiRad Wave-Change Switch -	1	6
1 R.I. Hypermite L.F. Transformer -	12	6
1 Grid Leak, 2 megohm and Holder -	1	4
1 T.C.C. .01 Fixed Condenser, Type 40 -	1	9
1 Grid Leak, .5 megohm, and Holder -	1	4
9 Belling-Lee Terminals, Type "R" -	2	3
1 Packet of Jiffilinx for wiring -	2	6
3 Belling-Lee Wander Plugs -	1	6
Flex, screws, &c. -	1	2

£4 9 6

Any Component can be purchased separately.

Official Blue Print with every Kit.

KIT "A"

Complete Kit of Components together with panel (ready cut and drilled), baseboard, Jiffilinx for easy non-soldering wiring.

89/6

OR BY EASY PAYMENTS 10/3 down and 9 monthly payments of 10/3.

KIT "B" £5:17:6 **KIT "C" £6:18:0**

OR BY EASY PAYMENTS 11/- down and 11 monthly payments of 11/- OR BY EASY PAYMENTS. 12/9 down and 11 monthly payments of 12/9.

Kit "A," together with specified Mullard valves. Kit "B," together with Table Cabinet illustrated above.

Visit our Showrooms at 159, Borough High St., London Bridge, S.E.1, to see the famous "Cosmic" Star Set.

TO INLAND CUSTOMERS.— Your goods are dispatched post free or carriage paid.

TO OVERSEAS CUSTOMERS.— Everything Radio can be supplied against cash. In case of doubt re-

garding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon delivery of the goods. All goods are very carefully packed for export and insured, all charges forward.

CASH or COD ORDER FORM

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

EASY PAYMENT ORDER FORM

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

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

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

for which (a) I enclose (cross out line) £.....
(b) I will pay on delivery (not applicable)

for which I enclose first deposit of £.....

Name.....

Name.....

Address.....

Address.....

P.W. 27/2/32

P.W. 27/2/32

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



This is ideal, for it not only gives you .0005 mfd. for the medium and long waves but, by a simple switching, .00025 mfd. for the short waves. In short, it is just the component needed for modern tri-band reception, and its recent invention was quite providential.

It should also be noted that it has a most excellent slow-motion control—and is, in fact, an achievement. It costs 15s. 6d. but is a high-class engineering production, and in view of this and its vital usefulness it cannot but be extremely widely used. In any case, its inclusion in the "Cosmic" Star will ensure that, and is a definite indication of our opinion regarding it.

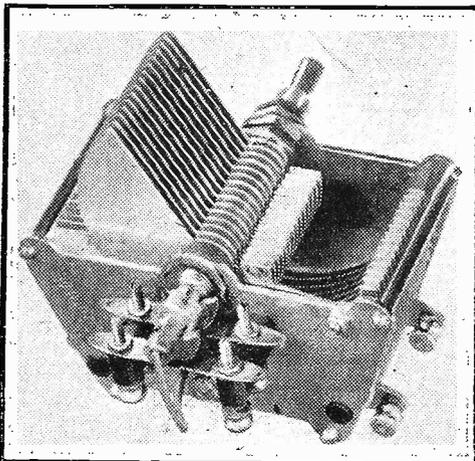
THE "DUOTUNE" EXTENSER.

THE standardisation of .0005 mfd. as the capacity for tuning condensers was not accidental; .0005 mfd. has been fixed upon as the most suitable compromise.

For it is a compromise, you know. A higher capacity would cover more stations with a given inductance, and with a lower capacity there would be a greater spread out of stations.

A further, but vital consideration, concerns the ratio of capacity to inductance for best results.

FOR "TRI-BAND" SETS



With a simple switch the Duotune acts as either a .0005-mfd. or .00025-mfd. condenser.

However, we do not need to go deeply into the matter on this occasion; suffice it to say that .0005 mfd. is an excellent compromise for the tuning of medium and long-wave stations.

But now that the "Cosmic" has arrived, a third wave-band will be popularised—the short waves. Now .0005 mfd. is O.K. for short-wave tuning providing a good slow-motion control is used, and the operator is prepared to acquire a little real tuning experience.

On the other hand, the short-waves would be more spread out and much easier to tune with a lower capacity.

But you don't want to use a separate tuning condenser if that can be avoided, and you don't want to drop the capacity and lose medium-wave stations.

A way out is to switch in a series capacity when on the short waves; or, better still, as in the "Cosmic" Star set, use a Ready Radio "Duotune" Extenser.

NEW R.I. CATALOGUE.

The latest catalogue published by Radio Instruments, Ltd., should be in the hands of all constructors, for it embodies a number of interesting diagrams. The Eckersley Coil is listed and a typical detector diagram showing how it should be used is included.

THE ULTRA "IMP" LOUDSPEAKER.

Those readers who have used Ultra "Air-Chrome" loudspeakers will know that these instruments are excellent propositions, and that for many years they occupied a pre-eminent position.

Employing an electro-magnetic unit, they have stiff fabric diaphragms, and the manner in which they produce good bass and yet retain excellent high-note response is still something of a mystery.

In the circumstances, you would expect a muffling or drumminess, but you don't get it!

I once ventured an opinion as to the reasons, and aroused hundreds of readers to write sceptical letters and postcards!

Fortunately, for me at least, recent textile researches have proved that, very possibly, I was right.

However, all this is in the nature of a digression, for the purpose of these paragraphs is to introduce you to the Ultra "Imp," a quite new product.

It is a junior permanent-magnet moving-coil loudspeaker of a quality that is fitting for the makers of the famous "Airchromes."

The Ultra "Imp" has a cobalt steel magnet and is supplied with a universal output transformer for either a Pentode or ordinary power valve.

It is available in a handsome dome-shaped walnut or mahogany cabinet (price £4) or as a chassis at £2 15s. 0d.

On test we found the "Imp" to be just as sensitive as an "Air-Chrome" and that, as many of you will appreciate, is saying a good deal. And in regard to reproduction, well, it certainly is very good indeed and, as claimed, has a wide frequency response.

We must include it among the best two or three of the junior "M.C.s," and as it is of first-class appearance too, it is bound to prove popular.

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

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

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

CHANGING THE MAINS.

I have received the following note from the Marconiphone Co., Ltd. It is of interest to users of D.C. mains:

"Radio listeners in areas served by D.C. electricity supplies are sometimes doubtful about installing D.C. radio apparatus in view of the possibility that sooner or later their electricity supply will be changed over to A.C.

"Intending purchasers of Marconiphone radiogramophones and receivers need have no such hesitation, since arrangements have been made for the conversion of D.C. Marconiphone instruments to A.C. as and when occasion arises.

"The latest model to be brought into the scheme is the very popular Marconiphone Radiogram Three—Model "330." These instruments can now be converted from D.C. to A.C. operation for a total cost of £10 18s. 3d., this figure including new A.C. valves of the appropriate type.

"Owners of the D.C. Radiogram Three who want their instrument converted should get in touch with the Marconiphone appointed dealer by whom it was originally supplied."

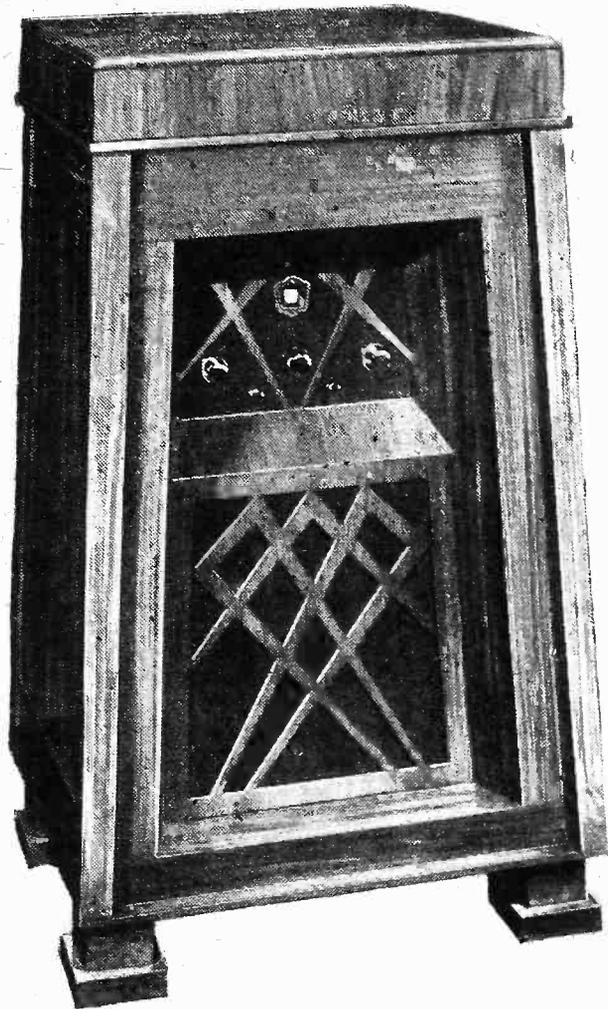
Such conversion necessitates the inclusion of mains transformer, rectifier, etc., so the cost is quite reasonable.

PETO-SCOTT GIVE A PARTY

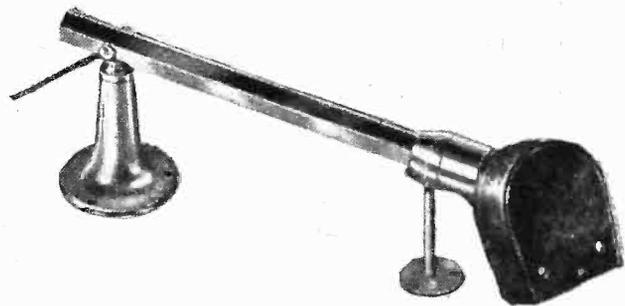


A photo taken at a very jolly social gathering of "Peto-Scott" and friends. Mr. Worthington, managing director, is in the centre of the front row, and on the extreme right Mr. Zutler of "P.W."

A job worth doing is worth doing well



The Ready Radio "Cosmic" Star is the ideal all-purpose set. No other 3-valver can give you so much satisfaction and pleasure. It represents modern design at its best. You will be proud of its performance—be proud also of its appearance. Build it into the Ready Radio Cabinet and fit it up complete as a radio-gram.



This beautiful radio-gram cabinet has been specially designed for the "Cosmic" Star. Ample space is provided for the set, batteries and speaker as well as gramophone equipment. Note particularly that the panel is recessed so that the terminal strip is easily accessible at the back. This is an important feature—an ordinary cabinet will prove very inconvenient.

The Ready Radio Cabinet is of highly polished walnut with lift-up lid and automatic support. Needle cup fitted in motor-board.

£3 : 7 : 6

READIRAD PICK-UP

An entirely new design possessing many unique features. Compensated spring balanced tone-arm to reduce record wear. Swivel head to facilitate needle changing. Extreme sensitivity and marvelously life-like reproduction. Correct tracking. Extremely handsome appearance. Never needs adjustment

27/6

See Order Forms on Page 1451.

..... RECOMMENDED GRAMOPHONE EQUIPMENT

- | | | | | |
|--|---|---|--|---|
| 1 Pertrix Accumulator, Type PXC3 - 11 0 | 1 R. & A. Speaker Unit, Type 40 16 6 | 1 Collaro Gramophone Motor, Type B.30, with Automatic Stop and Unit Plate - - £1 13 0 | or
1 Collaro Electric Induction Gramophone Motor - - £3 0 0 | MAINS SUPPLY
(eliminates H.T. Battery) |
| 1 Pertrix 120v. Ultra Capacity H.T. Battery 19 6 | or
1 Blue Spot 66R Unit with Major Chassis - £2 10 0 | | 1 Readirad .5 Meg. Volume Control 5 9 | 1 Ready Radio Eliminator (A.C.) with trickle charger, Type B.S. - £5 17 6 |
| 1 Pertrix 9v. Grid Bias Battery - 1 3 | | | | |

Immediate Dispatch, 15,000 Kits in stock!

CAPT. ECKERSLEY'S QUERY CORNER



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

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

Short Waves and Selectivity.

N. K. (Chatham) - "I have always understood that it was not difficult to obtain selectivity on short waves, that is, between 20 and 50 metres. In fact, I have frequently read that if a receiver designed for these wavelengths were made very selective it would be difficult to tune the receiver."

"I admit that the tuning on my short-wave receiver is sharp, but I find that it is almost impossible to obtain reception of one station without interference from others working a little way away."

"I should be pleased if you could indicate the cause of this interference and suggest

I should say you might try my resistance-coupler scheme, as shown in the diagram, adopting values and techniques for short waves."

Accumulator Terminals.

R. K. (Norwood) - "I have found great difficulty in keeping the brass terminals on my low-tension accumulator clean and free from a greenish deposit. What is the cause of this deposit, and in what way can I prevent this?"

The best way to keep copper sulphate deposit away from terminals is to prevent acid spray and acid fumes attacking the metal. Thus, thoroughly clean the terminals once and for all, then get some petroleum jelly or vasoline and smear this over the bright parts of the terminal (this keeps the acid away).

From time to time wipe off the old vasoline, clean things up, and put on a new coat.

Plate Circuit Resistance Values.

R. M. (Wolverhampton) - "I thank Capt. Eckersley for his comments some time ago on a query of mine concerning the correct manner of ascertaining the value of the anode resistance in an RC-coupled stage."

If the stage concerned is decoupled by a resistor and condenser in the usual manner, the value of the decoupling resistance to be taken into account?

For instance, if the anode resistance is found to be 30,000 ohms, and the decoupling resistance used is 20,000 ohms, do I only actually employ a 20,000-ohm anode resistance?

If R is the calculated anode resistance, done according to the way I explained (I am very glad it was of use to you), then R is always R, and is independent completely of the value Rd, the decoupling resistance. But the voltage applied to the valve will be decreased owing to the decoupling resistance.

The best way to overcome this difficulty is to tune the valve until they come to the value on which you have based your calculations. Suppose you say that

it is to be 100 volts on the anode of the valve with 10 milliamperes, but you are adding a decoupling resistance of 1,000 ohms. Then raise the H.T. volts from the value you assumed by

$$10 \times 1,000 \div 1,000 = 10$$

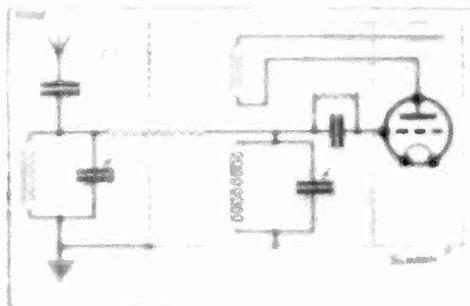
Of course you may have more current than the decoupling resistance.

A Lightning Arrestor.

B. M. N. (Banaster) - "My aerial and earth system is protected from lightning and similar discharges by means of an arrester containing what appears to be a sort of neon lamp."

A few days ago an electrical wire which is carried above the aerial broke, and evidently one of the rods touched the bare aerial wire. The lamp in the lightning

FOR SELECTIVE COUPLING



Capt. Eckersley suggests that the principle underlying the Schenker Tuner might be applied to obtaining selectivity on short waves, as well as on the medium and long. (See the reply to N. K. Chatham on this page.)

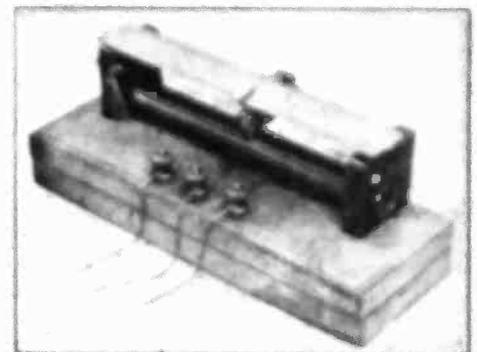
whether the trouble can be obtained in any manner.

The selectivity of a tuned circuit depends largely upon the ratio of the reactance to the inductance of the coil used in that circuit. The selectivity is greater the less the reactance inductance ratio, the more coupled tuned circuits etc. etc.

This statement applies independently of the frequency used. There is therefore no fundamental reason why selectivity should be worse or better on short waves, it depends purely on the high frequency circuit design. I think the reason why people talked about sharper tuning (and old words meaning nothing, as they are so frequently used) on short waves was because the tuning condenser moved over a given number of minutes or degrees of arc, made a bigger proportional change in frequency, at short than on medium waves, purely accidentally, owing to valve changes.

Also stations were not very close together in old days—now they are closer. No! the only thing you can do is to try coupled circuits.

RULING RESISTANCE



Here is an illustration showing how a cheap ruler can be used as a scale for potentiometer-wire, so facilitates quick adjustments and re-adjustments of the straight type of variable resistance.

was lit up very brightly until the battery light wire was removed by the operator, when it was adjusting the potentiometer when I happened to touch the battery a few moments afterwards it was extinguished.

It is the normal effect of the short, and as you think that the arrester is quite all right for future use?"

The arrester seems to be arreating very nicely. If the electricity people can put that voltage with that power behind it (common to electric power circuits, and the gas arrester pulled the potential down as it appeared to do, you need fear nothing from lightning, unless it's a direct hit.

Nothing protects against a direct hit, but the chances are millions to one against it happening, and when it does it isn't life or limb by having a window out, it's just the wireless set!

ONLY IN "P.W."

can you read Capt. Eckersley's replies to listeners' own problems AND REMEMBER

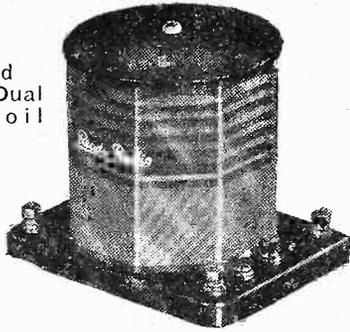
Captain Eckersley's technical articles appear only in:

"POPULAR WIRELESS" and "ELECTRIC WIRELESS"

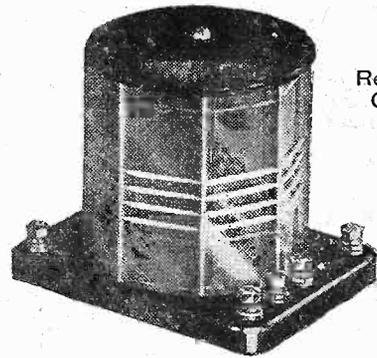
You must use READIRAD COMPONENTS

in your COSMIC STAR

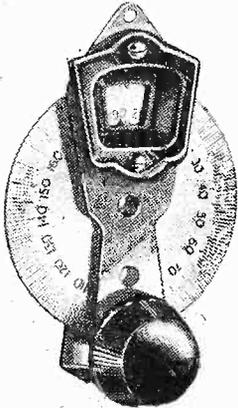
ReadiRad
Cosmic Dual
Range Coil
6/6



ReadiRad
Cosmic
Short
Wave
Coil
4/6



ReadiRad Slow-
Motion Disc
Drive, ratio 20
to 1 - 3/-



World-wide reception on all wave-lengths depends on the use of the correct components in the tuning circuits.

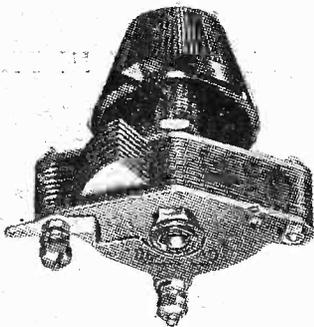
The coils must be wound strictly to specification and of the highest efficiency.

The tuning and reaction condensers must be operated through slow-motion controls which permit of smooth and critical adjustments.

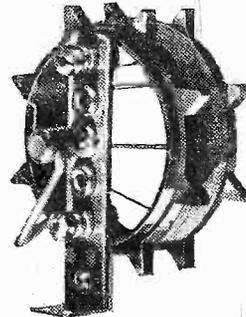
The reaction condenser must be provided with extended anti-capacity control.

All ReadiRad Components are tested and passed under the supervision of G. P. Kendall, B.Sc.

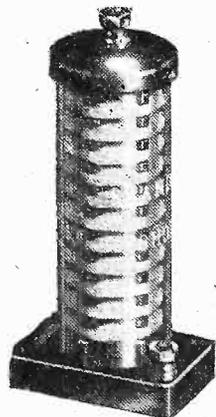
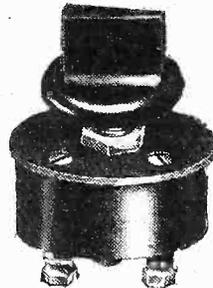
ReadiRad
Moderator
Condenser
00075
mfd.
3/6



ReadiRad Cosmic
Moderator Coil
2/6



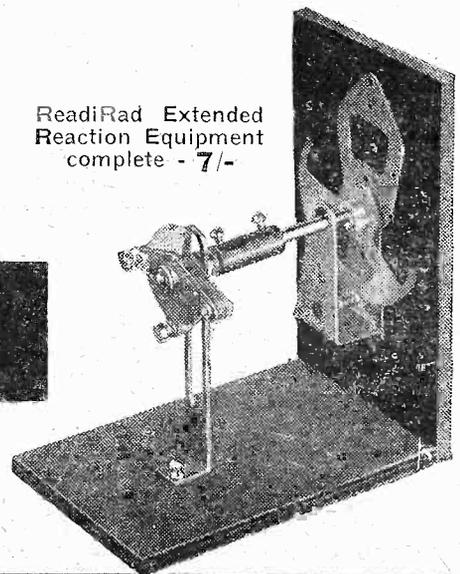
ReadiRad
Radio-Gram
Switch - 2/9



ReadiRad
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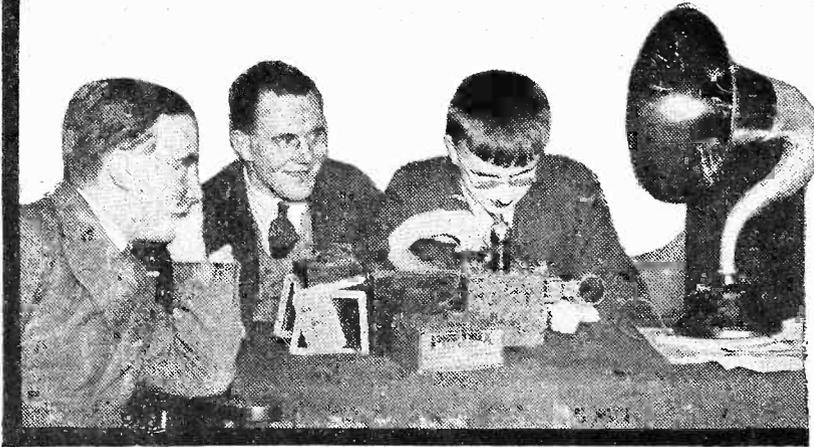
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BROADCASTING AND THE BLIND



A popular microphone artiste who is blind gives you his impressions of radio, and conveys to the reader in an extremely understandable manner the reactions of the blind to broadcast entertainment.

SINCE wireless broadcasting started there has been, from time to time, much talk of the peculiar aptitude of blind people for wireless listening. That is rather a vague way of saying that the blind, by reason of their blindness, are ideally suited to the limitations which differentiate broadcasting from the visible form of entertainment.

Not long ago an article appeared in a national newspaper dealing with this very topic. The writer, who spread himself over a column and a half in generalities, was obviously not blind. He did not give a single concrete instance of the advantages of blindness oversight in the matter of wireless listening.

RONALD GOURLAY



The writer of this article.

To my mind, the whole question turns on this point. Is there any *essential* difference, as listeners, between the blind and those with sight? Actually—and I speak as a lifelong blind man and an experienced wireless listener—*there is not*. What differences do exist—and undoubtedly there are some—are of degree and not of kind.

At An Advantage.

In a nutshell, I would say that your blind listener is your ordinary listener *intensified*. I hope that rather peculiar mode of statement can make my meaning clear.

Every wireless listener knows that on occasion darkness can impart an air of realism which is otherwise lacking in broadcasting. Many are the occasions on which the announcers have advised listeners to switch off the electric light.

Try to imagine one who lives *perpetually* in that air of vocal realism which the mere turning of a switch in the wall imparts to your radio. That is the realm of wireless which the blind man knows; a vital, intense world which touches him like actuality—and not like the sounds of paid players coming through his loudspeaker.

It is, perhaps, asking too much of those with sight to feel with me on this point, for none but the blind can fully realise the

enormous powers of one's imagination.

The results of this "intensity" of feeling are mainly threefold. In the first place, wireless listening is undoubtedly easier for the blind because their powers of concentration (so essential to realism) are more easily called upon.

I can well imagine that some people, through prolonged familiarity, merely *hear* the wireless. The blind man always *listens*. There is a wide difference between the two.

Again, the blind listener tends to be more *critical* than his brethren with sight—because to him sound is a so much greater part of life. His mind is a sort of fault-sieve of sound.

They Demand Good Entertainment.

This, I know, directly contradicts the generally accepted statement that the blind readily accept *any* form of entertainment. Definitely, they do not. They demand essentially *good* entertainment; mediocrity will not do.

I have no desire to flatter the British Broadcasting Corporation when I say that blind people are *more* than satisfied with the broadcasting fare served to the general public. Any blind person will tell you that the wireless programmes maintain an extraordinarily fine level of entertainment. That is a simple statement of fact.

Thirdly, I believe the blind listener is more appreciative of effort than the average man. When he says "That is a good play," or "That was well sung," he is tremendously sincere.

This fact has been brought home to me time and time again when I have played from the platform to an audience composed entirely of blind people. Applause is longer (at times em-

barrassingly so) and more spirited than with the normal audience.

I have heard it suggested that it would be a sound idea to appoint a blind man to the Board of Governors of the B.B.C. It is a suggestion which leaves me quite unmoved.

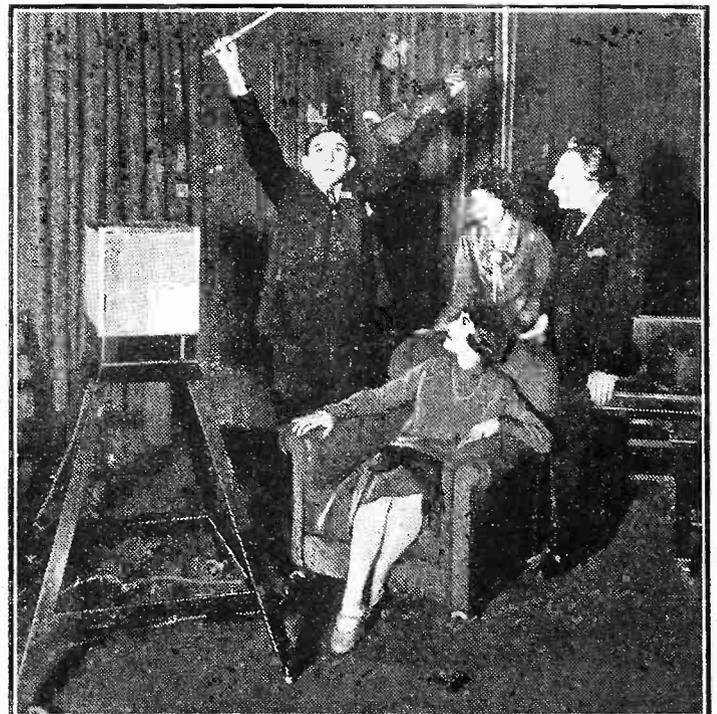
"A Grave Mistake."

Can anyone tell me in what way the presence of a blind man in the directorate would tend to improve the present level of wireless entertainment?

That, I repeat, is fully approved by the majority of blind listeners. Whilst the blind are as worthy of consideration as any section of the listening public, it would be a grave mistake to cater especially for them in the broadcast programmes.

Indeed, any such procedure might conceivably lead to a good deal of dissatisfaction amongst listeners. Altruism in that direction can certainly over-reach itself.

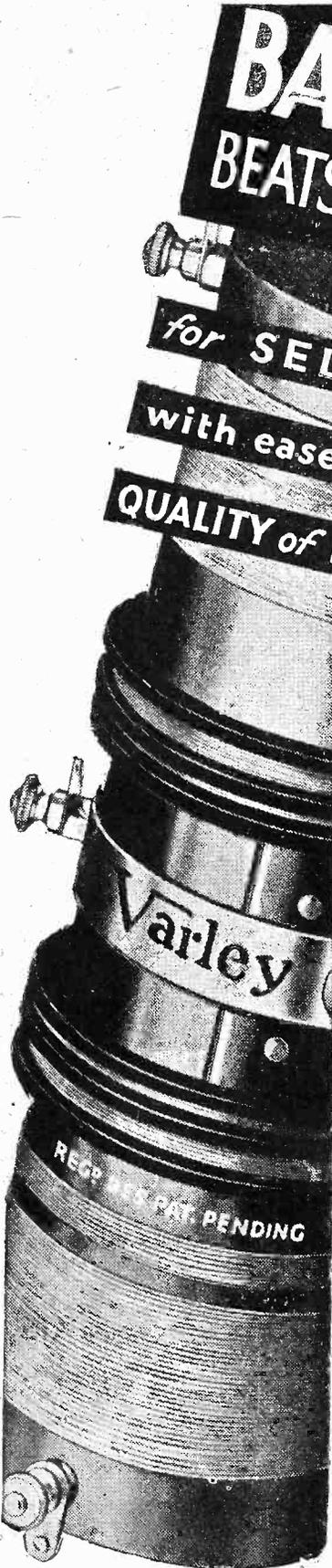
A BROADCAST PLAY IN PROGRESS



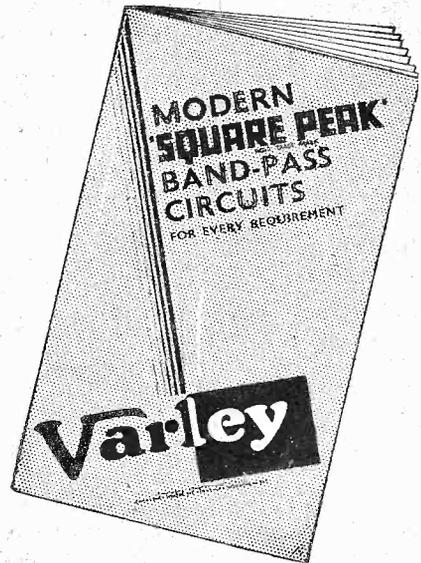
Prior to the broadcasting of any item that needs particular concentration the announcer often advises us to turn out the light. The blind listener is always in darkness, and for this reason probably gets more out of broadcasting than any ordinary person.

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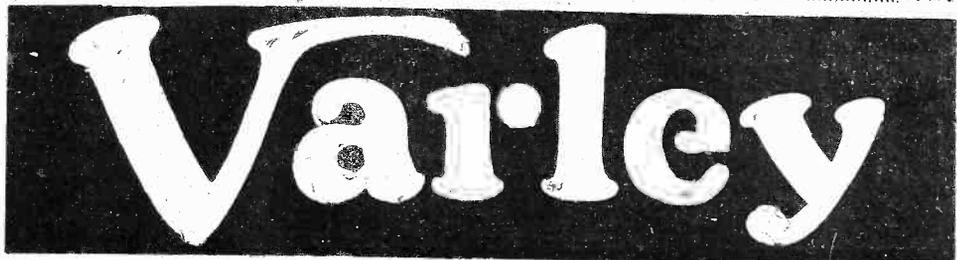
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P.W.



THOUGH spring is on its way, there are no signs as yet of any falling off in the general reception of distant stations. I anticipate that as the days lengthen and nights shorten we shall lose a certain number of the less reliable stations; but those which are completely reliable are so many that the long-distance enthusiast should in future find plenty of game for his hunting throughout the year.

Daylight reception on both the medium and long wave-bands continues to be extraordinarily good. On the higher waves the simplest set will suffice to provide a number of alternative programmes, whilst on the medium band I find that even a portable will give loudspeaker reception of stations such as Heilsberg, Hilversum, Prague, Rome, Langenberg and Brussels.

The Smaller Fry.

We must expect as the season advances towards spring to find certain nights when conditions are none too good. During the winter months, apart from atmospherics, one night is very like another, but in the lighter part of the year conditions vary considerably.

The great thing when you happen to strike a bad night is to confine yourself to the more powerful stations, for they and they alone will be worth hearing. As a compensation, phenomenally good nights

STATIONS WORTH HEARING

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

are bound to occur, and on these you can profitably indulge in a search for the smaller fry.

These often provide surprises. You may, for instance, be amazed to find a small station such as Kaiserslautern or even some of the Swedish relays coming in at full loudspeaker strength.

Try For These.

Here are a few out-of-the-way stations worth trying for in good conditions if you have not already logged them. Freiburg 570 m., Riga 525 m., Wilno 244 m., Rabat 416 m., Bolzano 368 m., Poznan 335 m., Tallinn 296 m., Rennes 272 m., Lille 265 m., Stavanger 240 m., Lodz 235 m., and Warsaw 214 m.

Of the larger stations the number that can be classed as completely reliable is large—Brussels, Prague, Langenberg, Milan, Rome, Stockholm, Katowice, Toulouse, Lwow, Strasbourg, Bruun, Breslau, Hilversum, Heilsberg, Turin and Trieste.

Others which very seldom have an "off night" are Bordeaux, Genoa, Gleiwitz, Nuremberg, Hamburg and Frankfurt. Un-

certain stations which are very good when they are good at all, but otherwise usually quite poor, are Budapest, Munich, Paris P.T.T., Gothenburg, Marseilles, Grenoble, Bratislava, Cologne, Leipzig, Horby, Toulouse P.T.T., Fécamp and Rennes.

Atmospherics, mercifully, have seldom been with us of late and there is no great amount of fading except in the lower part of the medium wave-band. Nor are there so many heterodynes as might be expected from the crowded state of the medium wave-band. The bad patch between Katowice and Stockholm still persists and Frankfurt is an occasional sufferer. Otherwise, though, very few of the more important stations are troubled much by this kind of interference.

Round 250 Metres.

The greatest annoyance that occurs when one is searching on the medium wave-band is the interference caused by spark signals on wave-lengths below about 250 metres. The transmitters themselves seem broadly tuned and on these wave-lengths the set is particularly liable to feel the effects of spark interference owing to the small amount of capacity in parallel with the tuning coils when the condenser readings are low. What a happy day it will be when the last spark transmitter goes finally out of commission.

THE past week has brought me a variety of interesting things—a bout of 'flu, the third number of "Rag-Chewing," the most gloriously rude letter I have ever had in my life, and the news that "F. N. B." (the champion in the contest) believes in my "0-v-0" theory. To put the last first, "F. N. B." would like to enter the lists with any other keen short-wave man, possibly on a handicap basis, for a week-end or any given period of time.

He also suggests that in the next full competition the winners and runners-up of the previous one should be handicapped by the number of points by which they led! A sporting suggestion, "F. N. B.," but I have some bright ideas up my sleeve for a different class of competition. More of this later.

The "Rag-Chewers' Club."

The February issue of "Rag-Chewing" (I have mentioned this little publication before) is very interesting. The R.C.C., its originators, explain the object of their existence, which, in cold print, is extremely sound; thus the Rag-Chewers' Club exists for the purpose of selecting a number of amateur transmitters who stand out among the European stations for their high standard of operating, first-class signals and general "ham-spirit." The formation of a club from these serves to set an ideal for their own

SHORT-WAVE NOTES



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

By W. L. S.

members to keep up to, and also for newcomers to strive towards.

For this reason, any new members must be passed by three existing members as the result of actual contacts by radio, during which their signals and operating will be closely examined.

Thus it follows that the membership of this august body will not include any of the "raw A.C. merchants" or the poor operators who make one send at three words p.m. and then ask for repetitions. Beginners, of course, are treated with a helping hand—not a "cold shoulder."

When one hears some of the incredibly poor amateur signals on the air nowadays, the necessity for a body of this kind begins

to become apparent! Would that the commercials had a similar club!

Although, on account of the first-mentioned "event of the week" my time spent in listening has been rather limited, I think I am right in saying that broadcast on short waves has been generally rather poor. The amateur bands have been very lively during the week-ends on account of the British Empire Union tests, but otherwise almost as dull as the broadcast bands.

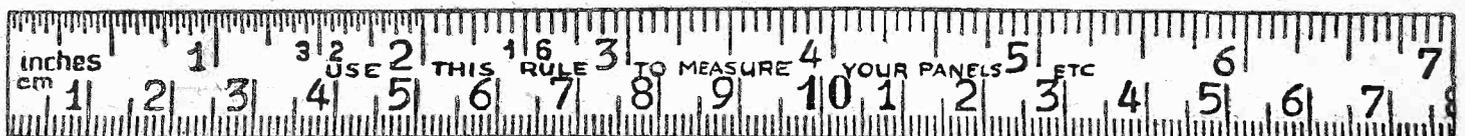
In connection with the latter tests, I was surprised to find that one could hear, within the same minutes, Australia, South Africa, Malaya, Ceylon, Canada and Iraq—all on the 20-metre band.

Those "Bad" Conditions.

This goes towards proving my theory that "bad conditions" often appear to exist on the amateur bands just because there is no one active. When there is a test of this kind that brings lots of stations on the air, one always seems to hear them.

We shall have to arrange the next "P.W." competition so that it comes with a test of this kind.

"J. K." (formerly of Bedford) writes from Cardiff to claim membership of our H.A.C. Club. This reminds me that I want to compile a members' list, so will all members please drop me a card, c/o "P.W."?



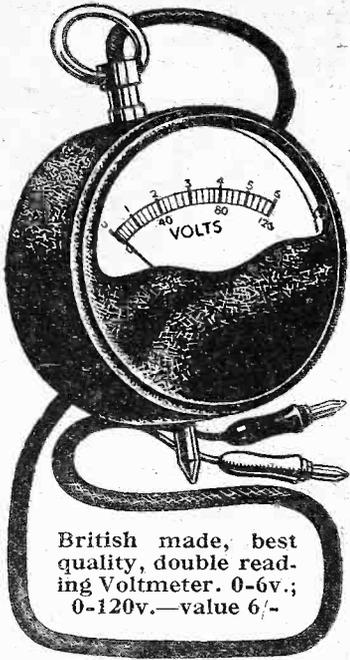
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1 Formo '0003-mfd. Reaction Condenser	2	9
1 Push-pull Switch	7	
1 " Three-point Switch	1	6
1 Sovereign Moderator Coil Unit	2	6
1 " '0003-mfd. Fixed Condenser	6	
1 Graham Farish '01-mfd. Mica Condenser	1	6
1 Bulgin Grid Leak Holder	6	
1 " 2-megohm Grid Leak	9	
1 Graham Farish '5-megohm Grid Leak and Holder	2	0
3 Lotus Valve Holders	1	6
1 Lewcos H.F. Choke, Type II.	6	0
1 R.I. DUX L.F. Transformer	6	9
9 Belling-Lee Indicating Terminals	2	3
1 Sovereign 100,000-ohm Spaghetti Resistance	1	3
1 Terminal Strip	1	3
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3 Grid Bias Plugs, Screws, Flex, Etc.	9	
10 feet Glazed Connecting Wire	6	

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1 Special Slow Motion disc for above	3	0
1 Complete R.I. Triple Wave Coil Unit, Type BY31	12	6
1 ReadiRad '00075-mfd. Solid Dielectric Condenser	3	6
1 ReadiRad '0003-mfd. Reaction Condenser with Slow Motion Drive	7	0
2 Push-pull Switches	1	2
1 " Three-point Switch	1	6
1 Sovereign Moderator Coil Unit	2	6
1 " '0003-mfd. fixed condenser	6	
1 " '001-mfd.	10	
1 Graham Farish '01 mfd. Mica	1	6
1 Bulgin Grid Leak Holder	6	
1 " 2-megohm Grid Leak	9	
1 Graham Farish '5-megohm Grid Leak and Holder	2	0
3 Lotus Valve Holders	1	6
1 Lewcos H.F. Choke, Type II	6	0
1 R.I. Hypermite Transformer	12	6
9 Belling-Lee Indicating Terminals	2	3
1 Sovereign 100,000-ohm Spaghetti Resistance	1	3
1 Ebonite Terminal Strip	1	3
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RADIOTORIAL

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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subject of Letters Patent and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

FITTING A PICK-UP TO THE "MAGIC" FOUR.

H. L. B. (Acton).—"I am making a radio-gram, consisting of your 'Magic' Four circuit, pick-up, etc. Can you please tell me the following points.

- (1) The connections for pick-up switch, etc.
- (2) Milliamps of above set as regards eliminator.

"(3) Should you have special valves for mains working, if so will you tell me what would be suitable.

"(4) Is it material whether gramophone motor is near set or should it be a certain distance away?"

Quite Easy Connections.

(1) You do not say which "P.W." "Magic" Four you are building, but the pick-up connections for a grid-leak-and-condenser arrangement are as follow: Grid of detector valve holder to centre of a single-pole double-throw switch.

The grid condenser and grid-leak connections (that formerly went to grid) go to one of the outer contacts of the new S.P.D.T. switch.

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Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service. Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4. A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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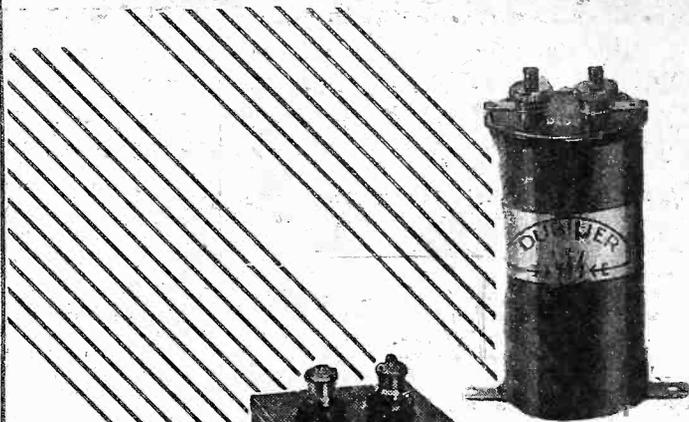
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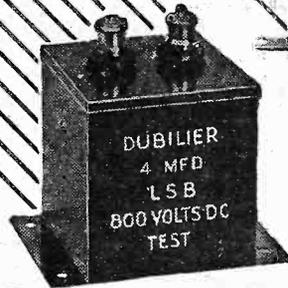
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1460.)

I always understood that they were comparatively insensitive and needed more power than could be given by an H.F., Det., L.F. set with short indoor aerial.

"A friend of mine, however, who has been pleased with the quality of my reception, has suggested that I get one of the permanent-magnet kind, as he says they are quite as sensitive as the cone loudspeaker which I am now using. If he is right, I should certainly like to try one, but I do not want to go to that unless there is a probability that it will be satisfactory.

"Is it really a fact that this type of loudspeaker is as sensitive as the cone type, in spite of what I always believed?"

The idea that moving-coil loudspeakers are insensitive originated from the very early models, which certainly needed a rather large input. But they have been improved enormously since they were first introduced, and the sensitivity is now very good indeed.

We think it is worth trying in your case.

Hand-Capacity on Short Waves.

W. G. (Folkestone).—"My chief trouble on the short-wave side of the set is its tendency for the tuning to alter when I take my hands away from the dials. I have discovered that this effect can be overcome by joining a variable condenser in series with earth, that is, between the earth terminal of the set and the earth lead.

"Has this been tried before, or have I struck something new?"

It is a good trick, that is not as well known among the short-wave fraternity as it should be, but it works only in certain cases. Usually quite a small variable condenser should be tried, and if the set is of the all-wave variety a flexible lead with plug

can be arranged to connect across it, so that it can be shorted out when not needed.

The stunt is not a new one, and has been advocated by W. L. S. (It deserves to be better known, as it is so much easier than covering the back of the panel with foil connected to earth, which is often recommended as a cure.)

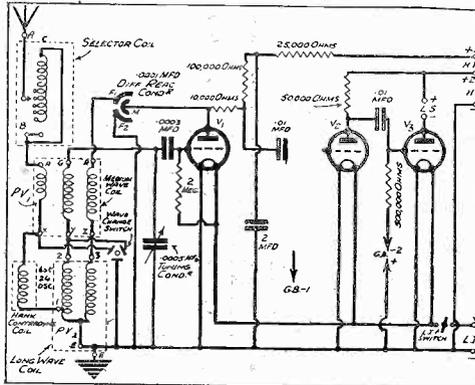
Americans on Broadcast Waves.

"PUZZLED" (Cambridge).—"Is it true that American broadcasting stations can be picked up in this country without using short-wave coils?"

Certainly, but only under special and favourable conditions. One of our readers recently completed a new set late at night, and the very first station he picked up when trying it out for oscillation, etc., was an American!

MISSING LINKS, No. 29

A GOOD THREE-VALVER.



Here are the connections for a well-decoupled three-valver, but two "components" have purposely been omitted. Can you fill them in?

LOOK OUT FOR THE ANSWER NEXT WEEK.

CALCULATING THE RESISTANCE VALUE.

H. F. (Bourneville).—"Occasionally we want to change the mains valve for another one of different make, and then the question of the automatic bias gives trouble. It is quite a simple matter to change the actual bias resistance, but my trouble is in knowing the right resistance to use, to give the required negative grid bias for different valves.

"I believe the idea is the same as Ohm's Law, namely $\text{resistance} = \frac{\text{E.M.F.}}{\text{current}}$ but the application of this rule in such a case is not clear, and I am afraid to work on it without understanding it. Could you put it in plain words?"

The valve makers tell you that you want a certain number of negative grid volts on the valve, when used under certain conditions of H.T. Suppose, for instance, that the valve in question needs ten volts negative bias when 200 volts are used for the H.T.

All you have to do is to follow the law you have quoted, the volts (E.M.F.) in question being the grid-bias volts required, and the current being the anode current which will be taken by the valve at the grid bias and H.T. values which you will use. The answer will be in ohms, and this is the correct value of the automatic grid bias resistance you need.

In an imaginary case of a valve requiring 10-volts negative grid bias, for instance, you will first have to ascertain from the curve of the valve exactly what anode current it should be taking at that negative grid bias and the appropriate high tension. Suppose it is 20 milliamperes.

This must first of all be expressed as amps. instead of milliamperes, and as there are 1,000 milliamperes in an ampere, the 20 becomes .02. So what you have to do is to divide the ten volts required by the .02 amps, and your answer is the number of ohms. In this case it is 500.

Other examples can be worked out in exactly the same way, the whole secret being to divide the number of grid-bias volts required by the anode current expressed in amperes.

CUTTING THE H.F. VALVE OUT OF "MAXI-POWER" FOUR.

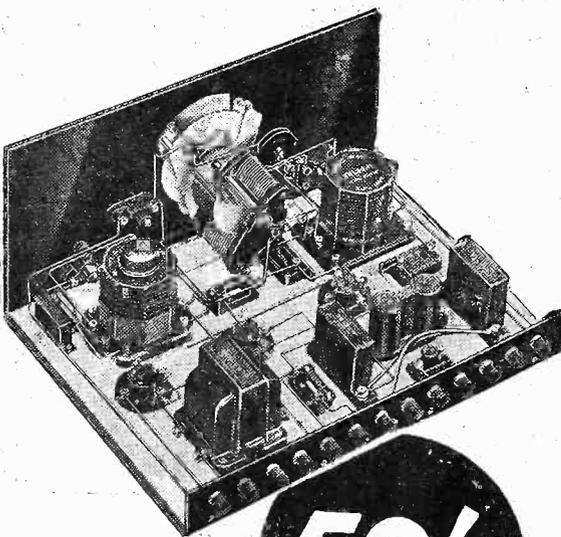
L. T. (Rochampton).—"Could you tell me how to fix a switch so as to cut out the high-

(Continued on page 1464.)

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1	Telsen .001-mfd. mica condenser	6
1	Telsen grid leak, 2 meg.	9
1	Telsen grid leak, 1 meg.	9
2	Telsen grid leak holders	1 0
1	Telsen aerial coil with selectivity adjustment	7 6
1	Telsen dual range S.W. coil unit	4 6
1	Telsen .0005-mfd. logarithmic variable condenser	4 6
1	Telsen .0003-mfd. reaction condenser	2 0
1	Telsen 2-point switch	1 0
1	Telsen 3-point switch	1 6
1	Telsen 4-point switch	1 6
1	Telsen Radiogrand transformer	9 6
1	Telsen 50,000-ohm Spaghetti resistance	1 8
1	Telsen 25,000-ohm Spaghetti resistance	1 0
1	Telsen .01-mfd. Mansbridge condenser	1 6
1	Telsen 1-mfd. Mansbridge condenser	2 3
1	Telsen binocular H.F. choke	5 0
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1462.)

frequency valve in the 'Maxi-power' Four when only three valves are required?"

To do this, you will have to change your aerial over to the grid circuit of the detector valve, and at the same time cut off the filament supply to the H.F. valve. This latter can be done either by inserting an on-off switch in the H.F. filament circuit, or by using a volume control rheostat with an "off" position.

Either method will serve to cut the valve out of action, and then all that is necessary is to change the aerial from its normal connection (A₁ or A₂), to a new aerial terminal.

This new terminal, which we will call A₃, must be connected to the wire which now joins the F₁ plates of the differential reaction condenser to the

"P.W." PANEL, No. 60. MEASURING PLATE VOLTAGES.

If a voltmeter is placed across filament and plate of a valve in operation, the resultant reading is often misleading on account of the current taken by the instrument itself if it is not a very good one.

A good method of overcoming such a difficulty is to use, instead of a voltmeter, a milliammeter in conjunction with a high resistance to limit the current flowing.

Whereas the ordinary voltmeter might pass 5 milliamps or so, in such circumstances, and thus radically alter the prevailing conditions, a 100,000-ohm resistance in conjunction with a milliammeter would limit the extra current. And thus the voltage calculated from it would be much nearer the working voltage than the figure given by the voltmeter.

L₂ coil holder and the .001-mfd. condenser, C₅. So a good place for the new terminal would be near the F₁ vanes of the reaction condenser, or else on a little new terminal strip fitted to the baseboard near the screen.

Either place will do, but be sure to keep the new lead (from A₃ to the condenser, coil holder, and fixed vanes F₁) as short as possible.

Normally the extra A₃ terminal is left without an external connection, but when you want to change to "local" reception you put the aerial on it, and switch out the H.F. filament.

Tune on C₂ as usual, but ignore C₁, which will now be inoperative. To change back again, simply change over the aerial lead once more and switch on the H.F. valve.

GRID BIAS FOR POWER VALVE.

"PUZZLED" (Swindon).—"I am rather puzzled over the frequent repetitions and warnings about changing grid bias, when so far as my own experience goes, no harm comes of it.

"The power valve I am using at present, for instance, has been in use for a year, and is still going as strong as ever, although I have never bothered to worry about switching off when changing its grid bias. What is the idea of these apparently needless warnings?"

"Surely it does not hurt the valve or the loudspeaker or any other part of the apparatus to make a change of a few milliamps in current, when under working conditions the receipt of a loud programme is doing far more than that all the time? This is a point I should like to be enlightened on."

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The fact that your power valve has lasted for twelve months, despite your not switching off when changing its grid bias is fortunate for you, but does not prove that the valve would not be in a far better condition to-day if you had observed the rule! We think you will agree that the reasons for it given below are valid and good ones.

A power valve always takes a fairly large grid bias, and the effect of this grid bias is always to reduce its plate current. Changes of a volt or two in the grid bias will result in changes of the anode current of several milliamps, and the higher the bias the lower the current.

Taking an average case, a change of from 9-volts negative bias to 10½-volts grid bias might mean a reduction in plate current, from (say) ten to eight

milliamps; and it is perfectly true that far larger changes than this are called for by the normal operation of the valve under conditions of reception. If the set is switched off when the change is made the grid bias is actually changed in such an instance

TECHNICAL TWISTERS

No. 102.—CONNECTING CELLS IN PARALLEL.

CAN YOU FILL IN THE MISSING LETTERS?

When similar cells are joined in parallel the of the combination is the same as the of one cell.

In the above case the of the arrangement is proportional to the of cells in parallel.

Thus three "20-amp." cells each of "2-volts," in parallel, will have a capacity of ". amps." and a voltage of "."

The parallel arrangement is therefore used for the supply of greater

Last week's missing words (in order) were: Insulator. Air. Mica, Paper. Capacity.

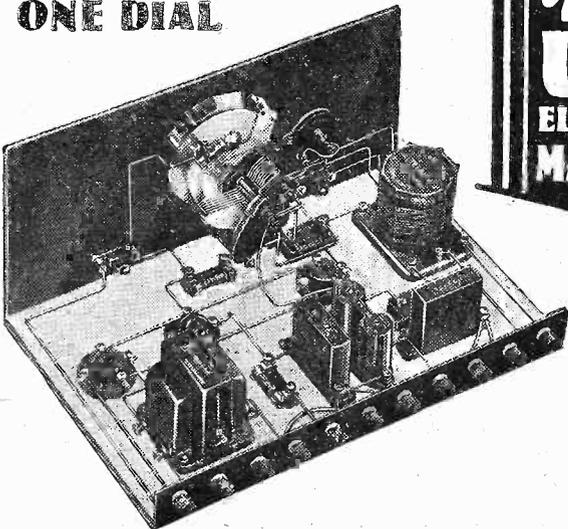
from the original 10½ to 9 when the set is switched on again. But this is not what happens if the set is not switched off while the change is made.

In such circumstances, at one moment the set is biased 10½ negative, and the next, with the H.T. full on, the grid-bias plug is removed from its battery, and the set momentarily has no bias at all on the power valve. There is an immediate great increase

(Continued on page 1466.)

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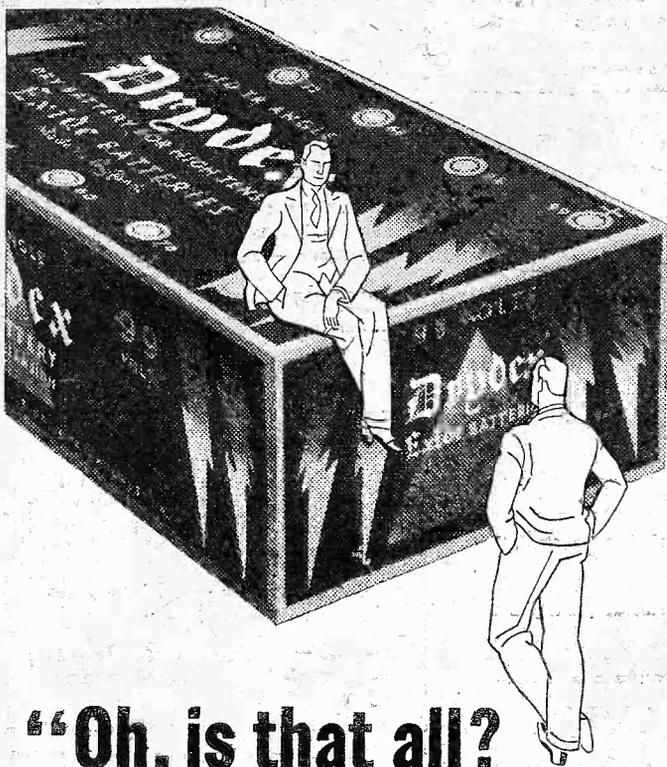
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1 Telsen grid leak, 1 meg.	1	9
1 Telsen grid leak, 2 meg.	1	9
2 Telsen grid-leak holders	1	0
1 Telsen aerial coil, with selectivity adjustment	7	6
1 Telsen dual range S.W. coil unit	4	6
1 Telsen .0005-mfd. logarithmic variable condenser	4	6
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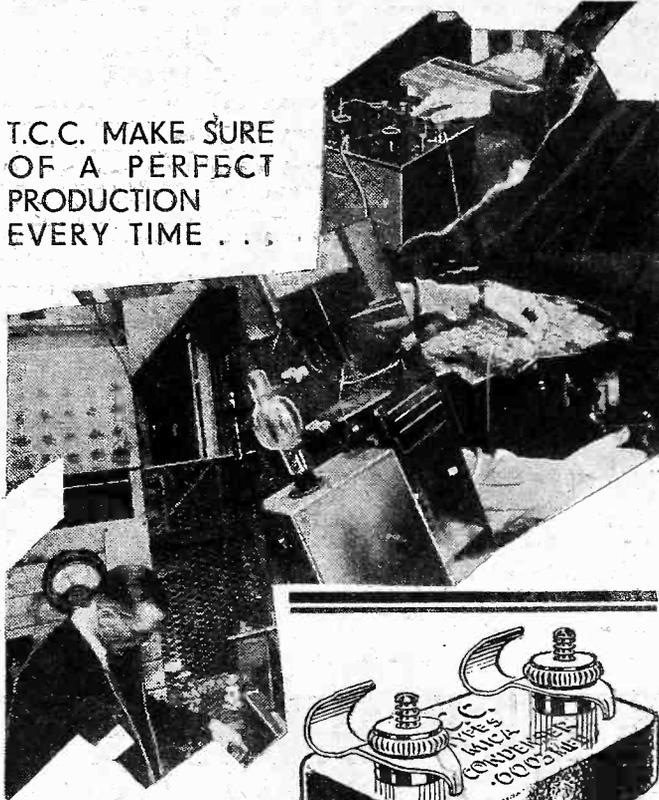
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1464.)

in the plate current—an increase far larger than that called for in normal operation. For some moments, while the owner is fumbling around with the plug, this very high current is being drawn from the battery and is playing havoc with the filament. Presently the change-over is correctly made, the fumbling with the plug comes to an end, and the set is biased to the correct negative potential again. But it will be seen that it was not the alteration of the bias which endangered the valve, but the interval while the change was taking place. No bias at all was employed in this time.

The only way to avert danger to the filament during this intermediate period is to switch the set off.

A PUZZLING POINT ABOUT RECTIFIERS.

C. P. (Leicester).—“Can you explain in brief the following point, which has been puzzling me?”

As I understand it electric current is an electron flow, and electron flow can be obtained (among other ways) by heating a filament, and attracting its electrons through the vacuum to the plate of a valve.

“They can go through the valve only in one direction, i.e. from filament to plate. No electrons pass from plate to filament inside the vacuum, so the valve can act as a rectifier, by passing current in one direction only.”

“That’s all right. But what beats me is a full-wave rectifier, with current passing in the wrong direction.”

“Apparently the above term means ‘both halves of the cycle are rectified.’”

“How can this be, if a current can only flow in one direction?”

“I hope I have made it clear.”

Yes, we think we see exactly what you mean.

And it is not going to be easy to explain without a diagram. However, let’s try.

Apparently you are satisfied about a half-wave rectifier. It passes current every time its plate is made positive, and then the plate “idles,” when the reversal of voltage occurs.

But you picture to yourself a full-wave rectifier as being active all the time by somehow taking advantage of a negative plate to provide current.

It doesn’t. Either plate of a full-wave rectifier “idles” half its time away, and passes nothing at all when negative voltage is applied to it by the mains transformer.

A “Two-fold” Secondary

But the centre-tapped transformer used for full-wave rectifying has what we may call a two-fold secondary winding; and while one half of this is joined to a plate made negative and so is passing no current, the other end of it is necessarily made positive, so current can at that moment pass on to it, and then along the secondary winding to the centre tap. Thus we have an arrangement, with a centre tap, from which current is passed out (for smoothing, etc.), permanently connected to two plates. At the moment when one plate is negative, doing nothing, the other is positive and accepting current which flows along half the secondary and out of the centre tap.

A moment later the conditions change. The formerly-active plate idles because it is made negative; and the other plate is made positive and so accepts electrons which pass along the other half of the secondary, and then also out of the centre tap as rectified current. (In a word, each starts when the other stops, and the centre-tap “skims off the accumulated cream”!)

It is not easy to express clearly in a few words, but we think if you look at a diagram of a full-wave rectifier circuit while reading the above your difficulty in understanding the action will vanish, and you will see there is no question of “current passing in the wrong direction.”

GRAHAM FARISH’S KIT SET.

Graham Farish Ltd. make the interesting announcement that they are entering the “Kit-Set” market with a three-valver called “The Amazing Three.”

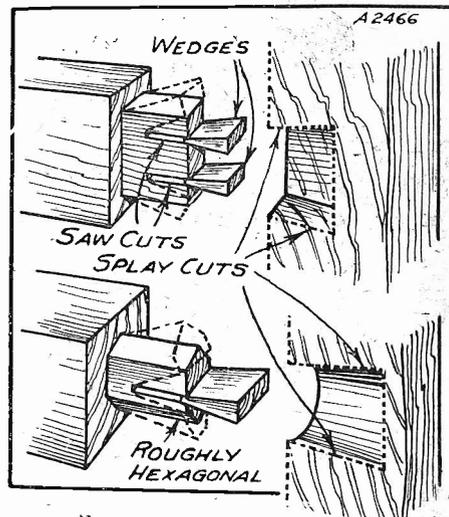
They acclaim it as “The Kit that named Itself,” with a selectivity far above the average for a set of the “straight three” type.

MAKING STRONG JOINTS

A Tip for Amateur Carpenters

STRONG, rigid, and fitting joints are a feature few amateur cabinet constructors can make successfully, especially when using dowels. The chief reasons being—the use of unseasoned tim-

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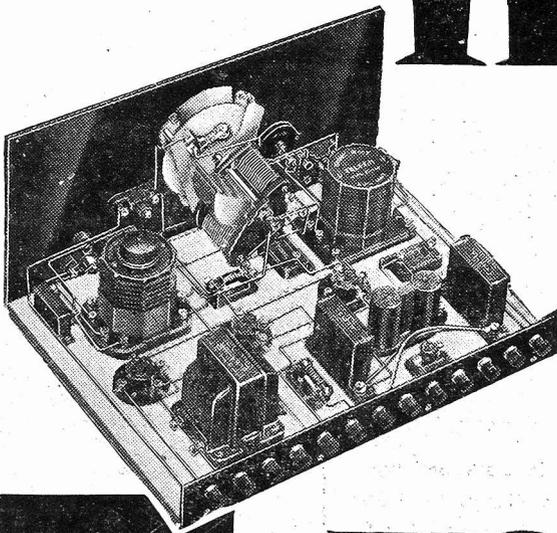
Joints made in this manner are locked into position as the two pieces of wood are fitted together.

EVERY COMPONENT FOR THE TELSEN TRIPLE THREE

Here is the list of Parts as specified and advertised by TELSEN.

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1 Telsen .0001-mfd. mica condenser		6
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1 Telsen grid leak, 2 meg.		9
1 Telsen grid leak, 1 meg.		9
2 Telsen grid leak holders	1	0
1 Telsen aerial coil, with selectivity adjustment	7	6
1 Telsen dual range S.W. coil unit	4	6
1 Telsen .0005-mfd. logarithmic variable condenser	4	6
1 Telsen .0003-mfd. reaction condenser	2	0
1 Telsen 2-point switch	1	0
1 Telsen 3-point switch	1	3
1 Telsen 4-point switch	1	6
1 Telsen Radiogrand transformer	8	6
1 Telsen 50,000-ohm Spaghetti resistance	1	6
1 Telsen 25,000-ohm Spaghetti resistance	1	0
1 Telsen .01-mfd. Mansbridge condenser	1	6
1 Telsen 1-mfd. Mansbridge condenser	2	3
1 Telsen binocular H.F. choke	5	0
1 Telsen fuse holder		6
1 Telsen illuminated disc drive	4	6

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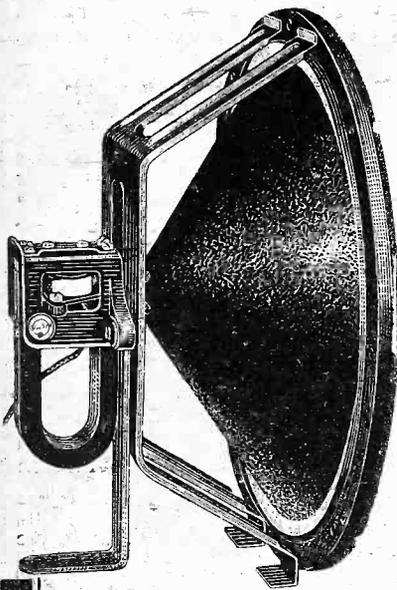
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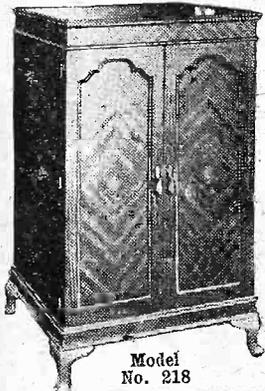
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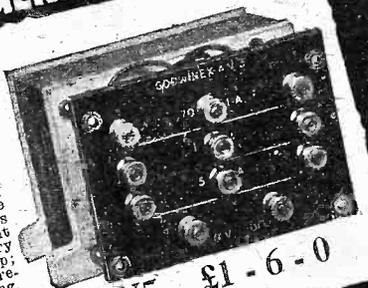
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The Regent Works, Arlington St., London, N.1. Telephone: Clerkenwell 5095. And at 21, Essex Road, Islington, N.1. Telephone: Clerkenwell 5634.



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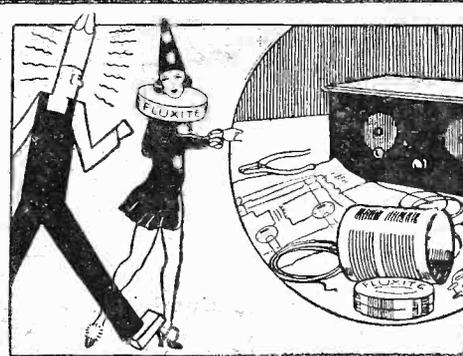
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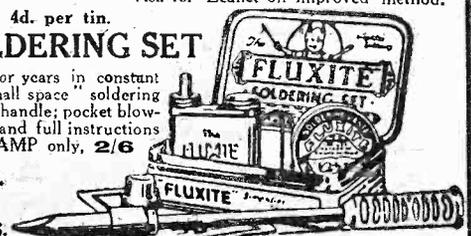
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Hardening Tools and Case Hardening.
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ALL MECHANICS WILL HAVE

FLUXITE

IT SIMPLIFIES ALL SOLDERING

MAKING STRONG JOINTS.

(Continued from page 1466.)

bers, resulting in shrinkage, or, in the case of a hole, expansion; making the dowel to fit the hole "slip easy" before permanently fixing, then relying solely on the glue to keep the joint in position; and not using a cramp.

Foxtail wedging, a method which partly

a wedge; this most probably would burst out the framing face. To overcome this danger, the mortise (or hole in the case of a dowel) can be cut splayed out wider at the bottom than at the outer edge; this is to take the new wedge shape of the tenon when expanded.

Another point to watch is the length of the wedge. This should never exceed the length of the saw cut.

THE LISTENER'S NOTEBOOK

(Continued from page 1444.)

stalest stuff. It says very little for Christopher Stone's originality and versatility that he can still put on "Life is Just a Bowl of Cherries." One wonders whether those people who arrange programmes ever sit them out in the company of people who had nothing to do with the selection.

Other irritating features. Why should musical turn after musical turn be put on and no spoken word interspersed? And why are those artistes (I think particularly of those singing straight songs) who fail to get their words over, never told about it? I should have thought that this was the first essential. Don't the musical experts hearing auditions attach any importance to this, or are they out for quality of tone only? Personally, I prefer to know what a singer is singing about, even if it is at the sacrifice of a little tone.

May I be bold enough to urge you to listen to the Children's Hour sometimes, but especially when Sir F. Cohen is speaking? His story of Mozart's life the other evening was a perfect gem. His reference to the fact that as a child he was said to resemble Mozart was delightful. For a man of eighty he is a marvel.

I was urged by a friend to listen to the Moscow (1304 m.) talks at 8 o'clock on Mondays and Thursdays. So I did, but the first talk proved a frost, as the speaker (a woman, I believe) who was to have spoken

(Continued on page 1470.)

SHORT WAVES ON THE "COSMIC"

This fascinating sphere of radio reception from all over the world will be dealt with in detail in a long and profusely illustrated article in next week's POPULAR WIRELESS.

Don't miss it! Also next week—

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does away with the use of a cramp, can be adopted for any tenon or dowel that cannot be fixed in the ordinary way through not penetrating the framing. The sketches should make this clear.

A dovetail is formed by inserting the end of a thin wedge into a saw kerf in the tenon. As this is forced into position permanently the wedge automatically drives itself home. Care should be taken not to use too thick

Dowels for "through" use should never be cut perfectly round in section.

A rough hexagon shape provides edges that bite into the receiving woods, thus helping to retain a good cut joint. Incidentally, where otherwise possible, they should never be cut from a piece of soft wood; its aptitude to shrink, regardless of how dry it feels, is greater than that of most hardwoods.

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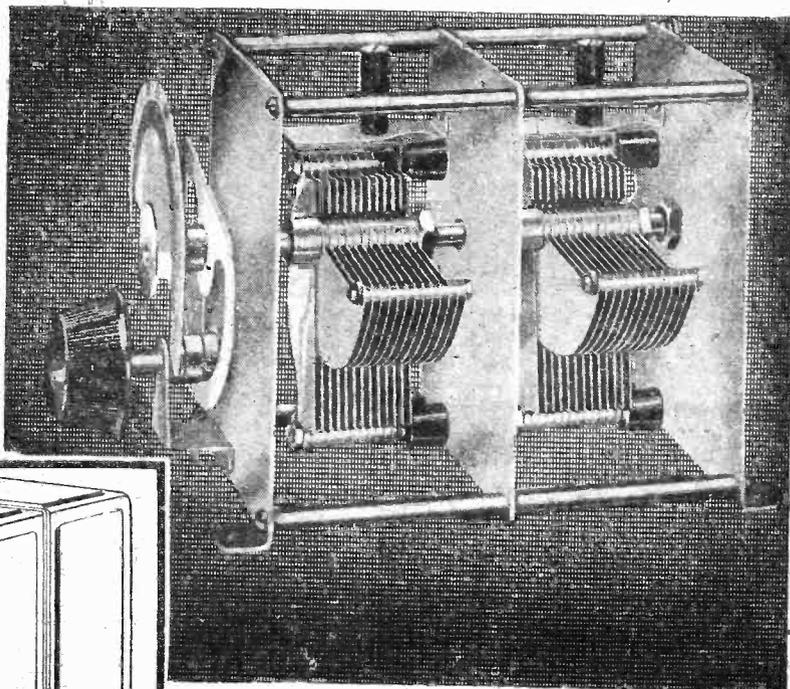
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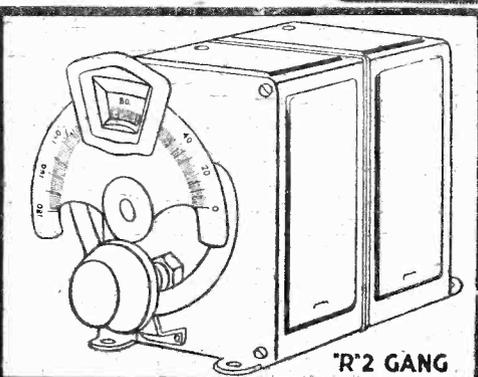


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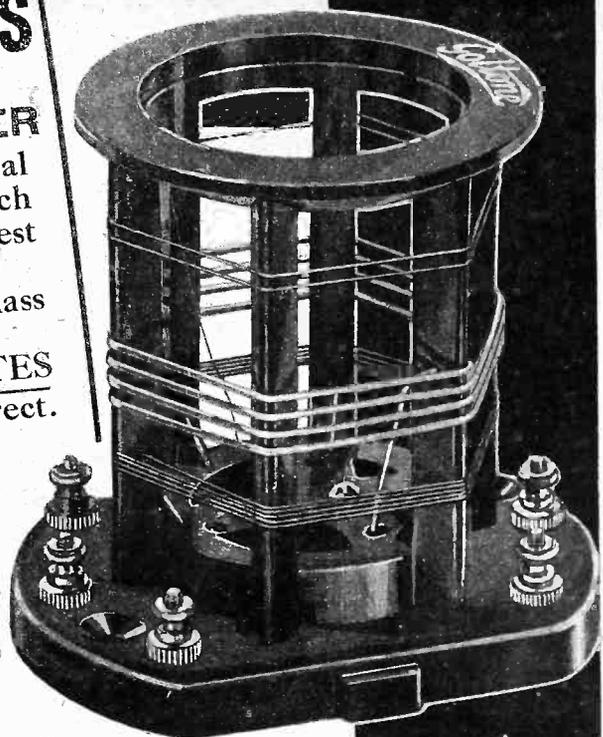
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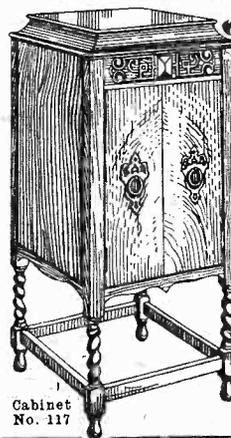
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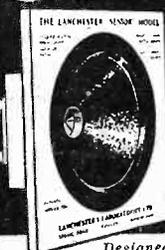
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THE LISTENER'S NOTEBOOK

(Continued from page 1468)

was ill. Instead, we were regaled to some Soviet music, but after listening to two songs, "The Prisoner," and "In Siberia" by male voices, I had to cry enough. It was most depressing!

The mention of male voices reminds me: Aren't such and similar choirs giving us "Oh, no John!" rather too frequently? Surely, there must be scores of other songs and glees far less hackneyed that they could give us.

I quote again from my correspondent. "One or two of the turns in the Street Vaudeville were topping, and it is clear that no rose need blush unseen in future. The women were the worst." That is a very adequate criticism, don't you think?

It seems, too, from Mr. Herbert Farjeon's second criticism of the week's Vaudeville that he was favourably impressed with the Pavement *Artistes'* show, though he couldn't say that some of the week's vaudeville turns were anything better than "pretty vile."

Here, I am with him entirely, as also in his attitude towards his *bête noire*, the studio audience. I was sorry his criticism had to be rushed so—it was obvious that he was racing against time—but one can't make the Palladium wait, of course. However, I am glad we didn't miss Billy Danvers. His last story—that of a dream he had had—sent me to bed roaring with laughter.

ACCESSORIES FOR THE "COSMIC"

(Continued from page 1431.)

reproduction, is one of those little matters where it is best not to take the advice of anybody until you have actually heard the speakers for yourself.

If it is purely a consideration of types that are suitable for the "Cosmic"—well, that is a matter in which we can help you. But again, it is a matter in which we must take into consideration the last valve in your set.

Choosing the Loudspeaker.

In general, if it is a valve of the small power type in the output, you would be well advised to confine your choice to loudspeakers of the cone types or to certain of the more sensitive types of small moving-coil loudspeakers.

You would be quite safe in making your choice from the Celestion, the Epoch, the Ultra, the W.B., the B.T.-H., the Blue Spot, the H.M.V., the Graham Farish, the Marconiphone, the Amplion, and the R and A ranges, all of which we have tried with very satisfactory results.

For those of you who go in for the larger type of output valve there is almost an unlimited range from which to choose. You can select almost any type with the certain knowledge that your "Cosmic" will work it satisfactorily, but whatever the type you finally select, we do strongly recommend you to choose from the makes given above.

Not all these people, by the way, make headphones. We understand that one or two of them do still make them, but useful

names to remember in connection with headphones are those of Ericsson and Brown.

In connection with the fourth item of our "Cosmic" accessories, which, you will remember is to do with pick-ups, it is our intention to make only a brief reference to this subject. For one thing, our remarks will only be of interest to those readers who have made the "Star" version, but apart from that, a special article is to appear on this subject in a forthcoming issue.

But for those who are contemplating the purchase of a pick-up, may we just say that you would be well advised to make your choice from the following: Marconiphone, Audak (Claude Lyons), Celestion W.5, Ready Radio, Blue Spot, Varley, H.M.V., Bulgin, Graham Farish.

In drawing to a close our review of "Cosmic" accessories, it seems opportune to mention the activities of one particular firm in connection with the "Cosmic" as a complete and self-contained Radiogram.

We refer to the special equipment that is being produced by Messrs. Ready Radio.

A Complete "Cosmic" Radiogram.

This consists of a particularly handsome Radiogram cabinet that has been specially designed to take the "Cosmic" Star receiver. The cabinet, which stands over three feet high, has a pleasing futuristic appearance and it accommodates everything.

In our opinion, the cabinet is in every way ideal for the purpose it is intended to fulfil, and what with the figured walnut finish and the high standard of workmanship that is evident throughout, we have no hesitation in commending it to all "Cosmic" enthusiasts who are interested in the Radiogram proposition.

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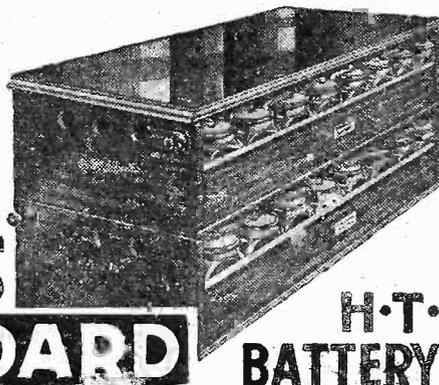
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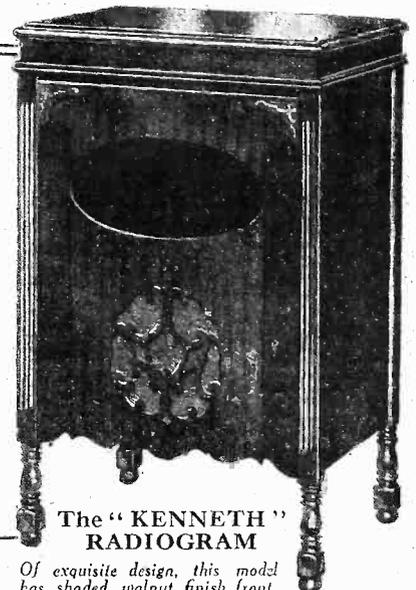


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TECHNICAL NOTES

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

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P.W. 27.2.32.

Saturation Point!

EVER since broadcasting started, or at any rate for several years past, people have been saying that the market must soon reach saturation point. When you consider the enormous sales of manufactured radio sets, not to mention the hundreds of thousands of sets which are made up by home constructors, it certainly does seem an extraordinary thing that the demand is actually greater than ever.

"Popular Wireless."

The United States is, of course, the greatest radio country in the world from the point of view of numbers; and it is very interesting to note the results of a radio census which was completed a little while back, by the order of the last Congress. This showed that over 12,000,000 radio sets were in use in the 30,000,000 homes in the United States, that is roughly about 40 per cent.

Since the count was made, however, it is estimated that another 4,000,000 radio sets have been sold, which brings the total to over 16,000,000. This means that every other home in the United States now possesses a radio set. Taking the known average of 4.1 persons to the American family gives a total radio audience of over 60,000,000 people.

The report in its final form shows that New York, Pennsylvania and Illinois each has more than 1,000,000 homes with radio sets, the total for New York being close upon 2,000,000. California ranks fourth, Ohio fifth, Michigan sixth, then come Massachusetts, Wisconsin, Missouri, Iowa, and Minnesota.

Some Radio Developments.

Those of you who take a serious interest in the broader aspect of developments in radio communication should obtain a copy of the Report of the Radio Research Board for the period ended December 31st, 1931. It deals with a large variety of important investigations recently concluded or now in progress.

One of the most remarkable of these is that which deals with the influence of the ionisation of the atmosphere on the propagation of the electric waves used in wireless communication. The heights and properties of the ionised layers of the atmosphere which deviate or reflect wireless waves have been experimentally determined.

The method used is that which is now generally known as the "frequency change" method, in which a continuous train of waves is emitted from a sending station and received upon a recording apparatus at a suitably placed receiving station; in making the tests, the wave-length is gradually altered and a record is made of the fluctuations due to interference between

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

the ground wave and the reflected wave. The height of the reflecting layer in question is deduced from the number of fluctuations caused by a known continuous change of wavelength.

Reflecting Layers.

From experiments of this kind it appears that there are three important zones of ionisation which are called the D, E and F regions. The E region sharply reflects waves of about 400 metres in length at many parts of the day, whilst the D layer reflects waves of this length only occasionally.

Shorter waves of about 100 metres in length will often pass through the E layer but may eventually be reflected by the F layer. These ionised layers change their position at different times of the day and season, and many observations have been made and recorded upon these changes.

The Report also deals with atmospheric and apparatus for recording the direction from which atmospheric come. Radio-frequency standards are also comprehensively dealt with and form one of the most interesting parts of the Report, so far as readers of "P.W." are concerned.

The various national standardising laboratories are now able to measure frequency with an accuracy which is actually beyond the constancy of the instruments used. It seems probable that in the near future the only way of making comparison measurements of sufficient accuracy to meet current needs will be by standard transmissions.

Frequency Measurements.

Amongst many other interesting matters dealt with in the Report are the basic frequency measurements at the National Physical Laboratory (employing the multi-vibrator wavemeter, a phonic wheel controlled by tuning fork and a pendulum clock) and comparisons between this apparatus and quartz oscillators and resonators are also given.

The Report can be obtained from H.M. Stationary Office, Adastral House, Kingsway, W.C.2, price 2s. net.

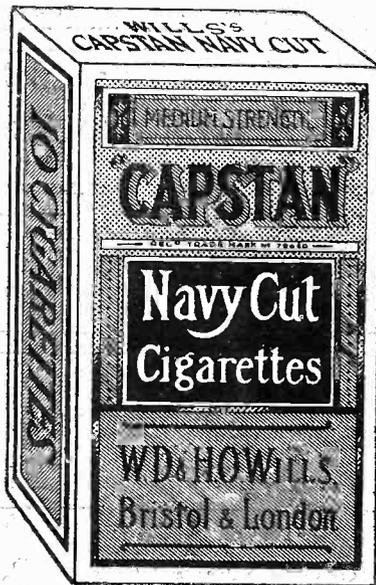
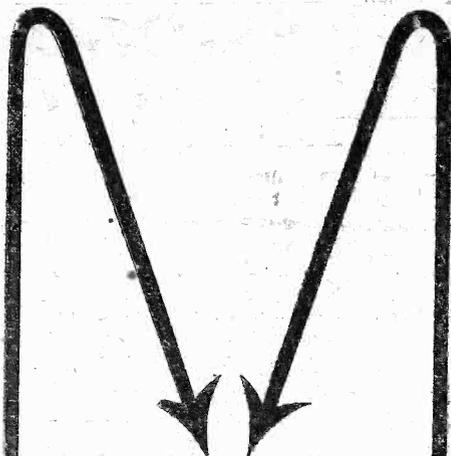
Valve Particulars.

I said something a little time back about the specification sheets supplied in the carton with a valve and several readers have suggested that the information contained on these sheets is often not a very good guide as to what the user really wants to know.

For instance, in the case of a power valve, we speak very vaguely about a "small" power valve, a "medium" power valve and a "super" power valve, but these terms have never been really defined and therefore different people interpret them according to different standards. The actual power which a valve will deliver to the loudspeaker is a quantity which it would be very useful for us to know.

We often hear of a valve power of, say, 10 watts, but this does not mean that the valve will deliver 10 watts of useful power to the loudspeaker. On the contrary, the useful wattage for our purpose may be (and usually is) quite a small fraction of the actual power rating of the valve.

(Continued on next page.)



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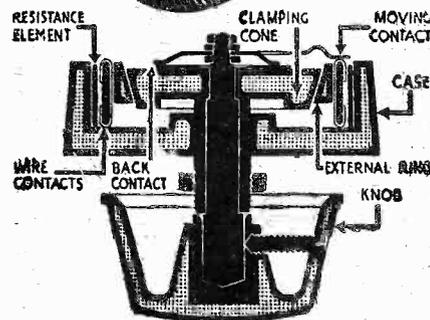
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TYPE 3



This new All-British resistance embodies many new and novel features which guarantee a higher degree of efficiency and a far steadier performance than resistances constructed on old and obsolete principles.

Advantages:

1. The extremely firm and even contact with the element. This is obtained by a new patented clamping cone which directly it is screwed down forces the external ring against the wire band.
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We recommend this resistance (Type 3) only for all values above 50,000 ohms where wire-wound potentiometers are not required. Patents for this new resistance have been applied for.

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TECHNICAL NOTES

(Continued from previous page.)

A 10-watt valve, for example, may well give only 2 watts of power which we can make use of. The wattage of the valve refers to the power (generally in the form of heat) dissipated at the anode when the valve is in operation.

Undistorted Power.

With regard to the power handed on to the loudspeaker, I should like to mention that this is the *undistorted* power and on the assumption that the loudspeaker is of the proper impedance. It is no use merely having a large amount of power handed over to the loudspeaker if this power is put out by the valve under operating conditions which do not render it free from distortion.

As I have said above, by the time you get the loudspeaker of the proper impedance in relation to the valve and you reckon the *undistorted power output* which you can obtain from the valve, this will probably turn out to be no more than one-fifth of the rated power of the valve.

The most usual curve supplied with the valve by the makers is that showing the relationship between grid volts and anode current for a particular value of the anode voltage. Generally the sheet contains several such curves showing the above-mentioned relationship between H.T. current and grid volts for different values of H.T. voltage.

These are "static" curves and it has often been objected to them that, in the first place, they do not indicate the state of affairs when the valve is actually in operation and, in the second place, they are of little use to the average valve user.

Grid Swing.

For amplifying purposes we work on the straight part of the curve and what the manufacturers' curve shows us at a glance is how many volts of grid-swing the valve will stand without going off the straight part of its characteristic; from the foregoing we can see what average value of grid voltage should be used, this being about the mean of the permissible grid swing.

For instance, supposing the straight part of the curve covers the range from actual zero grid-voltage to minus 15 grid-volts, then there is a permissible swing of 15 volts on the grid, and if we take a negative grid-voltage of $7\frac{1}{2}$ volts and apply this to the grid it means that the grid will have an average voltage of minus $7\frac{1}{2}$ volts, whilst under operating conditions this will swing between minus 15 volts and actual zero.

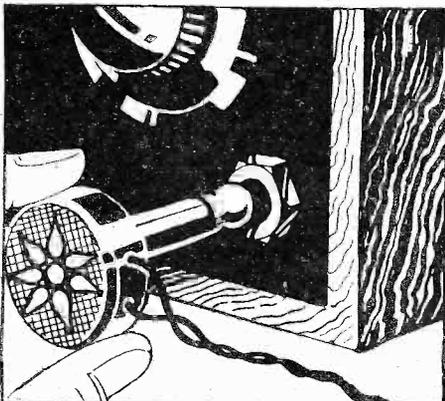
Since we have assumed, in this particular case, that the straight part of the curve covers this particular range of 15 volts, we see that these are the proper conditions in which to operate the valve.

In actual practice we do not have a steady grid-voltage applied to the grid; what we have is a steady voltage with an alternating radio-frequency voltage superimposed upon it, the latter, of course, taking charge of the situation.

In order to make use of the changes in the anode current which are produced by the changes in the grid-voltage, we have to put an impedance in the anode circuit; this may be a tuning coil, as in the high-frequency stages, or it may be the primary

(Continued on next page.)

Add the Professional touch to your set

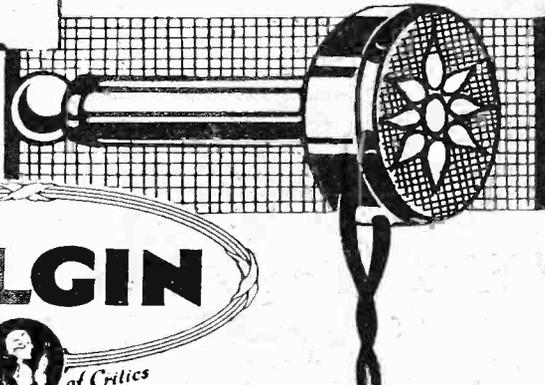


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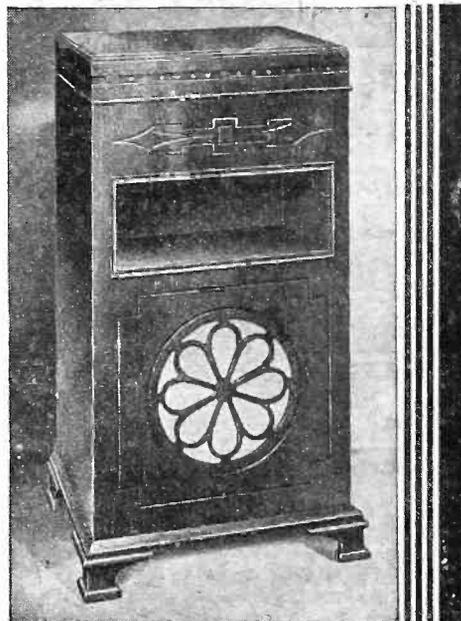
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TECHNICAL NOTES

(Continued from previous page.)

of an L.F. transformer or the winding of a loudspeaker, as in the L.F. stages.

Effect of Impedance.

I should mention that this impedance used in the anode circuit of the valve emphasises the characteristics of the valve as indicated by the static curve, and actually has the effect of increasing or lengthening the straight part of the curve and generally of lowering the slope, that is, the steepness of the curve relative to the horizontal axis.

Any particular curve is drawn with reference to a fixed high-tension voltage, so that a separate curve is needed for each value of H.T. voltage. Generally the manufacturers supply a set of several curves showing the relation between grid-volts and anode-current at different values of anode-voltage.

I think what I have said at any rate will show you how useful it is to sit down for a few minutes and study the manufacturers' curves, bearing in mind the high-tension voltage which you intend to use. It is not much use just putting, say, 120 volts H.T. on to a valve and then making a guess at the corresponding grid-bias voltage and blaming the manufacturers if the valve doesn't turn out all it is cracked up to be.

Put yourself in the manufacturers' place for a minute. If you were sending out valves of different types, the most that could be expected of you would be that you should supply as full technical data as possible. But if the user of the valve doesn't read the dope you supply with it,

you as the manufacturer can hardly expect to be blamed.

Efficiency and Wiring.

When you look at the wiring of a well-made receiver—a good commercial example, or a receiver wired up by an expert home-Constructor—you are bound to admire the clean-cut, tidy appearance of it, and you may be inclined to think that the appearance is all the maker had in mind.

But remember that in this, as in so many other things, tidiness and efficiency go hand in hand, and the neat wiring is much more important from the point of view of efficiency than of appearance.

When you are wiring up the components always make a point of using as few and as short leads as possible. Remember that the various connecting wires between the components are not desirable in themselves, but are simply an unavoidable necessity.

It would be much better if we could do without them entirely, but so long as we have to use them, let us reduce them to the absolute minimum. Often you can cut out a few leads by carefully placing the parts themselves.

A fixed coupling-condenser, for instance, can often be mounted directly by means of its soldering-tags, if you place the adjacent components at the correct distances apart. This does away at any rate with a couple of short leads.

The same thing applies to many other fixed condensers in the set and to grid leaks and so on. In fact, it is really surprising, if you sit down and study the matter carefully, how much of the wiring you can ultimately dispense with.

(Continued on next page.)

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1 ReadiRad .00075 Moderator Condenser	3	6
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3 Valve Holders	1	6
1 R.I. "Cosmic" Dual Coil Unit	12	6
1 ReadiRad Moderator Coil	2	6
1 T.C.C. .001 Fixed Condenser, Type "S"	1	6
1 ReadiRad Standard H.F. Choke	4	6
1 Lewcos 100,000-ohms Spaghetti Resistance	1	6
1 ReadiRad Radiogram Switch	2	9
1 T.C.C. .0003 Fixed Condenser Type "S"	1	3
1 ReadiRad Wave-Change Switch	1	6
1 R.I. Hypermite L.F. Transformer	12	6
1 Grid Leak, 2 megohm and Holder	1	4
1 T.C.C. .01 Fixed Condenser, Type 40	1	9
1 Grid Leak, .5 megohm, and Holder	1	4
9 Belling-Lee Terminals, Type "R"	2	3
1 Packet of Jiffilix for wiring	2	6
2 Belling-Lee Wander Plugs	1	2
Flex, Screws, &c.	4	6

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	£	s.	d.
3 Valves as specified (P.M.2DX, P.M.1LF, P.M.2)	1	7	6
1 Pertrix Accumulator, Type PXC3	11	0	
1 Pertrix 100v. Standard Capacity H.T. Battery	13	0	
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1 Pertrix 9v. Grid Bias Battery	1	3	
1 R.&A. Speaker Unit, Type 40	16	6	

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MUTUAL RADIO BUYERS

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TECHNICAL NOTES

(Continued from previous page.)

The efficiency of the set also depends to a large extent on the actual placing of the components, although if you are making up a set from a blue print supplied, say, with "P.W." or either of its associated journals, you need not worry about the placing of the components, as all this has been worked out for you by expert designers.

Useful Clips.

For experimental work I often use the little spring clips known as "crocodile clips," and I find these very useful, although they do not seem to be as popular as they deserve to be.

I used to use some foreign ones—at least I think they were foreign—which were fairly satisfactory, except that the little slotted screw terminal almost invariably pulled out of the hole, owing to the fact that it was only hanging on by about a couple of threads, just about as much as could be got into the thickness of the material with the addition of a slight burr where the hole was punched through.

Lately Messrs. Bulgin, Ltd., have put on the market a series of these clips of much better construction. In addition to the screw terminal they have a tubular part which can be used as a soldering tag, either alone or in connection with the screw terminal.

They can be had bright coppered, nickel-plated or lead-coated, the latter being useful when the clips are to be used directly on to battery terminals. For experimental work these crocodile clips are extremely useful, and if you have never tried them before you will find them a great time-saver.

Amongst other things, they can be used for clipping on to the different turns of a coil. There is only one little precaution you want to take and that is, as they have a fairly large exposed metal surface, you want to be careful to avoid any short-circuits or other accidental contacts.

What is the Anode Getting?

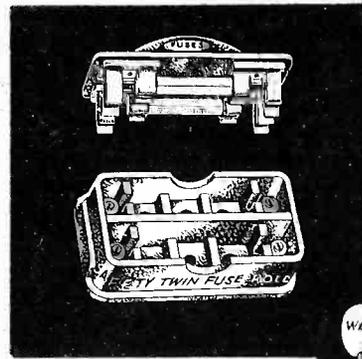
I have often been asked how the voltage applied, say, to the anode of a valve, when using a mains unit, should be measured. If a good, fairly fresh H.T. dry battery is used, or an H.T. battery of accumulators, the voltage applied may be taken to be pretty nearly that corresponding to the actual tapping, because the resistance of the leads is negligible compared to the resistance in the valve.

But with a mains unit, inasmuch as there is quite a considerable resistance actually included in the unit itself (generally this is the method by which the different voltage tappings are obtained, altogether apart from the resistance of the transformer), the output voltage depends essentially upon the current.

Now if you have the set in operation and you connect a voltmeter across the terminals of the unit, the current drawn by the voltmeter—at any rate, most ordinary voltmeters—may well be of the same order as the current being supplied to the set.

If this is so, the actual voltage whilst the measurement is being made may be considerably below the voltage under working conditions (which is really what you want to measure), and so you will get quite an erroneous reading.

(Continued on next page.)



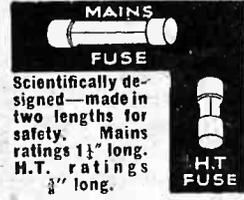
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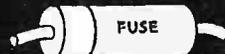
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AMMETERS, 2 1/2 in. moving coil, 1st grade, 0-14 amps., 25/-; 0-5 amps., 25/-; 0-10 amps., 25/-. Central zero ditto, 20-0-20 or 50-0-50 amps. Turner, with shunt, 25/-.

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GALVOS, Best bargain to-day, Silvertown Astatic, brass case, Horiz. 20 ohms., 7/6, useful for all testing and bridge. Type "G" bridge-galvo. suspen. needle, 20/- Paul Pivot, 17/6. Unipivots, £5. Tinsley suspen. Mirror, £3. Gambrell, ditto, vert., brass case, £4. Sullivan Reflecting, fine, £10.

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TECHNICAL NOTES

(Continued from previous page.)

Of course, if the voltmeter is of very high resistance, which it should be, it will make very little difference to the output voltage and you will get a reasonably correct reading. But, as I say, most cheap voltmeters have not nearly such a high internal resistance as they ought to have.

A Simple Dodge.

One fairly simple dodge is to include a milliammeter in series with the anode when the mains unit is working and to measure the anode current. Then substitute a battery for the unit and alter the tapping on the battery until the anode is taking the same current as before, as shown by the milliammeter.

Inasmuch as there will be an inappreciable drop of potential in the milliammeter itself, you can assume that the voltage on the anode is the same as that of the tapping on the battery, and this gives you a rough-and-ready but reasonably reliable means of ascertaining the actual voltage applied to the anode, under working conditions, by the unit.

It is a good plan, if you use this method, to measure the voltage of the battery tapping actually by means of the voltmeter. Unless the battery is very old and decrepit it should at least stand up to the current consumed by the voltmeter without any serious drop in voltage.

THE TELSEN RADIOMAG.

NUMBER 2 of the Telsen Radiomag, which is now available to the public, will certainly fulfil the hopes raised by its predecessor.

It will be remembered that the first number of this new periodical was very attractively arranged, and embodied with the complete catalogue of Telsen productions a mass of information useful to constructors. The high standard then set has been more than maintained in the second number, which contains sixty pages of well-prepared technical information.

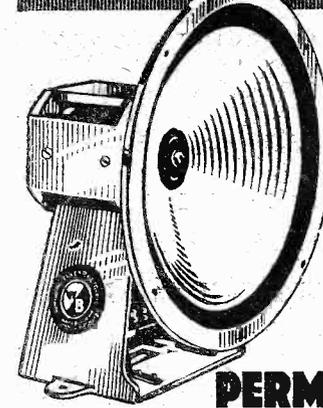
It is issued to the public at threepence per copy, and contains constructional details of a short-wave adaptor and a short-wave "Three," as well as of other receivers. The Telsen "Songster Two" is the smallest of these others, and the Telsen Empire Four the largest, while for the three-valve man there is the "Telsen Triple," the "Telsen Conqueror" and the "Telsen Commodore."

A clear theoretical diagram and blueprint illustrates each of these, and the brief but lucid description makes the construction of the set an easy matter.

In addition, there are details for fitting the Telexor, hints on Tracing Troubles, and an article on the choice and care of batteries. Another useful feature, which will appeal to the owner of a gramophone, is a page of tips about using a pick-up, and the last page of the book is devoted to a list of short-wave stations.

A particularly interesting contribution entitled "Radio is the Greatest of All Entertainers" is made by Mr. A. W. Macnamara, Governing Director of the Telsen Electric Co., Ltd.

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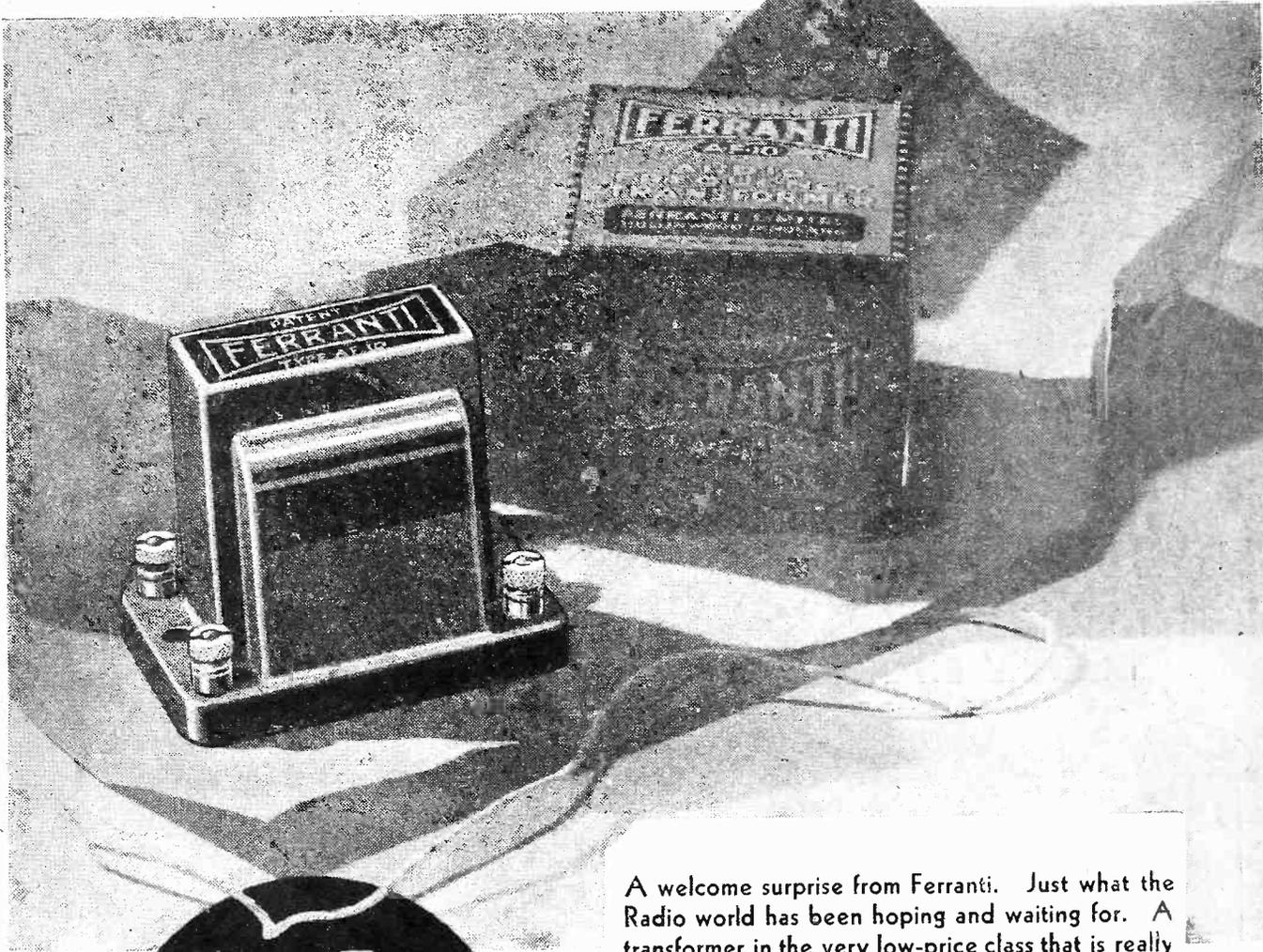


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5/6

THE NEW AF10
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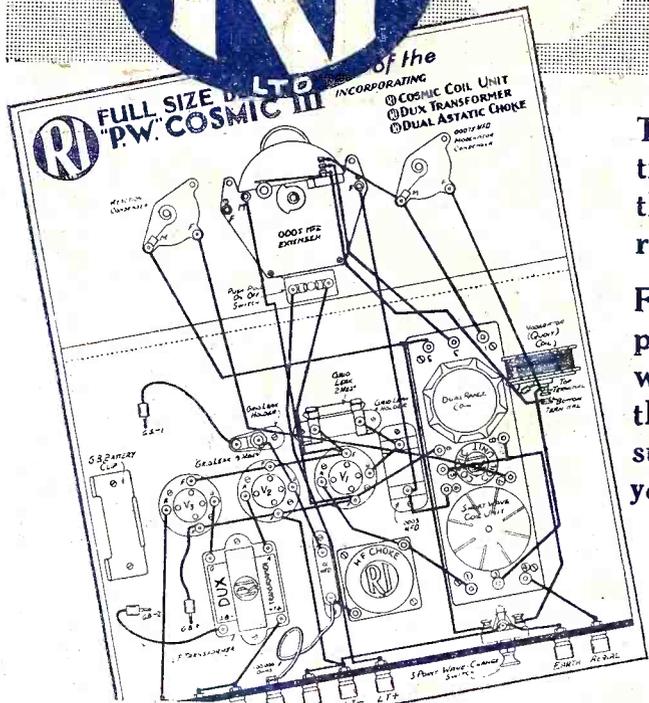
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The R.I. for the COSMIC III

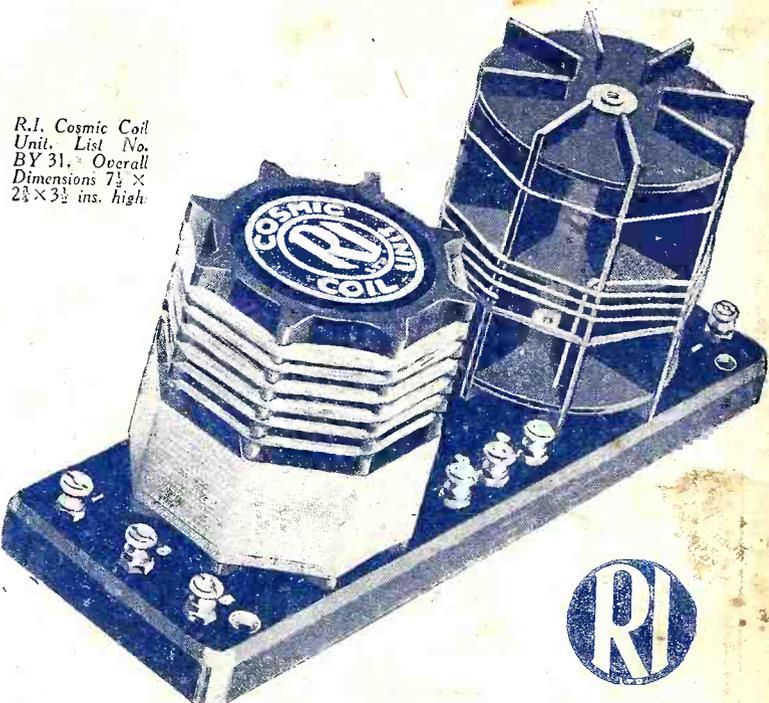


The "Cosmic" III is a great circuit which gives truly amazing results, particularly when fitted with the three R.I. components as specified and recommended by "Popular Wireless."

For the benefit of "P.W." readers R.I. have produced a full-sized Blue Print and Folder which gives valuable information respecting the employment of the R.I. components to give super efficiency to the set performance. Ask your dealer or us for a free copy.

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Showing how to fit and wire up the
 R.I. "Cosmic" Coil Unit
 R.I. "Dux" Transformer
 R.I. Dual Astatic H.F. Choke
 Ask your dealer or us for a copy.



R.I. Cosmic Coil Unit, List No. BY 31. Overall Dimensions 7 1/2 x 2 1/2 x 3 1/2 ins. high.



DUAL ASTATIC CHOKE

This choke is pre-eminently best for the "Cosmic" III and "Cosmic" III Star, because of its remarkable efficiency on the short waves as well as the medium and long waves. It is the only choke that cuts out all blind spots and resonant losses—an important feature for short-wave work. Freedom from H.F. interference with adjacent components is assured by its astatic winding and skeleton form of construction.
 List No. FY1.

7/6



"DUX" TRANSFORMER

The "P.W." designers' first selection for the "Cosmic" III. A remarkable transformer that has attained enormous popularity by unequalled performance in hundreds of thousands of sets. "DUX" has been specified as first selection for the "Cosmic" III because it is the lowest-priced transformer that is really efficient and which gives the good L.F. amplification which is a vital feature in the circuit. Inductance—30 henries. Ratios: 1:3 1/2 (standard) or 1:4 1/2 (autococonnection).
 List No. DY29.

6/9

COSMIC COIL UNIT

The reduction of dielectric losses in "Cosmic" III is vital—and for that reason the R.I. "Cosmic" Coil Unit possesses distinctive and exclusive advantages.

Its big features are:—
 One complete unit, combining coils for Long, Medium and Short waves, permits easy fixing and compact assembly. The skeleton construction of the short-wave coil former reduces dielectric losses to a minimum. Every coil is carefully tested on the "Cosmic" III circuit and checked with a wavemeter over the entire range of broadcast and short-wave bands. This is not advertising licence but a definite statement of fact. This unit has not only been specified by "P.W." for the "Cosmic" III, but also Mr. G. P. Kendall, B.Sc., Chief Engineer, Ready Radio, has specially selected it for use in the "Cosmic" III Star Set.

12/6

Advt. of Radio Instruments Ltd., Croydon, England.

'Phone: Thornton Heath 3211 (5 lines).

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