

PERCY HARRIS ON "HOW TO FIT A PICK-UP"

Amateur Wireless

and
Radiovision

THE IDEAL
MODERN
AERIAL
SEE PAGE 625

Every
Thursday

3^d

Vol. XX, No. 511

Saturday, March 26, 1932

The "MASCOT" RADIO-GRAM ADDITION FOR ANY SET



PERCY HARRIS EXPLAINS HOW TO DO IT

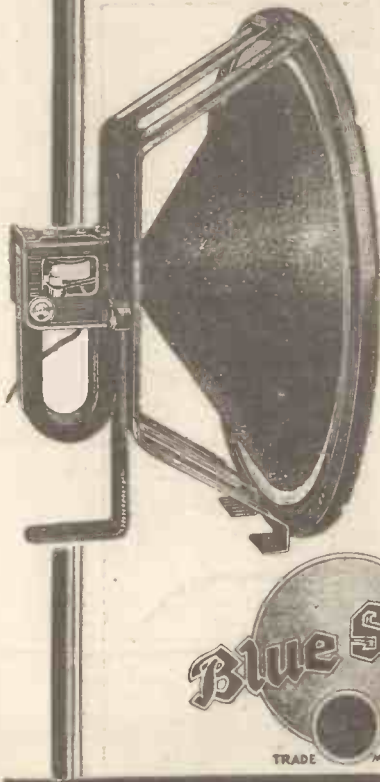
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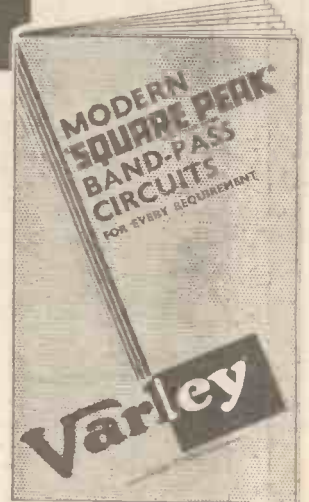
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Britain's unbeatable Band-pass Coil. The ideal pre-selective tuning device for any set—S.G., Reacting Detector or Super-Het. No other Band-pass Tuner combines such high selectivity with ample signal strength and natural full-toned reproduction. Designed on an entirely new principle, Varley "Square Peak" coils (subject matter of patents) are the first commercial band-pass tuners to do their job.

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If you wish to build yourself a really modern band-pass receiver—S.G., simple detector or super-het.—write to-day for the FREE "Square Peak" Circuit Booklet.



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Please send me, free and post free, the "Square Peak" circuit booklet entitled MODERN "SQUARE PEAK" BAND-PASS CIRCUITS FOR EVERY REQUIREMENT.

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You will Help Yourself and Help Us By Mentioning "A.W." to Advertisers

MARCONI 2-VOLT OUTPUT VALVES ARE STRICTLY ECONOMICAL

PT.2 is a high efficiency pentode (upper inset) with the phenomenally small H.T. consumption of only 5-6 M.A. at 120-150 Volts, a figure far below that of any similar valve yet available. The output is adequate for good reproduction with a moving coil speaker - - 17/6

★ ★ ★

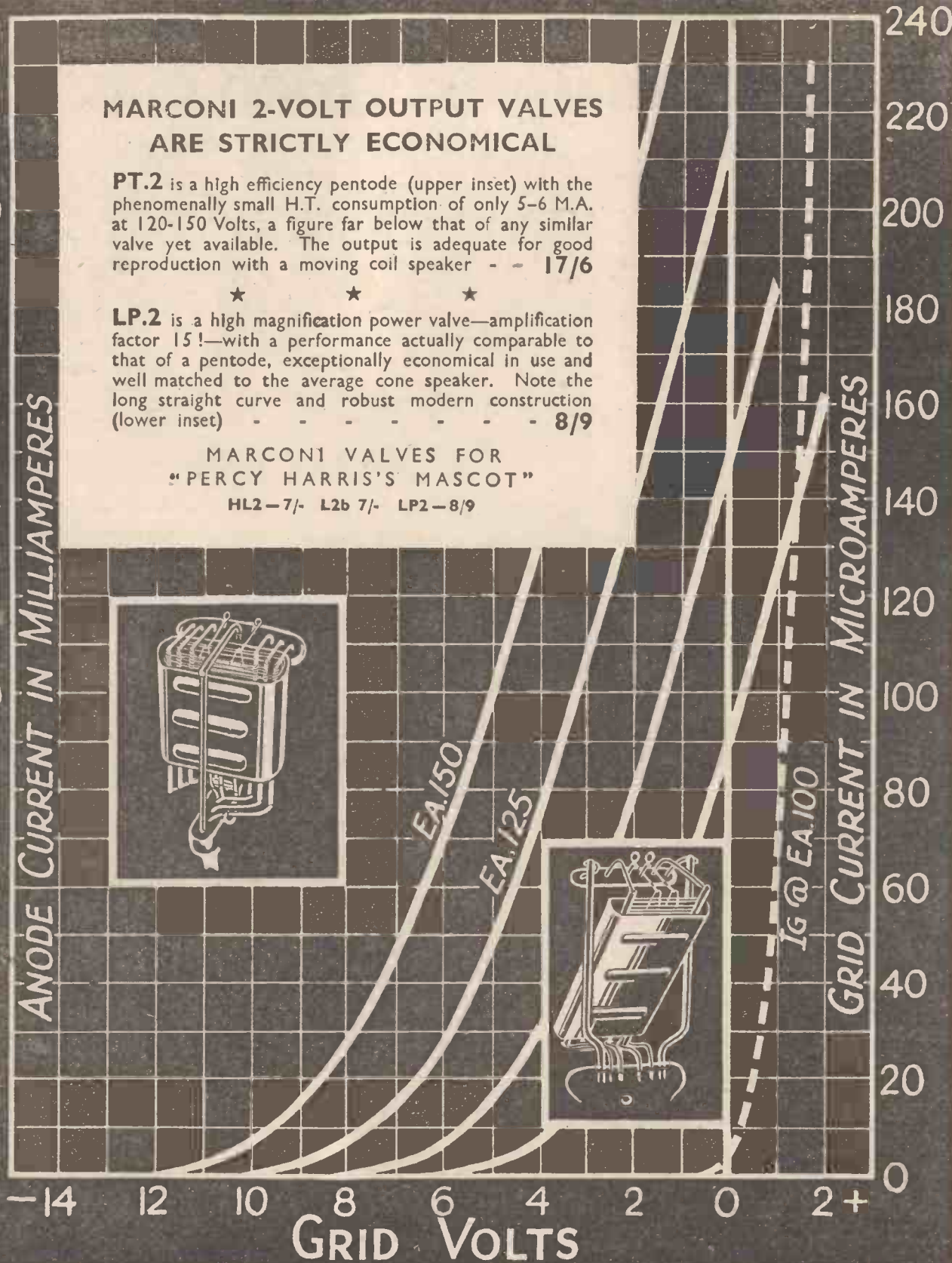
LP.2 is a high magnification power valve—amplification factor 15!—with a performance actually comparable to that of a pentode, exceptionally economical in use and well matched to the average cone speaker. Note the long straight curve and robust modern construction (lower inset) - - - - - 8/9

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"PERCY HARRIS'S MASCOT"

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ANODE CURRENT IN MILLIAMPERES

GRID CURRENT IN MICROAMPERES



What can I expect from His Master's Voice Radio?

Let the press experts tell you—Read below!

HOW DOES THE QUALITY OF REPRODUCTION COMPARE WITH OTHER SETS?

Wireless Magazine says: "This is one of the best sets we have tried this season. Loudspeaker output is extremely well-balanced, top and bass notes coming out with a delightfully natural timbre."

Amateur Wireless: "The quality of reproduction from the self-contained loudspeaker is simply great. The deep bass and the clear-cut treble combine to give a balance of tone not often found in table sets."

And *Wireless World* reports: "The quality of reproduction is well up to the standard expected from an 'His Master's Voice' product, with the output nicely balanced and the bass well in evidence without being overpowering, or obscuring the upper register, the reproduction of which is good."

"Control is altogether delightful" says *Amateur Wireless*. "If you are a set buyer who likes simple operation, here is a set that is outstandingly attractive." *Wireless World* adds: "Practically every modern feature likely to enhance the performance of the set and simplify its operation has been incorporated."

IS THE 435 SENSITIVE?

Wireless Magazine says: "Sensitivity is equally good at the top and bottom ends of the tuning scale, Cologne and Budapest were taken as the two extremities, and both came out well."

And *Wireless World*: "Sensitivity is well above the average for a receiver of this type."

IS IT SELECTIVE?

Wireless World: "When searching for distant stations, the characteristic sharp cut-off of band-pass tuning was quite evident by the way signals quickly attained maximum intensity and the rapid decline to inaudibility beyond the normal setting. The long waveband provided eight alternative programmes, all at good volume. Königswusterhausen, between Daventry 5XX and Radio Paris, was not affected by the proximity of these stations, although the last mentioned was exceptionally strong."

And *Amateur Wireless* says: "Selectivity will satisfy most listeners even if they live quite close to the regional centre."

While the *Gramophone* says: "The sensitivity and selectivity are all that can be expected of a set of this calibre; in this respect, indeed, we should rate it well above the average."

IS IT SIMPLE TO OPERATE?

"Control is altogether delightful" says *Amateur Wireless*. "If you are a set buyer who likes simple operation, here is a set that is outstandingly attractive."

Wireless World adds, "Practically every modern feature likely to enhance the performance of the set and simplify its operation has been incorporated."

OTHER OUTSTANDING FEATURES

"Its many technical points," says *Wireless Magazine*, will interest the enthusiast, and its wonderful performance will thrill the ordinary listener. Model 435 incorporates many requirements not found in the usual straight set."

While *Amateur Wireless* says: "It would be difficult to overdo praise for this excellent table console set, which has a great many points that distinguish it from the ordinary run of sets... I am very much impressed with the meticulous care taken at every point to assure good results," and sums up by describing the instrument as "one of the most outstanding triumphs of the British Radio Industry."

SPECIFICATION 3-valve radio receiver and moving coil loudspeaker in walnut cabinet. Mains operated (A.C. or D.C.). Band-pass tuning. Marconi valves. One tuning knob. One volume control—new "His Master's Voice" frictionless pattern. One operating switch—new continuous action pattern. Unique illuminated control scales, showing only what is operation—long waves, short waves or the playing of gramophone records from a pick-up. Mains aerial (A.C.) Plugs for additional loudspeaker.



A.C.
or
D.C. **20** GNS.

Price does not apply in Irish Free State.

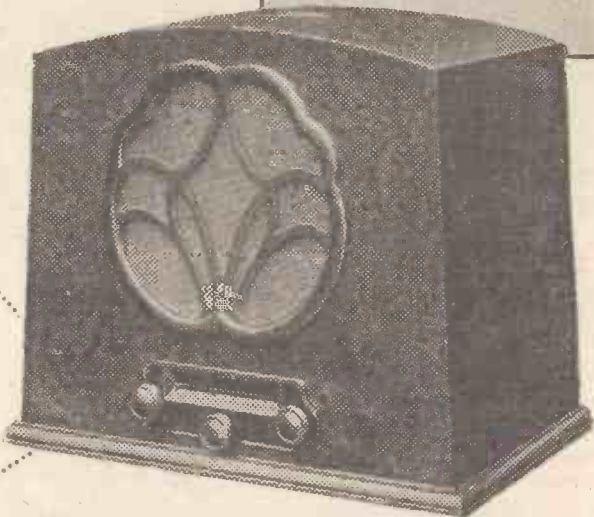
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The Gramophone Co., 365a Oxford Street, London, W.1. Please send me full particulars of "His Master's Voice" Radio Set Model 435, and address of my nearest dealer.

Name

Address

THE SET THE EXPERTS RECOMMEND



Obtainable on Hire Purchase Terms. Ask your "His Master's Voice" dealer for demonstration and full particulars.

His Master's Voice

MODEL 435. "TRUE TO LIFE"

Don't Forget to Say That You Saw it in "A.W."



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

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NEWS & GOSSIP OF THE WEEK

"P.W.H." AND THE "MASCOT"

THE first set which Mr. Percy W. Harris has designed for "A.W.," the "Mascot," is proving a wonderful success. It is a set which is different in performance from ordinary "threes." It has so many advantages and it is so cheap to build. This week Mr. Harris tells you more about the "Mascot."

HENRY HALL'S TUNES

IN case you are not yet *au fait* with the two signature tunes of the new B.B.C. Dance Orchestra, make a note of the fact that the opening tune is *It's Just the Time for Dancing* and the closing item *Here's to the Next Time*. Jack Payne's signature tune at the beginning and end was, of course, *Say It with Music*.

THE CUP FINAL

THE B.B.C. is to broadcast a running commentary on the Football Association Cup Final, to be held at Wembley, on April 23. George Allison and Derek McCulloch will be the commentators. The semi-final was not broadcast, but, as a consolation, the England v. Scotland international soccer match, to be held at Wembley on April 9, will be the subject of broadcast commentary.

SUMMER TALKS

AMONG the interesting talks arranged in the B.B.C.'s summer syllabus, is a series called "Speech in the Modern World," by Mr. A. Lloyd James and "Music—Common, New and Old," by Victor Hely-Hutchinson, the young and talented B.B.C. composer.

NOT ENOUGH ROOM?

DURING a lighting conference in London, 150 architects took the opportunity of inspecting Broadcasting House. What they said of the office accommodation is not placed on record, but it is no secret that some of the staff are very discontented with the inadequate office space outside the central tower.

ANOTHER REGIONAL PLAN

SWITZERLAND is pushing ahead with its regional plan and a new Marconi station is soon starting up near Tessin in Italian Switzerland. Two broadcasters, well heard over here, Beromuenster and Sottens, are the regional transmitters for German Switzerland and French Switzerland respectively. The new Swiss regional scheme is not unlike our own. The Tessin station, which is to be a 15-kilowatt, will be working in seven or eight months' time.

CHILDREN'S HOUR STORIES

THE B.B.C. West Regional Director, Mr. E. R. Appleton, is planning some ambitious ideas in his new "Joan and Betty" stories. He puts an entirely new complexion on Bible teaching. He uses all the resources of the B.B.C. studios, using trained speakers and actors and gramophone records for background effects. His idea is to make these stories come to life. They are heard in the National as well as West Regional programmes on alternate Sundays.

THE GERMAN ELECTION RESULTS

MANY listeners probably tuned in to German stations on March 13 for the election results before they were given out in the B.B.C. Sunday evening news bulletin. On many unselective sets in London the voice of German announcers could be heard giving last-minute results as a background to the B.B.C. broadcast. Feeling ran very high. Only Hindenburg, among the candidates, was allowed to broadcast.

"RADIOLA" AGAIN

WE hear that "Radiola," a popular French announcer who was well known over here in the early days of broadcasting on account of his Paris broadcasts, is now one of the announcers at the new Poste Parisien station. For a long while "Radiola" was the nickname of all announcers at Radio Paris, but the original "Radiola" was M. Laporte, who is now again to be heard at Paris.

COLONIAL PROGRAMMES

IN connection with the recorded items prepared by the Colonial Programmes organisation conducted by Mr. Malcolm Frost, we learn that several eminent writers have recently recorded book reviews as part of the scheme. Included are J. B. Priestley, John Buchan, and Hugh Walpole.

REGIONAL PROTEST EXPECTED

NOW that it has finally been decided to form a Scottish National orchestra



Mrs. Charles A. Lindbergh, the wife of Col. Lindbergh, at a New York microphone during a recent broadcast

NEXT WEEK: A "TWO" WITH EXTRAORDINARY "PUNCH"

NEWS & GOSSIP OF THE WEEK —Continued

In 1933, by the co-operation of the B.B.C. with the Glasgow Choral and Orchestral Union, we fully expect regional centres to protest. It seems hardly fair that Scottish Regional should have the advantage of a national orchestra while other regions have to put up with studio nonettes.

B.B.C. PUBLICITY

IT is interesting to hear that many restaurants have noticed a considerable increase in attendance on the nights of dance-band broadcasts. Several churches

of modern design, it is much more stable and the B.B.C. relied on only one receiving point. This was the roof of Harrods' Depository.

SOME LICENCE FIGURES

HOW greatly Regional-station development affects licence revenue is admirably illustrated in some figures recently supplied to us by the B.B.C. During the last four months of the past year Lancashire and Yorkshire each had licence increases of 60,000, Northumberland 20,000, Durham

large orchestral broadcasts, has not yet been fully tested out, it is now clear that not more than seventy players will be able to broadcast at once. The significance of this is only appreciated when you remember that the full B.B.C. Symphony Orchestra has 117 players. So, in spite of the elongation of the studio by the cutting back of the platform and gallery, the big studio is rather a washout—and presumably Queen's Hall will still have to be utilised for symphony broadcasting.

GERALD BARRY'S RETURN

MANY listeners will be glad to hear that Gerald Barry returns to the microphone on April 1 for a weekly Friday evening causerie entitled "The Week at Home." This will be a brightly delivered commentary on happenings of interest to everyone.

THE FIRST PLAY

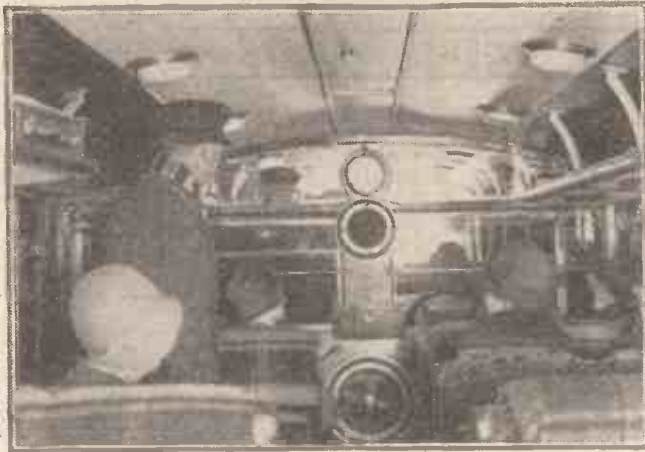
THE B.B.C. tells us that the first play to be broadcast from one of the play studios at Broadcasting House is a revival of *Doctor Abernethy*, and this will be followed by a new play called *Invictus*. Both will be produced by Peter Creswell. The date of the first play is provisionally fixed for the first week in May.

"SONGS FROM THE SHOWS"

SO popular are the John Watt productions entitled "Songs from the Shows," that at least one of them is to be recorded by a prominent gramophone company. John Watt will present "More Old Favourites" in a programme to be broadcast on March 24. Included will be Winifred Fisher, who was among the very earliest of broadcast artistes, although she has not been heard through the microphone for some time.

The power of the Riga broadcasting station will shortly be increased to 25 kilowatts.

ROAD COACH RADIO



A road coach travelling between Glasgow and London has been fitted up with a portable set to while away the long hours. The speaker can be seen just underneath the clock at the front of the passenger's compartment

have also commented lately on the fact that they are packed out when the service is to be broadcast. The B.B.C. is a much better advertiser than many listeners appreciate.

WATERPIPE EARTHS

IN view of the recent fuss made about water-pipe earths in the newspapers, it is interesting to record a B.B.C.'s engineer's thoughts on the subject. "The amount of current flowing in the earth lead of an ordinary broadcast receiver is negligible—and so is its effect on the water-pipe," he stated. "Of course, with a transmitter it is a different story, as the current then generated in the earth circuit is quite considerable."

GUS ELEN'S RETURN

THIS seventy-year-old music-hall artiste, who has staged such a spectacular "come-back," being now at the top of the bill wherever he appears, will take part in the vaudeville programme to be broadcast from No. 10 studio on Easter Saturday. Gus Elen will sing some of the old songs that made him famous forty years ago!

BOAT RACE ECHOES

FOR the recent relay the B.B.C. made use of a new 50-watt short-wave transmitter. This occupies only one-fifth of the space taken by the old transmitter. Being

9,000, and Cumberland 4,000. These increases may be attributed to the opening of North Regional. Probably in anticipation of the opening of Scottish Regional at Falkirk, 94,000 licences were added to Scotland's total. For the whole of Wales the increase was 13,000.

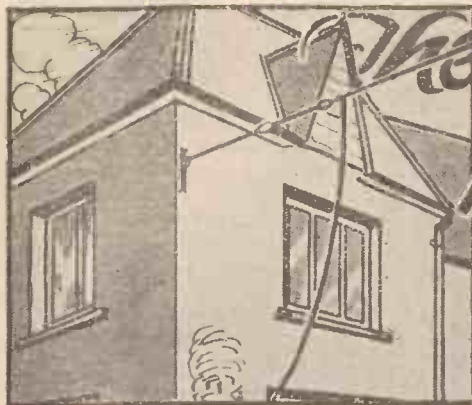
BIG STUDIO NOT BIG ENOUGH!

ALTHOUGH the "big" studio of Broadcasting House, designed for

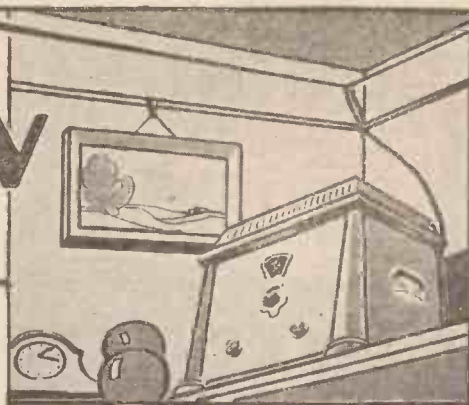
A TWO-MAN POWER STATION!



A novel means of getting power for a portable outfit in Northern Rhodesia has been adopted by Marconi engineers. This tandem pedal outfit, driven by natives, provides the 140-watts needed for the station which links up with Government Headquarters five hundred miles away



The IDEAL MODERN AERIAL



Listeners who get poor results often blame their aerial systems, but this may not be the root of the trouble. Just what constitutes a really efficient aerial is described here

WHEN broadcasting started no listener was considered an expert unless he had a huge cage aerial erection gracing the roof! An aerial system of this kind cost the best part of a ten pound note, as I remember full well, and looking back on those days, I am sure that it was money poorly spent.

Of course, there were no screen-grid valves in those days and high-frequency amplification of any kind was a doubtful quantity. The reaction to the modern

Every length of wire in an oscillatory circuit has the property of inductance, although in set design we do not usually regard the "inductance" of a piece of wire unless it is wound round into a coil. But still the average length of aerial has a measurable inductance.

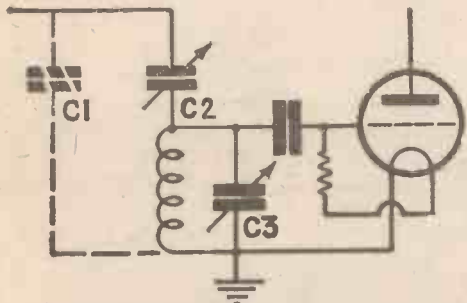
Obviously, it has resistance, as no matter how thick the aerial wire is it must offer some resistance to the current picked up. The resistance it offers to the high-frequency currents induced in it by the wireless wave form, may be much higher than the ordinary resistance to direct currents which you could force through the wire by connecting a battery to the two free ends. The resistance which we are concerned with is the "H.F." resistance—that offered to the high-frequency current.

An aerial also has capacity. It is, in effect, a big condenser. The aerial wire is one plate, the air the insulation and the earth (which is electrically connected to the earth of the set) the other plate. When planning your ideal aerial and when overhauling an outdoor wire to make it conform to modern conditions, you must remember all these facts.

Let me show you how they work in practice. The capacity of the aerial depends on the wavelength upon which it is working. It is higher at low wavelengths. It may be as much as .0001 or .0002-microfarad. If the aerial is not very

high, the capacity will be greater, while in the case of an indoor aerial where the wire runs only an inch or so from the wall, the capacity may be considerable.

That is where the term "electrical height" comes in. An aerial may be 50 ft. high and yet its electrical height above the nearest earthed body may be only 10 or 20 ft. It is the height above the other plate of this huge aerial condenser which



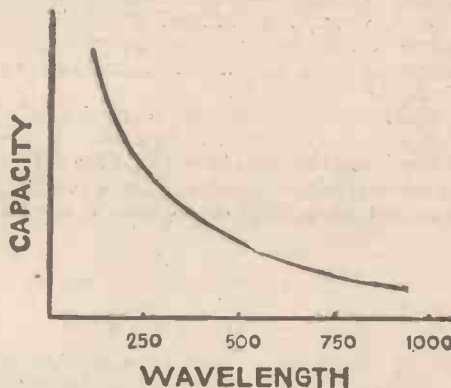
The effect of aerial capacity on the aerial tuning is illustrated by this circuit

so-called aerial, which consists of a piece of flex carelessly draped around a picture rail (or in a mains set, a short condenser connection to the lighting flex itself) has been all too sudden, and we are apt to forget just what constitutes an ideal aerial.

Friends of mine say that it is no use having an efficient outdoor aerial because the chief need in a set is sharp tuning. While their sets tune sharply on a short indoor wire, they say, the selectivity is seriously cut down when an outdoor aerial is used.

The real truth is that an efficient outdoor collector can add to a set's performance, without cutting down its selectivity. Mains aerials and short indoor wires are all very well, where nothing better is available. A properly arranged outdoor aerial will still make as much difference to a set, in many cases, as the addition of a screen-grid stage, and without broadening tuning.

Examine the technical side of the question. An outdoor aerial consists of a length of wire, probably 60 or 70 ft. long and supported 20 or 30 ft. above the ground. Experts will talk about "electrical height," "effective capacity," "aerial resistance," and so on. You must realise what these terms mean.



How aerial capacity varies with the working wavelength

matters. An indoor aerial at the top of a 30-ft. storey, but only 6 in. away from the wall, may be no more effective than an outdoor wire only 5 ft. from the ground.

The capacity caused by putting the aerial close to an earthed body may be harmful for two reasons. The capacity of the aerial and the inductance of the wire combine to form a tuned circuit. An aerial may thus have a natural tuning point of anything from 50 to 200 metres or so, according to its length, inductance and capacity.

This natural tuning point may limit the tuning range of the set if the capacity is very good or if the aerial is very long. It will certainly upset results when the aerial is used for short-wave working, even when the aerial is tuned to a harmonic.

In extreme cases this stray capacity acts as a by-pass and reduces the effective voltage induced in the aerial by the signals. If the aerial wire is very thin, its high-frequency resistance will be high.

High-frequency currents travel mostly on the outside of a conductor (this being known as the skin effect) and it is for that reason that stranded wire is preferred for

(Continued at foot of next page)



The series-aerial condenser in the set must be adjusted to counteract the damping capacity of the aerial

COMING—A SUPER "CENTURY SUPER"

Single-knob control—and designed by W. JAMES

I HAVE in my laboratory a wonderful five-valve single-dial super-heterodyne receiver.

This set represents as great an advance over present-day practice as did the "Century Super" of last year over the ordinary super-heterodyne receivers then available.

With the Editor's permission, this new set will be described in AMATEUR WIRELESS during the next few weeks.

Those who have used a "Century Super" receiver will know that the remarkable selectivity and station-getting properties are on occasions marred by interferences and particularly by whistles. This trouble of whistles is peculiar to the simple type of super-heterodyne and knowing this, I have worked for many months to find a solution that would be acceptable to amateur constructors.

Naturally one finds many ways of obtaining the desired results. But not all are likely to prove satisfactory under the varied conditions met with and the factors of cost, and the simplicity or otherwise of the

scheme must be most carefully considered.

I have now a very straightforward arrangement. There are three tuned circuits before the first detector and a stage of high-frequency amplification is included. Thus the new receiver, with its multiple tuned circuits, and high-frequency stage before the first detector, is really selective and sensitive as well.

You might feel that a circuit using a total of six separate coils would be a little difficult to put together.

But this is not the case at all. Four of the coils are built upon a single base and the other two are the usual plug-in type super-heterodyne coils. The wiring is actually easier than that of the "Century Super." The set is much neater and more quickly constructed.

It is much better looking, ganging is dead simple, and the results are far better than anything that was possible with older sets. I am particularly impressed with the quality.

The selectivity is naturally remarkably good. It is a fact that by turning one

control, stations come in and are gone every degree or so. There are many stations receivable at good quality. The range is much greater than that of the "Century Super"; particularly is this noticeable in the daytime.

And so you will see that I have a new set for you that will really provide outstanding results.

It is certainly outstanding in other respects, such as its construction and wiring. There should be no troubles from faulty parts as only the best are used. Finally, the cost is very reasonable and you will probably have some of the parts by you.

W. JAMES.

S.G. VOLUME CONTROL

A SIMILAR effect to that provided by a variable- μ valve can be obtained from an ordinary S.G. valve if the screen-grid voltage is supplied through a series resistance. For instance, an increased negative potential on the control grid will then naturally reduce not only the plate current, but also the screen-grid current. The latter, in turn, automatically increases the potential on the screen grid (since the voltage drop across the series resistance is now less than before and, therefore, tends to increase the plate current). One effect accordingly tends to offset the other on the plate current, causing it to vary more gradually and giving an elasticity of volume control which approximates to that which can be secured from a variable- μ valve. This little experiment may be tried by owners of screen-grid receivers.

M. A. L.

"THE IDEAL MODERN AERIAL"

(Continued from preceding page)

aerials as the useful area of a number of strands in a cable is greater than one single wire of the same diameter, the centre portion being almost useless.

Now, bearing in mind that an aerial forms a tuned circuit of its own, because of its inductance and capacity, you must imagine that when you attach the aerial wire to a set you do not simply anchor on a wire which is picking up the signals. You are, in effect, coupling up the aerial tuning circuit of the set to another circuit which is permanently tuned.

Long Aerials and Tuning

This will help you to understand why, when a long aerial is connected directly to the grid end of a tuning coil the selectivity is poor. The big capacity and inductance combination of the aerial is coupled as strongly as possible to the coil and the coil does not tune anything like so sharply as it would if there were no aerial connections.

To enable the aerial to pick up a big voltage and yet to reduce the electrical dampings caused by coupling the aerial rightly to the set, we use a pre-set condenser in the aerial lead.

In the circuit on the preceding page, c_1 is the capacity caused by the aerial, c_2 the pre-set condenser and c_3 the tuning condenser. You cannot alter c_1 , and c_3 is the effective tuning control, but by cutting

down the value of the pre-set c_2 , you loosen the aerial coupling.

Up to a point you reduce the voltage induced in the grid circuit of the valve, as c_2 is cut down. But you will generally find it better to have a fairly large aerial, picking up a good signal voltage, with as low a capacity as possible coupled through a pre-set to the set, rather than an efficient wire which appears to give better selectivity because it does not need a pre-set.

Do you see now why a short indoor wire, properly arranged, does not need a pre-set in the set? It is short and has a low inductance. It is well spaced and so the effective capacity is low. It does not electrically damp the tuning circuit to any

serious extent and so it does not need a pre-set to loosen the coupling between it and the receiver.

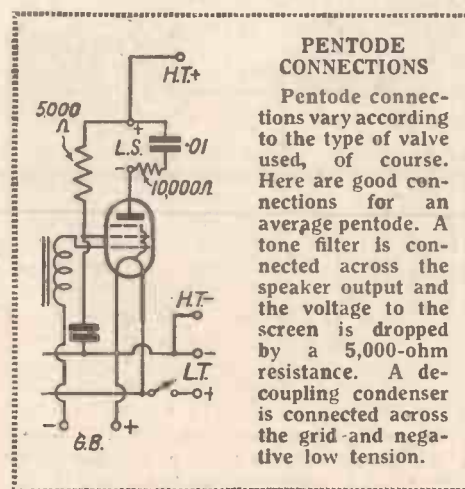
Tuning coils are tapped to improve selectivity and by connecting the aerial to the tapping point, the coupling is again reduced. By tapping the aerial fairly low down on the coil, and using a pre-set condenser, the coupling between the aerial and the coil can be varied by almost any amount.

Indoor Aerial Capacity

An inefficient indoor aerial, having a high capacity, may still need a pre-set condenser in circuit to make the set selective, but because it is inefficient it does not pick up a useful voltage and you are not making the most of the set's performance.

To keep the natural tuning and capacity of the aerial low, to make it pick up a useful voltage and yet not swamp the set's selectivity, have a wire not longer than 70 ft. and with an electrical height of not less than 15 or 20 ft. Take the greatest care in keeping the lead-in well spaced from the wall, as otherwise the capacity here may be greater than in the whole of the rest of the aerial.

Use stranded wire where possible, or at least, not a very thin single cable, in order to cut down the effective resistance. Make the whole aerial as efficient as possible and couple up through a series condenser and an intermediate coil tapping point in order to maintain selectivity, and reduce aerial loading.



PENTODE CONNECTIONS

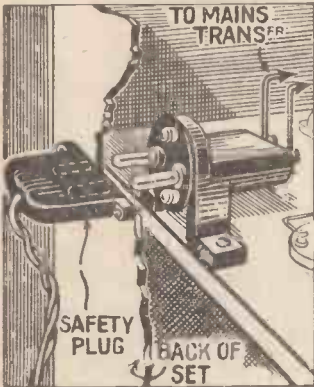
Pentode connections vary according to the type of valve used, of course. Here are good connections for an average pentode. A tone filter is connected across the speaker output and the voltage to the screen is dropped by a 5,000-ohm resistance. A decoupling condenser is connected across the grid and negative low tension.

HINTS AND TIPS FOR MAINS WORKING

Safety Working.

CONSIDERING how simple it is to make provision for absolutely safe mains working it is a little surprising that many amateurs still regard the use of electric light as being somewhat dangerous in connection with the wireless set.

The only possible danger is an electric shock when making



adjustments to the interior of the set while the mains are "live." Actually, this is the height of folly, but we all have moments of mental aberration, so a safety plug should be fitted, as shown by the sketch.

Here it will be seen that the back of the cabinet cannot be removed without breaking the mains connection to the transformer in the set. A hole is cut into the back of the cabinet just large enough to permit the insertion of the plug part of the device, while the socket part which is connected to the transformer, is mounted just behind the back of the cabinet.

Transformer Tappings.

On many mains transformers there are three or four alternative primary-winding connections, provided to make the transformer suitable for all voltages between 200 and 260 volts. Often the amateur is puzzled as to which tapping should be used, particularly when there is no transformer terminal corresponding exactly with the supply voltage.

The rule is to connect the mains to a higher rather than to a lower voltage tapping. If the mains are 210 volts, for example and the transformer has tappings for 200 and 220 volts, connect up to the 220 volts terminal.

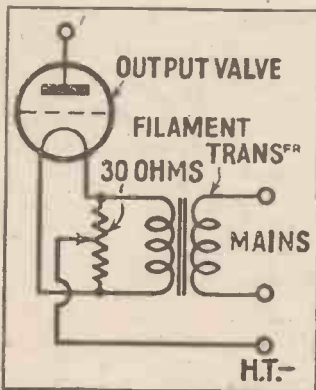
To connect the mains to a lower voltage rating than the supply voltage is not necessarily disastrous, but it may lead to serious over-running of the valves, since the voltage step up will then be greater than it should.

Mains Output Valve.

There are many excellent battery-operated sets in use, with well-designed high-frequency stages spoiled by the inadequate size of the output valve. It is quite a good plan in a general transition from battery to mains operation to start by "all-electrifying" the output stage.

The circuit shows how a 4-volt power valve, such as the PX4, can be used with a filament transformer in order to heat the filament directly from the A.C. mains, stepped down to 4 volts on the secondary. The "filament negative" is taken from the centre point of a low-resistance potentiometer, say 30 ohms, connected across the filament secondary winding.

This output can be used quite successfully with preceding stages of battery-operated valves and with a battery grid-bias. The last valve is the most important so far as power is concerned, and many sets that cannot easily be altered on the



high-frequency side can readily be adapted for mains output working as shown.

Mains Aerials.

It is now generally known that the mains conduit can be utilised as a makeshift aerial, provided that the supply is A.C. One side of the mains conduit, on the primary side of

the mains transformer, is connected to the aerial terminal of the set through a small fixed condenser, which may have a value between .0001 and .0003 microfarad. This condenser must have good insulation, otherwise the mains voltage may cause a breakdown in the dielectric.

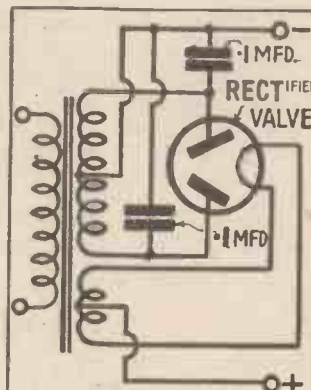
Whenever this type of aerial is tried, it is most important to see which way round the plug should be inserted in the mains socket. Often one way gives appreciably better signal strength than the other.

Another point to watch about the mains aerial is that better sensitivity is often obtained when an upstairs plug is utilised. With this type of aerial a good earth is essential.

Rectifier Hum.

In spite of generous smoothing after a valve rectifier, such as 4 microfarads on each side of the smoothing choke, it sometimes happens that hum from the mains is still pronounced. One of the most effective hum cures yet discovered is the use of two .1-microfarad fixed condensers connected between the two rectifier anodes and high-tension negative, as shown by the diagram.

The use of these two small condensers often enables economy to be made in the rest of



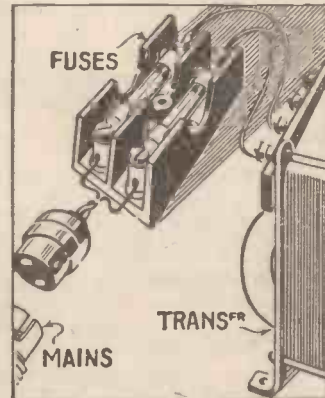
the smoothing. A 2-microfarad rectifier condenser before the smoothing choke and a 2-microfarad fixed condenser after it will usually be found enough to give perfectly smooth and hum-free operation.

Use Fuses!

One of the recommendations of the I.E.E., followed by

most mains set manufacturers of repute, is the inclusion of a fuse in each of the mains leads to the mains transformer. Then in the event of a breakdown in the transformer causing a great increase in the mains current, the fuse wire melts and so the mains are cut off.

The diagram shows how to connect a twin fuse in series with the mains plug and the transformer. One-ampere fuse



wire should be used, and preferably the fuse holder should be arranged so that easy replacements can be made.

Should a fuse "blow" at any time, do not be content merely to replace the burnt out wire with a new fuse—investigate the cause of the trouble.

Mains Running Costs.

Although it is generally realised that mains working, at least from an A.C. supply, is less expensive than battery working, many listeners do not know how to work out the actual cost.

The unit of electricity as supplied to the home is known as the kilowatt-hour. You use 1 unit when 1,000 watts of power has been expended for one hour, 500 watts for two hours, and so on.

To find the cost of running a mains set you must know two facts, one being the watts consumption of the set and the other the cost of a unit of electricity.

For example, a three-valver might take 50 watts and electricity might cost sixpence per unit. Divide 1,000 watt-hours by 50 watts and you get 20 hours as the length of time the set will run for sixpence. In other words 1,000 hours running cost 25/-.

THE HOW AND WHY OF TUNING—XXVIII

THE STRAIGHT LINES OF TUNING CONDENSERS

In this interesting instalment of the complete series on tuning, our contributor, "Hotspot", tells you the differences between straight-line-capacity, straight-line-wavelengths and straight-line-frequency tuning condensers

WHEN you turn the dial of a tuning condenser you alter the wavelength by altering the capacity of the tuning circuit, while the inductance of that circuit remains practically constant. Now according to the nature of the tuning condenser's law, that is according to the shape of the plates, and the relation between fixed and moving plates, the wavelengths corresponding to dial settings may be crowded at the lower end of the scale or evened out over the scale.

The important point to note is that the actual selectivity of a tuning circuit is not altered by changing the shape of the condenser plates, though as some plates can be shaped to give wider dial separation between stations of a given wavelength difference this mistake is often made.

Mechanically, it is true that one type of tuning condenser will give greater dial

represents a smaller difference in frequency than does a 20-metre wavelength difference at the lower end. For example, the frequency difference between 550 and 570 metres is 20,000 cycles, whereas the frequency difference between 200 and 220 metres is 136,000 cycles.

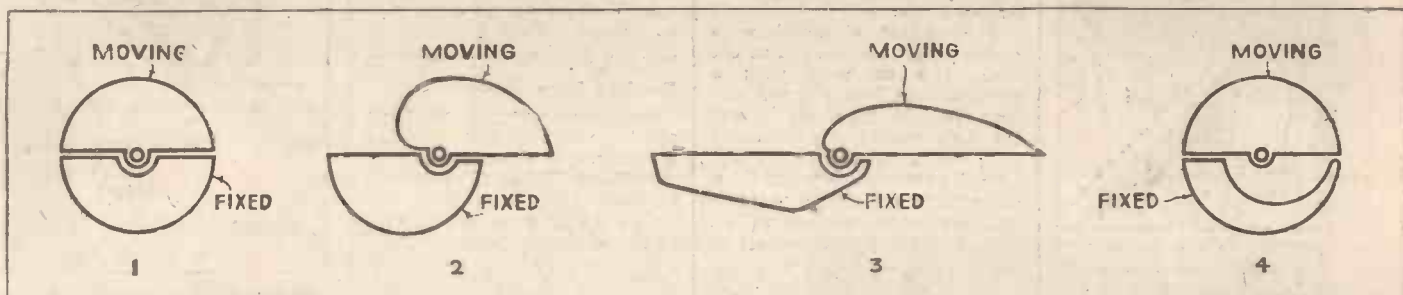
The importance of this fact is that to obtain absolutely equal dial spacing of stations separated by an equal frequency, in practice 9 kilocycles, we must use a tuning condenser that has plates so shaped that the dial reading is proportional to the frequency. In other words we need a straight-line-frequency condenser.

For various reasons this ideal type of tuning condenser, which was, curiously enough, developed some years ago, has not been greatly used. Instead, another straight-line law has been adopted, whereby the wavelength is proportional to the dial

inductance. The greater convenience of the straight-line-frequency type of condenser, with its equal spacing of the most important thing of all—stations—was abandoned, with regret, in order to take advantage of the ganging facilities of the log-law type.

But now that tuning coils are so accurately matched, being produced with a precision equal to that of tuning condensers, there is no particular point in keeping to square- and log-law condensers, and the tendency in the future will probably be a return to some form of straight-line-frequency condenser.

The simplest possible construction for a variable tuning condenser is the straight-line-capacity type, whereby, with semi-circular plates, a given difference in dial setting represents a constant difference in capacity, all round the dial.



These diagrams show the main differences in condenser-plate design. Fig. 1 shows the shape of plates used for a straight-line-capacity condenser. Fig. 2 shows straight-line-wavelength. Fig. 3 shows one form of straight-line-frequency plate construction. Fig. 4 is also straight-line-frequency, with the fixed plates cut away to restrict space

separation between two given stations than any other type of condenser, but the electrical selectivity, if I may use such a phrase, does not depend on how the tuning capacity is varied, but on how much it is varied. Not, that is to say, on whether 10 or 15 degrees change in dial reading are needed, but on how many microfarads capacity change are needed.

For logging stations we obviously want to aim at a change in tuning-dial settings that will provide us with well-spaced, if not equally spaced, points for all the stations wanted. Thus if we have a 0 to 100 degree dial and there are 100 stations in the wavelength band covered by the tuning circuit when the tuning condenser is varied from its minimum to its maximum capacity, we should like to be able to get one station for every degree on the scale.

The next point to bear in mind is that stations are not separated by a constant amount of wavelength, but by a constant frequency. On the basis of a 9-kilocycle separation in frequency there are 106 stations capable of being accommodated between the wavelength limits of 200 and 550 metres.

A difference of, say, 20 metres at the higher end of this wavelength band

setting—a straight-line-wavelength condenser, in fact.

Capacity and Wavelength

It happens that, with a fixed inductance, the wavelength of a tuning circuit is proportional to the square root of the capacity. So with the plates designed so that the capacity is proportional to the square of the dial setting it follows that the wavelength will be actually proportional to the dial setting.

The square law or straight-line-wavelength condenser would be quite useful, up to a point, if used to tune separate circuits, but not so useful in ganged tuning circuits, where the tuning-coil discrepancies would be made good by differences in the individual tuning-condenser capacities.

For this purpose, namely ganged tuning, still another type of condenser plate construction was worked out. This is called the log-law condenser and the feature is that for a given dial-setting change the percentage wavelength change is the same all round the dial.

This condenser was really developed for use with ganged tuning circuits in which the coils were not of exactly the same

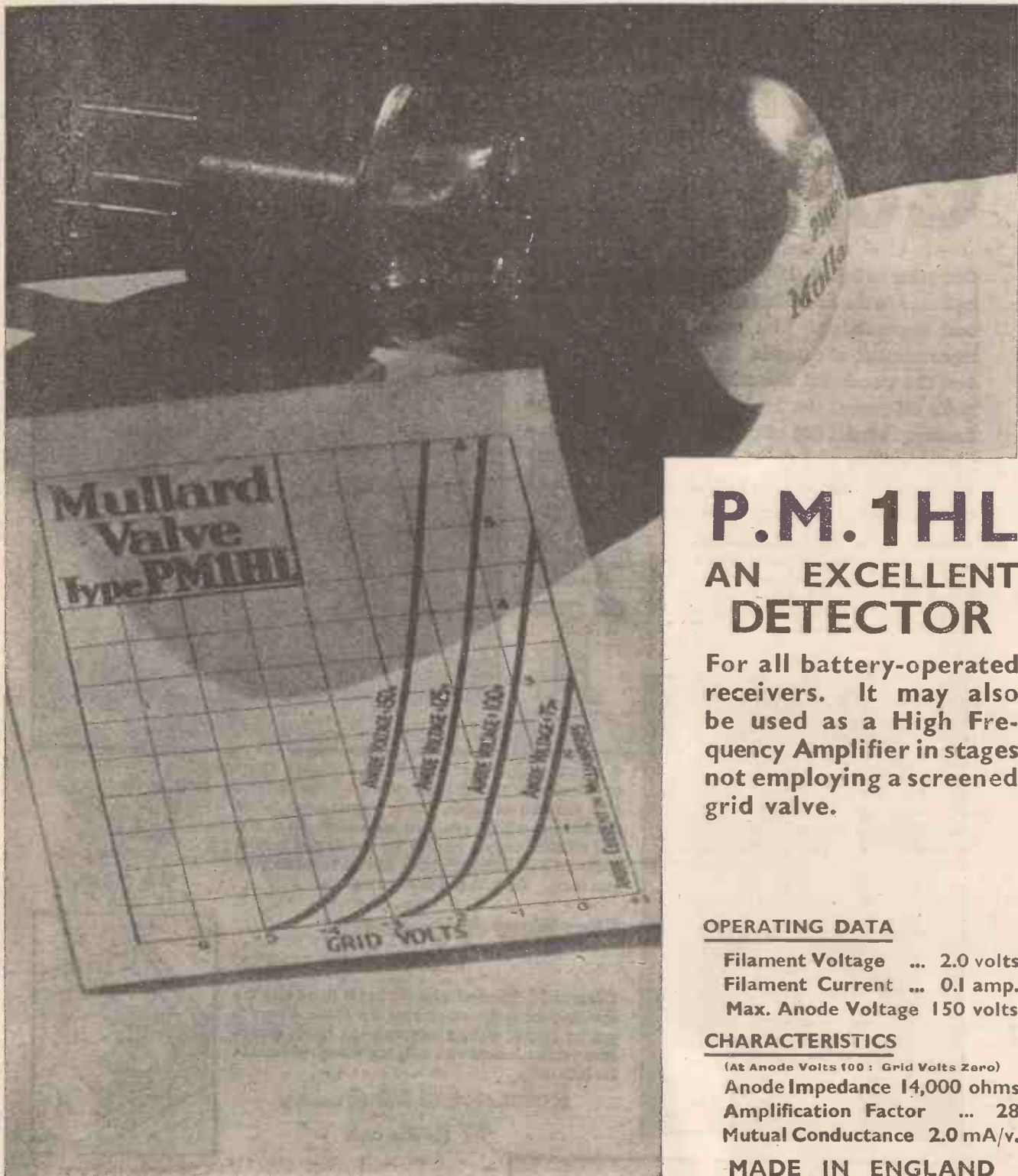
But, as we have seen, the wavelength is not proportional to the capacity, but to the square root of the capacity, which in practice means that stations separated by a given kilocycle frequency will be crowded at the bottom of the scale of a straight-line-capacity condenser, and very widely spaced at the top of the scale.

From a station-logging point of view the straight-line-capacity condenser is the worst, and the straight-line-frequency condenser the best.

Some idea of the relative shapes of the main types of tuning condenser discussed in this article may be gathered from the diagrams. Fig. 1 shows the straight-line-capacity condenser used for wireless sets in the early days. Fig. 2 shows a typical straight-line-wavelength condenser, and Fig. 3 shows one of the several possible forms of straight-line-frequency condenser.

This particular shape suffers the disadvantage of needing a large amount of space when the plates are fully extended, but this trouble can be overcome, to a large extent, by suitable shaping of the fixed plates, thus enabling a semi-circular shape of moving plates to be used, as at Fig. 4.

HOTSPOT.



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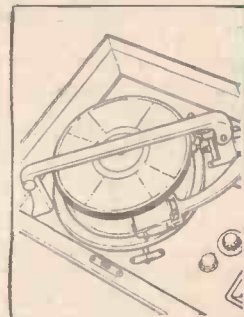
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Oh Your Wavelength!

WELCOME NEWS

EVERY wireless man, I suppose, is rejoicing over the glad news that there have been reductions in valve prices; and pretty useful reductions they are, too, when you come to think of it. All of the H.F., H.L., and detector types are down to 7s. in the 2-volt battery series, whilst small power valves are now 8s. 9d. and their big brothers 12s. Battery S.G.'s have dropped to 16s. 6d., and pentodes to 17s. 6d. Amongst mains valves the only reductions are those which concern screen-grids and pentodes, but these are very substantial. The S.G.'s have fallen from 22s. 6d. to 19s. and pentodes from 25s. to £1.

LET'S HOPE SO

MYSELF, I trust that the fall in valve prices will lead to the scrapping of ancient valves which, after good and faithful service, are now long past their best. I have quite a number of friends who have been putting up with reproduction that is not half as good as it should be simply because they could not bring themselves to consign to the dustbin valves which worked in some kind of way. The result has been reduced efficiency on the high-frequency side of the set and noticeable distortion on the low-frequency side. Valves are not yet exactly three a penny, but they are now so cheap that users will show much less compunction—at least, I hope so—about getting rid of old stagers. Take the average three-valve set consisting of screen-grid, detector, and a power valve in the last holder. The price of a complete outfit was until recently £2 2s. (20s. plus 8s. 6d. plus 13s. 6d.). Now it is £1 15s. 6d. (16s. 6d. plus 7s. plus 12s.), a reduction of 6s. 6d.—or very nearly the price of a G.P. valve. If we give valves on the average a life of eighteen months, this means just under two shillings a month or sixpence a week for valves, which really isn't extravagant.

OTHER COMPONENTS, TOO

OTHER wireless bits and pieces have also been considerably affected by the new order of things. You can now buy for 5s. 6d. a 60-volt British-made standard-capacity battery of good quality, though nothing of the kind was available under 7s. six months ago.

A MAINS HUM TIP

WHILE testing out a new A.C. receiver the other day a very persistent modulation hum was encountered. As is well known, this trouble is only apparent when the receiver is tuned to a station, the actual carrier wave being modulated at the hum frequency. Not any amount of extra smoothing has any effect

on this particular type of hum, and other methods have to be adopted for its elimination.

In the particular case under consideration the trouble was found to be due to the earth connection to the receiver, and could be cured in the usual way by connecting a condenser between one side of the supply mains and the chassis. It was found also, however, that the hum could be overcome in another rather interesting way. The aerial coil employed had an aerial winding entirely separate from the grid winding except for the usual earth link at the bottom end. It was found that if this link was broken and the bottom end of the aerial winding taken to an entirely separate earth, the whole trouble disappeared and at the same time mains noises were very much reduced.

AN OBSCURE CAUSE

UP to the moment, why this modification cured the trouble is rather obscure, but it seems possible that it is due to a difference in potential between the local earth and that provided by the mains through the incidental capacities of the receiver, and also to the impedance of the earth connection. In some cases it is not necessary to provide an earth on the chassis of the receiver other than that due to the mains and in this case the local earth can be connected to the aerial winding and the trouble cured without the provision of an extra condenser. This method, of course, requires that the aerial winding should be quite separate from the grid windings.

CONSTRUCTORS' CABINETS

THE man who makes his own wireless sets to-day is very fortunate in being able to obtain really good-looking cabinets at extraordinarily low prices. I have just been glancing through some old catalogues, and the prices prevailing five or six years ago would come as a revelation to those who have only recently taken up wireless as a hobby. I notice one cabinet—nothing very ambitious, either—advertised as late as 1927 at £4 5s. Nowadays you can buy a good-looking cabinet for a few shillings, or if you are a handy man you can purchase materials for making one for a remarkably small outlay. In the bad old days, when cabinets were worth their weight in silver, I often used to make mine from veneered plywood; and they didn't look half bad, either. I remember once making for a five-valve set a cabinet which cost me altogether about half a crown. Nowadays, though, there is really little need to take the trouble to make one's own cabinets, unless woodworking is one's hobby, since attractively designed and well-made cabinets are offered at such reasonable prices.

LOUD-SPEAKER DEVELOPMENTS

TIME was when the moving-coil loud-speaker was beyond the reach of any save those who possessed well-lined purses. Early types, too, all required an energising current which had to be derived from electric mains or from batteries. I am very much impressed with certain of the reasonably priced permanent-magnet moving-coil speakers that have recently appeared on the market. The great advantage of the permanent-magnet system is, of course, that the loud-speaker costs nothing at all to run, since no energising current is required. By careful design, such a loud-speaker can be made capable of handling a very large input—quite as much, in fact, as is likely to be required even in a house with rooms much above the average size. Another good point is that some of these speakers are sold complete with matching transformer, which gives them a proper chance of doing themselves justice. I am using one at present of which the cost was just about a quarter that of my big moving-coil speaker, and I must say that I am delighted with its performances. It is sensitive and it is true. Some of the older moving-coil speakers had pronounced bass resonances and not a few of them would not work satisfactorily unless the volume was bigger than I care about in the ordinary way. These small loud-speakers will handle both moderate and large volume equally well.

WORTH-WHILE FUSES

IFELL into a nasty trap the other day which I think is worth recounting. The trap itself is one which I feel few people would have foreseen. For the consequences I have only myself to blame. I burnt out a valve entirely due to the fact I was too careless to insert my customary fuse in the H.T. negative lead. It is really quite extraordinary how this fuse will pay for itself over and over again in experimental work, and, as a general rule, I never hook up a circuit without a fuse in the H.T. lead.

However, to revert to the snag in question, I was experimenting with a set on a metal chassis. The valves were inserted into sockets in a bakelite strip running along the back of the set, so that the valve sockets were practically flush with the aluminium chassis. There was some fault in the receiver, and I was only using part of it at the time. Having got this portion to my satisfaction, I thought I would insert another valve and try and bring a further stage into operation. I carelessly picked up a valve and proceeded to insert it in its socket, when I heard a little click in the loud-speaker and I saw an ominous blue spark at one of the valve pins.

On Your Wavelength! (continued)

A CURIOUS SLIP

WHEN I looked into the matter I found that I had not even inserted the valve in its socket. In some way I had managed to burn the valve out without even getting it into its socket. Of course, I immediately tested the valve, but there was no doubt about it—the filament had been completely burnt out, indicating that I had connected the valve across the H.T. in some way. I thought at first that I had managed to get the filament pins across the filament and anode sockets, but I found that this was not the case, and that in any case it was impossible to do this, owing to the spacing of the pins.

It was not for several minutes that I realised the real cause of the trouble. The aluminium chassis, was, of course, at earth potential, and I must have inadvertently inserted one of the filament pins into the anode socket of the valve-holder, and allowed the other filament pin to touch the metal chassis. This would immediately place the H.T. supply across the filament and result in a burn out. A little experiment showed that the clearance between the side of the valve holder and the chassis was considerably less than the distance between the filament pins, so that this fault was quite a feasible one, and I came to the reluctant conclusion that this was what had happened.

THE WORLD'S 'PHONE EXCHANGE

THE telephone service to South Africa via beam wireless was opened a week or two ago, and I see in my paper to-day that you can now telephone to Honolulu if you feel like spending £3 a minute in doing so. Before the end of this year India will be within reach of our telephones, and that pretty well links up not only the British Empire, but the greater part of the world. You can lift off the receiver in your own home now and put a call through to any country in Europe, Australia, New Zealand, Africa, and almost any part of America. For this marvellous world network we have the wireless valve to thank. But for that invention nothing of the kind could ever have taken place. We ought to be proud of the initiative shown by our country in the matter of world communications. No other nation has played anything like the part that we have, and the result is that to-day London is the world's telephone exchange.

ANOTHER NEW VALVE?

THE detector valve seems so far to have escaped the changes which have overtaken its H.F. and L.F. cousins. For instance the screen-grid and variable- μ types have been evolved for high-frequency working, whilst there is the pentode on the output side, but the good old three-electrode detector still carries on in solitary state. Of course

there are a few who swear by the diode, and some others who still remain faithful to the crystal, but for most of us the choice lies not so much in the type of valve as in the kind of circuit, that is, whether to use grid-leak or anode-bend rectification, not forgetting the power-grid system which lies somewhere betwixt and between. Each method has its own particular advantages, according to whether one places sensitivity or quality first on the list. It occurs to me that there is room for a new type of valve, specially constructed to give high-grade detection, irrespective of the particular kind of circuit associated with it.

NOT SO SIMPLE

NO doubt it would be a pretty tough problem, but that does not necessarily mean to say it could not be solved. Compared with multi-grid valves, like the S.G. and pentode, the three-electrode detector may appear relatively simple in operation, but, believe me, this is not so. It must be sixteen years now since I first ran into the theory of the grid-leak, and I still treat it with considerable respect, although in those days we did not bother much about percentage modulation or second harmonics.

Strangely enough, none of the rectifiers seem to be very elementary in action. I mean so far as the underlying theory is concerned—not even the "simple" crystal to say nothing of the dry-contact type used in eliminator circuits. Even to-day, in spite of all that has been written on the subject, the precise "inner workings" of H.F. rectification are still largely a matter of speculation.

SELECTING WAVELENGTHS

THE selection of wavelengths for a short-wave station is not at all an easy business, owing to the queer little ways of wavelets. At one time

MAINS UNIT MOUNTING

A mains unit mounted close to a speaker in a console type set may cause interaction and hum when in one direction, although when stood on its side this may not be so noticeable as the



positions of the smoothing chokes and power transformer are altered. In the set shown the unit is stood upright so that there is no interaction with the windings of the speaker.

of the day it may be found that by far the best results are obtained on, say, 30 metres, whilst a little later this wavelength becomes useless, and another must be found. Though there is room for literally hundreds of transmissions to take place simultaneously on the band between 15 and 60 metres, the trouble is that any station aiming at a twenty-four hours efficient service may require quite a number of alternative wavelengths all to itself. Another point is that atmospheric interference may be perfectly poisonous on one band of short wavelengths, but absent, or very nearly so, on another. It is curious to notice how the distance-spanning powers of certain stations seem to vary from year to year. Old readers may remember that in 1925 and 1926 we used to obtain terrific volume at night-time from KDKA, operating on about 62 metres, and heard not very much of certain other stations. A little later the 62-metre wavelength went from good to poor, from poor to bad, and from bad to worse. Simultaneously, W2XAF, working on round about 32 metres, leapt into prominence as a magnificent transmission. For the last two or three years most of us have obtained the best short-wave results on wavelengths between 20 and 50 metres, but now there are signs that transmissions using rather higher wavelengths may be best worth searching for.

WHAT'S A VACUUM?

IT was that famous schoolboy Smith Minor who defined a vacuum as something full of emptiness. Others, though, labour under the delusion that what we are pleased to call a vacuum within, say, the glass bulb of a valve means that every trace of air or of other gases has been removed. I have just come across the statement that in a vessel which has been pumped "dry" a vacuum means a complete absence of everything but ether. If you were to produce, by means of highly efficient pumping, a vacuum equal to one ten-millionth part of an atmosphere, there would be a good deal besides ether left within a bulb so treated. A cubic millimetre is something pretty small: it is just about the size of the average pin's head. At an ordinary atmospheric pressure a cubic millimetre of air contains the number of molecules represented by the figure 4 followed by sixteen noughts. Pump until you reduce the pressure to one ten-millionth of an atmosphere, and you knock off seven of these noughts. You are still left, in other words, with four thousand million molecules of gas in every single cubic millimetre within the bulb. This figure is just about equal to the human population of the world. Imagine the earth reduced to the size of a pin's head and you have some idea of the degree of emptiness which exists in what we are pleased to call a high vacuum.

THERMION.

"A.W." READERS' TELEVISION TRANSMISSION

AN ARTICLE OF SPECIAL INTEREST TO TELEVISION ENTHUSIASTS



Two "A.W." Readers are getting very good results with their home-made television transmitter, operating on the normal rotating disc principle. Their gear is described in this article by a correspondent.

MANY amateurs in the country are, of course, getting good results in television reception of the transmissions given regularly by the B.B.C. and by a number of foreign stations. Some are using commercial apparatus and others have made up their own amplifier, optical system and rotating disc.

It has been left to two enthusiastic London readers of "A.W.", though, to go a step further and make up a successful television transmitter.

I have just seen their apparatus working, and faces and simple subjects such as clocks, newspaper bills and cartoons have been successfully televised from one part of the house to another.

The transmission is by wire, of course, and not by wireless. The home-built transmitter in one room is connected by two lengths of flex with a receiver in a room on another storey about 50 ft. away. A stand-

ard method of synchronising has been adopted and the apparatus could be adapted with practically no modification to wireless transmission. All the mechanical and optical difficulties associated with the actual television side of the gear have been overcome.

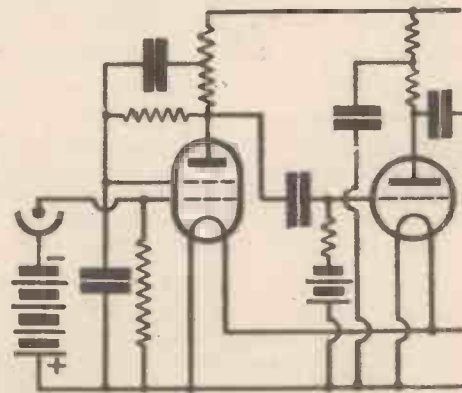
Considering the good results, the simplicity of the gear, and its low cost are surprising. The subject to be televised is illuminated by a 500-watt projection lamp in a modified photographic-slide lamp housing. There is a reflector at the back and a condenser in front to make the most of the light. The lamp has a life of only a hundred hours or so!

Intercepting the beam is the scanning disc rotated by a small motor driven from A.C. mains. The scanning disc is a standard 30-hole job, causing a pencil of light to scan the whole subject.

I must emphasise the fact that the

successful results have been obtained with a relatively inexpensive vacuum-type Tungfram photo cell, and not with one of the costly gas-filled cells.

The photo cell is housed in a box with

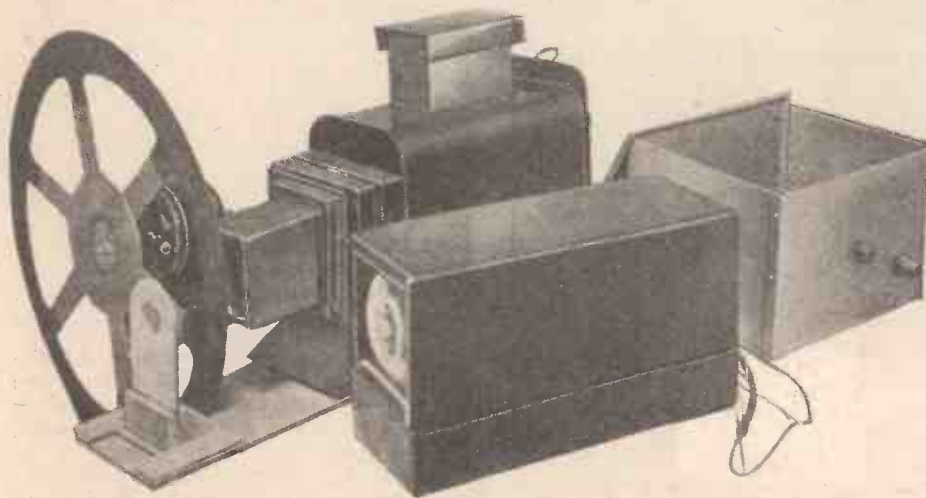


The circuit of the first two stages immediately following the photo cell. Screen-grid amplification is used in the first stage

a lense front and the two first stages of the photo cell amplifier are right at the back of it, so that the leads are very short. The amplifier box is stood about 18 in. away from the subject being televised. The photo cell amplifier has a screen-grid valve in the first stage and the whole box is metal lined to prevent the slightest electrical interference with the photo cell.

The cell is mounted in an ordinary valve holder, in a metal lined compartment, and the screen grid valve is connected to it by leads only a couple of inches or so in length. The first two valves are separately biased to cut down inter-stage interference and separate dry batteries are mounted in clips in the metal compartments. The voltage on the photo cell can be varied until the best results are obtained.

(Continued at foot of next page)



The scanning disc and motor, photo cell amplifier boxes and optical arrangements can be seen in this view of the transmitter

More About the "Mascot" Coils

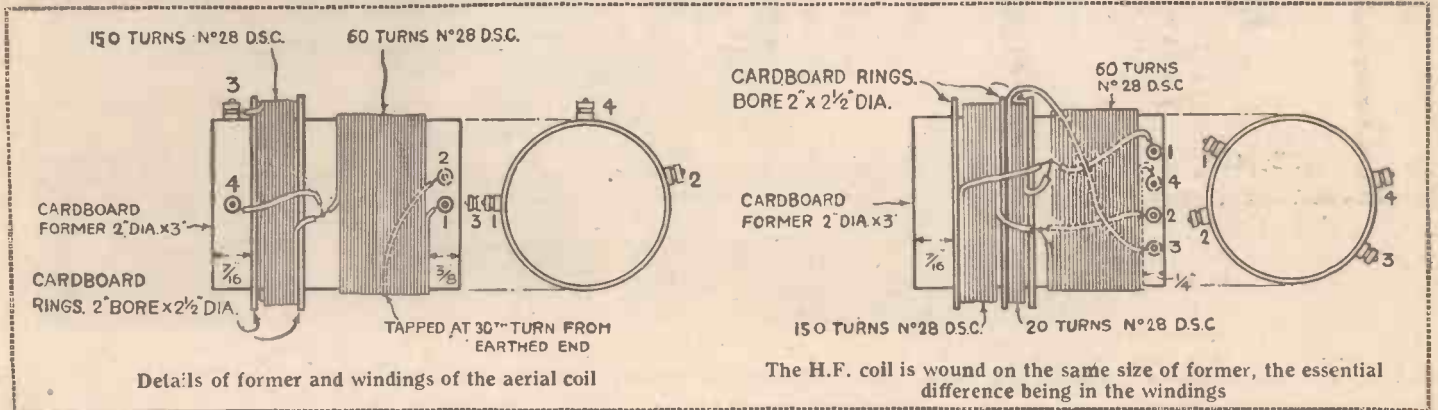
LAST week I gave full particulars about how to wind the "Mascot" coils, using the simple cardboard or paxolin tubes. The fact that the coils are wound on such tubes has led some readers to wonder whether this kind of former is essential and whether the popular ribbed ebonite formers are adaptable.

Cardboard or paxolin tubes were used in

shown in the diagrams which I gave. It is necessary to emphasise the importance of choosing the correct diameter, for the projecting ribs make the overall diameter of the coil considerably more than that of the circular portion of the former. In choosing such a former, then, see that the diameter of the finished winding is the same as that of the paxolin tube.

dispensing with the necessity of using rings.

Tuning coils of different types vary considerably in the matter of reaction turns, according to the way in which the set is designed. The reaction winding on the "Mascot" coil has been very carefully worked out in conjunction with the set itself, and any variation may cause the set to lose its great virtue of particularly smooth reaction. For this reason failure may attend the attempt to use tuning coils



the model illustrated as they are cheap, easy to wind, and require no special preparation. The coils so made are efficient and neat, and the fact that the surface is perfectly smooth makes neat coil-winding simple. At the same time, the ebonite formers are just as satisfactory, and when the correct diameter is chosen, the number of turns used is the same. These details are

Commercial Coils

Good examples of perfectly satisfactory "Mascot" coils are those made by Messrs. R.I., Wearite, Goltone, Peto-Scott, Tune-well, Sovereign and Read-Rad, illustrated on page 562 of the March 12 issue. It will be noticed that by cutting away some of the ribs suitable slots are made, thus

designed for use in another receiver.

PERCY W. HARRIS.

Marcel Laporte, the original *Radiolo* and first announcer of Radio Paris who, for some time, has been acting in this capacity at Juan-les-Pins, has now been specially engaged to fulfil these duties at the new Poste Parisien high-power station.

"A.W." READERS' TELEVISION TRANSMISSION "

(Continued from preceding page)

Following these first two stages of the photo cell amplifier are five stages of amplification in a metal box. A volume control (potentiometer type) is provided to prevent overloading, and the motor-

boating which, rather naturally, starts up when all the stages of amplification are going "all out."

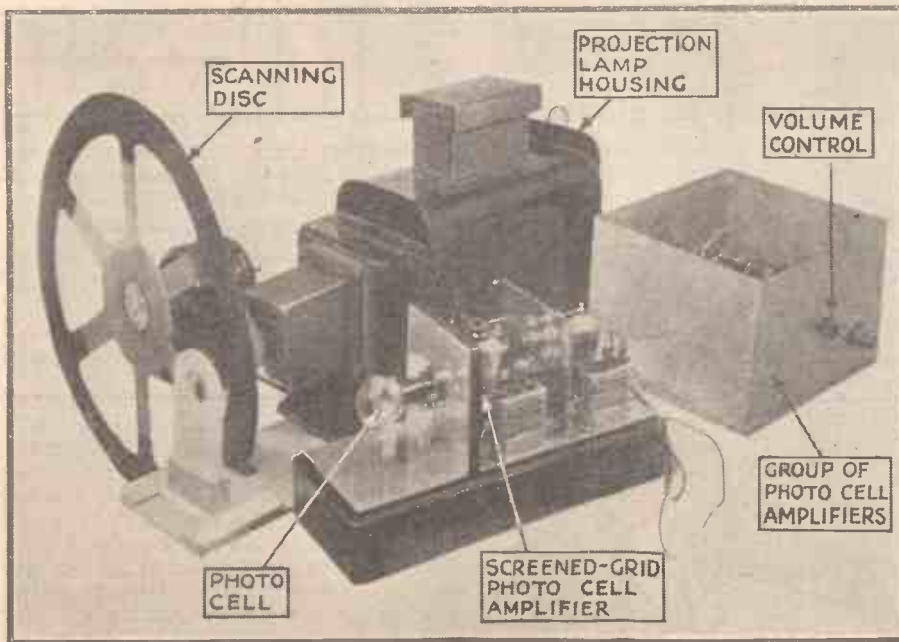
In increasing or decreasing the stages of amplification, two valves must be switched in or cut out at a time, for otherwise a negative image is obtained. The high-tension for the photo-cell amplifier is obtained from an ordinary commercial

H.T. arrangement, using a valve rectifier, and no special precautions have been taken to ensure a smooth H.T. current flow.

The little transmitter is entirely automatic in working. The illuminating bulb is switched on and the scanning disc started up. The photo-cell amplifier is then switched on and the operator, listening on phones, waits for the steady ripple of the television signal. Phones are always worn during a transmission as the sound of the television note is a useful guide to the quality of results and saves a lot of signalling between the transmitter and the receiver.

With the present gear, faces are quite recognisable and the time can easily be read on a clock face held up in front of the scanning beam.

The two readers, Messrs. E. J. & J. W. Holmes, who have built the gear, did not at first realise that it could be used for reflected light television transmission, and their first experiments were with lantern slides. As they improve their apparatus, they hope to increase the scanning area, and later, perhaps, to have a wireless link between the transmitter and the receiver.



This lettered photograph gives a good idea of the home-built amateur television transmitter

Radio Maroc (Rabat) has raised the power of its broadcasts to 6 kilowatts (aerial); transmissions are made daily between 12.30 and 2 p.m.; 4-5 and again from 8 p.m. to 11.30 or midnight. On Sundays these concerts are relayed during the day on 23.39 metres and at night on 32.26 metres.

Our Broadcast-Britic

TALKS ABOUT

MALE VOICES



HENRY HALL,
Director of the B.B.C. Dance Orchestra

WITHOUT the least intention of being ungallant I must say I think male voices are a much greater success on the wireless than female voices.

I never thought so more than during the broadcast of the twenty-first anniversary concert of the Holme Valley Male Voice Choir, which came through from the Town Hall in Huddersfield.

There is something in the quality of men's voices that seems to suit the microphone. Now that this particular choir has come of age I hope the B.B.C. will arrange for us to hear more of it.

The programme was very well chosen. Stanley Pope's singing of Stanford's ever-popular *Songs of the Sea* was a good beginning. Also, I liked Holst's *Choral Hymns*, but the most attractive of the three items was Percy Fletcher's charming suite called *Cupid's Garland*, dedicated to the conductor and choir.

I should like to ask for a repeat of this delightful work which must have appealed to thousands of listeners. Ida Boothroyd sang delightfully; she is certainly a soprano who might well be heard again.

Before leaving this, a very attractive concert, I should like to record my keen appreciation of the singing of the tenor, Hubert Marshall. There was none of the usual tenor whimpering; his tone was manly and broad. Good English singing!

I listened with interest to *His Majesty Proclaims*, which had, I thought, some quite big moments. To my way of thinking, the whole production was spoilt by the music. Not, I hasten to add, that it was bad music; on the other hand, it was very pleasant music.

This play had a touch of the *Prisoner of Zenda* about it; I cannot think that it was improved by sudden stoppages in the action for someone to sing a song. It wanted no songs. Surely, it is not good dramatically to turn quite good situations into something approaching a farce merely for the sake of music?

Stainless Stephen excelled himself last

week. He is a comedian who obviously takes some trouble over his work; not all of them seem to do that. Many of his witticisms were extremely clever; also, his style is always eminently suitable to the microphone. He keeps to the matter in hand—that of entertaining listeners; he goes on solidly with his work, only pausing when the studio audience will not allow him to proceed. Congratulations, O Spotless One! Your best broadcast!

My thrill this week came on Sunday afternoon—*Othello*. Henry Ainley was even finer than I thought he could be, which is saying something; I am an admirer of his English. Other outstanding people in it were Peggy Ashcroft as Desdemona, John Gielgud as the villainous Iago, and Leslie French who played Roderigo in a way I have never heard the part played before. May I add a word of congratulation to the producer, Val Gielgud, and to F. A. Harding for his sensible cutting of the work?

Apart from the pleasure of *Othello* as a drama, I am all in favour of Shakespeare for Sunday afternoons.

Elizabeth Schumann's Bach singing on Wednesday night was something to remember. I wonder how many AMATEUR WIRELESS readers heard her? If they missed this they missed a fine voice and some wonderful melodies. (Perhaps I had better leave it at that!)

Did you hear *Faust* in English from Manchester? I think the fact that it was in English must have simplified it a great deal for the average listener. It was a good broadcast with some very dramatic moments.

I heard two piano recitals this week, one by Fanny Davies and the other by Gertrude Peppercorn. Miss Davies played Schumann only. I thought the *Nachtsluck* a trifle on the quick side.

A word to Miss Peppercorn. Scarlatti is not too good for wireless purposes. Both those sonatas sounded rather tinny. Playing without the pedal is no good for broadcasting. Also, though I enjoyed your Debussy, next time will you play *Gardens in the Rain* a little quicker? Debussy did!

The tenth train conversation was quite

up to the high standard these features have evinced thus far. Our Bill was easily recognisable. I do like his expression, "My wife didn't half create at me." His dialect is certainly the right stuff. I listened to Ashley Sterne again. He was very amusing; he generally is. All the same, I think we want some serious reviews. It is all very well to say "not a serious review" and then to give more or less a vaudeville turn; that is not good criticism. What I feel we need is something really constructive. If the critics are to do anything for the B.B.C. it will be only when they have sound ideas of a constructive nature to offer. *Where are our real critics?*

Confessional is the sort of intimate play that is eminently suitable for broadcasting. It held me right to the end which, however, I found to be rather sudden. In fact, I thought for a moment or two that something had gone wrong in the studio. I was quite relieved to hear the announcer's voice again.

And now for Henry Hall.

The first thing that struck me was that the band is well-balanced; I think, as time goes on, when we have had time to become familiar with it, we shall appreciate it from that point of view, besides becoming sensitive to its excellent rhythm.

My second impression was that there is a distinct air of refinement about the actual tone of the instruments. I think many dance-bands have become racketty, so to speak; I noticed an absence of that unwanted quality.

The singer disappointed me a little. Putting my thoughts to him directly, I should like to say this: I beg you to avoid too much *mezzo-voce* tone. Dance-band singers of less ability than yourself have given us all the adenoidal explosions we require. May I suggest that you stand a foot further from the microphone and let out your best tone. Your diction is first-rate; let us have all your tone with it.

I am writing this during the actual broadcast; my final impression is a happy one. I honestly think Henry Hall will lift up the standard of dance music. I wish him good luck.

WHITAKER-WILSON.

It is reported from Belgrade that authority has now been obtained for the erection of a 6-kilowatt transmitter to replace the small Rodno Radio station now operating on 430 metres.

THE Harris "Mascot" is so simple to build and operate that there is little more to be said regarding the manipulation of the receiver for normal use. Indeed, by this time you will have found for yourself that the claims made in the first two articles are by no means exaggerated. The quality, in particular, will make a wide appeal, this quality being due, as explained previously, mainly to the special audio-frequency stability obtained by careful attention to layout and the use of the earth shield, which is a special feature of this receiver.

Using a Pick-up

Stability, quality, and gain all being high, a number of readers have asked me if it is possible to make provision for a gramophone pick-up without introducing undue complications. This is not only possible, but extremely simple, for this point was borne in mind in the layout, although not actually introduced in the design already published. In that, the maximum simplicity was aimed at, as not all readers are desirous of using a pick-up.

However, for the benefit of those who wish to do so—and I can tell you that they will be very pleased indeed with the results—it is only necessary to obtain a plug and double-circuit jack (Lotus JK2 is used in my own "Mascot") and to drill just one hole in the panel.

If you will examine the layout and wiring diagram on page 594 of last week's issue, you will see that, looking at the set from the rear, there is an appreciable space to the right of the low-tension switch between that and the second tuning condenser. A hole should be drilled on the right-hand side of this switch (on the left looking from the front), and the jack inserted in the usual



PERCY HARRIS AS RADIO-GRAM

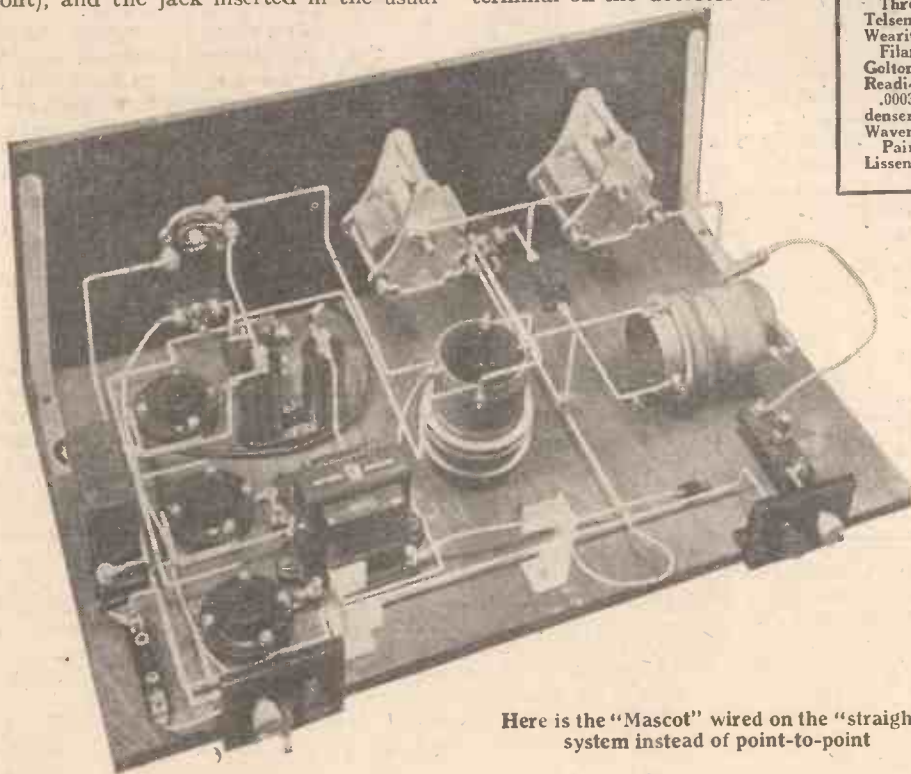
Full construction
in the two p
details togeth

THE MODERN

manner. The jack has three soldering terminals, which we will call Nos. 1, 2 and 3, starting from the top. This jack is so arranged that when no plug is inserted, contacts 1 and 2 are together. The only changes in the wiring are to disconnect lead No. 19 from the grid condenser, to the grid terminal on the detector valve

THE COMPONENTS THAT YOU WILL

- Cabinet, (Peto-Scott).
- Ebonite panel 18 in. by 7 in. (Peto-Scott, Lissen, Becol, Trelleborg, Readi-Rad, Potter).
- Baseboard, 18 in. by 10 in. (Peto-Scott, Readi-Rad, Camco).
- Two .0005-mfd. variable condensers (Lissen, Telsen, Lotus, J.B., Polar, Utility, Readi-Rad, Goltone, Wavemaster, Formo).
- Two slow-motion dials (Lissen, Telsen, Lotus, Goltone, Polar, Utility, Formo).
- Three-point shorting switch (Bulgin, Telsen, Goltone, Lissen, Sovereign, Wearite, Readi-Rad, Tunewell).
- Filament switch (Bulgin, Telsen, Goltone, Lissen, Sovereign, Wearite, Readi-Rad, Tunewell).
- .0003-mfd. differential reaction condenser (Telsen, Lotus, Polar, Utility, Wavemaster, Goltone, Readi-Rad).
- Pair of panel brackets (Bulgin, Lissen, Camco).
- Pair of dual-range coils (Readi-Rad, Peto-Scott, R.I., Sovereign, Goltone, Tunewell, Wearite).
- Three valve-holders (Junit, Peto-Scott, Telsen, Lissen, Lotus, W.B., Wearite, Goltone, Igranic, Benjamin, Clix).
- .0003-mfd. fixed condenser, with series clip (Dubilier type 610, T.C.C., Lissen, Sovereign, Telsen, Formo, Graham-Farish).
- .006-mfd. fixed condenser (Dubilier type 670, T.C.C., Lissen, Graham-Farish).
- .01-mfd. fixed condenser (Dubilier type 670, T.C.C., Telsen, Lissen, Graham-Farish).
- 2-mfd. fixed condenser (Telsen, Lissen, T.C.C., Dubilier, Formo, Ferranti).
- 1-megohm grid leak (Lissen, Telsen, Dubilier, Graham-Farish, Sovereign).
- 2-megohm grid leak (Lissen, Telsen, Dubilier, Graham-Farish, Sovereign).



Here is the "Mascot" wired on the "straight" system instead of point-to-point

holder and to make a new lead which goes from the grid condenser to terminal No. 2, and another lead which goes from the grid terminal of the valve holder to terminal No. 1. Terminal No. 3 is now connected to grid bias negative.

Automatic Switching

If you now examine the theoretical diagram you will see what happens. The pick-up is connected to the plug and when it is desired to use the "Mascot" for the reproduction of gramophone records, all that is necessary is to push the plug into the jack. When this is done one lead of the pick-up is connected to terminal No. 1 and the other to terminal No. 3. The mere

ADDITIONAL COMPONENTS REQUIRED FOR RADIO-GRAMPHONE MODEL

- Cabinet (Vibranti Products).
- Jack (Lotus J.K.3, Igranic).
- Pick-up (Varley, H.M.V., B.T.H., Limit).
- Motor, clockwork type (Garrard).



This circ

CRIS'S "MASCOT"

A

GRAMOPHONE

Additional details of the "Mascot" were given in preceding issues. Here are some further details with instructions for using it as a radio-gramophone

SET REDUCED IN COST AND SIMPLIFIED

REQUIRE TO BUILD THE "MASCOT"

Grid-leak holder (Wearite, Read-Rad, Bulgin, Lissen, Telsen, Dubilier).

High-frequency choke (Climax, Lissen, Telsen, Lotus, Bulgin, Goltone, Varley, Igranic, Peto-Scott, Tuncwell, Read-Rad, Sovereign, R.I.).

Low-frequency transformer (R.I. "Dux," Lissen, Telsen, Lotus, Ferranti, Goltone, Igranic, Lewcor, Varley, Sovereign).

Pre-set series aerial condenser (Sovereign, Formo, type J, Lissen, Telsen, Goltone, Polar, R.I.).

100 M/a fuse and holder (Microfuse, Bulgin, Belling-Lee).

50,000- and 100,000-ohm spaghetti resistances (Sovereign, Lewcos, Lissen, Telsen, Varley, Bulgin, Tuncwell, Goltone, Graham-Farish).

Two terminal blocks (Unit, Sovereign, Belling-Lee).

Four terminals marked Aerial, Earth, L.S.+, L.S.— (Bulgin).

Pair of grid-bias battery clips (Bulgin, Gripso).

Connecting wire (Glazite).

Four yards thin flex (Lewcoflex).

Five wander plugs, marked G.B.+, G.B.—1, G.B.—2, H.T.+, H.T.— (Clix, "Master," Belling-Lee, Ealex).

Two spade terminals, marked L.T.+, L.T.— (Clix, Belling-Lee, Ealex).

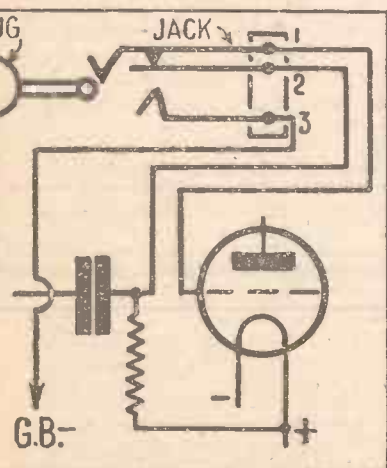
Crocodile clip (Bulgin).

Piece of aluminium foil, approximately 8 in. square (any ironmonger).

120-volt H.T. battery, 9-volt G.B. battery (Lissen, Pertrix, Drydex, C.A.V., Fuller, Ever-Ready, Oldham).

Accumulator (Lissen, Pertrix, C.A.V., Oldham, Fuller, Ever-Ready).

Loud-speaker (Epoch type C17, H.M.V., W.B., Blue Spot, Celestion, Lissen, Reproducers, Lanchester).



The diagram shows the modification of the circuit diagram for attaching a pick-up

insertion of the plug in the jack separates terminals Nos. 1 and 2, thereby disconnecting the grid condenser and leak from the grid and substituting for it one lead of the pick-up. As terminal No. 3 of the jack is connected to grid bias negative, we now see the pick-up is connected in effect between the grid and filament of the detector valve, the grid condenser and leak being entirely disconnected. If

you like, of course, you can insert in series with the pick-up a separate battery to give a slight negative bias to this valve, but generally you will find the set will operate quite well with the existing grid bias battery.

On withdrawing the plug, contact No. 1 immediately and automatically comes into contact with No. 2, thus restoring the connection to the grid condenser and leak.

Terminal No. 3 which is connected to grid bias negative is, of course, left quite free and unconnected to anything.

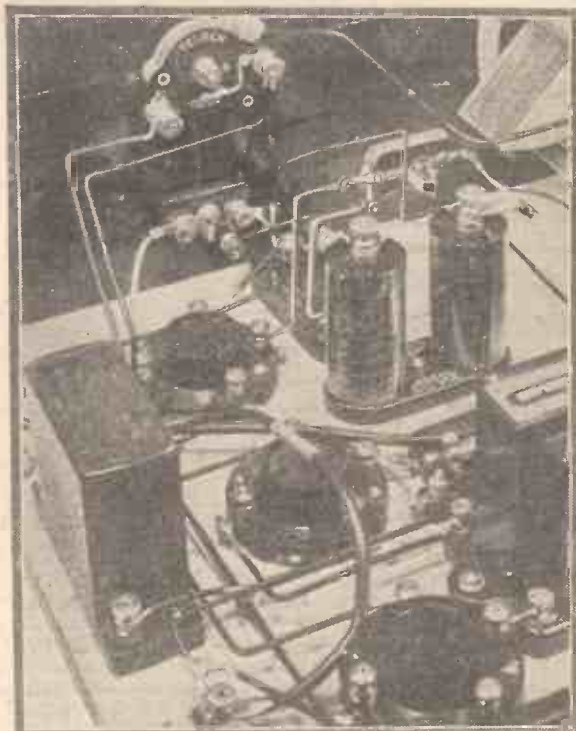
Applicable to Other Sets

The particular scheme of joining a pick-up to a jack and connecting the jack as in the "Mascot" receiver can easily be applied to any other set using a grid-leak detector, with either the leak across the condenser or straight to L.T.+, as in the "Mascot." Simply disconnect the lead from the condenser to the grid terminal of the valve, making sure that the end of the grid leak normally connected to the grid is also disconnected from the valve. The substitute leads will then be as in the "Mascot," but, of course, the lead from terminal No. 3 will be taken to the nearest convenient grid bias negative point.

Volume Control

Any good high-grade pick-up can be used, and the volume control should be joined in the usual fashion across the pick-up at the turntable end. You can then control the volume to a nicety immediately you start the record without dodging back to the set, if it is not conveniently placed.

Best of all, of course, is to fit the



The actual alterations to the set for the inclusion of a pick-up are indicated in this photograph

"Mascot" into a complete radiogram cabinet, such as the Vibranti Products which is illustrated, and into which the set will fit.

Use of Mains Unit with the "Mascot"

In view of the great audio stability of the "Mascot," no trouble whatever will be found in using it with any well-known mains unit, either ready made or home constructed. Provision is made as you will

"PERCY HARRIS'S 'MASCOT' AS A RADIO-GRAMOPHONE" (Contd. from preceding page)

notice, for a 9-volt grid-bias battery, but, if you have a mains unit with plenty of high tension, there is no reason why you should not use a super-power output valve, which will require a heavier grid bias. The advantage of being able to use a super-power valve is not that you will get any greater amplification, but with it you will be able to handle a much louder signal without distortion. This comes in very useful if you wish to use the "Mascot" for reproducing programmes before quite a large audience.

A FULL-SIZE BLUEPRINT OF THE HARRIS "MASCOT" IS AVAILABLE, PRICE 1/-

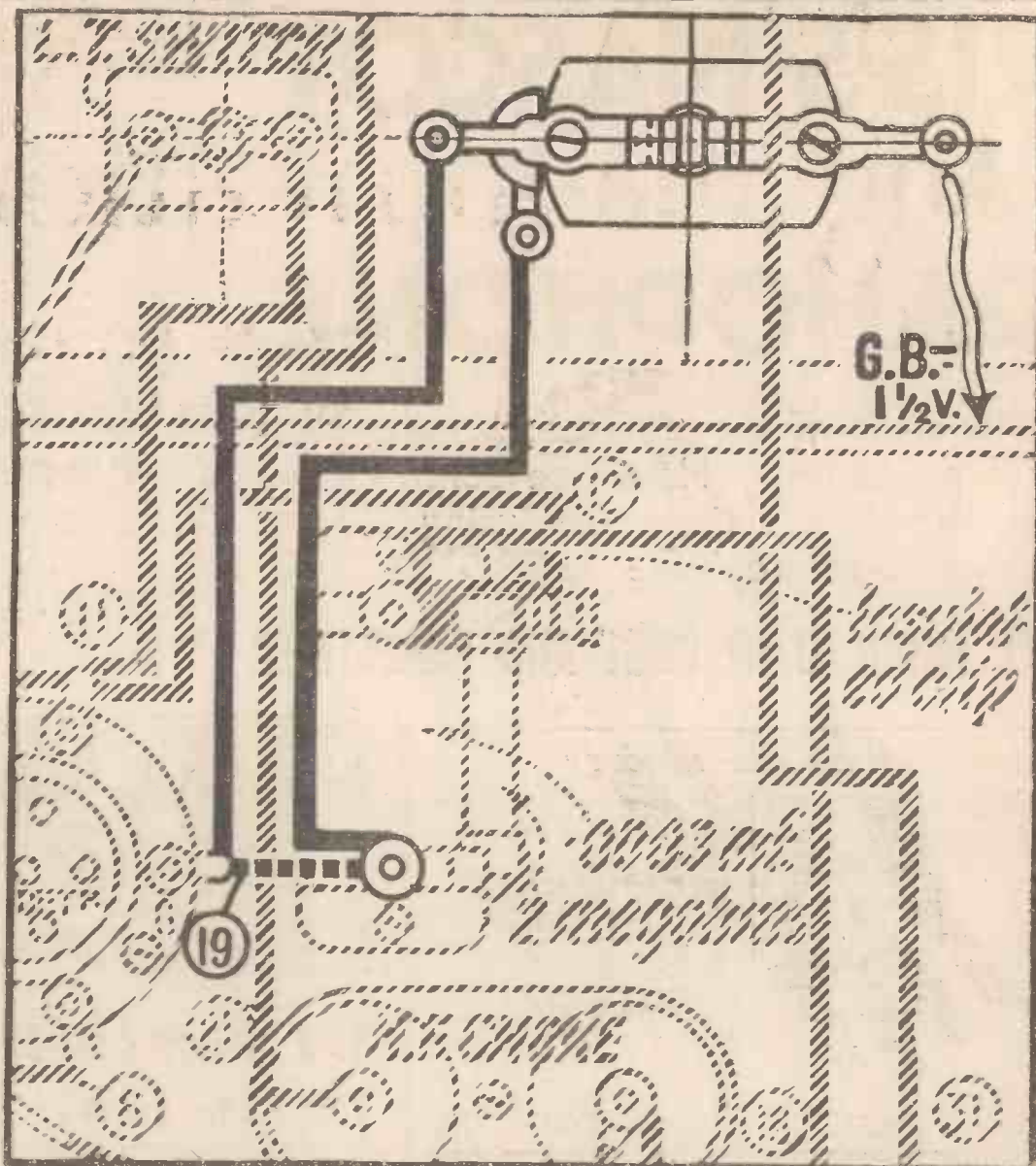
Good super-power valves in those cases where adequate high-tension supply is available from a mains unit are Mullard PM202, Marconi and Osram P2, Mazda P240, Cossor 230XP, Six-Sixty 230SP, Lissen PX240, Dario SP, Eta BY602, Fotos BD5, Triotron SD2, Tungstram SP230.

OUR LISTENING POST by Jay Coote

HAVE you heard the fresh tests made by Radio Florence on 500.8 metres? You may recall that during the winter the aerial masts of this station crashed to the ground during a severe snowstorm. New masts have now been erected; they are over three hundred feet high and the transmitter is gradually increasing its power to its full 20 kilowatts. Florence is linked up with the Northern Italian group of stations, and will S.B. with Milan, Genoa, Turin, and Trieste. Within the next few weeks Bolzano will also be included in this network. The call remains: "Radio Nord Italia."

The Bari transmitter, situated at Cegli del Campo, a station of the same power, is rapidly nearing completion and should be ready for its first broadcasts towards the end of April. The wavelength to be used will be in the region of 280 metres, unless Italy decides to jump another claim. Although possessing its own local studio, Bari will rely on Rome and Naples for the major portion of its programmes.

During the past fortnight reception of Continental transmissions, although easily achieved, has not always proved satisfactory, inasmuch as the number of stations straying from the virtuous path has produced irritating



This is a full-size drawing of the altered connections for adding a pick-up to the "Mascot." The solid lines indicate the new wires and the shaded ones the existing wiring. The wire shown dotted must be removed.

heterodynes in various sections of the wave-band. The advent of new and more powerful stations, such as Poste Parisien and, say, the Leipzig 150 kilowatt—an immense event—plus the stealing of allotted channels by the Russians, will not improve matters. It is therefore good news to learn that a new European wave plan will be brought up for discussion at the next conference of the Union Internationale de Radiodiffusion, which is taking place at Lausanne in June. Possibly few alterations can be carried out before the International Convention at Madrid in September, but it is evident that drastic measures will be required if present contingencies are to be met.

I learn that Portugal has definitely made up its mind to possess a broadcasting system and that, as an initial effort, a 20-kilowatt transmitter, to be supplied by England, is to be installed at Barcarena in the vicinity of the capital. Its wavelength may possibly be 455.9 metres. There seems little doubt that all incentive in that country to this end

was supplied by CT1AA (Lisbon), the private station which is regularly heard on 282.25 metres.

Many more Russian stations are being logged to-day than was the case a few months ago and listeners are finding them in all parts of the broadcasting band. The Soviet Union, with its Five Year Plan, has been going ahead in its re-equipment of old transmitters and in the erection of new plants, with the result that the power of the stations in most instances has been considerably increased. Almost nightly you may now log Leningrad, Moscow (Old Komintern), and Trades Unions, the Stalin station (424.3 metres), Baku (1715.5 metres), Tiflis (1052.6 metres), Kiev (1034.5 metres), and Kharkov (937.5 metres). Over and above these giants a search in the early morning hours will bring you the Leningrad relay, RV70, on 348.8 metres, and another local Moscow station on 378 metres. Towards 3 a.m. you will find a number of U.S.S.R. transmitters on the air with physical exercises and early morning concerts.

Lively detection big magnification



HOW TO GET MANY FOREIGNERS ON ANY SET!

Put these two valves into any two-valve set, or any set with one stage of L.F. amplification, and you will be amazed at the results you get, the mighty loud-speaker volume you enjoy, the distance-searching you can do, the number of extra foreign stations that come in at fine full loud-speaker strength.

THE LIVELY LISSEN DETECTOR VALVE

The Lissen Detector Valve—H.L.210—liven up your tuning, gives you extra range, greater sensitivity. It is so responsive that it brings the foreign stations in like magic. Not only this, but it passes a crisper, more powerful signal on to the L.F. stage of your receiver, and you get louder, clearer radio altogether. Ask for Lissen H.L.210.



5'6

THE LISSEN ECONOMY POWER PENTODE

The Lissen Power Pentode Valve—P.T.225—converts any set with one stage of L.F. amplification into a fine, full-volume "Pentode-output" receiver. This valve puts new power into your loud-speaker, and new brilliance of tone, too. Use it instead of a power valve and at once you get an amazing step-up in volume. Where before you got a whisper, now you get a torrent of pure sound. And it takes no more current than the power valve it replaces—its H.T. consumption is only 7 m/A. Ask for Lissen P.T.225.



12'6

LISSEN VALVES

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, MIDDLESEX

Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention



IN MY WIRELESS DEN

Weekly Hints — THEORETICAL
CONSTRUCTIONAL & BY
W. JAMES

An S.G. Advantage

THE screen-grid valve has one big advantage that ought not to be lost sight of and it is one that used to be stressed.

If you happen to live near someone with a set having reaction on the aerial circuit you will the more readily appreciate the point. For there is nothing like this for spoiling the quality of your own reception, quite apart from the squeals and howls that you get when the other fellow is tuning-in.

A screen-grid stage would stop this; connected between the aerial and the reaction circuit, as in ordinary sets having a screen-grid high-frequency stage, the valve will stop the oscillations from passing from the detector to the aerial circuit.

It is, of course, quite possible to make a screen-grid stage oscillate, by using too little shielding for example, but normally, designs are so arranged that the stage is quite stable, as it must be for the best results. Then you can use the set in the most sensitive condition, that is, with the detector circuit nearly oscillating, without affecting the aerial circuit in a way that can damage the reception of your neighbours.

Finding the Best H.T.

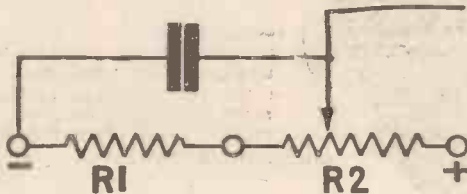
The anode-bend rectifier is not used so much in new sets as formerly, but it is still to be found in certain classes of set, such as the super-heterodyne.

There is no difficulty in providing the best high-tension voltage when a tapped battery is used, but the position is a little different when a main's unit is employed. The actual voltage required depends chiefly upon the valve and its grid-bias, and it should remain at a steady value or the results will suffer. For this reason it is necessary to supply the valve from a potentiometer instead of the usual resistance which is used for adjusting voltages.

The potentiometer is joined across the positive and negative terminal of the main's unit and may consist of a fixed resistance as at R1 in the accompanying diagram and the adjustable part R2, or a single potentiometer resistance may be used. As low a value as possible should be used; with a total voltage between the positive and negative of, say, 120 volts, and a resistance of 30,000 ohms, the current passed by the potentiometer is 4 milliamperes. This is large in comparison with the working current of the detector and so the result is that if the detector is set to pass the normal current of a fraction

of a milliampere when no signal is being received the conditions are correct.

Thus, if a strong carrier wave is received and the current tends to increase by half a milliampere, the voltage of the supply to the valve hardly alters. Most mains



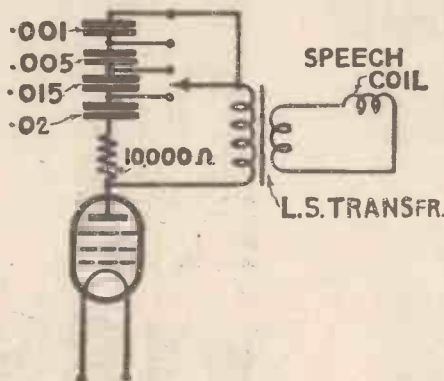
Connections for a resistance in series with a potentiometer in order to vary H.T.

units have a potentiometer circuit connected to one of the taps, but if not, one is easily provided.

Changing the Tone

It is well known that the relative strength of the higher frequencies produced by a pentode on that stage can be varied by altering the values of the condenser and resistance circuit connected to the anode.

Thus, if the capacity of the condenser is increased, the higher notes are reduced in strength. If you reduce the resistance the same effect is produced. With a small condenser, such as .001 microfarad and a



A tapped bank of condensers in an output circuit for changing the tone

resistance of, say, 10,000 ohms, the higher notes would usually be much too strong. But much depends upon the room in which the loud-speaker is used and its actual position in the room.

Tests with different values of resistance and capacity made with the loud-speaker first in one room and then another show

how greatly the results vary with the room.

I found that a capacity of .015 microfarad and a resistance of 10,000 ohms right when the loud-speaker was used in one room. But for equal quality when the loud-speaker was taken to a different room, the value of the capacity was no more than .005. A practical test of this nature seems to indicate that a tone control is a desirable thing to have. But the demand for the least possible number of knobs and cheapness acts to prevent the adoption of this feature in most cases.

There is nothing to stop the amateur from fitting his own tone control, however, and this is easily done by providing a few condensers of from .001 to .02 and plugs and sockets or a switch for connecting them, as shown in the accompanying diagram.

Using Two Speakers

Will receivers of the future have two or more speakers instead of the single one now fitted?

Many people who have tried using two instruments together claim that better quality of reproduction is obtained than from one only.

Sometimes different types of reproducers are used together, one of them dealing very well with the high notes and the other one handling the lower notes properly, and perhaps failing over the rest of the audio range.

It is quite an old trick to use a pair of speakers in this way, but I was never sure, myself, that the quality from the two was as good as that from a single high-class reproducer. But still, it may turn out cheaper to produce acceptable results by using two instruments than one good type.

There is plenty of room for improvement. The efficiency of the speakers used with broadcast apparatus is extraordinarily low. Those who use battery sets and have to put up with less volume than those having a mains set with a two-watt output valve would benefit considerably by an increase in the efficiency.

Clean the Screen!

When making connection to a screen it is advisable to clean the place where the wire is to make contact.

Scrape the surface with a knife and then fix the wire with a screw or bolt, using a washer. Some screens are cleaned by the makers and then sprayed in order to preserve the finish. A poor contact will be formed unless the surface is scraped.

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P.M.4



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Free State Distributors: Kelly & Shiel Ltd., 47 Fleet Street, Dublin.

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ETA

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PERCY W. HARRIS WRITES ABOUT— CONSTANT-REACTION CIRCUITS

LAST week I mentioned that the much-scorned reaction amplification is again coming into its own. Perhaps I had better say that this modest but useful member of the radio family, who has been doing a good job of work all along, is once more being recognised by the high-brows. Reaction circuits of all kinds have always interested me, more particularly because they allow of an exceptionally wide range of experiment.

It is always a pleasure to handle a circuit in which the reaction control is so smooth that one scarcely notices when the set passes into oscillation, and as I have shown in the Harris "Mascot" receiver, very remarkable results can be obtained with such arrangements.

This week I want to tell you a little more about what are termed "constant-reaction circuits" which have been rather neglected the last year or two, owing to the wide range of interesting new circuits made available by the screen-grid valve.

One of the best of the constant-reaction circuits is that worked out by my American friend, Commander Loftin, in conjunction with his technical associate, Mr. White, and known, therefore, as the Loftin-White

filament a winding L2 coupled inductively to L1 as shown by the arrow.

If the windings are the right way round, as we move L2 round towards L1 we shall get an increase of reaction amplification up to the point where the whole circuit bursts into oscillation. The condenser C2 in this case is made large, and is there to avoid short-circuiting the high-tension supply which otherwise would go straight back home through the winding L2.

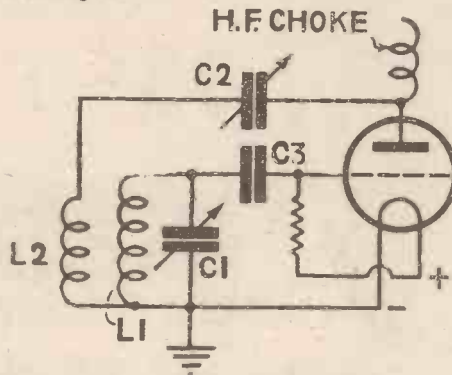


Fig. 2. A similar arrangement to Fig. 1. circuit, but with fixed coupling between the coils and the reaction made variable by the C2 condenser

C2, of course, effectively prevents the passage of direct current, but being large, offers no appreciable barrier to the passage of high-frequency current. Let us now ask ourselves what would happen if C2, instead of being large, were small. The best way to find out is to try it and so we will re-draw the circuit in Fig. 2, where the coupling between L2 and L1 is now made fixed and C2 is made variable. Obviously, if C2 is set at a minimum, then no high-frequency current will pass to the plate through the coil L2. Let us make

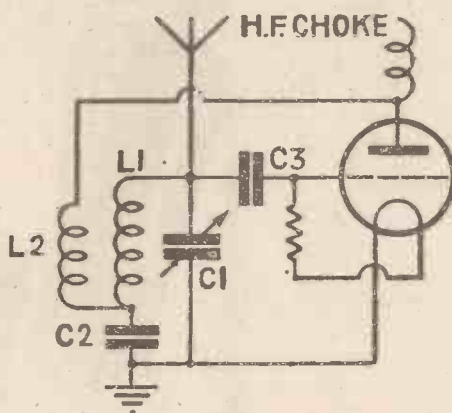


Fig. 3. A circuit in which constant reaction can be obtained by correct coil coupling and condenser values

C2 as large as it was in Fig. 1, and arrange L2 so that the set is oscillating fairly freely (you will, of course, disconnect the aerial when this is happening). Now gradually reduce C2 and a point will be reached when the set goes off oscillation,

reaction thus being controlled by C2 in the conventional way.

Most readers I know, are well acquainted with these two circuits, and many will have experimented with them, but I am asking you to make these experiments again to give you a clear understanding of the special experiments to follow. I want you to repeat the experiment you have just made at both ends of the wavelength scale. You will find in circuit Fig. 1 that on the short waves, that is to say with the condenser C1 at a low value, oscillation will be obtained with the coil L2 further away from L1 than is necessary on the longer waves where C1 has a larger value. In Fig. 2 you will find that oscillation will occur with a smaller value of C2 on short waves than is necessary on the longer. If you care to plot condenser readings you will find that as you go up in wavelength, you will increase the value of C2 as well as C1 in order to get oscillation.

The point I want to emphasise here is that the inductive coupling between L2 and L1 in Fig. 1 increases as we increase the frequency of the signal and similarly in Fig. 2 for a fixed value of C2 the coupling effect increases as we increase the frequency of the signal. If we can make a combination of inductive and capacitive coupling in such a way that one increases with frequency and the other decreases with frequency, and if we could get these values

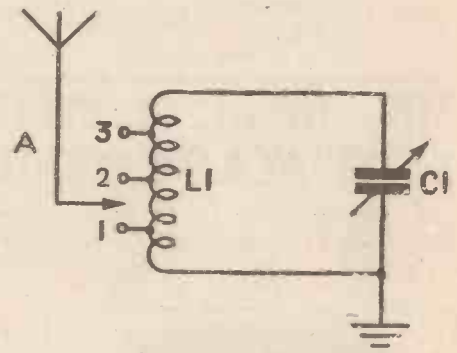


Fig. 4. Showing details of an aerial tapping arrangement which has a bearing on constant reaction

balanced, then we should be able to have a circuit with constant reaction over the whole scale.

Now consider Fig. 3. Here we have a tuned circuit consisting of L1, C1 and C2, C1 and C2 in series. We also have a reaction winding L2 which is joined to the base of L1 and thus the path of the reaction current from the plate is through L2 and C2 in series back to filament. The point of particular interest in this circuit is the action of C2, which in this case is also part of the tuned circuit L1 C1 and C2. Let us imagine that very high frequency currents are passing through C2. It then affords a very easy passage for these currents and very little voltage is set up across it. Now imagine very low frequency currents are passing through it. It resists the passage of these, for the passage proves difficult and very high voltages therefore (relatively, of course) are set up across it.

If you think now for a moment you will see that the higher the voltage set up

circuit. This must not be confused with the Loftin-White audio-frequency amplification circuit with which I have done a great deal of experimental work in America and of which I hope to tell you more later. We are dealing now with the Loftin-White constant-coupling circuit which can be used both in reaction and non-reaction circuits. Many band-pass circuits are obviously based on experiments of Loftin and White, although the names of these two inventors are rarely mentioned in connection with them.

However, to return to reaction circuits. In Figs. 1, 2, and 3 I have shown a progressive modification of a single-valve circuit from a form you know well to one with which I hope you will experiment. In Fig. 1 we have a single-valve detector circuit consisting of L1 tuned by C1, connected as usual to the grid and filament of the valve with the conventional grid lead and condenser *in situ*. In order to get reaction amplification we join between the plate of the valve and the

across this condenser the greater the effect of this voltage in the circuit L1, C1, C2. This will be even clearer if we consider Fig. 4, where A is the aerial and 1, 2 and 3 are taps on L1. Tap 3 will give the highest voltage across L1 when the aerial is connected to it and A1 the lowest voltage, A2 being intermediate. In Fig. 3 the effect of having the condenser C2 where it is is to give a kind of voltage tapping which is dependent on the frequency. The higher the frequency the lower the voltage for the coupling.

We thus see that in Fig. 3 we can arrange an inductive coupling between L2 and L1 which gives an increase of coupling with an increase of frequency, while at the same time C2 will give a decrease of coupling with an increase of frequency. If the values are correctly chosen, then this circuit can be made to give a constant reaction effect over the whole scale.

You should try experiments with this circuit, taking a number of fixed condensers, say .01, .02, and so on and various coils for L2. In order to make the circuit simple I have shown a direct connection of the aerial made on to the top of the grid coil, but this, of course, will give a much too heavy aerial damping and therefore you should place a compression condenser or other variable of .0003 maximum in series with the aerial before attempting to get constant reaction with the aerial connected.

This is a most fascinating line of experiment which every "fan" can try for himself. Circuits of this kind will become very important in the near future in view of the growing use of tone correction.

SUPER-HET RECEPTION

THE use of a preliminary stage of H.F. between the aerial and the first detector, or frequency-changer, is to be recommended on two grounds. In the first place it serves to prevent the local oscillator from feeding back energy into the aerial and so causing interference to other listeners, more especially if an open type of aerial is used. In the second place, it gives a decidedly longer reach. Unless the signal input to the first detector has a certain minimum value, it is swamped by the local oscillations, and subsequent amplification in the intermediate frequency stages is of no avail. For long-range working it is better to sacrifice one of the I.F. stages and add a preliminary H.F. amplifier.

M. B.

CHANGING YOUR OLD SET

IT is often difficult to know what to do with an old and out-of-date set when the purchase of a new one is contemplated. The problem is solved in one instance by Radialaddin, Ltd., of Dept. A.W., 47 Berners Street, W.1. This concern supplies any make of radiogram, set, or kit of parts in part exchange for old home-made sets. Components alone cannot, of course, be accepted. The balance is payable in cash or instalments, so that practically every circumstance is catered for. Details can be obtained free on mention of "A.W."

AIR-GAPS ELIMINATE LEAKAGE

IN the old type H.T. accumulators, electrical leakage is inevitable—moisture settles on their unbroken tops, forming a film which provides a direct connection between the positive and negative terminals. And serious waste is the result.

But in the Lively 'O' Accumulator, each cell is separated by an air-gap—Air is a most effective insulator—thus electrical cell-to-cell leakage is definitely eliminated. There is no 'falling off' in voltage due to leakage—no self-discharge—no waste. The Lively 'O' gives pure, smooth current in abundance—just what your Set needs. Your Dealer stocks 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 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.



The
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H.T. ACCUMULATOR.

MADE IN TWO SIZES:

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Standard 10-volt Unit.
(2,750 Milliamps) Each **5/6**

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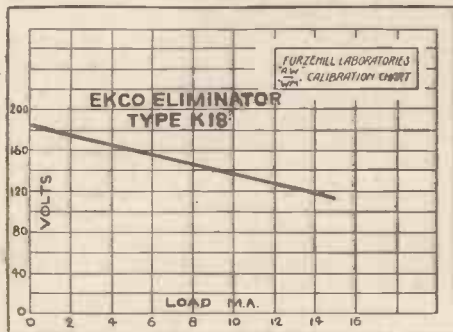


A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

Ekco K18 Mains Unit

THE Ekco combined L.T. and H.T. A.C. eliminator type K18, is a very well-made job, and is one of a series designed especially to fit into portable receiver cabinets. Arrangements are included for trickle-charging 2-, 4-, or 6-volt accumulators, and for supplying up to 18 milliamperes high-tension current. It is rated for input voltages varying between 200 and 250 volts at 40 to 100 cycles.

The circuit employed is quite standard, a single-wave rectifier supplying the high-tension current, while a bridge type rectifier is used in the trickle-charging circuit. Metal rectifying units are employed throughout, the well-known Westinghouse type being used. There are three voltage outputs, a power tap rated at 120 to 150 volts, a general-purpose tap rated at 60 to 80 volts, and an S.G. tap. The last two are variable to a certain extent, the former by means of moving a small bridge piece to one of three positions, and the



Variation of voltage with load on the Ekco combined L.T. and H.T. type K18 eliminator

latter by moving the plug into one of two positions.

In appearance the eliminator is very neat, the apparatus is assembled on a metal base plate and is enclosed by means of a copper-oxidised finished metal cover, the small control panel being mounted in the middle of the cover at the top.

On test the eliminator was found to be quite satisfactory, there being only a very faint background of hum when being used with a sensitive 3-valve receiver. A regulation test was conducted with the following results. With a load of 15 milliamperes, the power tap gave 116 volts, at the same time the general-purpose tap delivered 2 milliamps at 80, 60 and 35 volts, and the S.G. tap .5 milliamperes at 85 or 70 volts.

With a 10 milliamperes load on the power tap the voltage was 138, while the

voltage on the other taps were 108 and 65 for the general-purpose tap, and 103 and 89 for the S.G. tap. The overall variation of voltage with load on the power tap can be seen from the curve accompanying this report. The trickle-charging circuits were quite satisfactory, the charging rate being just over .2 amp. for 2-, 4-, or 6-volt accumulators.

The eliminator retails at a price of £4 12s. 6d. or £5 7s. 6d. if required for operation on 25 cycle mains. It can be recommended for general use.

Lotus Output Choke

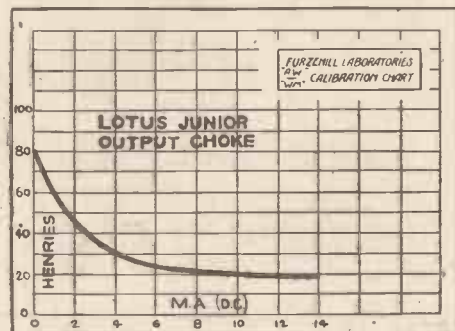
THE new Lotus Junior output choke is a small, neat component which has been designed for use in receivers



A new Lotus output choke

equipped with power valves which have a steady anode current not exceeding 10 milliamperes, at which current the rated inductance of the choke is 20 henries.

The choke is housed in a mottled brown bakelite case extended at the base to



Characteristic curve of the Lotus choke tested

carry the terminals and to facilitate mounting, the appearance being similar to that of the Lotus interval transformer, which has been on the market for some time

On test the choke was found to be quite up to its rating, the inductance being still 20 henries at 12 milliamperes. The actual variation of inductance with direct current in the winding can be seen in the curve accompanying this report. The D.C. resistance was approximately 700 ohms, so that the voltage drop across the winding on full load is practically negligible, and it may be assumed that the full high-tension voltage will be applied to the anode of the output valve. The choke can, of course, be used satisfactorily in all kinds of circuits, provided that the current does not exceed the rated 10 or 12 milliamperes.

Selling at a price of 5s. 6d. the choke is good value and can be recommended.

Igranic Permanent Magnet Speaker

A NEW permanent magnet moving-coil loud-speaker which we have recently tested is that manufactured by the Igranic Electric Co., Ltd. This speaker is built up on a very massive



A good permanent-magnet speaker, the Igranic

cast-iron chassis, which is provided with holes to enable it to be bolted to the cabinet or baffle with which it is being used.

The permanent magnet which is screwed to the back of the chassis, is of the familiar cross type, copper-plated to prevent rust.

A special fabric type diaphragm is employed, this being doped to give it the necessary stiffness. The free edge suspension is formed as a part of the diaphragm itself, and is corrugated to give sufficient flexibility. The centering device is also formed as a part of the diaphragm, and is bolted to the centre pole of the magnet.

On test the instrument gave very pleasant results, the overall frequency response appearing fairly good from 100 up to about 3,500 cycles. The speaker is well and sturdily made.

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Including Multi-Ratio O.P. Transformer.

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Please forward this ENQUIRY FORM (without obligation).

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Make..... Model and List Price.....

Present Set: Make.....

Date of Purchase..... Original Cost of Set.....

Balance of purchase price would be payable by me as follows:

- Plan A. Whole of balance in cash.
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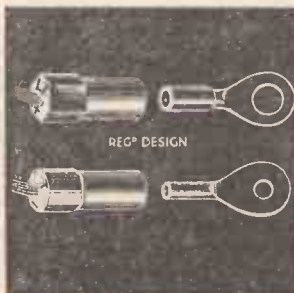
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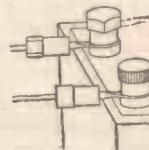
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SETS OF DISTINCTION

AERODYNE
— SHORT-WAVE
— ADAPTOR

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Price; £1 15s. Od.

"I CAN claim a pretty extensive knowledge of short-wave receivers of all sorts, being an amateur transmitter and the holder of one or two records, as well as the holder of the 'Wortley Talbot' Trophy for my pioneer work on 10 metres, and I can truthfully say that, judging from the short test I made, the Aerodyne adaptor will make almost any broadcast set a one-hundred-per cent short-waver."

So wrote an experienced short-wave "ham" to the makers of the Aerodyne adaptor, and as I saw a copy of the letter before I did my own tests I anticipated a pleasant evening. I was in no way disappointed. The Aerodyne is one of the best little short-wave units I have yet tried, and should meet the needs of the great majority of listeners who, having broadcast sets of the detector and low-frequency amplifier type, want to explore the short wavelengths between 15 and 100 metres.

Some of you will no doubt be acquainted with the principle of the circuit used in the Aerodyne unit, but for the benefit of newcomers I will briefly explain it. The first point to note is that the unit is complete in itself, and requires neither valves nor batteries, other than those used in the existing set to which the unit is connected.

A One-valve Short-wave Unit

The unit is, in fact, a complete one-valve short-wave set, with a leaky-grid detector, short-wave tuning and reaction, and short-wave choke in the anode circuit. The only difference between this type of unit and a "pukka" short-wave one-valver lies in the method of connecting up the high- and low-tension batteries.

Instead of taking these connections to terminals they are taken to pins of a valve holder plug. Thus the low-tension leads from the unit detector valve go to the two filament pins of this plug. The high-tension positive from the anode of the unit valve goes to the anode pin of the plug.

Now you may wonder where the plug goes. Quite simply into the detector socket of the broadcast set. You take out the detector valve, put it into the holder of the unit, and then insert the plug into the detector valve holder of the set.

As this plug carries the high- and low-tension connections of the unit detector valve it follows that the unit valve will automatically be fed with the necessary "juice" from the batteries of the broad-

cast set. Which means that the use of the unit does not in any way add to the battery connections.

The grid pin of the plug from the unit is left blank, so on removing the valve from the detector position in the set and inserting the plug from the unit, you automatically cut out the grid-tuning circuit of the set, and of course the short-wave tuning of the unit comes into action, since this is connected up to the unit detector.

A Useful Accessory

The whole object of this type of unit is to enable the low-frequency-amplifying part of the existing broadcast set to be

detector-I.F. sets, so I will now explain how this is arranged. The first thing you notice is the attractive metal panel, which is graced with two knobs actuating two scales mounted behind escutcheons. The dials are very sensibly marked in degrees from 0 to 180, and the left is for tuning, while the right is for reaction.

These controls worked extremely well during tests, and I was very pleased to find that there was an entire absence of backlash in the slow-motion movement. Both the variable condensers are mounted well behind the metal panel, so that the hand-capacity effects, which can be a fearful nuisance on short waves, are entirely absent.

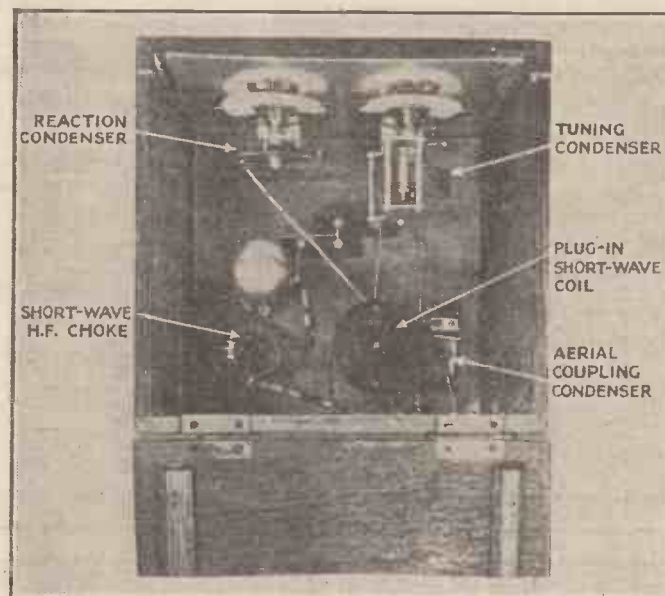
You simply must have precision control on the short waves. You get all this in the Aerodyne unit. And behind the panel, on the baseboard, are neatly and efficiently arranged the remaining components of the detector circuit, including the valve holder, short-wave choke, and valve holder for the interchangeable short-wave coils, of which there are two. Wound on simple solenoid lines, these short-wave coils comprise two separate windings, one for tuning with spaced turns, and the other for reaction, with close-wound turns. The smaller coil has four turns, and the wavelength range is 15 to 40 metres with the tuning condenser provided.

The larger coil is of the same diameter, namely 2½ inches, but has just over 12 turns, and tunes from 40 to 100 metres.

The wavelength ranges of each coil are clearly marked on the tops of the ebonite coil formers, so there is no confusion.

The aerial is coupled to the unit detector tuning through a neat little semi-variable capacity, made in the form of two small upright aluminium brackets, one of which can be varied in position, so that just the right aerial coupling capacity to give smooth reaction and tuning free from "blind spots" can readily be obtained.

(Continued on next page)



A plan view of the Aerodyne Short-wave Adaptor

utilised in conjunction with the special short-wave tuning detector circuit added externally. Nothing could be much simpler than the connection of the Aerodyne unit to any set. Although this type of unit is most suitable for sets without high-frequency amplification it can be used with sets having a stage or more of high-frequency amplification.

Incidentally, there is a super-heterodyne model of the Aerodyne for such sets, and I advise those wanting to make the most use of any high-frequency amplification to choose the super-het. model.

My present tests refer to the adaptor for

Apart from the terminals for the connection of the aerial and earth, which leads must of course be taken from the set to the unit, the only other unit connection is the plug already described. This is fitted to the end of a three-way flex coming from the high- and low-tension points of the unit.



One of the short-wave coils used in the Aerodyne Adaptor

Finally, the cabinet is a neat little oak affair, with hinges to keep the lid down—and consequently the dust out.

I have used the unit with two different sets, one a simple two-valver, and the other a three-valver having a stage of resistance coupling followed by a stage of transformer coupling (probably the ideal short-wave low-frequency arrangement) and with both sets the unit has put up a really splendid show.

I have been impressed with the smoothness of the reaction, very readily achieved by using a Mullard PMiHL valve and 48 volts on the anode. Reaction could be obtained over the complete wavelength range from 15 to 100 metres, and the sensitivity in the 30-metre band, where you will easily find America, amply proves that the short-wave coil is well designed.

I can recommend this Aerodyne adaptor with the greatest confidence. It is a thoroughly trustworthy addition to the ever-growing range of short-wave gear.

SET TESTER.

**NEW BROADCASTING STATION
RADIO FLORENCE**

A New Italian Station has just been opened in the Florence district of Italy, and a description of it is given here by a Correspondent

THE new station which you can hear testing on just above 500 metres is Radio Florence, a newcomer to the ranks of Italian stations.

Italy has eight medium-wave stations at present, but for a long time the need has been felt for a high-power relay of the Rome and Milan programmes.

Following the success of the Trieste station, the recent opening of the Florence station marks a further important advance in the reorganisation of the Italian broadcasting system undertaken by the E.I.A.R.—the Italian Broadcasting Company.

The transmitter for Florente, like those for Trieste and the next projected station

at Bari, was manufactured by the Marconi Company at Chelmsford.

Florence is at present transmitting on a temporary aerial; the final aerial is to be of the quarter-wave "T" type suspended from two 300-ft. high self-supporting steel towers.

In accordance with the modern practice, the broadcaster is connected to the aerial through a twin wire feeder which conveys the H.F. power to a feeder house located at the lower end of the aerial down-lead. Here the H.F. energy is transferred from the feeder to the aerial by coupling circuits.

Owing to its temporary aerial, Florence is not at present transmitting on full power. When radiating on the final aerial it should rank among the most popular transmitters in Europe for strength and quality.

On 500 Metres

Florence is scheduled to operate on the wavelength of 500.8 metres and the wavelength can be varied between 250 and 550 metres if required.

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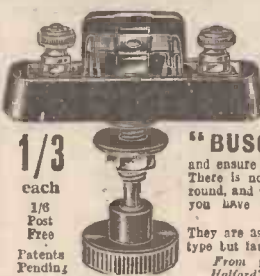
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Phon Museum 1414.

BROADCAST TELEPHONY

Broadcasting Stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)
GREAT BRITAIN								
25.53	11.751 Chelmsford (G5SW)	10.0	315	950 Marseilles	1.0	NORTH AFRICA		
242.3	1.238 Belfast	1.0	327.5	916 Grenoble (PTT)	2.0	363.4	825.3 Algiers (PTT)	16.0
201.6	1.147 London Nat.	50.0	328.2	914 Poste Parisien	1.2	416	721 Radio Maroc	
288.5	1.040 Newcastle	1.2	(also testing on 85 Kw.)			(Rabat) 6.0		
288.5	1.040 Swansea	0.12	345.2	869 Strasbourg (PTT)	11.5	and 32.26 m. (9,300 Kcs.)		
288.5	1.040 Plymouth	0.12	also on 33 m. (9,000 Kcs.)			NORWAY		
288.5	1.040 Edinburgh	0.3	384.4	779 Paris Toulouse	8.0	235.5	1,274 Kristiansand	0.5
288.5	1.040 Dundee	0.12	447.1	677 Paris (PTT)	0.7	240.2	1,249.2 Stavanger	0.5
288.5	1.040 Bournemouth	1.0	460	644 Lyons (PTT)	1.5	361	824 Bergen	1.0
288.5	1.040 Aberdeen	1.0	1,445.7	207.5 Eiffel Tower	13.5	367.6	816 Frederiksstad	0.7
301.5	995 North National	50.0	1,725	174 Radio Paris	75.0	495.8	605.1 Trondheim	1.2
309.9	968 Cardiff	1.0	GERMANY			1,083	277 Oslo	60.0
355.9	843 London Regional	50.0	19.73	15,226 Zeesen	15.0	POLAND		
376.4	797 Glasgow	1.0	31.38	9,560 Zeesen	15.0	214.2	1,400 Warsaw (2)	1.9
398.9	752 Midland Regional	25.0	217	1,382 Königsberg	0.75	234.9	1,283 Lodz	2.2
480	625 North Regional	50.0	217.5	1,370.9 Flensburg	0.5	312.8	959 Cracow	1.5
1,554.4	193 Davenport (Nat.)	30.0	227.4	1,319 Cologne	1.5	334.4	897 Poznan	1.9
AUSTRIA								
218.7	1,375 Salzburg	0.5	227.4	1,319 Münster	0.5	380.7	788 Lvov	16.0
245.9	1,220 Linz	0.5	227.4	1,319 Aachen	0.25	409.8	732 Katowice	12.0
285.2	1,052 Innsbruck	0.5	232.2	1,292 Kiel	0.25	560.1	530 Wilno	18.0
352.1	852 Graz	7.0	239.4	1,253 Nürnberg	2.0	1,411.8	212.5 Warsaw	120.0
453.2	666 Klagenfurt	0.5	245.9	1,220 Cassel	0.25	PORTUGAL		
517	581 Vienna	15.0	253.1	1,185 Gleiwitz	5.0	232.2	1,063 Lisbon (CFIAA)	2.0
also testing on 1,235.3 m. from 7.0 p.m. (Mon., Wed., Sat.)								
BELGIUM								
200	1,456 Antwerp	0.25	269.8	1,112 Bremen	0.2	also on 42.9 m. (Fri.)		
210.2	1,429 Liege	0.15	270.5	1,085 Heilsberg	00.0	ROMANIA		
215.3	1,393 Chatelineau	0.2	283	1,060 Magdeburg	0.5	394	761 Bucharest	12.0
215.6	1,391 Bruxelles		283	1,060 Berlin (E)	0.5	RUSSIA		
Conference			318.8	941 Dresden	0.25	349	860 Leningrad RV70	10.0
210	1,389 Liege	0.2	325	923 Breslau	1.5	358	838 Moscow (Exp)	15.0
221	1,355 Binche	0.1	300.0	832 Mühlacker	00.0	378	792.5 Moscow Regional	20.0
240.8	1,245.8 Liege (Exp.)	0.1	372	806 Hamburg	1.5	389.0	770 Archangel	10.0
259	1,158 Liege (Coinc.)	0.4	389.0	770 Frankfurt	1.5	424.3	707 Moscow-Stalin	100.0
283.0	1,058 Brussels (SBR)	0.5	419.5	715 Berlin	1.5	427.5	701.7 Pokrovsk-Volga	20.0
337.8	888 Brussels (No. 2)	15.0	453.2	662 Danzig	0.5	449.4	667.5 Odessa RV13	10.0
509.3	589 Brussels (No. 1)	15.0	472.4	635 Langenberg	00.0	508.5	590 Astrakhan	10.0
BULGARIA								
318.8	941 Sofia (KodnoRadio)	0.5	532.4	569 Munich	1.5	720	416.6 Moscow (PTT)	20.0
CZECHOSLOVAKIA								
240.6	1,201.8 Prague (2)	5.0	559.7	569 Kaiserslautern	1.5	824.2	364 Sverdlovsk RV5	50.0
263.8	1,137 Moravska-Ostrava	10.0	559.7	569 Augsburg	0.3	937.5	320 Kharkov (RV20)	25.0
279.3	1,074 Bratislava	13.0	558	530 Hanover	0.3	1,000	300 Leningrad	100.0
293	1,022 Kosice	2.5	569.3	527 Freiburg	0.25	1,053	284.9 Tiflis	10.0
341.7	878 Brunn (Brno)	32.0	1,034.9	183.5 Norddeich	10.0	1,116	268.5 Moscow Popoff	75.0
488.6	614 Prague	120.0	1,484.9	183.5 Zeesen	00.0	1,170	256.4 Tashkent	25.0
DENMARK								
281.2	1,067 Copenhagen	0.75	2,525	110.3 Königswuster		1,200.5	238 Novosibirsk	10.0
1,153	260 Kalundborg	7.5	2,900	103.5 hausen (press)	15.0	1,284	233.5 Moscow (Trades Unions)	105.0
also on 31.51 m. (9,520 Kcs.)			4,000	75 ditto		also on 50 m. (6,000 Kcs.)		
ESTONIA								
290.1	1,013 Tallinn	11.0	298.2	1,006 Huizen	8.5	1,380	217.5 Novosibirsk	100.0
405.8	644 Tartu	0.5	299.5	1,001.3 Radio Idzerda (The Hague)	3.0	1,481	202.5 Moscow	100.0
FINLAND								
201	1,031 Tampere	1.0	1,071.4	280 Scheveningen-Haven	10.0	1,600	187.5 Irkutsk	15.0
291	1,031 Viipuri	13.0	1,875	160 Hilversum	8.5	1,715.5	175 Bakou	10.0
308.1	815 Helsinki	12.0	HUNGARY			SPAIN		
434.6	690 Pori	1.5	210	1,429 Budapest (2)	3.0	250.9	1,196 Barcelona (EAJ15)	1.0
1,796	167 Lahti	54.0	550	545 Budapest (1)	18.5	266.6	1,125.2 Valencia	2.0
FRANCE								
220.3	1,361.5 Béziers	0.5	ICELAND			348.9	860 Barcelona (EAJ1)	8.0
222.1	1,350.3 Fécamp	5.0	1,200	250 Reykjavik	16.0	368.1	815 Seville (EAJ5)	1.5
237.4	1,269 Bordeaux-Sud-Ouest	2.0	IRISH FREE STATE			423	709 Madrid España	2.0
245.9	1,220 Strasbourg 8GF	1.0	224.4	1,337 Cork (6CK)	1.2	424	707 Madrid (EAJ7)	2.0
250.1	1,199.5 Juan-les-Pins	0.5	413	725 Dublin (2RN)	1.2	450.6	557 San Sebastian (EAJ8)	0.0
255.1	1,176 Toulouse (PTT)	1.0	ITALY			SWEDEN		
265.4	1,130 Lille (PTT)	1.3	25.4	11,310 Rome (2RO)	15.0	230.0	1,301 Basle	1.25
271.4	1,105.1 Rennes	1.2	247.7	1,211 Trieste	10.0	257	1,167 Halmö	10.0
285.4	1,051 Montpellier	0.8	273.2	1,098 Turin (Torino)	7.0	306.8	977 Falun	0.5
286	1,049 Radio Lyons	10.0	312.2	961 Genoa (Genova)	10.0	321.9	932 Göteborg	10.0
294.7	1,017.7 Limoges (PTT)	0.5	318.8	941 Naples (Napoli)	1.5	435.4	689 Stockholm	55.0
304.9	984 Bordeaux (PTT)	13.0	331.5	905 Milan	7.0	541.5	554 Sundsvall	10.0
307	977 Natan-Vitus (Paris)	0.5	368.1	815 Bolzano	1.0	777.5	386 Östersund	0.6
also on 43.75m. (6,865 Kcs.)			441	680 Rome (Roma)	50.0	1,241.0	241.6 Boden	0.6
LATVIA								
			524.5	572 Palermo	3.0	1,348.3	222.5 Notala	30.0
			198.5	1,570 Riga (tests)	16.0	SWITZERLAND		
			525	572 Riga	15.0	244.7	1,220 Berne	0.5
			LITHUANIA			403	743 Sötens	25.0
			1,037	155 Kaunas	7.0	459	653 Bormuenster	60.0
TURKEY								
						1,204.8	249 Istanbul	5.0
						1,538	105 Ankara	7.0
YUGOSLAVIA								
						307	977 Zagreb (Agram)	0.75
						430.4	697 Belgrade	2.5
						574.7	523 Ljubljana	2.5
						2,450	1,224 Skopje (tests)	20.0

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WHEN SUBMITTING QUERIES

Please write concisely, giving essential particulars. A Fee of One Shilling (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

Not more than two questions should be sent with any one letter.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications

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

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

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

When the National Broadcasting Company of America takes over its new premises at New York, transmissions will be carried out throughout the twenty-four hours. This service will be assured by high-power stations at New York and Chicago. In view of the difference in time, it may be found possible to make a relay of European concerts a regular daily feature for the midday programmes.



Mains Units

SIR,—I propose building a mains unit to give 200 volts 30 milliamperes H.T. and 4 volts 3 amperes A.C., and I wish to build the transformer and choke according to the directions published on November 7, 1931, and February 6, 1932. The figures given in the two articles for the turns per inch and current-carrying capacities of enamelled wire do not agree with each other. Why is this, and which table should I use?

I wish to make a choke to carry 30 milliamperes, and to have an inductance of 50 henries. Using the formulae of the article, I find that about 10,000 turns are required with No. 30 core. Is this amount necessary, or would the choke be satisfactory with, say, 2,500 turns?

H. W. M. (Houghton-le-Spring).

The number of turns per inch given in the article of February 6 were for D.C.C. wire. The correct figures for enamelled wire are those in the article of November 7. The current-carrying capacities are different because there is less tendency for a choke to heat up than a transformer, due to the fact that there is usually only one coil, while the inner coils of a transformer are insulated from the outer ones by several layers of paper which prevent the heat from travelling to the surface. The outer windings of a transformer can be run at the higher rating given for choke-coils if desired. Your choke will not have 50 henries inductance unless the full number of turns is wound on, but most eliminators are free from hum with a 35- or 30-henry choke. Stalloy stampings are obtainable from J. Sankey & Sons, 168 Regent Street, W.1.—Ed.

Gramophone Needles—Steel v. Fibre

SIR,—I should like to thank Messrs. William Hall & Co., Ltd., for their reply in a recent issue. May I beg a few more inches of your space?

The leading record manufacturers, I think, will be the first to acknowledge that their sound-boxes and pick-ups are designed primarily for steel needles. In these circumstances the manufacture of the "ordinary high-grade fibre needles," to which your correspondents draw attention, has not been given the same amount of scientific research that, undoubtedly, would have been given if the intention of those companies had been to design their reproducers specially for fibres. It has been proved beyond doubt that an efficient fibre should be designed on the following lines: The residual oil should be removed. The triangular sides should measure between 3/32nds and 1/8th of an inch. The "shell" should face the edge of the record when in the sound-box. For maximum preservation of the point the needle should undergo a hardening treatment.

With regard to the position of the needle in the groove my statement is intended to be taken quite literally and I need only draw attention to the very informative article by Mr. H. E. Gauss, B.Sc., of the Gramophone Co., Ltd., in the December, 1931, issue of your excellent sister journal, *Wireless Magazine*. As to the appliance I use to "re-cut" a fibre needle so that it fits the groove I should perhaps explain that when the fibre has been re-pointed with the usual cutter (adapted, of course, to cut the large fibres from the "soft" side to the "shell") the record itself, during the first few revolutions, shapes the point to the appropriate groove. This shaping process applies equally to steel needles and to fibre—the important difference being that the wear on the record in the case of steel is considerably greater.

The tonal quality and band of frequencies covered by pre-electrical recordings is so far below that of modern electrical recordings that it is no exaggeration to say that any reproduction from them, whether through the medium of steel or fibre, is comparatively dull and uninteresting. Strangely enough, I find for these old records a small personal balance in favour of steel.

I have yet to hear any steel-driven reproducer which will give results superior to those of my own specially designed and tuned fibre sound-box—and I have heard most of the commercial products. The results of the experiments made by your correspondents with constant frequency records and "worn" needles are entirely correct; moreover, it is well known that the reproduction of a note of constant frequency, and especially one of very high or very low frequency, for any continued period is by no means simple—a fibre will

break and a steel needle will wear the groove sufficiently to alter the characteristic. The point which is overlooked is that a treated fibre needle used in a sound-box specially designed for it would not be "worn" until it had played, without re-pointing, many "heavy" 12-in. records. Your correspondents are by no means alone in falling into this and other incorrect conclusions regarding the possibilities of fibre needles; indeed, a writer in a contemporary radio journal states that fibre needles "stick" to the grooves—this is presumably due to the presence of residual oil which should have been removed.

I agree that your correspondents are upholding the steel needle as a better reproducer—i.e., irrespective of record wear. For comparative tests, however, they appear to have taken "ordinary high-grade" fibre needles and allied them with sound-boxes and pick-ups which were singularly unsuited to be used with them. Had they experimented with apparatus which was properly comparable I feel that they might well have come to the conclusion that fibre needles were equal, if not superior to steel, and, in addition cause considerably less wear to the records.

J. L. C. (S.E.23).

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One hole fixing, bakelite insulation, 2-point, 1/9; 3-point, 2/-.

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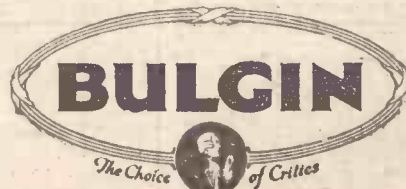
It is, therefore, no mean attainment to be able to justly claim the same paralleled standard of excellence in a switch.

The S.15 stands alone—a veritable masterpiece of components which has established the name Bulgin more and more as the hall-mark of quality.

The specially designed mechanism of this switch ensures ABSOLUTE CONTACT, DEFINITE MAKING OR BREAKING OF A CIRCUIT, LIFE-LONG DURABILITY.

If you are seeking absolute finality in PUSH-PULL switches the Bulgin S.15 QUICK MAKE AND BREAK ends your search.

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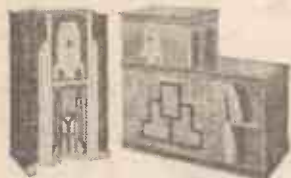
Quick Make & Break Switch

SETS FOR SET BUYERS—Continued from last week's issue

£6 17s. 6d.

Six-Sixty Chassikit

One of the most selective three-valve kit sets available for battery or mains operation. The price above is for the battery set. An attractive range of cabinets of all shapes and sizes is available to house this kit set. The aerial band-pass tuning is ganged to the inter-valve



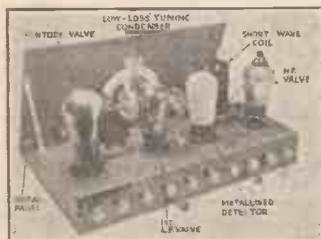
tuning, thus giving single-knob control. The other controls are exceptionally well designed.

485

£6 17s. 6d.

Eddystone Kilodyne Four

Specially recommended to home-constructors. This is a short-wave set with a screen-



grid high-frequency stage, detector and two low-frequency stages. The layout is low-loss in every respect and there is a coil to cover the medium waves.

493

£8 8s.

Marconiphone Super-power Two

A well-designed two-valve set for A.C. mains operation. Has an output above the average. Utilises a U10 mains rectifying



valve. Will get powerful foreign stations as well as the locals. Suitable for working a moving-coil loud-speaker.

484

£10 15s.

Osram Music Magnet Four

One of the most sensitive battery kits on the market. There are two screen-grid stages and three highly selective tuning



circuits, ganged to a single tuning control.

482

£15 15s.

Ekco Three-valve Console

A good all-round console set incorporating a powerful screen-



grid, detector pentode circuit and a balanced-armature cone loud-speaker. Works off A.C. or D.C.-mains supplies. Control is easy and a mains aerial attachment is provided.

486

£15 15s.

Lotus A.C. Three-valver

An all-electric three-valve console set with a self-contained energised moving-coil loud-



speaker. Powerful screen-grid, detector and pentode circuit, designed on modern chassis system with screened two-gang condenser and tuning coils. Outstandingly good quality.

497

£18 18s.

Blue Spot Four-valver

A table cabinet four-valver with unique controls and an unusual circuit. This comprises a screen-grid high-frequency



stage followed by an anode-bend detector, resistance-capacity coupled to a screen-grid first L.F. amplifier, in turn coupled to a power output valve. Suitable for all A.C.-mains supplies between 100 and 240 volts.

503

£21

Cecophone Table Four

Designed for good quality of reproduction from a large number of stations, this is an A.C. four-valver with two screen-grid stages, power-grid detector and pentode output with a U10 mains rectifying valve. Includes single control of tuning, local-distance switch and combination switch knob for gramophone



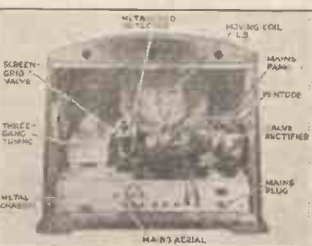
reproduction, wavelength changing and mains on-off. A set for a good speaker.

492

£21

H.M.V. Three-valver

Gives fine quality from a large number of home and foreign stations on the self-contained moving-coil loud-speaker. Has



band-pass aerial tuning preceding the powerful screen-grid detector pentode circuit. Mains-aerial attachment. Tuning escutcheon is horizontal and very easy to read.

498

£24 3s.

Columbia Four-valver Console

A fine four-valve console for A.C. and D.C. mains. Incorporates a good energised moving coil loud-speaker. Two screen-grid valves, detector, and pentode output. Three tuning



circuits accurately ganged for one-knob control. Gets all the principal foreign stations at full strength.

501

£30 9s.

H.M.V. Model 501 Table Radio Gramophone

A unique instrument—a complete radio-gramophone, but in



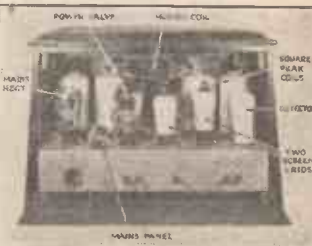
table cabinet form. Lacks nothing of larger machines and gives delightful reproduction from a large number of broadcasting stations as well as gramophone records.

488

£30 9s.

Varley Square Peak 4

A four-valver A.C. mains set for the connoisseur. Has a self-



contained moving-coil loud-speaker. Selective band-pass tuning and all other modern improvements are incorporated.

495

£73 10s.

H.M.V. Model 531 Radio-Gramophone

A de luxe radio-gramophone incorporating a six-valve superhet. circuit and a separate three-valve power amplifier. It has



automatic record-changing mechanism and literally dozens of special features.

502



AN all-Bristol Concert will be given on March 26, when the City of Bristol Police Band will play. West Regional listeners will hear this programme.

The last concert of the six which are being given by the B.B.C. in co-operation with the Belfast Corporation, is to be devoted to a performance of Mendelssohn's "Elijah," and it will be broadcast on March 26.

Another choral work to be given on Good Friday, March 25, by the Cardiff Musical Society, is Mendelssohn's "Elijah." This will be the third concert of the season and will be relayed from the Park Hall, Cardiff.

To provide a broadcasting service for some 450,000 German-speaking Russians in the Volga Republic, the Soviet authorities have decided to build a 20-kilowatt transmitter at Pokrovsk. It will be connected by cable to Moscow whence special German programmes will be broadcast.

According to the latest published statistics there are 1,197 broadcasting stations in the world, of which Europe possesses 274.

A radio beacon is to be established shortly at North Ronaldshay, Orkney. The beacon is to have a wavelength of 300 kilocycles (1,000 metres) and will transmit "MNG," followed by a ten seconds dash every four minutes. During fog the signal will be transmitted continuously, and in clear weather for direction-finding purposes every half-hour.

Listeners have been hearing a good deal lately about the subject of the B.B.C.'s search for talent in the remoter parts of Scotland. This search for hidden talent has its comic side also, from the B.B.C.'s point of view, and the Aberdeen station is to have an April First programme, when it will put on a broadcast extravaganza entitled "Hidden Talent."

Although in its early tests, next month the Breslau 75-kilowatt station will use an ordinary aerial, experiments are to be carried out later with a vertical aerial slung downwards from the top of the mast. The Leipzig transmitter now nearing completion will be capable of radiating up to 150 kilowatts. It is hoped to get it ready by June. The old Leipzig plant will then be dismantled and re-erected at Trier (Treves) to act as a relay for the Frankfurt-am-Main programmes with which it will work on a common wavelength. The experiment will be an interesting one, inasmuch as hitherto it has been deemed impracticable to adopt this method for transmitters of more than 1 kilowatt aerial power.

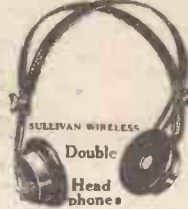
It is officially stated by the *Ente Autonomo per la Radiodiffusione nella Svizzera Italiana*, the broadcasting association responsible for the operation of the new Swiss station to be erected on the Monte Ceneri, near Lugano, that the 15-kilowatt transmitter is under construction at the Marconi Works at Chelmsford. It is hoped to start on the buildings in the course of the next three weeks. Although a definite channel for these transmissions has not yet been fixed it is expected that either 680 or 720 metres will be used, as both wavelengths are considered favourable for the district.

With a view to carrying out a publicity campaign for the French seaside and inland watering resorts, it has been suggested in Paris that twice weekly a number of French studios should devote ten minutes to broadcasts specially destined to listeners in neighbouring countries.

ELECTRADIX

No 2 BRITISH GOVERNMENT BARGAINS.
LOWER PRICES THAN EVER.
Continued from March 12 issue.

More of this useful apparatus is listed below.
AUTOMATIC CUT-OUTS. Electromagnetic, for 12 to 100 volts, 10 amps., auto cut-in-out with vibrator volt regulator combined. Cost pounds. To clear at absurdly low price of 7/6.



SPEAKERS AND TELEPHONES. 5,000 HEADPHONES. Sullivan's 120-ohm. with headbands, sacrificed at 3/6. 8,000 ohms, 4/6, cost 35/-. Brown's Reed, 1,500 ohms, 12/6 per pair: 120 ohms, 7/6 per pair. Single Receivers, make fine Loud Speaker Units, 750 ohms, 7/8; Single Phones, Western or Ericsson, 1,000 ohms, 2/6 each with Cord. Single Receiver Magnets, bobbins and case for conversion to Gramophone Pick-ups, 1/-.

Soft Rubber Earpiece Cushions, 2d. pair, or 1/6 doz. pairs. D.111 Field Phones, L.R. leather head-band and cords 2/6 pair. Brown's Swivel Headbands, 1/6 pair. G.P.O. Long Magnet receivers, price 2/- only. 5-way outdoor Telephone Wire, cheap 3d per yard. Indestructible Phone Cords, 1/-.

Moving-Coil Speakers, with input Transformer, Jensen 6v. for Battery Sets, 25/-. Dynoplus 6v., 30/-. B.T.H. R.K., 220v. D.C., 40/-. Jensen A.C. 110/250v., with input and mains transformers and rectifier, list £5 10s. Sale, 55/-. Milgate Speaker Units with 10 in. Truro Cone 5/6.

HOUSE TELEPHONES. Micro-tele., hand-comb., Unbreakable Metaphone sets. For operation on existing bell circuits. Micro and Phone receiver on one handle, fitted auto-switch. Ideal for bouidoir to kitchen or garage. Fitted in 5 minutes. Half price at 12/6 per pair.

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Porcelain, H.T. 4-rib stand off Insulators, 2/-. Ceiling Roses, porcelain, 6d. Indicating on-off Mains Switches, 1/3. Mains Plug and Sockets, shock-proof, safety red and black, 1/- pair.

TRANSFORMERS. Intervalva, Marconi, Erica, set type, very compact and efficient. List 12/6. Sale, 2/6. Sifam Power-amplifier Transf., new in box, 4/9. 12 months guarantee. Western Electric Output Transf., 2-1 ratio, 2/6. Sterling, 1 to 1, 3/-. A.C. MAINS. Transformers—please specify wants.

WIRELESS RECORDERS. Morse Inkera, in new condition. Magnificent British Workmanship. Solid brass case, fine finish on base, with tape reel. Cost £30. Sale £25 10s. to £7 10s.

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AMMETERS. 2 1/2 in. moving coil, 1st grade, 0-1 1/2 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/-.

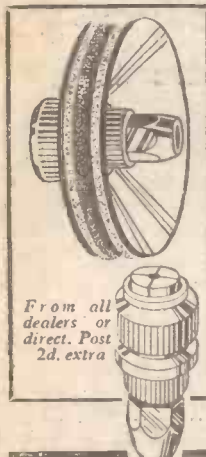
PORTABLE METERS. G.P.O. volt-milamps, 45/-. Elliott multi E.108, 4 ranges, 35/-. M.C. Plated Portable, 0-3, 0-30, 0-300 volts, 25/-. ditto 0-12 amps., 25 volts and 250 volts 26/-. Pocket 7-range set, type "B" 50/-. Ten range sub-standards by Nalder, Crompton and E.E., all ranges in volts and amps. to 600, a £25 Set for £8. Portable Mov. Coil Movements, in wood case, for home-made Tester, 12/-. Silvertown pocket Galvos for circuits, 7/-. Switchboard meters 3 in. to 8in. all ranges cheap.

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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 "C" bridge-galvo, suspens. needle, 20/-. Paul Pivot, 17/6. Send addressed envelope at once for new Sale List printed. It is impossible to repeat these goods.

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New Speakers

IN the new Marconiphone leaflet you will find details of several new speakers, all of which I can confidently recommend. The 120 type is an energised moving-coil job for D.C. mains, the 132 a fine permanent magnet moving-coil instrument capable of handling over three watts, and the model 131 a bigger permanent-magnet job, with a greater performance. Copies of this leaflet can be had free through my catalogue service. 728

Clarke's Atlstat

The Atlstat is an H. Clark & Co., Ltd., component, the main purpose of which is as a potentiometer volume control. It gives a logarithmic increase of resistance for equal movements of the knob and it can be used as an L.F. or gramophone volume control, as a variable anode resistance, as an H.F. volume control, or as a variable H.T. feed. 729

Lissen Band-pass "Three"

Lissen, Ltd., have just sent me a folder describing the console type band-pass three-valver, with single-dial tuning. It is claimed that one gets super-het performance with this three-valve outfit and certainly the technical layout appears highly satisfactory. OBSERVER. 730



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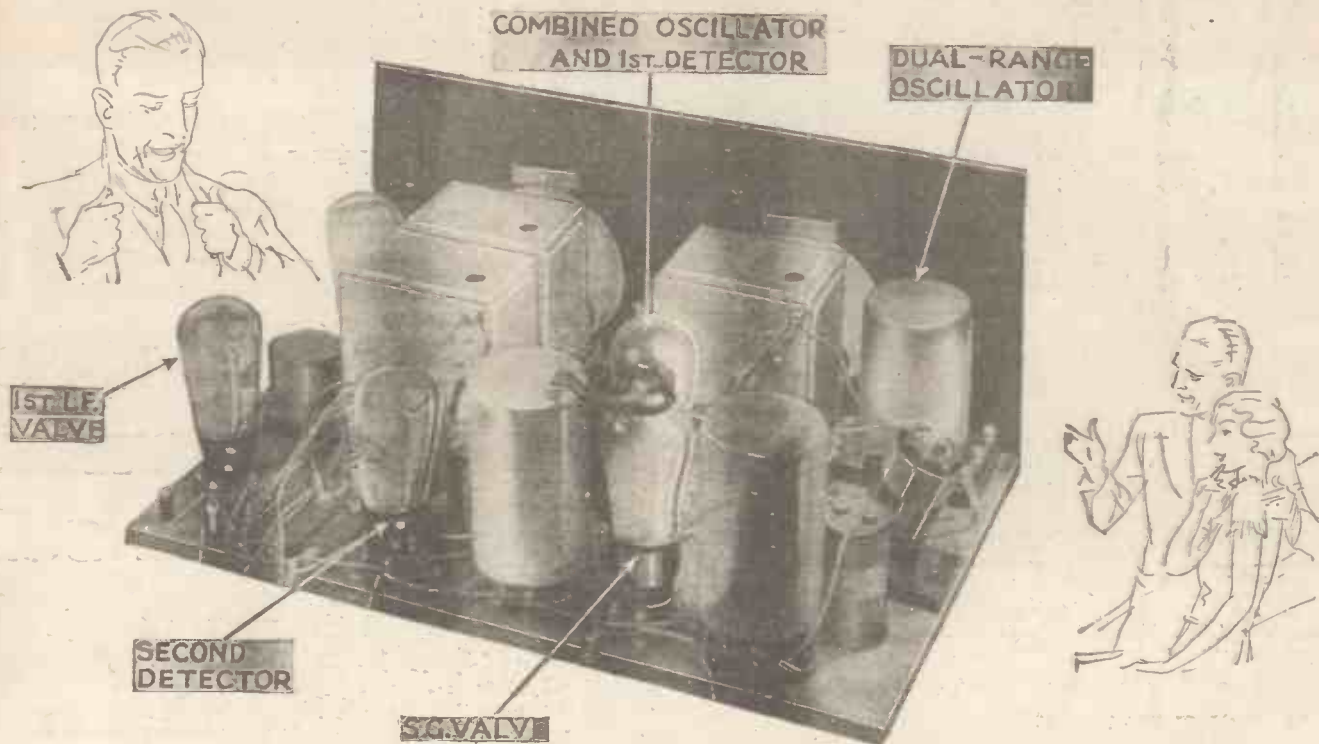
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Amateur Wireless Blueprints Dept., 58-61 Fetter Lane, London, E.C.4

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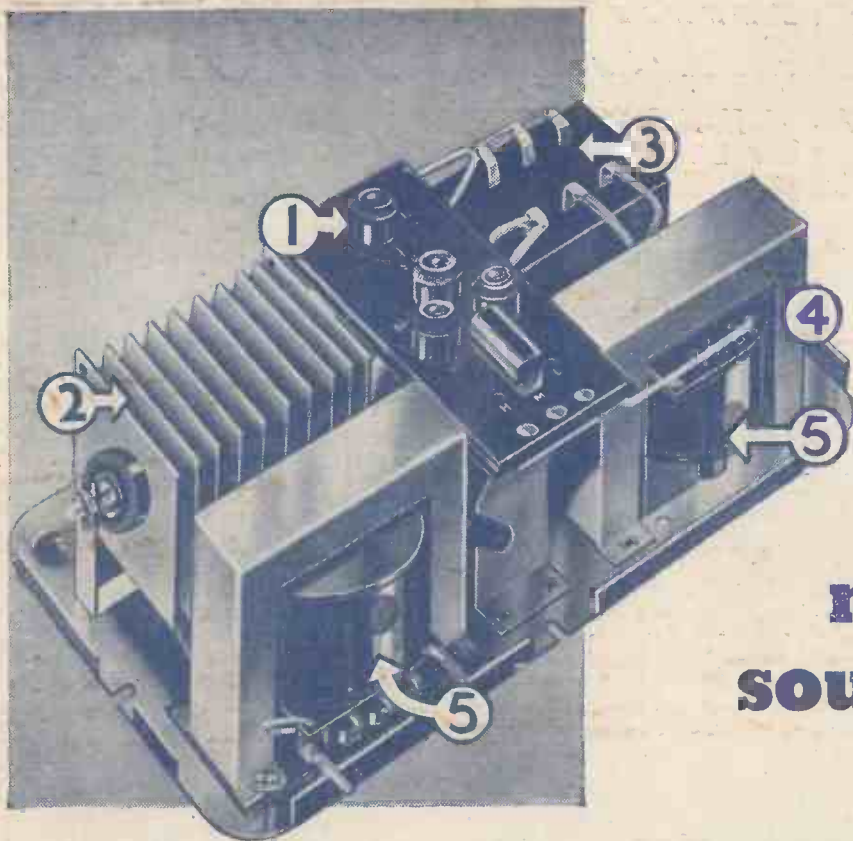
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- TESTS OF NEW APPARATUS
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WIRELESS MAGAZINE

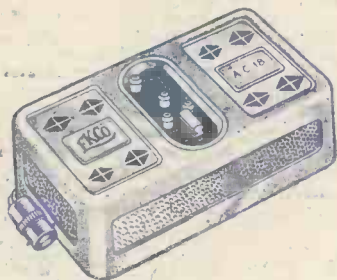
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