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MODERN WIRELESS

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Vol: XVI. N°58

OCTOBER 1931

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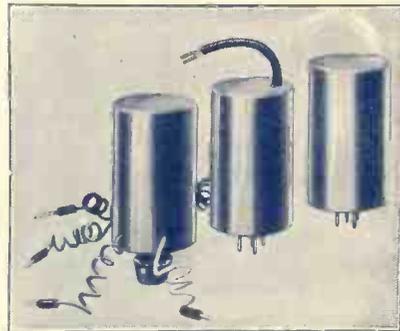
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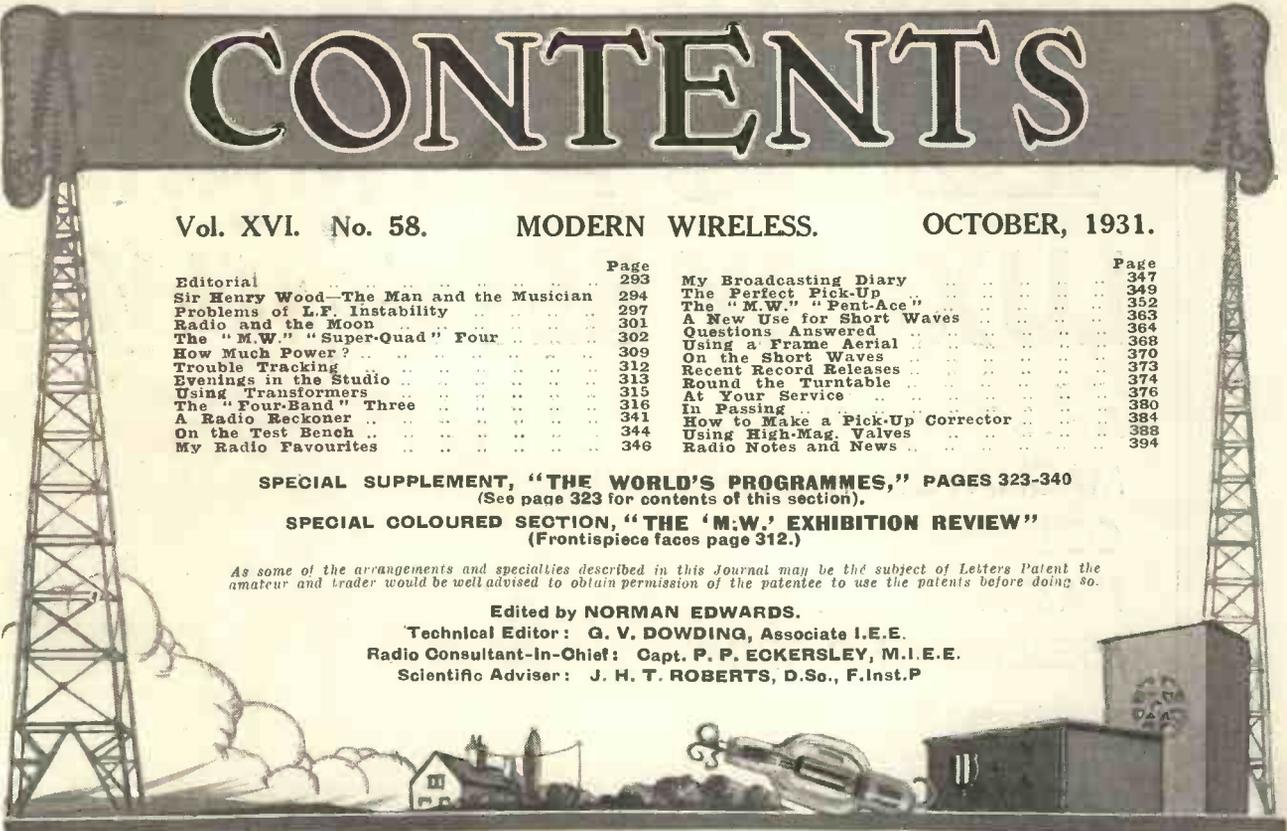
As some of the arrangements and specialties described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentee to use the patents before doing so.

Edited by **NORMAN EDWARDS.**

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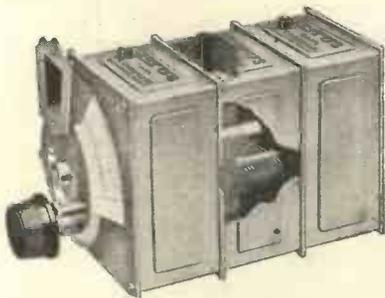


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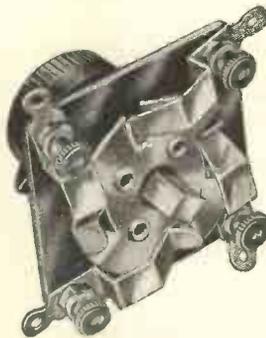
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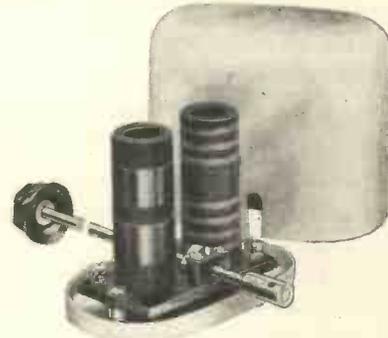
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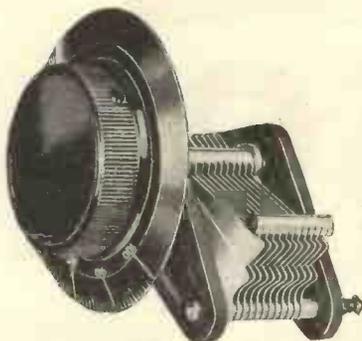
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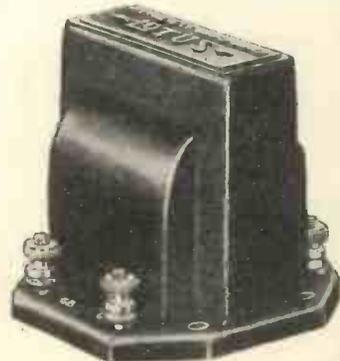
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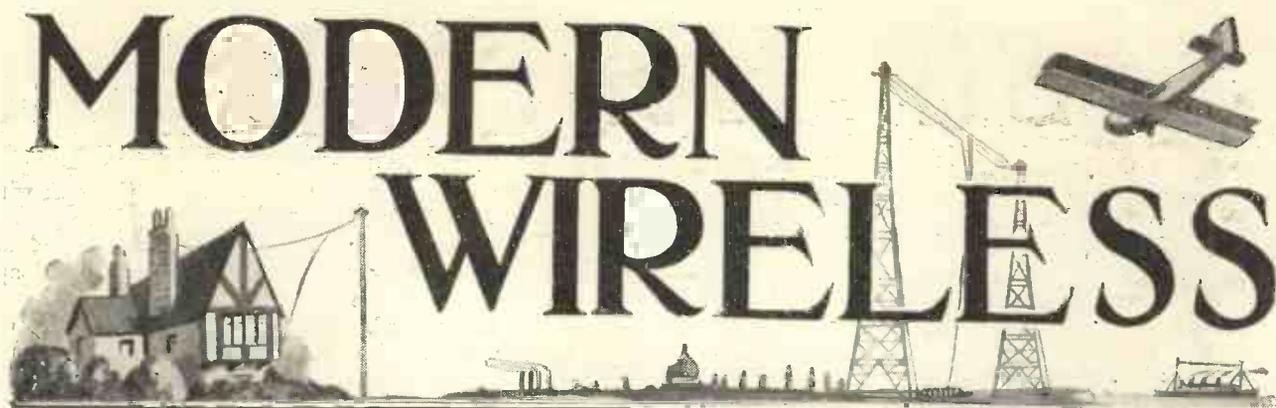
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MODERN WIRELESS



Vol. XVI. No. 58.

BRITAIN'S LEADING RADIO MAGAZINE

OCTOBER, 1931

Our Special Supplement—A Boom Season—The Blue-Print Set—Another Original Receiver.

Our Special Supplement

ONCE again we have pleasure in presenting to readers the special Exhibition Number of MODERN WIRELESS. To celebrate what undoubtedly will prove to be the biggest British Wireless Exhibition ever held in this country, we include in this issue a special twenty-four-page coloured supplement, dealing exclusively with the Exhibition.

We believe this supplement will give readers a comprehensive idea of the magnificent exhibits which may be found at Olympia; and because of the special paper used for this supplement, the photographic reproductions of the various sets, components, loud speakers, etc., are so clear that you can easily get an idea of the splendid workmanship and general style of this year's British Radio Manufacturers' models.

It is, of course, impossible to give you an absolutely detailed account of all there is to be seen at the Exhibition, but in the special Exhibition Review included in the supplement we have attempted to give you a broad outline of the Exhibition and to indicate to you some of the outstanding radio items of the season.

Although photographs and words are useful, we frankly admit that the only way in which you can completely appreciate the excellence of this year's Exhibition is by paying a visit to Olympia. And not once, but twice, and even three times!

A Boom Season

THIS is going to be what is known as a "boom season" for radio. The licence figures are steadily increasing, sets are cheaper, more efficient, and in every sense more attractive.

For the home constructor there are a multitude of components—many of them of improved design and reduced cost; and with the revival of interest in the super-heterodyne you can easily imagine the pleasant hours to be spent this winter in building yourself a set which will put you in touch with foreign stations without the annoyance of interference.

When you come to consider the money which you probably spend in a few months in forms of entertainment, such as theatres, cinemas, football matches, etc., and when you come to consider what you could do in radio

with the money thus spent, you will quickly realise that there is no better entertainment investment than in a good wireless set.

Our Blue-Print Set

WRITING of sets reminds me that we are introducing to you in this number the MODERN WIRELESS version of the now-famous "Super-Quad" receiver. This set has proved so successful that we have decided to produce an "M.W." version, and, incidentally, to present to our readers a full-size 1s. Blue Print of the practical layout.

This "M.W." "Super-Quad" is, we venture to say, something entirely new. It is a full-power super-het., using only four valves; and it incorporates the Extenser tuning system. Have a look at the blue print. We think you will admit that its construction presents very few difficulties; and we can assure you that on test you will be amazed at its programme-pulling powers.

There is only one thing which limits this receiver, and that is atmospheric conditions. And that limitation is a general one, for we do not yet know of a single set in the world which is impervious to atmospherics. You can use this particular receiver on an ordinary aerial, and you will find it completely free from those "repeater" and other faults found even in 6-, 7-, and 8-valve super-hets.

Readers may ask: "Why haven't you described a 6-, or 7-, or 8-valve super-het.?" The explanation is simple. We vetoed the idea because we think it essential to bear in mind the economic conditions to-day, and therefore the technical staff have been working at the production of an economic super-het. which we reckon to be a real achievement in radio reception technique. Build it and see for yourself; and, remember, the original model may be seen on our Stand No. 67 at Olympia.

Another Original Receiver

ANOTHER set which we recommend to your notice is the "Four-Band" Three. Here again is an original design. By operating a single panel switch the set can be transformed from a two-band ordinary broadcast receiver to a two-band short-wave set or vice versa. This receiver may also be seen on our Stand at Olympia.

Sir Henry Wood

THE hardest worker in England; the man with the best-known back in London; "the Wood-worker"; and (affectionately, by some of his orchestra) "Timbers"—these are some of the appellations which the amazing career of Sir Henry Wood has evoked. He is to-day, during the thirty-seventh consecutive year of Promenade Concerts, still the most active musician in this country, and the most popular.

The Distinguishing Mark

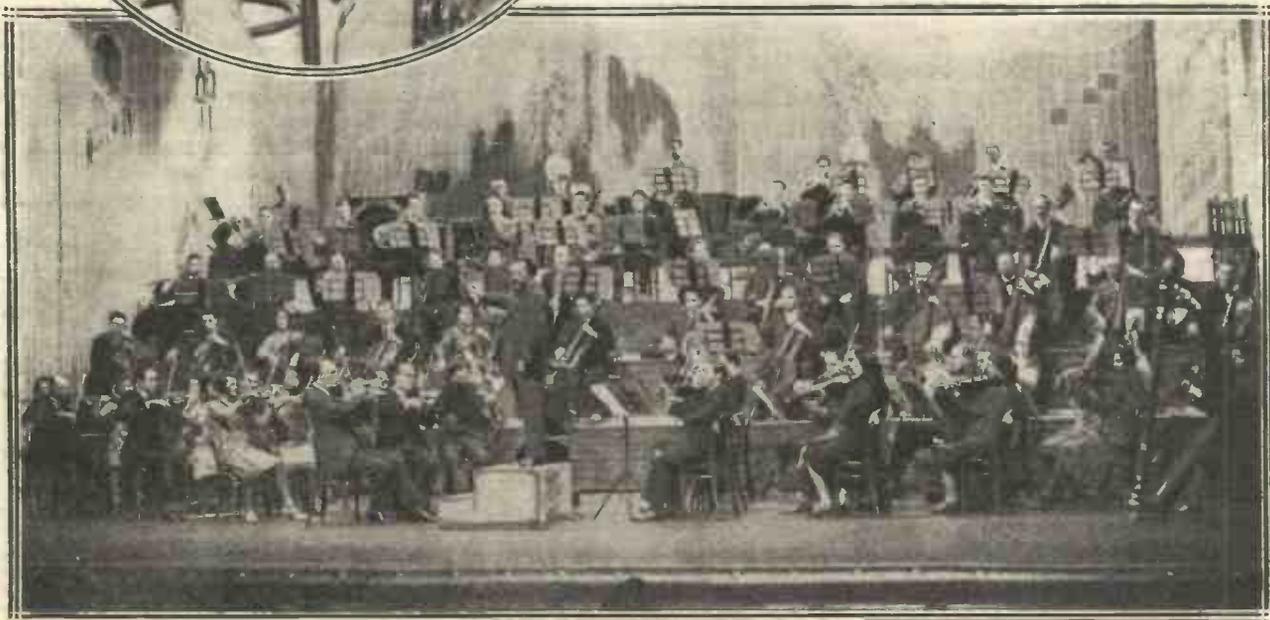
He has cared for and directed the musical taste of the masses who care for art without any pandering to the desire for quick results or straining for effect by esoteric propaganda. Sanity has been the distinguishing mark of Sir Henry Wood's work.

Coteries and cranky enthusiasms have passed him by. He has kept to the middle of the road with a steadiness which is all the more remarkable when it is realised that he has temperament, although he never shows it; that he must at times find it hard to suffer fools gladly, although he never once has made an exhibition of the nervous fret which is supposed to characterise musicians and artists.

A Many-Sided Individual

The musician is balanced, and the man has an imperturbable equipoise. Sir Henry has never neglected other interests. He is a many-sided individual. He is as proud of his achievements with brush as with baton.

At the top is a view of Apple Tree Farm, the home of Sir Henry Wood, who is shown in the circle seated in his study, and, below, rehearsing his orchestra at the Coliseum.



—the Man and the Musician

Some Intimate Sidelights on one of the World's Hardest Workers.

By *RICHMOND WEST.*

Indeed, he is a very good artist in water-colours. His skill as a carpenter is exceptional and he has built at his country house at Chorley Wood a rustic arbour which is a triumph of ability over difficulty. He purchased a complete aeroplane case and cut it up into sections, made the framework of his building, manoeuvred the walls into place—and this needed very powerful shoulders—and by some very clever drilling of bolt-holes fixed up a beautiful arbour thatched with reeds.

The Enemy of Half-Heartedness

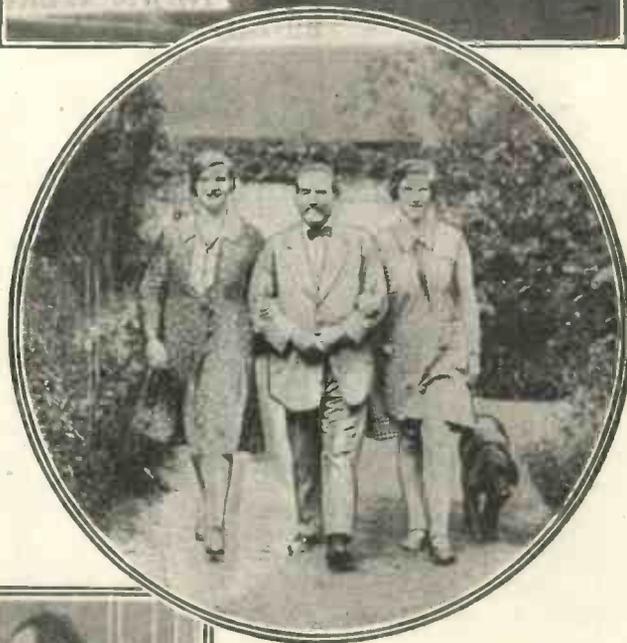
This is only one illustration of the patience and persistence of the man who has built up a great edifice of musical appreciation and love not only in London but in many provincial centres.

He is thorough in carpentering, building and in music-making: patient, meticulous, insistent upon every fine shade and nuance being properly placed and timed, vigorously opposed to the slipshod, a sworn enemy of inefficiency and especially of half-heartedness, which breeds it.

He Nearly Decided Against Music!

He began as a prodigy. Unlike most prodigies he consolidated his early achievements with hard work. At twelve he was giving quite brilliant organ recitals. But he never devoted himself to music alone. In fact, he really wanted to be an artist.

He went to the Slade School for two years. But he found that art did not yield a livelihood. He was soon to see that he must decide for or against music as a whole-time job. Fortunately for us he chose



Sir Henry Wood was given a wonderful reception when he presented an orchestral concert at the London Coliseum, and here you see him conducting a Bach composition on this memorable occasion. Above, he is walking in the grounds of his Hertfordshire home with his two daughters, Miss Tatiana and Miss Avril.

The Musician of Monumental Thoroughness

for music. At twenty he was appointed conductor of the Rousby Opera Company.

But it would be inaccurate to suggest that even music and art exhaust his interests. He has a strong scientific bent. He is a keen student of physics and astronomy. His knowledge of acoustics is really remarkable.

Einstein & Charlie Chaplin

When Einstein came here on his first visit to lecture on his famous, and for most of us, incomprehensible theory, Sir Henry Wood was among those who went to hear the great mathematician. He finds time to meet Charlie Chaplin and has very individualistic views on the future of films, and particularly the place of synchronised music in future developments.

concerts, score in hand, stop-watch ready, opera-glasses in action to pick out the player of a particularly enchanting bit of melody, to watch how the incomparable Toscanini did his job. Sir Henry is always learning.

I do not profess to know all he does, but if I were to catalogue his activities during a busy concert season from what I personally know of them, the list would appear to the average person to be incredible.

Whatever he does he does with monumental thoroughness. I have known him rehearse a new work for six hours with a well-trained orchestra. He marks the bowing. He covers the score until it looks like a Greek manuscript.

He conducts always with a score, not because he has not a phenomenal repertoire at his finger-tips, but because he deems it unnecessary to

watch the antics of conductors!

You will say that a man who lives at this high pressure must keep fit. He does, and with the same thoroughness. The other day I asked him how he did it. "I take great care," he replied, "and have regular meals and sleep. I do exercises in the morning, and massage.

One Too Many for Time!

"I have cold baths every day, and when it is warm, as it often is in the middle of a 'Prom' season, I have several. I drink water in the interval of a concert, and do all my conducting on a boiled egg, toast and tea."

Do not run away with the idea that he is a cold ascetic. He is not. But his is a disciplined delight in life. Good food he enjoys. Good wine he likes in moderation. And I should guess that he likes a good cigar as much as, if not more than, either!

At sixty he feels thirty. People who have known him for twenty years say that he has not altered in that time. His gestures are as vigorous as ever, his step as light and firm, his eye as bright and glinty.

Even the little round, bald patch on the top of his head does not grow larger, as if Time, having made that one slight mark on this defiant personality, had suddenly given up the job as hopeless!

The Master of His Job

A word about the musician. Technically there are few conductors even in this age of virtuosi who are better equipped than he. His ear is acute, his mastery of the prosody of music probably unsurpassed, his repertoire enormous, his taste catholic in the extreme, his knowledge of what this and that instrument can do full and invincible.

Most of our now famous singers and composers owe something to him, either as teacher, as friendly critic, or as enthusiastic supporter in such practical ways as a "trial" at a Promenade Concert. His work among the students of the Royal Academy of Music is, perhaps, his finest contribution to the music of the future.

Here we are inclined to take him for granted. America has made him tempting offers, and there he would have become a great star and virtuoso. But characteristically he preferred to stay to teach the youngsters.

GREAT AMERICAN NEWSPAPER-OWNER BROADCASTS



William Randolph Hearst (right) being introduced to the microphone at WABC, New York, by Mr. Lowman, the operations director of the Columbia broadcasting system.

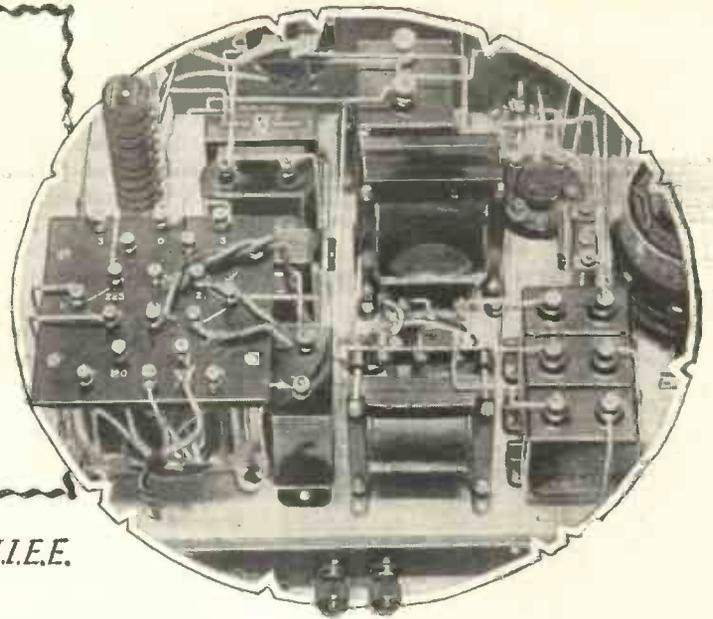
And although Sir Henry Wood probably conducts more concerts in a year than any other conductor in the world, he never misses a big night at the opera, the visit of a new conductor or composer.

He dashes over to Salzburg and Bayreuth for Mozart and Wagner, and when Toscanini visited us last year Sir Henry was present at all the

impress an audience with feats of memory. His modesty is as large as his zest. He cannot see himself as the hero of even his own symphony concerts.

He is just a man who does a job of work and wants to do it well. He would like his orchestra and himself to be hidden from view. He believes that people should hear music, not

PROBLEMS of L.F. INSTABILITY



By Marcus G. Scroggie, B.Sc. A.M.I.E.E.

MANY a constructor fired with a desire to build a set giving a really good quality has collected components giving perfect "straight-line amplification," and the very latest in power valves and loud speakers, has gone perhaps to the length of "band-pass filters" to avoid high-note loss, and yet the quality of reproduction has been disappointing.

Many a good set is spoilt by a tendency to instability on the low-frequency amplifying side, and in this article the author—a recognised authority on the subject—goes fully into the cause, prevention and cure of this trouble.

REDUCING INTERACTION

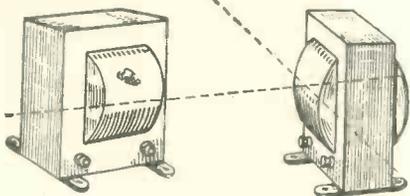


FIG. 1. A2251

If two transformers are mounted at right angles, as shown above, there is less possibility of trouble through interaction.

Or perhaps distortion has been present unnoticed (for as explained in a previous article the ear is remarkably tolerant), yet if the reproduction could be compared with some standard the difference would be instantly appreciated.

A Simple Explanation

Others have found that the addition of an L.F. stage, the substitution of a pentode for a power valve, or a "mains unit" for a battery, has failed to give the expected improvement in quality or amplification or both. These and many other effects are due usually to one form or another of "feed-back," a phenomenon which is always ready to exert its unwelcome

influence, often in unexpected places. The following is intended to be a simple explanation of feed-back (and how it may entirely negative the utmost care and expense put into a receiver), together with some hints on how to avoid it.

The Trigger Action

In any practical receiver (or amplifier) employing valves there is amplification. That is to say, the power released in the anode circuit of the valve, and which may be used to drive either the next valve or the

loud speaker, etc., is greater than the amount of power which it was necessary to supply to the grid.

There is the old analogy of the rifle; the power released from the cartridge is very much greater than that supplied by the finger to the trigger in order to bring about its discharge. Or to change the illustration to one which is closer both in

AN OUTPUT FILTER

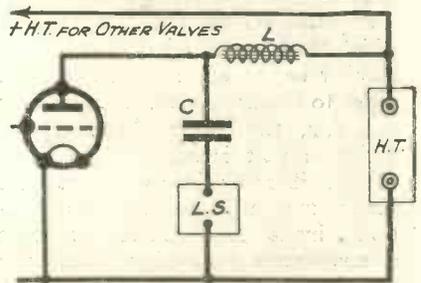


FIG. 3. A2253

The great advantage of this arrangement is that the speech and direct currents are kept in their proper places, low-frequency currents being withheld from the battery, and the H.T. prevented from entering the speaker windings.

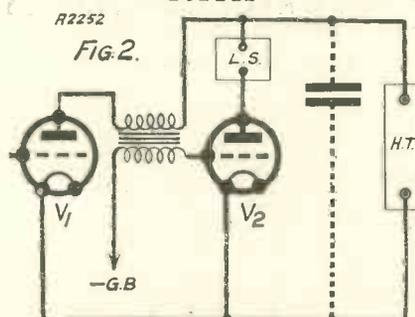
name and in action, there is the valve of an engine, which requires but a very small power to be imparted to it in order to set in motion comparatively huge forces.

Many Millions!

The feature of the radio valve which is not possessed by these others in quite the same way is that, within the limits of its power-handling capacity, the power released in the anode circuit is proportional to that supplied to the grid.

Now there are a variety of ways in which the power thus released, which

PROVIDING AN EASY PATH



A high-capacity fixed condenser connected across the H.T. battery will sometimes effectively prevent howling should the battery's resistance be high.

in a single valve may be many thousands of times that supplied,* may leak back to the grid circuit. A very large part of radio design is devoted to preventing such leakage or *feed-back*.

It is a comparatively easy matter to avoid trouble due to the amplification of a single valve, but when

"PUSH-PULL" PROGRESS

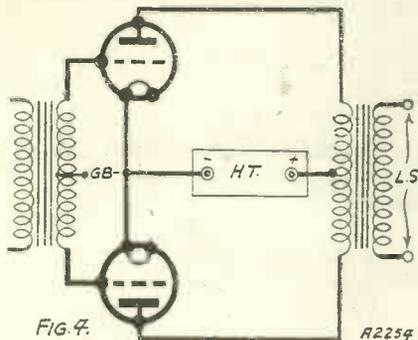


FIG. 4.

A2254

In recent years the "push-pull" circuit has become popular in broadcast receiver design, and is very useful when H.T. voltage is limited.

several valves are used the amplification of each must be multiplied together to give the total, which usually runs into many millions (reckoning in terms of *power*, it must be remembered).

An Insidious Form

Suppose we have an amplifier in which the power which drives the loud speaker is just one million times the input to the first valve, then, roughly speaking, the feeding back of one millionth part is sufficient to cause the amplifier to go into self-oscillation. Except in some cases when the oscillation is inaudible, and merely produces a mysterious paralysing effect, the noise calls attention to such a feed-back

* One must distinguish between *voltage* amplification, which is normally rather less than the *amplification factor* of the valve, and the *power* amplification, which is usually enormously greater under the same conditions, owing to the smallness of the *current* taken by the grid. Power is, of course, made up of both voltage and current.

and will shout for steps to be taken to abolish it.

It may range from the slow chugging known as motor-boating to an ear-splitting squeal, but the insidious form of feed-back which is more especially the subject of this article is that which is insufficient to cause oscillation and which may, therefore, go unrecognised, but which has a very serious effect nevertheless.

Feed-back is, of course, possible in both the high-frequency and low-frequency departments of the apparatus; in fact, its prevalence in the former is the better known and is the reason for the existence of screened-grid valves. We are at the moment considering only L.F. feed-back. H.F. feed-back is more often referred to as *reaction*, and may be intentional or otherwise.

The Frequency Factor

There are a variety of ways in which electrical energy can be fed back in an amplifier, and the extent of most of them depends upon *frequency*; as we are dealing with L.F. amplifiers this may be anything between 50 and 5,000 cycles per second. (Or a rather bigger range if we are fastidious.)

Firstly, there may be inductive coupling. This effect increases with frequency, and is not likely to give much trouble, because the precautions are for the most part fairly obvious. It is most likely to occur in a compact receiver in which there are at least two L.F. transformers close together (inter-valve and output, or two inter-valve). The output transformer or choke, if any, must be watched, because it often has a gap in the iron core, and however desirable this may be in order to avoid magnetic saturation it does tend to increase the stray magnetic field and cause coupling with other transformers.

Another reason is that the output transformer handles most power.

Even so, provided it is iron-shrouded it is unlikely to couple enough to cause trouble if the other transformer immediately precedes it in the circuit, but if it is the first transformer in a set with two transformer-coupled stages the extremely high amplification may easily be enough to cause

VERY EFFECTIVE

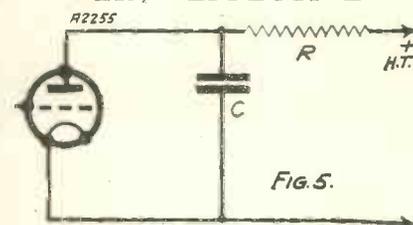


FIG. 5.

This is the usual filter or de-coupling arrangement, and is almost essential to prevent L.F. oscillation in sets giving high amplification.

oscillation, and the transformers must be further separated.

Remember the Right Angle

In any case, it is most desirable to arrange the transformers with their coils at right angles to one another; that is to say, the axis of one coil should pass through the centre of the other coil and be at right angles to *its* axis, as shown in Fig. 1. The same remarks apply to choke couplings, but to a less degree, because of the lower amplification.

Other components are unlikely to be troublesome unless very grossly misplaced, such as the detector H.F. anode choke being mounted close to and in the same axis as an inductive wire-wound resistor connected in the anode circuit of a later valve. A glance at the layout will reveal any such blunders.

Capacity feed-back also increases with the frequency, and one must remember that although the normal limit of functioning of the L.F. amplifier is about 5,000, it is often capable of amplifying much higher frequencies, particularly if resistance coupled, and this must be borne in mind in considering the possibility of an undesirable amount of stray capacity.

Those By-Pass Condensers

For this reason the values of the by-pass condensers in the circuit are important. These by-pass the upper frequencies and prevent radio-frequency currents straying through into the L.F. circuits, and also prevent the L.F. amplifier being operative at a higher frequency than necessary, and thus rendering it more liable to capacity feed-back troubles.

A "HIGH-MAG" CIRCUIT WHICH REQUIRES PLENTY OF DE-COUPLING

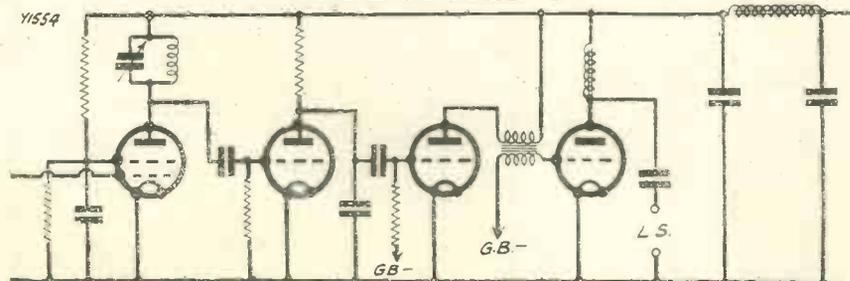


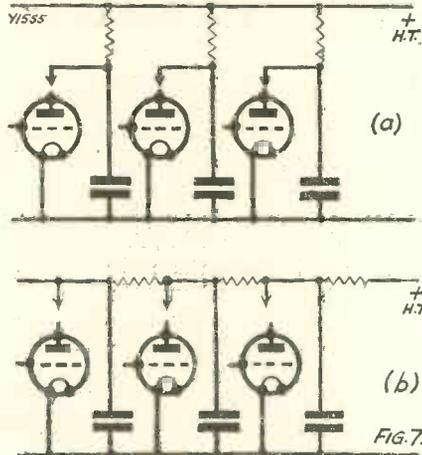
FIG. 6.

Here is the "skeleton" of a powerful four-valve circuit. A receiver of this type requires a very thorough de-coupling system owing to the high magnification occurring.

Details of Set Design That Make All the Difference

The difficulty is that if these condensers are made too large they by-pass the upper musical tones as well, to the detriment of reproduction. Unfortunately it is hardly possible to give very definite data regarding the best capacity to adopt, because it is controlled by so many considerations, such as the number and type of valves used, the design of the coupling components, the selectivity of the H.F. circuits, and the taste of the listener, which in some cases inclines

ALTERNATIVE METHODS



(a) In this arrangement a separate filter is used for each valve, or the resistances can be connected in series as at (b).

towards full reproduction of high tones and in others towards elimination of mush, scratch, and other background noises at the expense of a certain amount of brilliance of tone.

If the amount of amplification is moderate the dilemma does not arise, for there is then no difficulty in avoiding capacity feed-back, without relying on extensive use of by-pass condensers.

“Shouting for Trouble”

As regards the actual avoidance of capacity feed-back, this can be summed up in the principle of keeping parts of the circuit between which there is considerable amplification well spaced apart. For example, it is usually fatal to bring the loud-speaker connections close to the gramophone pick-up connections. Cases have been known where pick-up and loud-speaker extensions have been run parallel for some distance. That is shouting for trouble.

The remaining principal type of feed-back, and one which is often much more obscure and difficult to

trace, is *common impedance*. This arises from the practical necessity of feeding all the valves in a receiver from a single H.T. supply (battery or otherwise) and, similarly, for L.T. and perhaps grid bias.

Considering for the moment H.T. only, the function of the power supply is to provide a steady flow of current. Under working conditions, however, the audio currents (i.e. those corresponding to the programme being received) all take the same path through the H.T. battery or power unit, except in so far as reservoir condensers or other devices are provided to by-pass them.

“Reservoir” Reminders

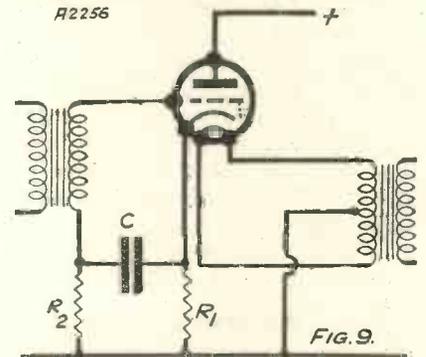
These condensers must be distinguished from the by-pass condensers from the anodes of valves, which have already been referred to, for they do not create a path away from the coupling components and hence there is no necessity to limit their size. Now these audio currents naturally are greater in each succeeding valve, and that in the power valve which feeds the loud speaker is much greater than any of the others.

It is one of the elementary laws of electricity that whenever a current passes through a resistance a proportionate voltage is set up across the resistance, and in the case of a varying or alternating current as now being considered a voltage also appears whenever it passes through an inductance or capacity.

This voltage is not added to that due to resistance in the ordinary way, but is added in the same way as the two sides of a right-angled triangle are added together to give the length of the third side.

An H.T. battery has a certain amount of resistance, which increases as the battery is used up, and an H.T. mains unit has a combination of resistance, inductance and capacity (referred to as impedance). There is therefore an alternating voltage set up in the H.T. supply, due to the audio current in the power valve, which is conveyed to the preceding valves.

BIASING A MAINS VALVE



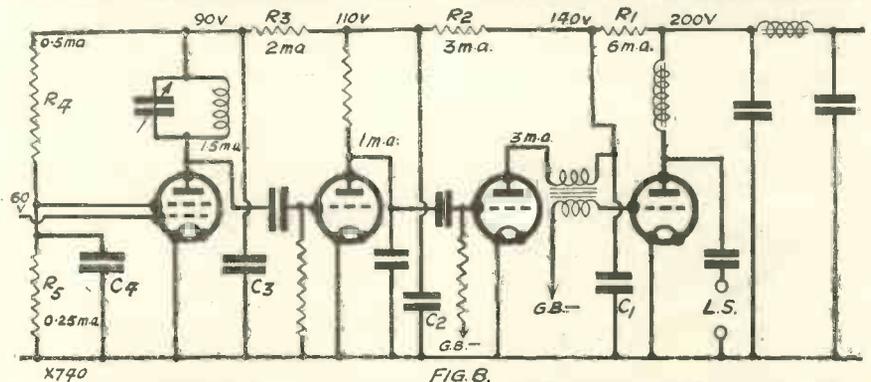
A convenient method of obtaining grid bias for an indirectly heated valve is to connect a resistance in series with the cathode.

This is seen from Fig. 2, which represents a simple L.F. amplifier circuit, omitting non-essentials. Valve V_1 is transformer-coupled to valve V_2 , which works a loud speaker, and both are supplied with current from a source of H.T. which we will suppose has 300 ohms resistance. We will also suppose that the audio current in the loud-speaker circuit is 5 milliamps.

A Practical Instance

The voltage set up across the H.T. is, of course, the number of ohms multiplied by the amount of current in

THERE WILL BE NO “FEED-BACK” TROUBLES HERE!



Nearly All Receivers Need Efficient "De-couplers"

amperes, so in this case is 1.5 volts. This 1.5 volts is superimposed upon the direct current supplied to V_1 , so has just the same effect as a voltage due to the normal amplifying function of V_1 , that is to say, is stepped-up by the transformer and amplified by V_2 , there to cause a further voltage across the H.T., which is fed back again, and so on.

A Voltage Comparison

What happens exactly is a rather complicated matter which may require lengthy calculation to determine, but one can obtain a rough idea of the effect of the resistance in the H.T., which is common to these two valve circuits, by comparing the voltage thus fed back with that required to drive the loud speaker with 5 milliamps,

In an average case it might require 4 volts at the grid of V_2 , and if the

opposition to the voltage necessary to keep things going, thus having the effect of greatly reducing the amplification, or it may bear some other relation to the input voltage which will modify the performance more or less.

The precise behaviour will depend on frequency. This is clearly so when one attempts to improve matters by connecting a reservoir condenser across the H.T., as shown (dotted). This has the effect of providing an alternative path for the audio currents, but not for the steady current from the H.T. The effectiveness of this path increases with frequency.

Thus supposing the condenser is 2 mfd., at 5,000 cycles this is only about 16 ohms, which will reduce the feed-back voltage very greatly. On the other hand, at 50 cycles it will be a path of 1,600 ohms, which hardly reduces the trouble at all, and there

condenser we can bring the highest frequency at which the feed-back is sufficient to cause oscillation below the lowest frequency at which there is sufficient amplification, then there will be no oscillation.

This is not all, however. Long before the oscillation point is reached the feed-back is sufficient to increase or reduce the amplification at certain frequencies much more than others, destroying whatever claims the amplifier may have to be distortionless. The obvious thing to do is to reduce the impedance of the H.T. source.

Effect of One Dud Cell

If it is an accumulator battery the resistance is usually negligible, but a mysterious attack of acute feed-back has been traced to a corroded connection, so keep all connections clean and tight. Dry batteries should be as massive as possible and not allowed to run down too much. A single dud cell may increase the resistance by hundreds, or even thousands, of ohms.

A mains power unit necessarily has a very large impedance for smoothing purposes, and when added to a set previously designed for batteries very often causes trouble. As already explained, an ordinary 2-mfd., or even 4-mfd., condenser, while effective at high audio frequencies, is of practically no use in stopping motor-boating, as its impedance is as large or larger than that of the H.T. source.

Big strides have recently been made in the development of electrolytic condensers, which have a very large capacity in a small space, but we are still some distance from a condenser of adequate capacity capable of working at the high voltages which are desirable for good volume, at a reasonable cost.

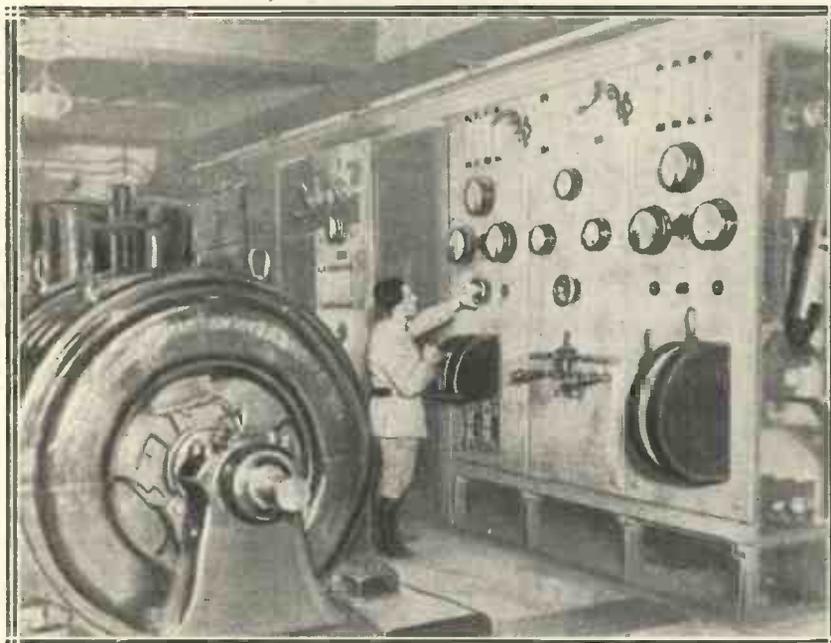
The Filter Circuit

The power valve audio current being by far the largest, it is a great help to divert this from the H.T. source. At the same time it is essential in mains-driven sets to isolate the loud speaker from the high-voltage part of the circuit, for safety. If one uses an output transformer for the latter purpose, with a single power valve, the audio current still passes through the H.T., but the popular choke method of Fig. 3 avoids this.

The choke L should be at least 20 henries (preferably more), capable of carrying the anode current of the

(Continued on page 406.)

SWITCHING ON THE EIFFEL TOWER STATION



An engineer at the switchboard of the Eiffel Tower broadcasting station, which actually belongs to the military authorities. Hence the uniform!

transformer ratio is 1:4 this would be the same as 1 volt at the anode of V_1 . But we have already seen that the feed-back voltage is actually greater than this, and therefore amply sufficient to keep the cycle of events maintained without any reception taking place; in other words, there is a likelihood of continuous oscillation being set up.

This is not necessarily the result, for the voltage fed back may be in

is therefore a likelihood that the circuit will oscillate at a low frequency.

Cleaning Up the Source

Moreover, the impedance of the loud speaker, if of the moving-iron type, is less at low frequencies, and the current and the feed-back consequently greater. At extremely low frequencies the amplification begins to fall off, so if by increasing the

RADIO AND THE MOON

CAN we wireless to the moon? It does not seem a very useful thing to attempt considering that the moon is a bleak, desolate wilderness bereft of all life save a few hardy shrubs.

But Dr. Hoyt Taylor, of the U.S. Naval Research Laboratory, is to try and send signals to the moon in order to prove once and for all whether our wireless waves can penetrate into outer space or, as many believe, are earth-bound by the Heaviside layers.

Echoing Across Space

Dr. Taylor will be able to tell if the wireless signals arrive or not by the echo—for so precise and exact have our instruments and measurements become of late years that no very great difficulty is anticipated in picking up this echo. There are, of course, a number of points to watch.

It will not do, for instance, to mix up the echo from the moon with the echo caused by the signal travelling round and round the 24,000 miles of the earth's circumference; or, again, by the echo caused by ordinary Heaviside layer reflection or long-distance echoes believed to come from millions of miles away in space.

Fairly Good Reflector

On the night, or nights, when the tests are to be made the exact distance of the moon from the earth will be calculated almost to half an inch. If we suppose the distance of the moon from the earth to be 239,000 miles—which is the average distance, then as wireless waves travel at a speed of 180,000 miles per second, the echo from the moon should be heard in about 3 seconds—the exact time and distance will be most accurately calculated.

By G. H. DALY.

Can radio waves be made to penetrate the Heaviside layer and go off into space? Experiments to decide this question are shortly to be made in America.

It is possible, of course, that an echo of a similar time period might be caused by another factor which might lead to confusion, but such an illicit echo would not be likely to occur so regularly as an echo from the moon.

There are a number of other points which will have to be watched. Obviously the moon must be visible, and the wireless signal, if possible, must fly off in the direction of the moon.

so the echo is likely to be extremely weak and continuous experiments may be necessary before it is definitely detected.

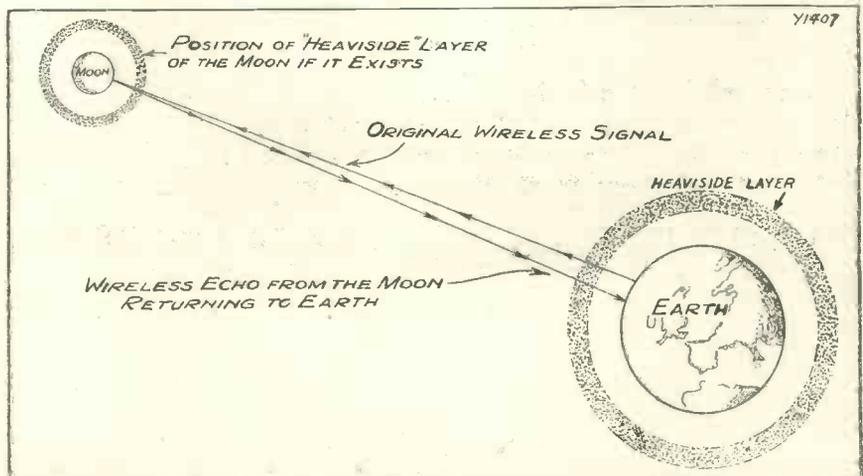
The surface of the moon should be a fairly good reflector of wireless waves, although a certain amount of the signal will be absorbed by the moon and thus lost. This is owing to the dry quality of the soil on the moon—its surface is mainly of volcanic rock and solidified lava.

Very Dry!

If the moon had vast oceans and damp surfaces, then we might expect a much stronger echo, but the moon apparently has no water, and the waves will therefore tend to sink into its surface.

It is owing to the large amount of

WILL THE ECHO ANSWER "YES"?



The paths of the radio waves to the moon and back are indicated above, but whether any echo will be received still remains to be "seen."

The moon is not very large—only 2,160 miles in diameter, and a wireless signal might easily miss it. At best only a small percentage of the transmitted energy can possibly be reflected,

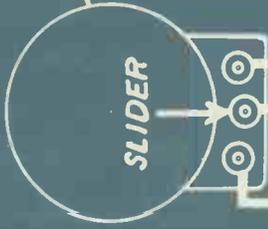
water on our own earth that wireless reception is as good as it is, because water and damp soil tend to reflect the waves back into the atmosphere

(Continued on page 412.)

FULL SIZE BLUE- PRINT OF THE M.W. "SUPER QUAD"

PRICE 1/-

POT METER. VOL. CONTROL.
50,000 OHMS.



EXTENSER - .0005 MFD.

SELF CHANGER
CONTACTS

SELF CHANGER
CONTACTS

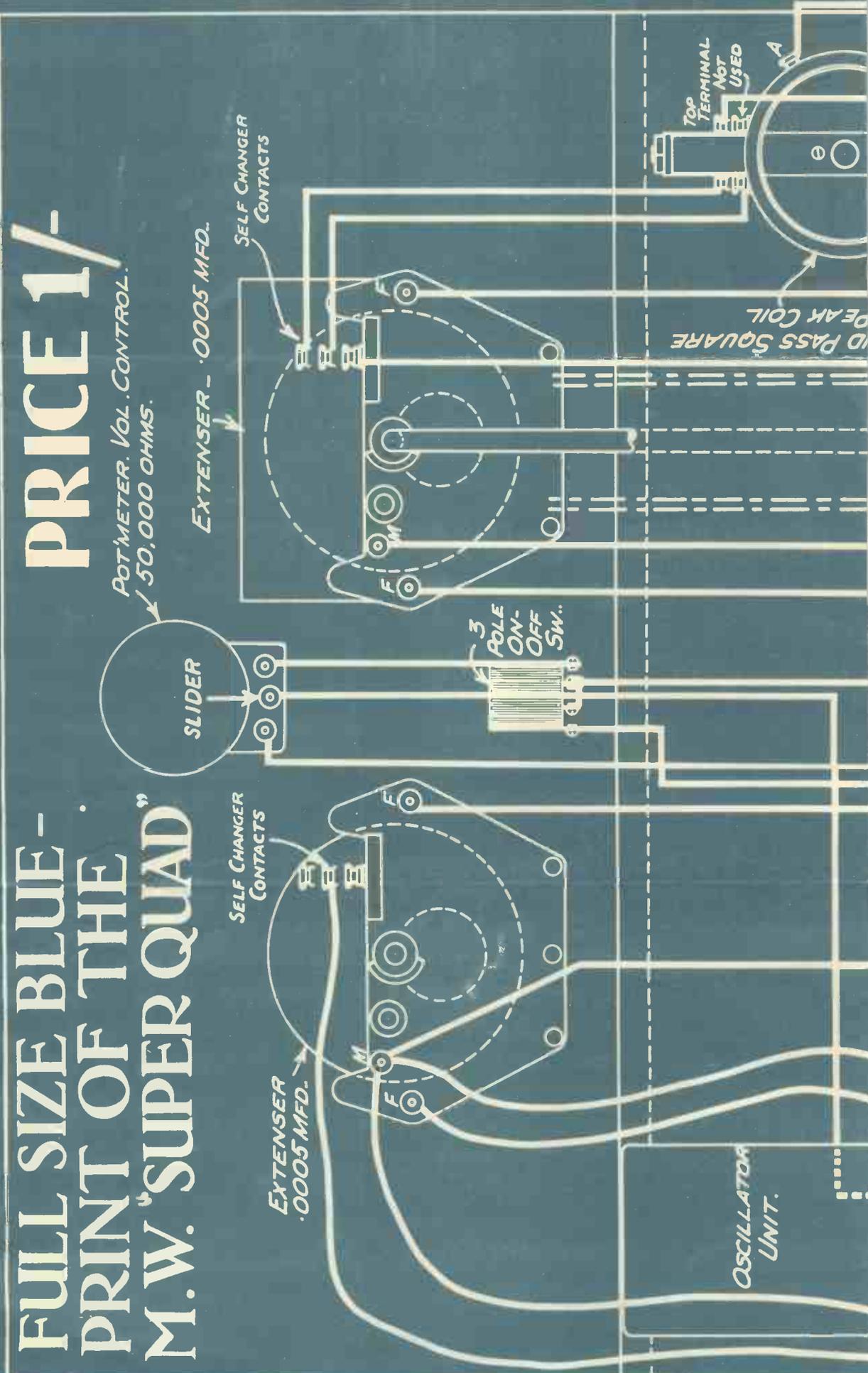
EXTENSER
.0005 MFD.



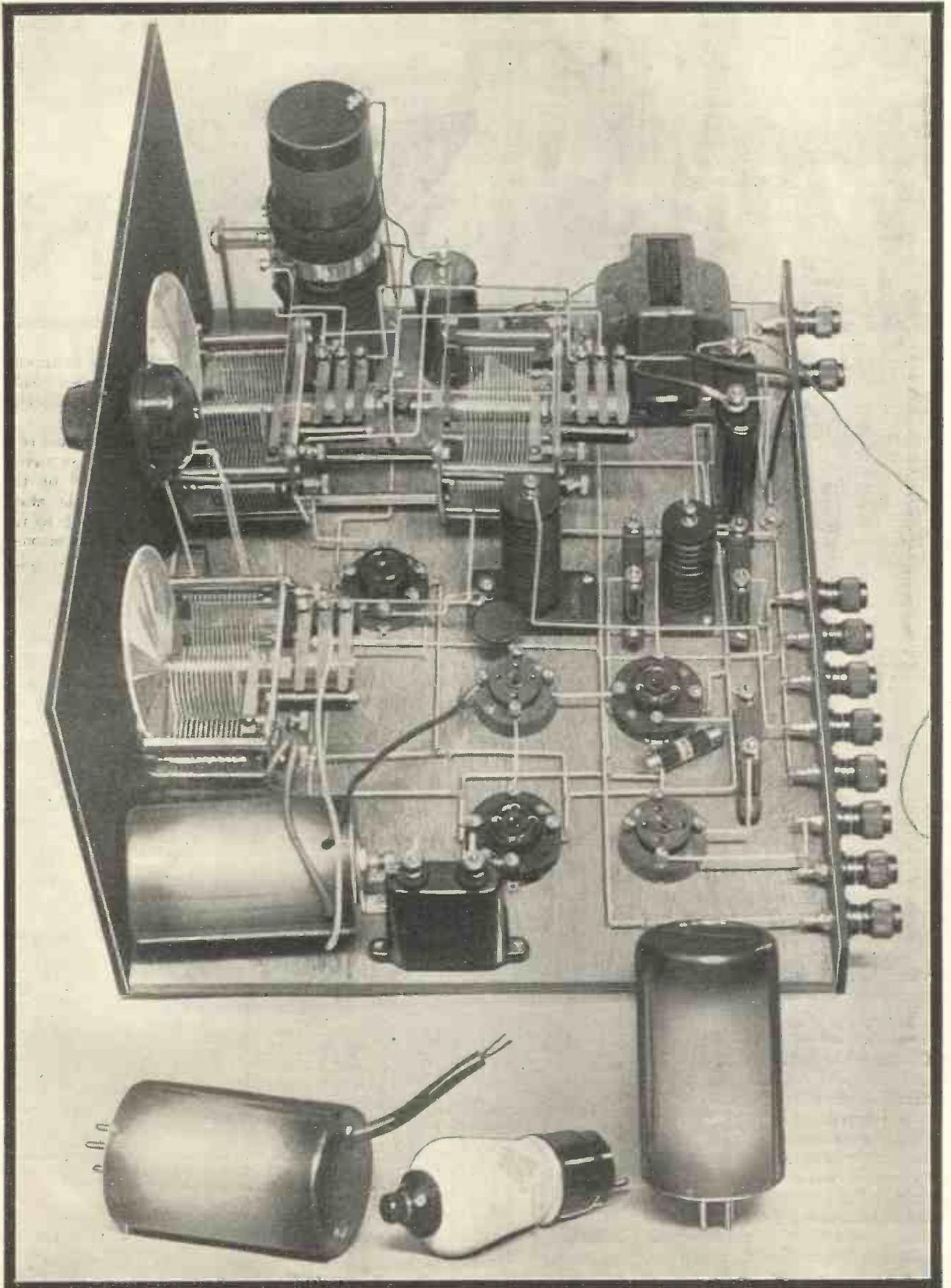
PEAK COIL
ID PASS SQUARE

TOP
TERMINAL
NOT
USED

OSCILLATOR
UNIT.



It Makes " Continentals " Sound Like " Locals "



Our Blue Print Set

The "M.W." "Super-Quad"

This magnificent super-het is the first of its kind ever produced, and includes several entirely original features. It incorporates Extenser tuning, and although only four valves are employed, and it is extremely easy to build, it possesses full-power super-het qualities.



A YEAR or so ago, while tests were being carried out on a range of H.F. amplifiers which had been constructed in the "M.W." Research Department, it was suggested that the super-heterodyne receiver should again receive serious attention.

It was felt that with modern S.G. valves very much more satisfactory amplification could be obtained from the intermediates than in the old days when ordinary H.F. valves were employed, and conse-

quently it should be possible to cut down the number of stages and thus make the set a less expensive proposition.

A Really Super "Super"

Consequently research was commenced on these lines, and a number of super-heterodyne receivers were turned out. They were not for publication purposes, but built merely so that experiments of all sorts could be tried and data collected that would

enable us to build a really super-"super" later on.

As we have already stated in previous issues, it is easy enough to design super-hets of six, seven, eight or more valves, and to get such amplification from them that the level of background noise is such that it seriously affects the received broadcasts.

That is one of the snags of really high amplification at radio frequency, and has been one of the reasons why

ALL THE PARTS YOU REQUIRE ARE IN THIS LIST

PANEL

16 × 8 in. (Permcot, or Wearite, Goltone, Peto-Scott).

CABINET

Panel space 18 × 8 in., baseboard 12 in. deep (Pickett, or Camco, Osborn, Peto-Scott, Ready Radio).

EXTENSERS

1 Double-gang .0005-mfd. Extenser with insulated cam, and disc drive (Cylidon).
1 Single-disc-drive. Extenser with metal cam (Cylidon).

SWITCH

1 Double-pole toggle switch (Bulgin).

RESISTANCES

1 25,000-ohm Spaghetti (Ready Radio, or Magnum, Telsen, Keystone, Bulgin, Varley, Graham Parish, Lewcos).

1 2-meg. grid leak with wire connector, or terminals (Igranic, or Graham Parish). (Other makes with holder can be used, such as Telsen, Ediswan, Dubilier, Ferranti, Mullard, Ready Radio, Watmel).
1 50,000-ohm potentiometer (Sovereign, or Regentone, Varley, Magnum).

VALVE HOLDERS

5 4-pin holders (Lotus for valves, and Bulgin for intermediate coils, or Telsen, Clix, Formo, Igranic, Wearite).
1 5-pin holder (Lotus, etc.).

FIXED CONDENSERS

1 .0002-mfd. (T.C.C., or Telsen, Ready Radio, Goltone, Ferranti, Igranic, Lissen, Ediswan, Mullard, Dubilier).
3 .001-mfd. (T.C.C. and Formo, etc.).
1 2-mfd. (Ferranti, or Telsen, Peto-Scott, Mullard, T.C.C., Dubilier, Helsby).
1 1-mfd. (Dubilier, etc.).
1 .04-mfd. special non-inductive (Dubilier).

CHOKES AND COILS

2 H.F. (Ready Radio and Lewcos, or Telsen, Varley, R.I., Wearite, Peto-Scott, Magnum, Dubilier, Lotus).
1 Square Peak Extenser coil (Varley).
1 Oscillator coupler (Ex. Osc. 126) (Lewcos, or Wearite), with baseboard-mounting bracket.
2 Bandpass intermediate (1 I.F.T. 126, and 1 I.F.T.P. 126, Lewcos).

TRANSFORMER

1 L.F. (Telsen, or Ferranti, Igranic, R.I., Varley, Lewcos, Lotus, Goltone, Formo, Atlas).

MISCELLANEOUS

1 Terminal strip, 16 × 1½ or 2 in.
10 Indicating terminals (Belling & Lee, or Igranic, Clix, Belex, Goltone).
G.B., H.T. and L.T. plugs, etc. (Belex, Belling & Lee, Clix, Igranic).
Flex, Glazite or Lacoline, screws, etc.

the super-het has not been popular in this country during the last few years.

Quality of reproduction is a most important feature in a set, and unless this can be obtained with reasonable degree, any set that may be designed is wasted.

You cannot be said to have this quality if serious background interference exists, and this cutting out of background was one of the tasks the research department set themselves.

Unfortunately it is wrapped up with other problems, especially that of selectivity. This latter is an essential, and the use of even a frame

We say "wasn't it?" because it has been solved, after months of patient research and innumerable set-buildings.

We had to do four things—all four being necessary in the obtaining of quality loud-speaker reproduction and economy of operation—we had to correlate selectivity, sensitivity, simplicity, and silence of background.

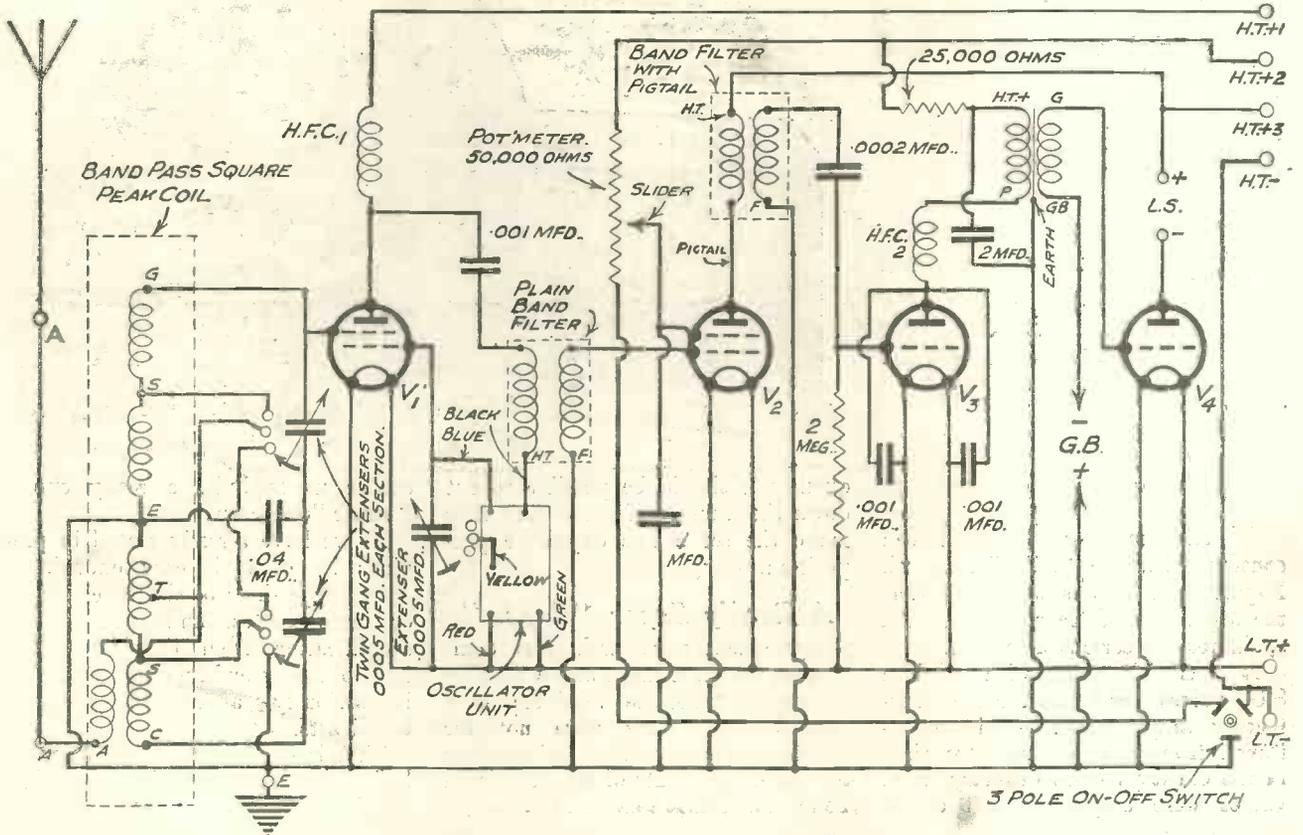
Many New Ideas

The "M.W." "Super-Quad" is the result of this combination—and, we say it with justifiable pride, it is a real eye-opener.

Moreover, it is designed for use with an ordinary outdoor or indoor aerial. The frame aerial, though efficient it may be considering its size, cannot possibly compete with the ordinary aerial-earth system where energy pick-up is concerned. But in the case of all the standard types of super-hets the frame is required to obtain selectivity.

With the "Super-Quad" this is not so, for we have designed the tuned input circuit so that between 9 and 12 kilocycles separation is obtained right away. This can then be further increased in the intermediate stages

Every Valve Does Its Full Share in This Successful Circuit



The band-pass tuning allows us to use an outside aerial, with all its attendant advantages, without causing interference to nearby listeners by radiation. This, combined with the general circuit arrangements, is the reason why this remarkable receiver gives such outstanding results.

aerial without any other aid (such as several sharply-tuned or band-passed intermediates) will not give sufficient selectivity for present-day purposes.

The Problem Solved

And herein lies the snag—increase the number of intermediates to increase selectivity and up comes the background noise apparently out of all proportion to the selectivity increase.

A nasty problem, wasn't it?

It is simply bristling with new ideas; not merely circuit twists and added gadgets, but definitely new schemes introduced not just to make the set look different, but to simplify its construction and its operation, and to reduce its initial and running costs as far as possible.

We have always considered that for the average listener and home constructor five valves is the limit, even in a super-het. Here we have gone one better, for the "M.W." "Super-Quad" only uses four.

until an extraordinary degree of sharpness is achieved. Until, in fact, the best compromise between selectivity and quality is reached.

How It Is Done

How have we done it? By using a really efficient band-pass arrangement in conjunction with a double-grid detector-mixer valve. This is followed by a really high-efficiency band filter and then by one high-magnification band-pass intermediate.

That is only the beginning of this

Tour Europe on the World's First "Extensered" Super-Het

remarkable set, however, for we have evolved a circuit arrangement that allows wave-change switching to be done away with and the famous Extenser to be used.

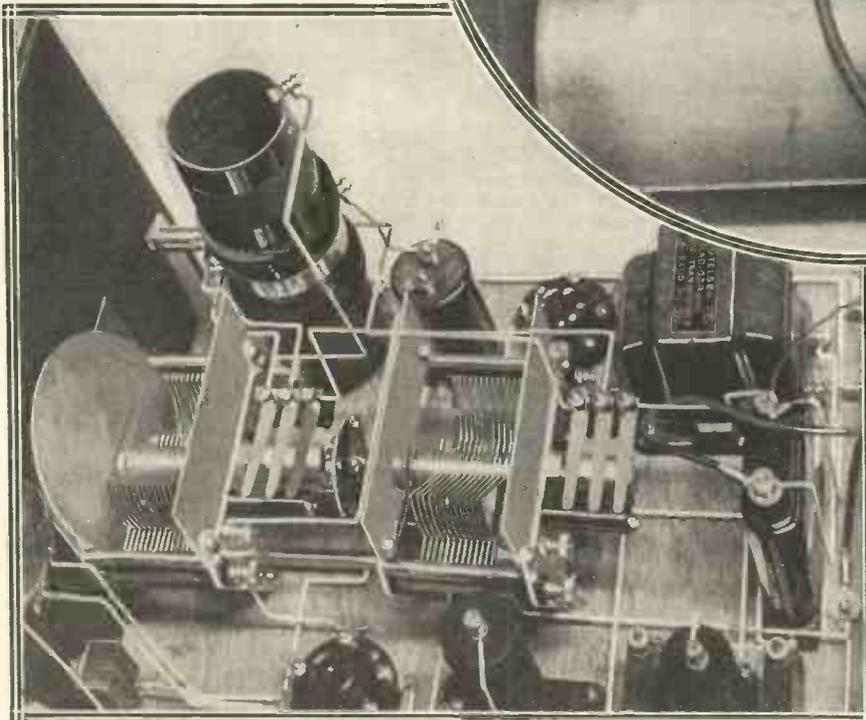
Consequently, therefore, not only have we superb selectivity with square-peak tuning, but also no wave-changing to worry about; the set glides from medium to high wave-bands, and vice versa, without a pause, and quite automatically.

Definite Dial Degrees

Do you want a medium-wave station? Very well, tune it in; you'll find it on your tuning and oscillator dials between 0 and 100. Or perhaps you wish for Radio Paris, or some other long-wave broadcaster. Just turn the two dials between 100 and 200 and the station will roll in at surprising volume.

No fiddling wave-change switches, no oscillator selector knob to turn. Your Extensers do everything automatically for you, and, furthermore, you can tell at a glance exactly which wave-band you are on.

SWITCHES ELIMINATED



This ganged Extenser is used for tuning the aerial band-pass coil seen standing on its end. Both these components are very accurately matched, so you are spared the trouble of balancing-up the circuits—often a very tricky business.

But we have not come to the end of the good features of the "Super-Quad" yet—not by a long chalk!

We have said that the frame aerial has been done away with, with its inevitable, though sometimes slight, unsightliness, and you will immediately say to yourselves: "I bet it

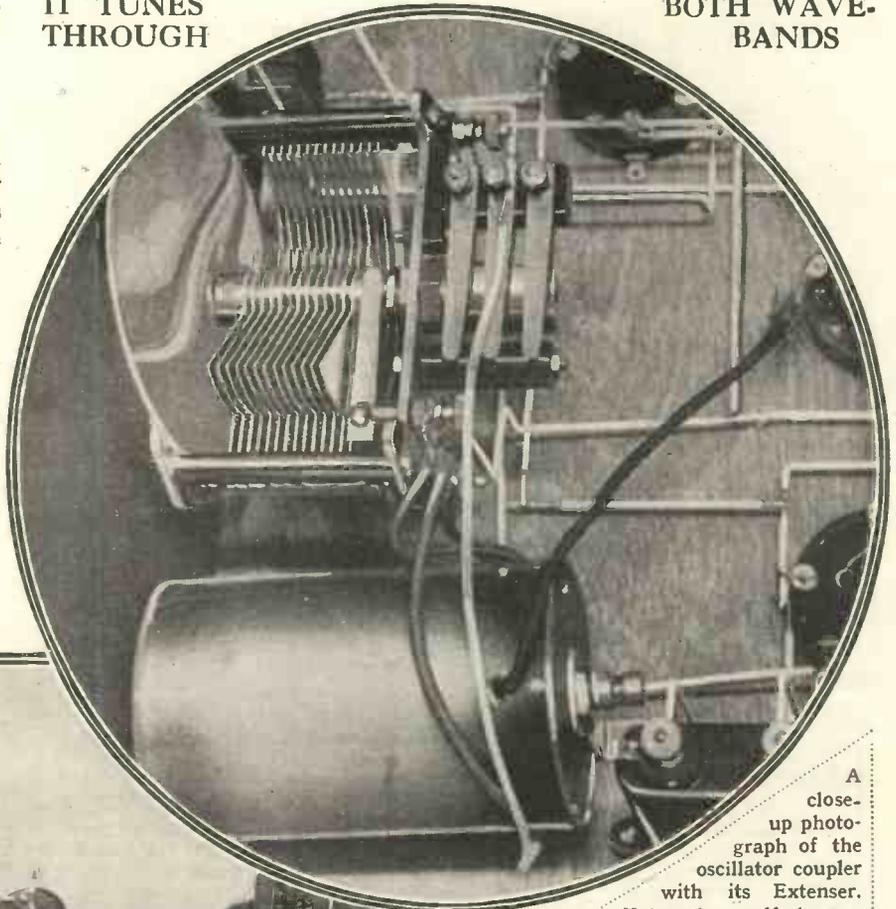
kicks up a disturbance in the neighbourhood!"

No Radiation

No, it does not radiate, even though a large outdoor aerial is used. It cannot do so, because although you may be using a combined detector

IT TUNES THROUGH

BOTH WAVE-BANDS



A close-up photograph of the oscillator coupler with its Extenser. Note the self-changer on the shaft end.

and oscillator valve, with no preceding H.F. stage to stop radiation, you are not mixing into the aerial-grid circuit of the valve, but into the valve electron stream by means of a second grid. Furthermore, you are applying powerful oscillations from anode to one grid circuit of the valve, but these oscillations are not at the same frequency as the incoming energy from the aerial.

Consequently they are not in tune with the aerial-grid circuit of the detector. And, this being a band-pass circuit, will refuse to be

energised by oscillations that are so far removed in frequency from its own tuning. In other words, you will get no radiation, and this has been repeatedly demonstrated by having other sets operating *within five feet* of the "Super-Quad," from which not the slightest interference could be detected, though it was itself upset by the ordinary sets when they were in an oscillating condition.

But, you will say, all this is all right, but what will the set do?

Without in any way exaggerating,

absolutely nothing to announce their coming.

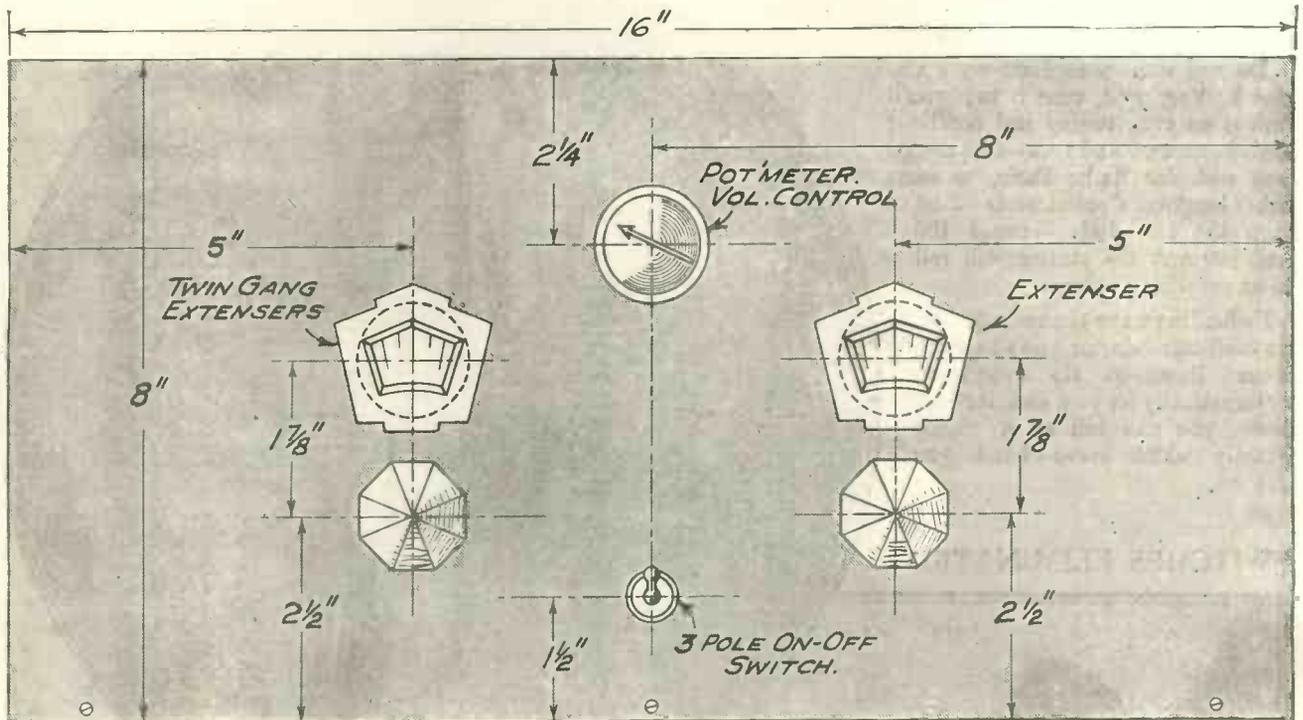
No Tuning Noises

There is no reaction control on the "Super-Quad," so that you are merely tuning in silence until that silence is suddenly broken by a loud programme. No irritating chirps, caused by the use of reaction; no carrier-wave hunting and resolving to do. Either the station is there, entertaining you with its programmes, or it isn't—*because it's not transmitting.*

volts. The remaining H.T.+ should be in about 60 volts.

The blue print shows no grid bias for the S.G. valve, and no noticeable improvement in results and only slight anode current reduction is provided by its use. It can be used quite easily if desired, however, by breaking the lead between the negative filament terminal of V_3 and "F" on the plain band filter, and taking the former to G.B. + on a single 1.5- or 9-volt cell and the latter to G.B. negative. It will only take a moment or two

Here are the Controls of this "Many Station" Set



PANEL LAYOUT.

A magnificent receiver which is very easy to tune, there being only two main controls. The one on the left works a gang Extenser for tuning the aerial band-pass coil, and the right-hand one is the oscillator Extenser. Besides these there are only a volume control and on-off switch. So, you see, it is really very simple.

the "M.W." "Super-Quad" will astound you. Not only by reason of its phenomenal performance, but also because of its superb selectivity, its smooth control, and above all the extreme ease of operation which accompanies Extenser tuning.

Automatic Band-Changing

You can glide in and out of the two wave-bands on the "Super-Quad" with an ease that will astonish you if you have never before handled an Extensered receiver.

No pause while aerial and oscillator circuits are switched over—just a smooth glide from one wave-length band to another.

And the results! Stations you have only heard about but never picked up will come rolling in with

There is no fiddling about, or critical knob hugging after elusive carriers that just won't turn into music. The mechanical action of the Extenser is a treat, while the volume control—a screening-grid potential adjuster—is ideal.

And that control is needed, too. A very large number of programmes on the medium as well as the long waves need reducing in strength, so great is the power of this set.

Everything in the design has been done to combine efficiency with ease of operation, so you will see that there are no worrying H.T. adjustments to make. Just put the H.T.+3 plug in the maximum of your battery (or mains unit, for the set can be used on the mains if the unit is a good one) and H.T.+2 plug at about 90-100

But to get back to the operation of the set. It is designed for ordinary aerial (outdoor or indoor) use, and the two tuning controls are handled in the same way as with an ordinary receiver.

Very Simple Tuning

The right-hand one—the oscillator—will give two settings for most stations, and should be rotated very carefully and slowly. The band-pass tuning control is not so sharp, and constructors will find no difficulty in finding stations.

We have said nothing about the on-off switch, which is placed below the volume control, and is a double-pole toggle break switch. This double-pole break switch is essential, because

With the "Super-Quad" a Frame Aerial is Unnecessary!

not only has the D.C. circuit to be broken, but also the H.T. circuit where it goes to one side of the screened-grid potentiometer (the volume control).

If this were not done H.T. would flow all the time the H.T. battery was connected up, whether or not the L.T. was switched on.

"Ah," you remark, "the results and the control of the set may be all you say, but what about the construction?"

That, too, has received the utmost attention, and we believe we are justified in saying that there never has been

a four-valver, with the advantages that this one has, that has been easier to construct. In fact, we could go further and say there has never been a "four" of any description that is simpler to build.

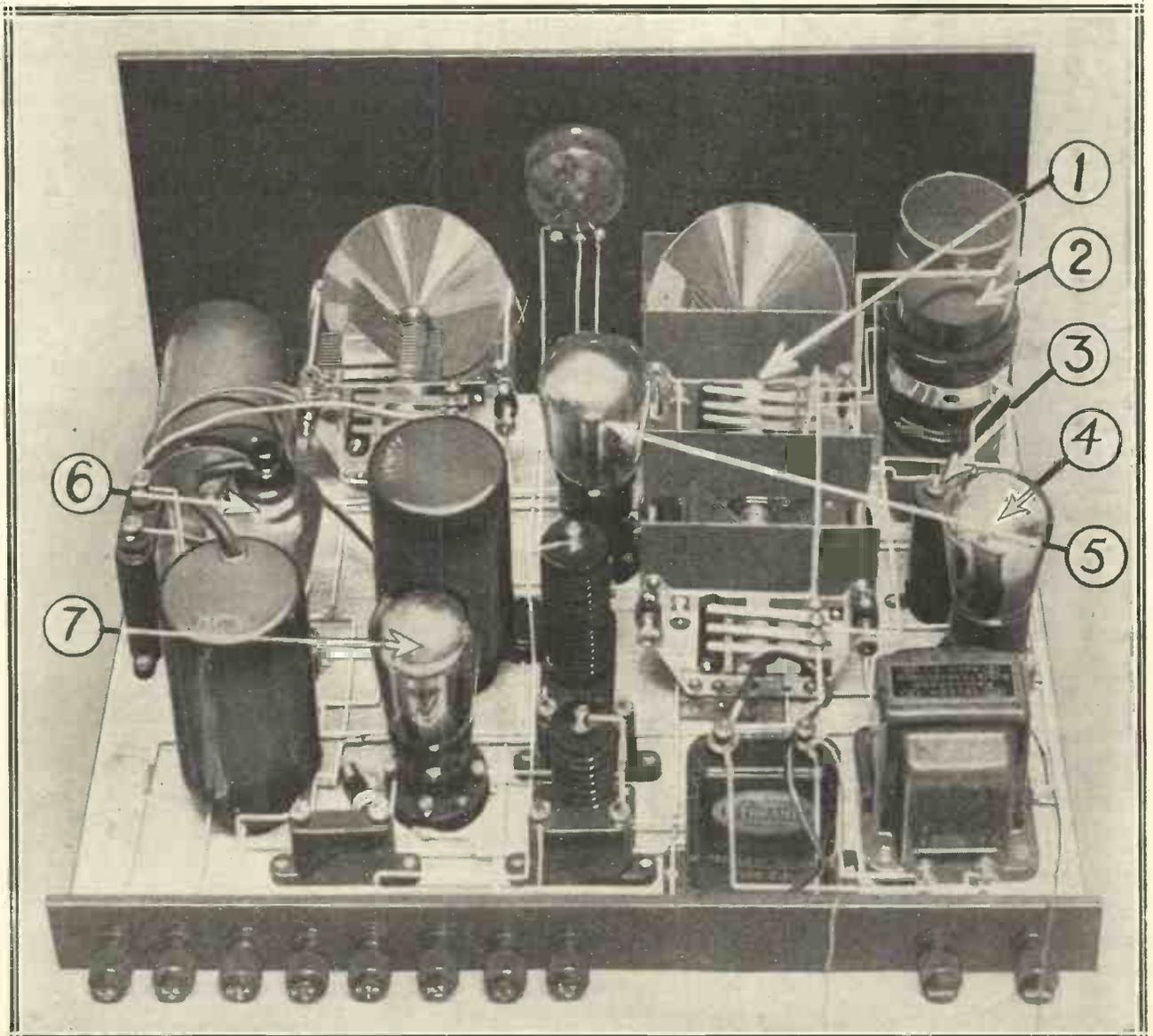
Straightforward Wiring

Just look at the blue print, which is full-size, and therefore can be employed as a template if desired, and you will see that not only is the layout as simple as can be, but the actual wiring is just as simple.

There is only one section that needs

a little care, and that is the wiring of the ganged Extenser and the band-pass coil. This must be carried out exactly as shown on the blue print, and especially is it advisable to check over the connections between the Extenser contacts and the three terminals in the middle of the Square Peak coil. In the coil we used—specially designed for Extenser wave-changing—four terminals were fixed round the metal pillar used for fixing the coil. Three of these are "active," and the fourth, as marked on the blue print, is a dummy.

The Numbers Indicate Points of Interest in the Design



(1) Is the accurately matched ganged Extenser unit for tuning; (2) the aerial band-pass coil; and (3) a non-inductive coupling condenser which has a fixed capacity of .04 mfd. Now, dealing with the valves: (4) is the output valve; (5) combined first detector and oscillator (bi-grid); (6) the intermediate H.F. amplifier, and (7) the second detector valve.

You Can Build it with Less Trouble than Many "Three's"!

Messrs. Varley, however, are going to omit the dummy terminal, so that in future you will get the coil with only three switch terminals. These will be marked S, S₁ and T, and should be taken to the three Extenser contacts

such things as transformers and valves. The oscillator and intermediate coils you cannot go wrong on, as those specified *must* be used if good results are to be obtained.

that we need say nothing about it, except to advise all who make the set to rotate the condensers slowly.

There is no sign that you are coming on to a station until you get there, so that a little practice will be necessary before you get the hang of things. After that, picking up programmes by the dozen will become ridiculously simple.

Unlike ordinary sets, there is no reaction knob hugging to do, and no resolving of stubborn carriers in often vain endeavours to make them yield up their programmes. The stations just arrive and that is all there is to it.

ACCESSORIES

Loud Speaker. (B.T.-H., Blue Spot, Undy, Mullard, Celestion, Amplion).

Valves. 1 D.G. valve (Cossor). 1 S.G. (Cossor S.215, or Mazda, Osram, Six-Sixty, Mullard, Eta). 1 H.2 or H.L.210 type (Osram, or Six-Sixty, Mullard, Mazda, Eta, Cossor, Fotos, Tungsram, Dario). 1 Super-power (Six-Sixty 230P., or Mazda, Cossor, Osram, Mullard, Fotos, Dario, Tungsram, Eta).

Batteries. 1 H.T., 120-150 volts super-capacity (Drydex, Pertrix, Ever Ready, Lissen, G.E.C.). 1 G.B., to suit output valve (Ever Ready, etc.). 1 G.B. 1½-volt, for S.G. valve (Ever Ready, etc.).

Accumulator. 2-volt L.T. (Exide, Ediswan, Lissen, Pertrix, G.E.C.).

Mains Unit. State type of set, voltage, and type of mains when ordering (Regentone, Ekco, Tannoy, Lotus, Heayberd, Atlas, R.I.).

A Final Point

The trimming of the ganged Extenser is a simple affair. It probably won't need trimming, but if so this is the procedure. Tune in a distant station, preferably on the long waves, and then loosen the screw fixing the disc coupling between the two Extenser units.

Keep the unit nearest the panel steady and slowly rotate the back one till the maximum strength is obtained.

Then a slight adjustment on the front section and the ganging is complete. Tighten up the screw, being careful the moving vanes of the two sections do not rotate during the process—and there you are.

The tuning of the set is so simple

Delight to Handle

The "M.W." "Super-Quad" is a sheer delight to handle, with its perfect mechanical smoothness of contact and its uncanny knack of picking up station after station all round the dial, and will at once spring right to the forefront of modern radio receivers.

IT PUTS POWER INTO YOUR PROGRAMMES

as are the terminals shown in the blue print. It does not matter which terminal goes to which Extenser contact *as long as they all go*.

Of the rest of the construction there is little to say. Everything is perfectly straightforward, and constructors should not find the slightest snag in building the set.

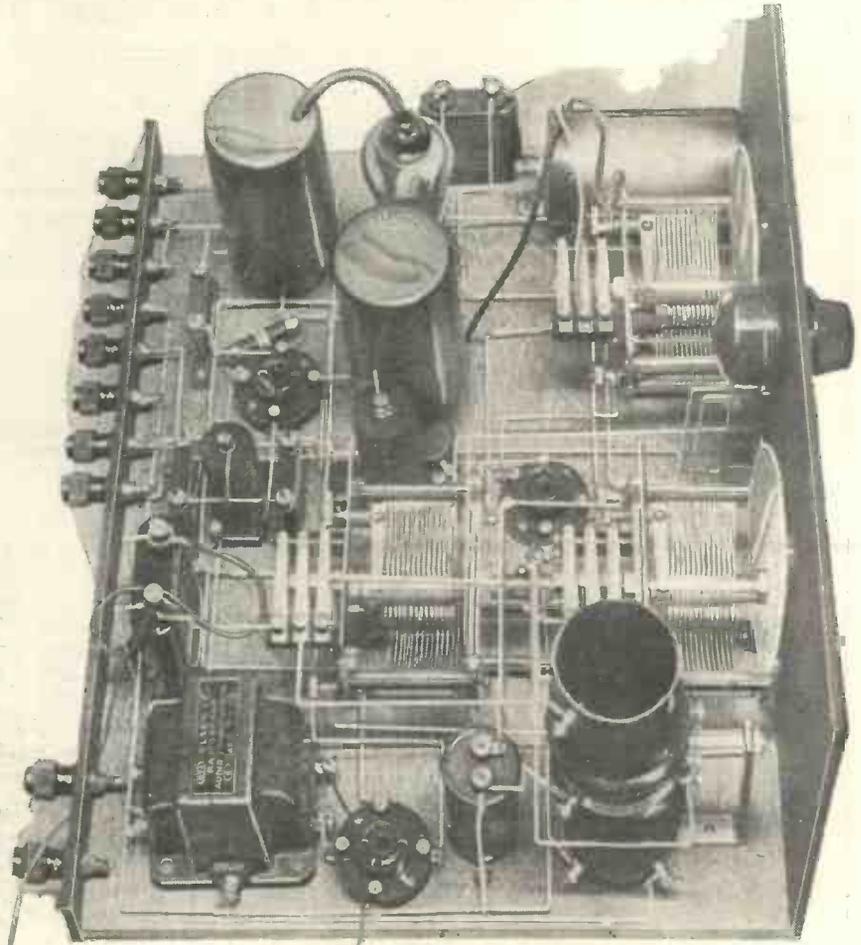
The valves used in the set require a little consideration. The bi-grid valve should be of the five-pin type, the inner grid being taken to the centre pin. That used with the greatest success in the original set was a Cossor.

The Valves to Use

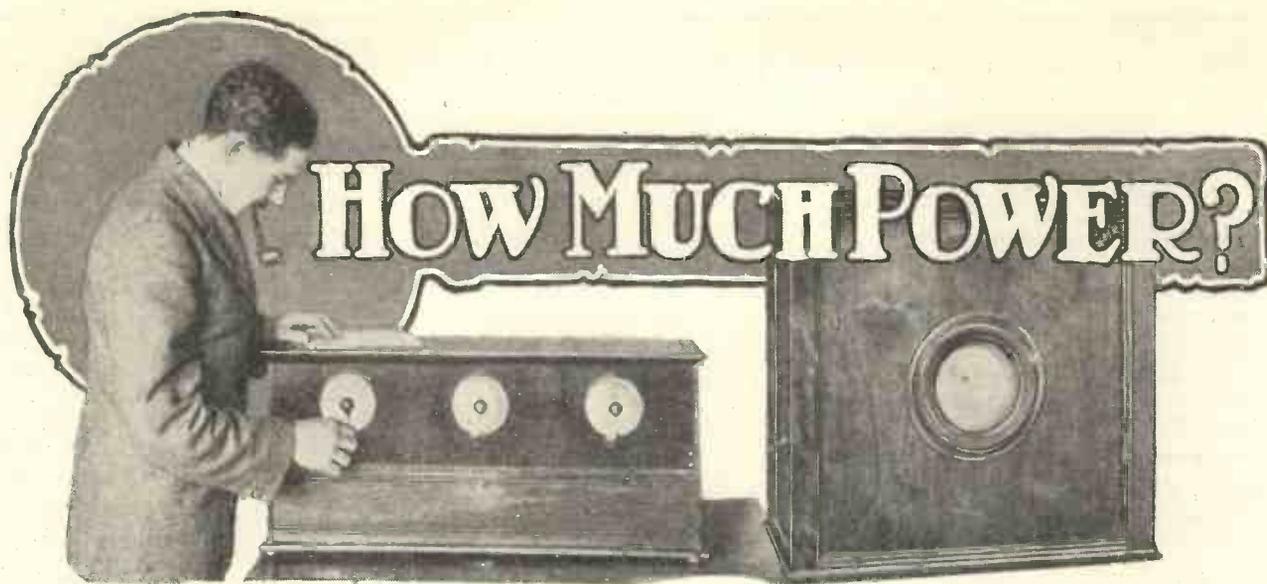
The S.G. valve of the S.22 type is excellent for the receiver, as is the Mazda S.G.215. Other valves are given in our accessory list, though it is worth drawing attention to the above here, and to the use of a P.2 as output valve, for these valves are particularly valuable in a receiver of this calibre. Battery voltages, too, are given in the accessory list.

Now for a final word or two before we leave you—having built the "Super-Quad"—to enjoy its remarkably fine reproduction and station-getting powers.

Keep as closely as you possibly can to the specified parts, especially to



Owing to the tremendous H.F. amplification given by the "Super" section, one valve on the L.F. side proves ample. Note the exceptionally straightforward wiring.



ONE often hears people say, glibly enough, "The So-and-so station was coming in at full loud-speaker strength, with sufficient volume to fill a large room." But it is doubtful whether they often stop to wonder just what "full loud-speaker strength" really means in terms of actual power handed to the speaker.

Open to Debate

It is a subject on which there is not very much information available, and such as there is exists for the most part in highly technical publications such as the proceedings of learned societies. It has occurred to me that it would, therefore, probably interest quite a number of "M.W." readers if I were to try and explain in simple fashion the modern conception of loud-speaker strength in terms of "watts."

Now, I must warn the reader before I start that much of what I am going to tell him will be decidedly a matter of opinion. I shall try to present a balanced account of the matter, avoiding extremes, but it should be borne in mind that there is considerable argument about the question, and the figures I shall give would be halved by some authorities and doubled by others.

The "Milliwatt"

You may take it, however, that I am giving you the views of the majority, avoiding the exaggerations of the ultra-high-power enthusiast, on the one hand, and the "small ideas" of those who pin their faith to hyper-sensitive loud speakers on the other.

Let me explain first the unit in

What is full loud-speaker strength? Undoubtedly the answer to this question will vary with the person answering it. Technically the power in the loud speaker is rated in milliwatts, a rating that is very clearly explained here.

By
G. P. KENDALL, B.Sc.

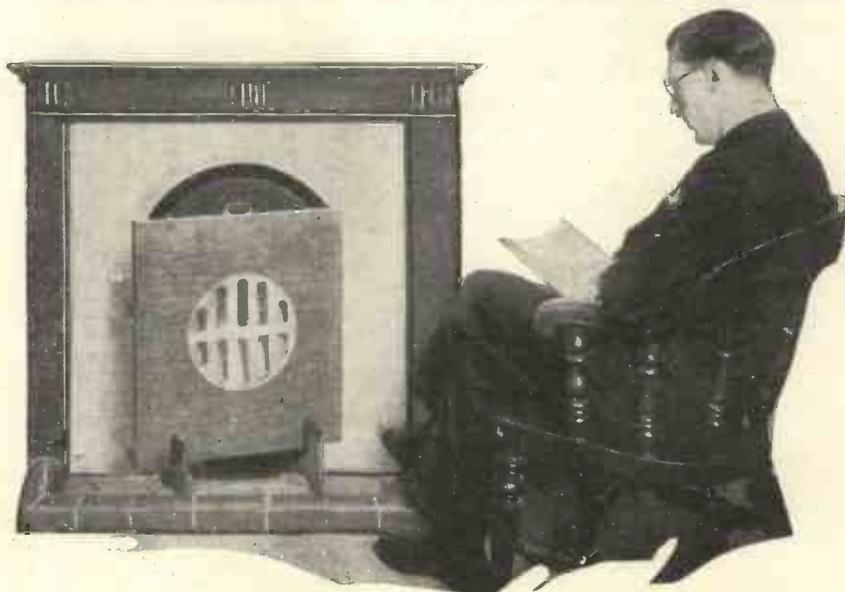
Thus if you have a current of 1 milliamperes flowing at a pressure of 1 volt in a circuit, the power available in the circuit is 1 milliwatt. Let us try and familiarise ourselves with the magnitude of this unit, in order that we may be able to appreciate better the figures that we shall be considering later on.

Anode Currents

Here are a few examples which may help you to get a clearer idea of the milliwatt. Some of the valves in your set will no doubt be of the type consuming 1 of an ampere at 2 volts, and this represents a power of 200 milliwatts for filament heating. If you have an H.T. fuse of the flashlamp bulb type in your receiver

which we shall be working. The normal basic unit of power in electrical work is the "watt," but this is rather too large for our present purpose. Instead, it is customary to use a smaller unit called the "milliwatt," which is one-thousandth part of a watt.

"LOUD SPEAKING" IS A MATTER OF OPINION



Volume that some people would consider "just right" will be "absolutely deafening" to others, but taking a reasonable average definition of "loud speaking" it can be assumed that at least 100 to 150 milliwatts must be passed to the speaker for good results.

it will quite likely be of the type which would take about '06 ampere at 2 volts if you were to use it for illumination purposes. This represents a power of 120 milliwatts.

Then take the anode currents of the various valves in your set. If you have a screened-grid H.F.

"Under normal domestic conditions it is naturally impossible to aim at complete realism, but one can at any rate try to achieve something in the nature of a fairly faithful 'picture' of the original reproduction as regards volume level."

stage its anode current may perhaps be 4 milliamperes at 120 volts—this is equivalent to 480 milliwatts; the detector with, say, 1 milliamp. at 50 volts is dealing with 50 milliwatts, and it is only when you come to your output valve that you find an appreciable amount of power. For example, if your output valve is of the super-power type it may be consuming, perhaps, 15 milliamps. at 120 volts, and this means 1,800 milliwatts, or 1.8 watts.

Just a point about these figures. Do not make the mistake of imagining that the power I have quoted as being "handled" by each valve is the actual power output available from it. The output valve, for example, with its 1,800 milliwatts, will not give anything like that amount of power to your loud speaker under working conditions. If you can persuade it to deliver between 300 and 400 milliwatts of actual alternating current energy in the form of signals to your loud speaker you will be doing very well.

Minimum Volume

Now let me endeavour to give you an idea of the amount of power which must be handed to your loud speaker to give you what is commonly regarded as the minimum volume which can justifiably be described as loud-speaker strength. With the modern type of cone loud speaker of average to good sensitivity this can be taken as something round about 100 milliwatts.

You can actually hear a somewhat weaker signal on the loud speaker, but it is doubtful whether anyone would argue that it is real loud-speaker strength. You can take it that this figure represents the sort of signal which the long-distance enthusiast would have no hesitation in logging as "station heard on the loud speaker."

For enjoyable listening a somewhat higher volume level is definitely desirable if the programme is to have real entertainment value. Probably, for this purpose, one should reckon 150 milliwatts as the minimum. Even this would only be found adequate in a room of moderate size, and is by no means a loud noise.

A Satisfactory Figure

Let us see what we can do to get a more definite idea as to what sort of volume this 150 milliwatts represents. Probably the easiest way to do so is to consider the type of valve which will just give this volume when working full out and not quite overloading. Well, the ordinary type of small power valve, consuming about 6 to 8 milliamps. of anode current at 120 volts, when correctly biased, will just about do it, and this is a volume level with

THE SENSITIVE CONE



Most speakers of the type using an ordinary armature unit, and known as cone speakers, require less power for a given volume than moving-coil speakers. The one illustrated here is the "Modern Wireless" "Inter-Axial" Junior, as described in the February issue.

which most of us are fairly familiar. Such a valve will certainly work a loud speaker of a fairly sensitive type after a fashion, but many of us, nowadays, do not consider it adequate for really enjoyable listening.

Still considering the cone type of loud speaker (or, indeed, any type

except the moving-coil), we can fix a volume level of somewhere about 200 or 250 milliwatts as being desirable for the real enjoyment of programmes in a room of medium size. This represents a degree of volume which ensures the satisfactory hearing of any particular item without the necessity for complete silence in the room.

The programme would still be heard, for example, in spite of a conversation in not too loud a tone of voice going on at a point in the room at some little distance from the listener. One would not in these circumstances have to listen very attentively to catch the words of an announcement, for example.

The Last Valve

Now to get an idea of how such a volume level can be obtained. The super-power type of valve is undoubtedly called for, and one with a normal working current of some 12 to 15 milliamps. at perhaps 150 volts H.T. is about the "smallest" one that will fill the bill. Such a valve, working under good conditions, with all sources of distortion other than overloading kept down as much as possible, will just about deliver the 250 milliwatts we have assumed as desirable. Of course, super-power valves vary considerably in their capabilities, but I am assuming a good one of the current season's types.

Needless to say, under practical conditions one would legislate to have something of a margin in hand, if possible, and not work right up to the limit of the valve. The normal procedure, therefore, would be to use a valve of this type, but with a rather more generous H.T. supply; for example, 180 volts if the valve is rated to stand it and one has a mains supply.

Simple Calculation

I expect that by this time the reader will have begun to wonder how I am estimating the amount of power output obtainable from a given valve type. It is rather an interesting point, which I do not think has been explained in a general article in "M.W." before. Actually, I have been using a rule which applies only roughly, it is true, but nevertheless sufficiently well to give one quite a good idea of the capabilities of the types of power valves at present current.

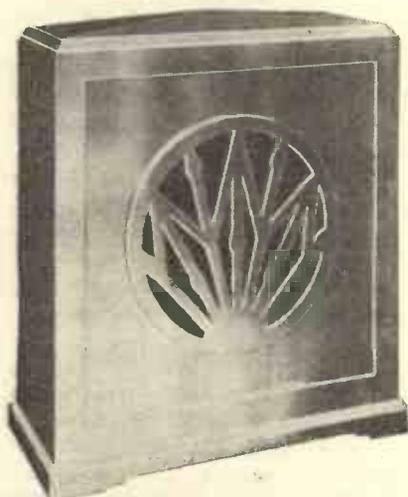
Do not imagine that it is really accurate, but nevertheless it gives one quite a helpful approximation for

A Good Safety Margin is Desirable

output valves of the triode type. (Note the qualification, because it does not apply to pentodes.)

This is the rule. Determine the normal working anode current of your valve when correctly biased, and multiply this by the anode voltage, so obtaining the "milli-wattage" of the anode feed current.

SPECIAL INDUCTOR SPEAKER



This is an inductor speaker of special type made by the Celestion people. Inductor speakers are in a way a cross between the moving-coil and the reed-type speaker.

Thus suppose that your valve consumes 10 milliamps. at 150 volts, that is, equivalent to 1,500 milliwatts. Then to obtain the amount of power which that valve can deliver in the form of signal energy to your loud speaker when it is handling as strong a signal as it can take without overloading, divide by 5. In the example I have taken this, of course, would be 300 milliwatts.

Before you will obtain this one-fifth ratio in actual practice, naturally you must have something approaching ideal conditions, with the elimination of all feed-back effects, and so on, and a correct output circuit. These ideal conditions are not very easy to realise in practice, hence my previous remarks about allowing certain margins.

Pentode Power

I mentioned just now that the rule does not apply to the pentode, but for this valve there is another simple ratio. Just divide your anode supply milli-wattage by 3 instead of by 5. This means, obviously, that the pentode is in a certain sense rather more efficient than the triode valve,

since it will give you a rather greater power output for a given anode consumption, quite apart from the higher degree of magnification it provides.

Let me emphasise once again that both these rules are extremely approximate. They merely give you a useful working guide, and must not be taken too literally, nor applied to exceptionally "steep slope" valves.

Now we come to the much more difficult question of the moving-coil speaker. So far I have been giving you figures with which most authorities will agree in the main, but controversy rages round the power output desirable for the moving-coil type.

Higher Level Required

Admittedly, the later types of moving-coil speakers are very much more sensitive than their predecessors, and indeed are considerably more sensitive than the average cone loud speaker.

Unfortunately, it must also be admitted that to get the full benefit of the realistic reproduction with which the moving-coil speaker can give you a definitely higher volume level is desirable. True, a moving-coil loud speaker can sound extremely good at quite a low volume level, but it is equally true that it sounds very much better when working considerably more loudly.

Here I can but give you my own personal views upon the matter, which, incidentally, I find are shared by many other "quality enthusiasts." Briefly, my liking is for reproduction at such a volume level that if you hear, for example, a singer, the reproduced voice will be at somewhere about the same loudness as that singer would give if actually present in a fair-sized room.

A Faithful "Picture"

I must not dwell too long on this point, for no doubt the reader will be able to see for himself its implications in regard to the desirable level for speech, and will also be able to make a guess at the effect of an orchestra. Under normal domestic conditions it is naturally impossible to aim at complete realism, but one can at any rate try to achieve something in the nature of a fairly faithful "picture" of the original reproduction as regards volume level.

It has been my experience that to

realise this ideal the 250 milliwatts which form a good level for the cone type of loud speaker is the absolute minimum for the moving coil. Calculation and attempts at actual direct measurements seem to show that something in the neighbourhood of 400 or even 500 milliwatts will be needed for this standard with a moving coil of average sensitivity in a fair-sized room.

Plenty of Margin

This is certainly quite a high volume level, but when it has been obtained with entirely satisfactory quality it is surprising to note how it is appreciated. It is usually sufficient to make conversation decidedly difficult, but I find that the majority of listeners do definitely like it when they hear it.

To get such a volume level naturally means quite a sizable output valve. It means a valve taking an anode current of some 15 milliamps. at 150 volts as the absolute minimum, assuming ideal output conditions and so on.

For safety one can usually reckon that it means this same anode current at nearer 200 volts, and even then some considerable care is necessary to realise the full output.

MOVING-COIL TYPE

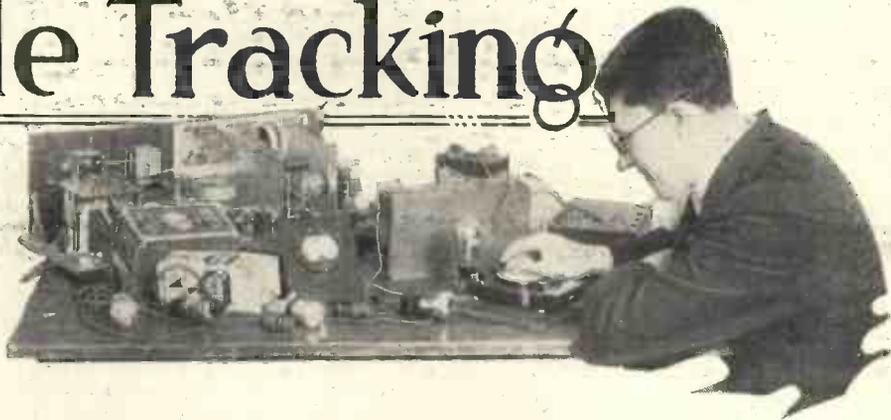


To get the extra fine results that the moving-coil loud speaker is capable of giving it is usually desirable to have a definitely higher volume level than with other speakers.

In conclusion I may perhaps be permitted to add that my own preference is for a very large margin of safety in this matter, in order that one may work at any even remotely desirable volume level without any chance of overloading the output valve.

Trouble Tracking

On this page the Chief of the "M.W." Query Dept. discusses, month by month, some of those common difficulties and troubles which can be so perplexing. This month he deals with the importance of coil spacing.



I AM convinced that much of the inefficiency which occurs on the H.F. side of home-built receivers is due to bad spacing of the coils.

The troubles are twofold. One common mistake is to use large diameter inductances and inadequate screening. The second is to employ adequate screening and to place the coils so close to the metal shields that damping and poor selectivity results.

The main point to bear in mind is that an inductance possesses a magnetic field and that the magnetic linkages or lines of force due to this field permeate the space in the vicinity of the coil.

Cause of Oscillation

These lines of force will cut any conductor which comes within the field, and if the shielding between the successive stages is not sufficient, interaction between the various coils will occur with consequent instability.

Most of us who have done any experimental work with H.F. amplifiers have, at some time or other, had to deal with instability, or, in other words, an H.F. valve that will persist in oscillating directly the circuits are brought into tune.

Now, this trouble may be caused by use of coils which are inadequately screened, or because there is no screening at all.

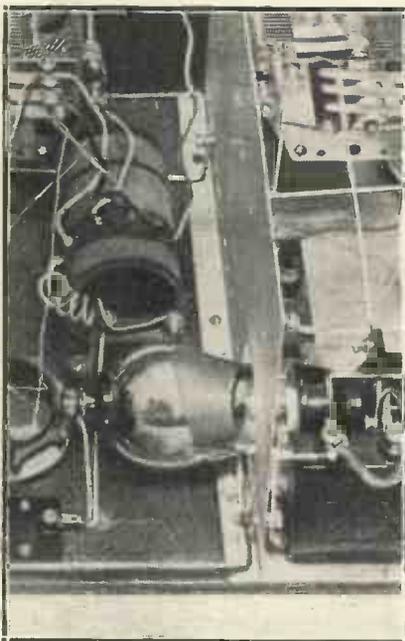
Ineffective Screening

For instance, although you may place a vertical shield between the aerial and detector grid coils of an H.F. amplifier, in many cases it will serve no useful purpose from the point of view of the magnetic field from the coils. Suppose the inductances are wound on large diameter formers, and are designed to be highly efficient. This very efficiency can be a danger, because the magnetic field will "reach out" and pass round,

under, and over the screen, the result being as though no screen were used. This effect can often be minimised by re-arranging the coils in relation to the screen and to each other.

On the other hand, we can build a metal box round the coils so that there can be no possibility of the magnetic fields interacting. This is

A POINT TO WATCH



In an H.F. amplifying stage the H.F. and aerial coils should be of comparatively small diameter and kept well away from the screening.

an excellent scheme, provided it is properly carried out, but it is essential to keep the coils at a certain distance from the screening.

If a coil is placed close up to a plate of copper or aluminium there is a loss of inductance in the winding, and it becomes necessary to put on more turns (sometimes 50 per cent) in order to obtain the same inductance as before. This is very serious,

because the coil is no longer efficient. Its high-frequency resistance is greatly increased and both selectivity and amplification suffer.

The loss of inductance becomes greater the nearer we place the coil to the metal shield, and so it will be seen that in the case of a screening box the coil winding must be placed well away from the metal sides.

A Compromise

If the coil is large, then the box itself must be large. In practice the diameter and length of the inductances have to be kept within reasonable limits in order that the screening boxes shall not be too unwieldy. It is a matter of compromise, and a clever set designer can arrange things so that he gets perfect stability combined with high amplification and good selectivity.

While I am on this subject of coil screening I should like to say a few words about "fieldless" coils. No doubt some of my readers will be wondering why inductances of the ordinary conventional type should be used when there are methods of winding which cut down the external magnetic field to a minimum.

Special Coils

For instance, apart from the single-layer coil, and the various schemes adopted for winding plug-in coils, there are methods known as toroidal, binocular, astatic, etc. These last three schemes are all employed with one object in view, and that is to cut the field down to a minimum. In doing this, however, the high-frequency resistance of the coil goes up and so we are no better off in the end.

In fact, in many cases we are worse off, because if we arrange our screening correctly the high-frequency resistance of the screened coil may easily be less than that of the special winding.

THE "M.W." Exhibition Review



From September 18th to 26th the annual National Radio Exhibition at Olympia, London, will be held. In this specially illustrated art supplement we endeavour to portray to readers some impression of that vast concourse of the radio industry, to act as guide to those who will visit, it and as a mirror to those who cannot see the actual Show.

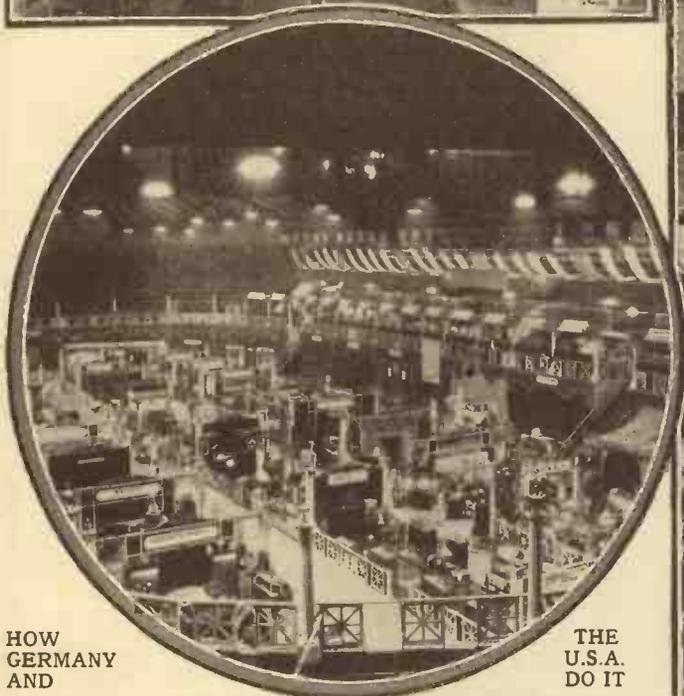


CONTENTS

In Other Countries—What to Look for at Olympia—How to Get There—Key Components and Accessories—Searching the Stands—Some Leading Lines—Outstanding Sets and Speakers—Our Stand-to-Stand Review—Components and Accessories for Every Set Builder.

Our Stand
is
No. 67
(Empire Hall)

In Other Countries



HOW GERMANY AND

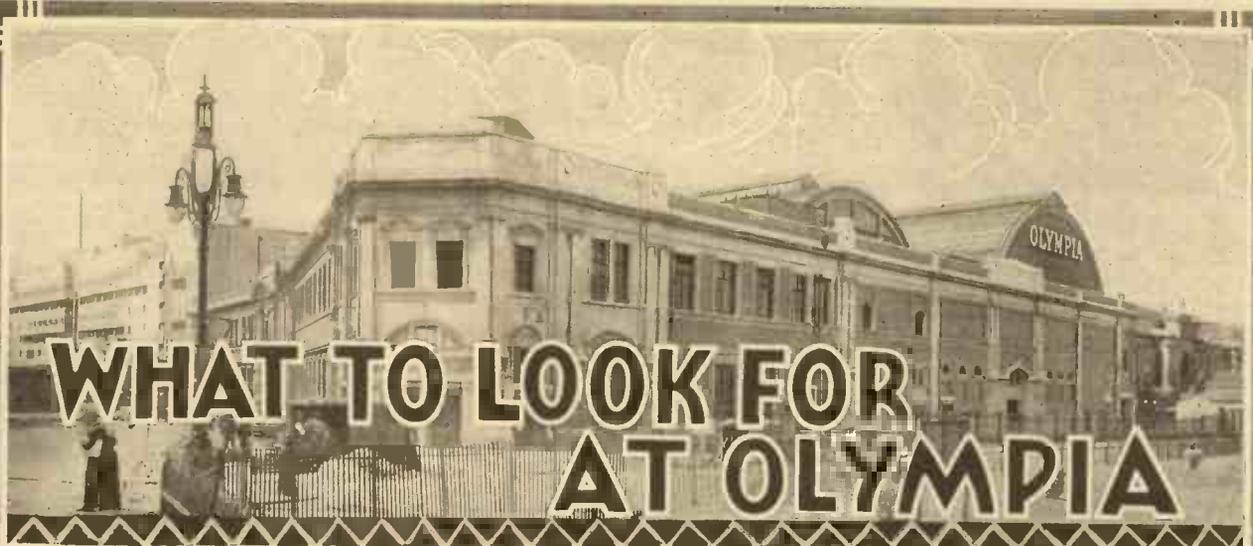
THE U.S.A. DO IT

At the top is a view of the main hall during the Berlin Radio Show, and below it we see how Madison Square Gardens looked under similar circumstances.



IN THREE MORE CAPITALS.

(Top) A corner of the London Show at Olympia. (Left) Paris shows her Radio wares; and (above) the Moscow Radio Exhibition.



IN an article of this description we cannot attempt to give anything like a complete idea of what there is to be seen at the National Radio Exhibition this year

Some of the main points of interest that are to be seen at the Show

and even to America. It was introduced to the public at a time when the radio trade was at its slackest, when the "close season" was beginning, and this was done deliber-

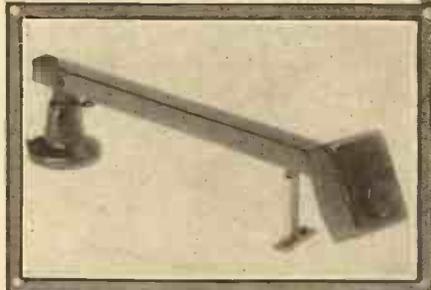
Inexpensive Coils

A Novel Pick-up



Winding your own coils is simple and economical if you use Coil "Quoits." Here is a box of these ingenious formers made by Peto-Scott, Ltd.

offspring to the front in this manner, but we consider our excuse to be a good one, because, in our opinion—and we know in the opinion of a great number of our readers, of trade friends, and of experts disinterested in the trade—the Extenser is a really outstanding example of radio development.



This is the Celestion W.5 pick-up—one of the latest and best of this type of component.

The Extenser

This tuning device, which enables one to carry out wave-changing without the use of any separate switch control, has already made its mark in British radio, and is rapidly spreading through the Continent

ately so that the public would be able to get used to the idea before the new season began. At the Show this year on many of the stands you will be able to examine this newcomer to the world of radio at your leisure.

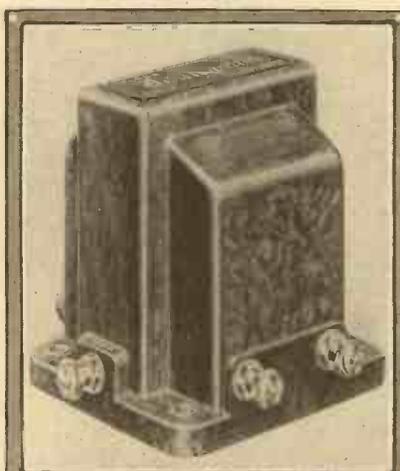
at Olympia. A much more comprehensive, though necessarily somewhat catalogued, description of what is to be seen is given a few pages farther on under our stand to stand review.

Outstanding Developments

In this section, therefore, we merely try to bring to your notice just a few of the outstanding developments and modifications in the realm of radio which will be in evidence at the Wireless Exhibition.

It is, of course, only natural (since our contemporary, the "Wireless Constructor," was the means of introducing it) that we should mention first and foremost the Extenser. We feel sure that readers will forgive us this seeming lack of modesty in pushing our own

The "Audio" Side



A popular member of the vast Telsen range.

Many Firms Represented

This article must necessarily be written some time before the Exhibition opens, and so it is impossible to be dogmatic as to how many Extensers will be seen there and how many firms will be showing; but as far as we know at present the following concerns will have models of the Extenser on view in various forms, and in some cases actually in circuit in complete sets:

Cyldon's, who have always been to the forefront in variable condenser manufacture, are making a very big showing of the Extenser

What to Look for at Olympia—contd.

The Pick of British-

both in sets and in various component forms.

Formo are also showing, and so are Wavemaster, the Webb Condenser Co.; but, in addition, you will probably find the Extenser on many other stands and in various sets. You will naturally find it in complete receivers on our own stand, to which we give you the heartiest of invitations to come and examine things as much as you like, and to ask questions of the special technical staff who will be in attendance throughout the Show.

The New Coils

But to get back to the Extenser. There will be at least five completely different forms on view, including the single plain drive, single vernier control, double drum, triple gang with drum control, and triple gang with vernier disc control.

After the Extenser we naturally come to the various coils used with it. These need not be of special types, but, as our readers know, we have also produced our own special coils for use in our sets this season. These are known as the P.V. and P.J. coils, and will be in abundant evidence on our own stands and on the stands of many firms.

Band-Pass Tuning

But also of outstanding interest is the special coil which is now being loudly acclaimed by the public, which can be used with the Extenser if required, and is to be seen on the stand of Oliver Pell Control, Ltd. We refer, of course, to the Varley Square Peak band-pass tuning system, which enables amazing selectivity with perfect quality to be obtained on almost any type of receiver. This coil is undoubtedly a great advance, and has been held as such by the trade and the home

constructor during the few months that it has been on the market.

"Super-Het" Kits

Following closely in interest in the way of coils will be the oscillators, filters, and intermediates for the various super-het kits which will abound at the Show. One of these kits has been used in the construction of the "M.W." "Super-Quad," described in this month's MODERN WIRELESS, and shown on our stand, while other equally good makes of coils are to be seen throughout the Show.

Many firms are interested in the question of the super-het, such well-known concerns as Wright & Weaire, Igranic, Lewcos, and R.I., Ltd., taking a leading part in the development of super-het coils. Coupled with these, of course, there has been an outbreak—if we may put it that way—in frame aerials, and a great number of frames of various types and sizes and prices will be seen on the stands.

These are well worth a careful examination. Frame aerials vary far more considerably than one would imagine

at first sight, and it is a very important accessory in any super-het that is not designed for use with an outdoor or plain aerial. The frame aerial can make or mar the super-het, and so to any of our readers who may be thinking of choosing a frame we would say go into it very carefully and see them all before you choose one.

Plenty of Valves

We have discussed the radio-frequency side of the set, as it were, and though such things as H.F. chokes, screens, valve holders abound, they are not exactly new,

Famous



This unique collection of coils and Extensers shows some of the latest and best of these components. Readers will recognise the special "M.W." coils and coil quitois; the Wavemaster, Formo and Cyldon Extensers; Lewcos "super-het" coils, and the Varley Square Peak coil unit.

Built Radio Components for You to Choose From

and so we will pass on to the valves.

Here we find several quite outstanding developments, including the double-grid valve, which has been brought out by Cossor, Mullard, Osram and one or two other manufacturers; the new screened-grid valves, including the S.21 and S.22, and, of course, the D.C. indirectly-heated types.

For the "D.C." Man

These latter are of extreme importance to the man with D.C. mains, as they enable him to get results comparable with those from

Components

the indirectly-heated A.C. valves which have long led the world for sheer efficiency per stage in radio reception. It is also interesting to note the Mullard big pentodes, of which a wonderful display will be shown at Olympia.

A Novel Transformer

Coupled very closely with the valves come the L.F. components, and here we must draw your attention to the R.I. "Parafeed." This ingenious and interesting little transformer has been on the market some time now, but it is at the Radio Exhibition that the general public "en masse" will see it for the first time. So do not forget to go along and have a look at it. We will not say any more about it here, for it is impossible in words to describe adequately the "Parafeed" transformer—its very size, makes it worth a visit.

Mention of transformers naturally brings to mind the name of Ferranti, and quite a number of new things are going to be seen on their stand this year. For instance, for the first time in the history of the

firm we believe (apart from their own particular tuner) they are making coils; that is, turning them out for the home constructor. Those they have chosen are the P.V. and P.J. coils. Apart from these a larger range of components can be seen, including meters, dual-range condensers, fixed condensers, new resistances and, of course, transformers.

The G.E.C. Inductor and B.T.-H. speakers are well worth examination.

Dry Rectifiers

This year a still greater number of mains type transformers will be seen, and these have been brought out very largely to deal with the metal rectifiers manufactured by the Westinghouse Co. Their range of rectifiers up to H.T.7 has been reduced in price, and a new one, the H.T.8, has been placed on the market.

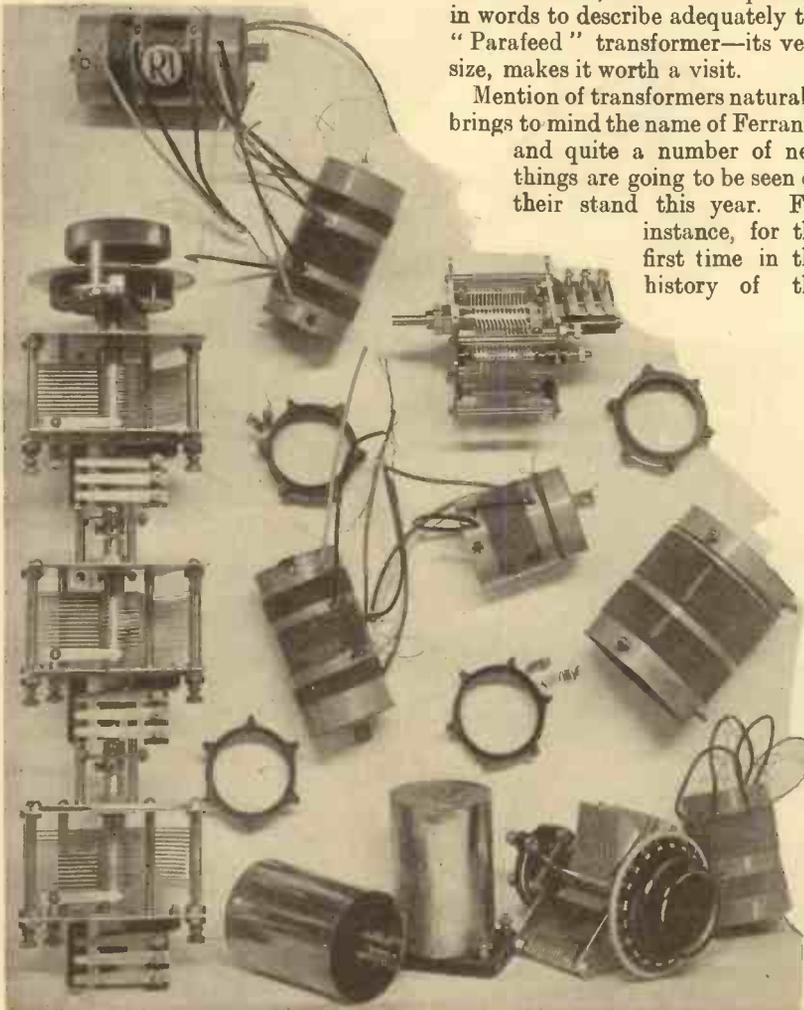
This latter is a very interesting and valuable component. Its price is 21s., and it is capable of giving 60 milliamps. smoothed output at 250 volts. So in your ramble round the Show do not forget to have a look at the Westinghouse stand.

Sixpenny Valve Holders

Prominent among the L.F. transformers at the Exhibition will be Messrs. Telsen Electric, and readers will be able to see the products which have been advertised during the last few weeks in what has been generally known as Telsen's Big Push. Sixpenny valve holders, which are among the best obtainable, start the range.

Lotus Radio also have inaugurated a new series of cheap components, and, in fact, the whole of the Show tends to demonstrate the fact that radio is going to be cheaper.

In this section of the photograph more Extensers are shown, including the new triple-gang Cyldon, the R.I. super-het and P.J. coils, Wearite coil quoits, a Goltone P.V.I coil, and some Ready Radio P.J. coils.



The loud speaker on the left is one of the famous Air-Chrome type made by the Ultra Electric Co., while on the right we have a J.B. variable condenser.

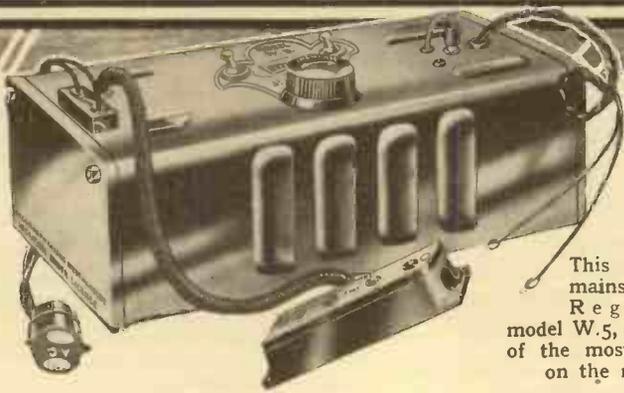
Meters form some of the most valuable gear a radio enthusiast can possibly have, and the one on the right is typical of the style of instrument made by Messrs. Ferranti, Ltd. It is of low-tension type, though all kinds can be obtained from the same source

Edison Bell pick-ups (above) have been known to radio-gram listeners for a long time, and the Exhibition will provide a varied selection. On the left we have a typical Osram valve — the U.5 rectifier.

This large A.C. valve is the Mazda P.P.5/400

Examples of power supply — (left) a Heyberd unit, and (above) a Standard Battery Co. H.T.B.

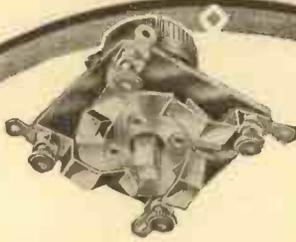




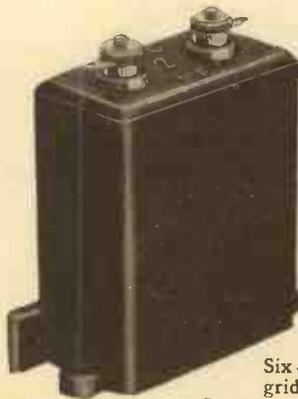
This neat little mains unit is a Regentone model W.5, and is one of the most compact on the market.



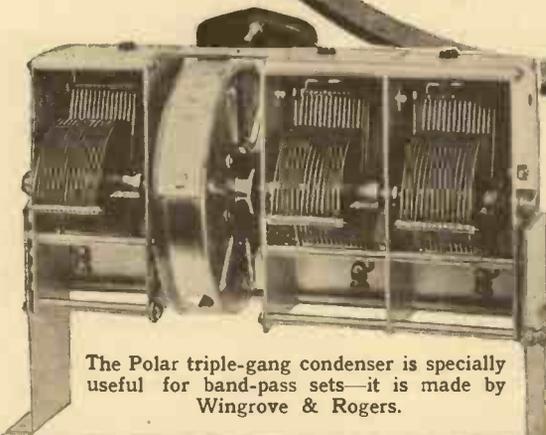
The Ekco four-valve Console is a handsome receiver.



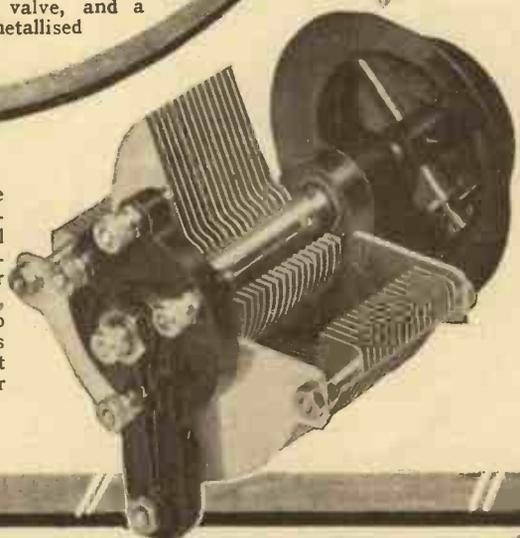
The above unusual-looking switch is a Lotus component, while the accumulator's origin is clearly seen. It is one of the famous slow-discharge models that are so popular among listeners.



Here are the T.C.C. 2-mfd. condenser, a Six-Sixty double-grid valve, and a Cosmor metallised S.G. valve.



The Polar triple-gang condenser is specially useful for band-pass sets—it is made by Wingrove & Rogers.



Complete with slow-motion dial and self-changer contacts, the Formo Extenser is excellent value for money.



HOW TO GET THERE

The process of getting to Olympia from practically any part of London is not really difficult, especially during Show time, because most of the buses are labelled "To and From Olympia," while from many Underground stations through tickets can be obtained.

Let us see how to get to this Mecca of radio enthusiasts from various London termini, via the Underground railways

KING'S CROSS.—Metropolitan Rly. (King's Cross Station). Book to Addison Road.

ST. PANCRAS.—Metropolitan Rly. (King's Cross Station). Book to Addison Road.

Below we publish a special map showing the bus routes that take you to Olympia, and the main-line stations, from all of which you can get electric trains to the same destination.

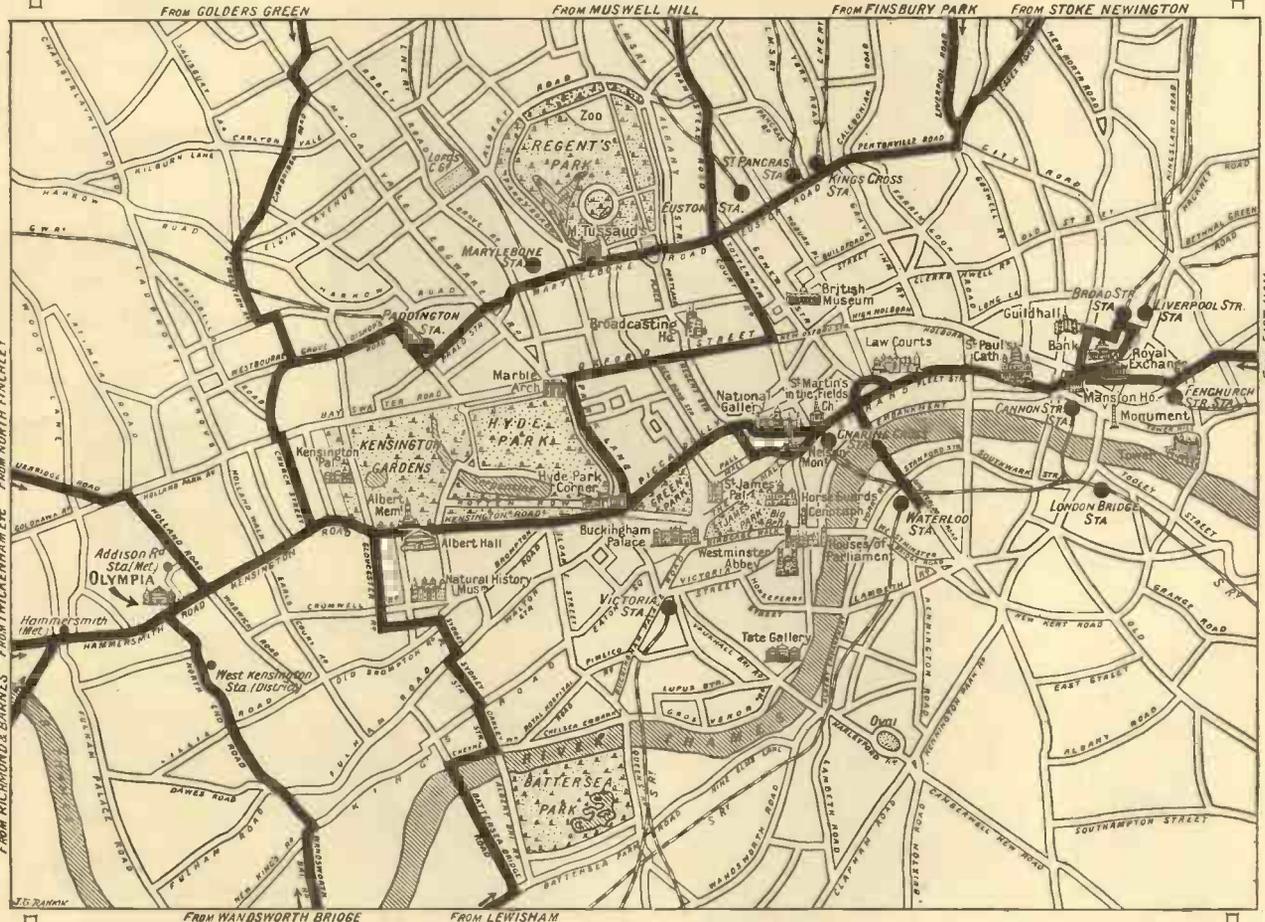
CHARING CROSS.—By District to Kensington High Street, and then by bus.

CANNON STREET and LONDON BRIDGE.—By District to Kensington High Street, and then by bus. Or by Hammersmith train to Baron's Court or West Kensington stations.

WATERLOO.—To Charing Cross, and then as above by District.

FENCHURCH STREET.—Mark Lane, District to Baron's Court, West Kensington, or High Street Kensington.

LIVERPOOL STREET.—Metropolitan to Addison Road.



EUSTON.—Metropolitan Rly. (Euston Square Station). Book to Addison Road.

MARYLEBONE.—Metropolitan Rly. (Baker Street Station). Book to Addison Road.

PADDINGTON.—Metropolitan Rly. (Bishops Road to Addison Road, or Praed Street to Kensington High Street, and then bus to Olympia.

VICTORIA.—By District to Kensington High Street, and then by bus.

Apart from these lines, the Piccadilly Railway goes to Baron's Court, which is quite convenient. Also a large number of bus routes pass the door of the Exhibition.

On our map these are shown in deep black, and the bus numbers are as follows: 9, 27, 28, 33, 49, 73, 92, 102, 127, 233, 273, 291.

So if you see any of these buses you may be sure that you can get to the Radio Show by bus. Tram routes will not help very much except as means to get you to one or other of the bus routes or electric railways.



Key Components and Accessories

Important points that are well worth the close attention of the home constructor are dealt with in this section of our Special Supplement

WHAT is a key component or accessory? It is somewhat difficult to explain exactly, but the dictionary has the word "key" as "that which explains a mystery," so with a little derivation from this definition we can safely say that a key component is one which explains the mystery of the working of a set (not that it must be taken that receivers are mysterious *because* they work); or, in other words, one upon which the operation of a receiver particularly depends.

Obviously we cannot say that the operation of a set depends on any particular one component, but there are certain components which have more effect than others. For instance, one valve holder will be much the same as any other valve holder, but if you take as example an L.F. transformer, then changes in type have very noticeable effects not only on the sensitivity of the set but upon the quality of reproduction.

Items You Cannot Interchange

We can interchange valve holders quite easily and know that we will get the same results, but we cannot do the same with L.F. transformers, nor can we with coils or valves, or in a lesser way with variable condensers.

In fact, twisting the definition a little bit we might say that a key component or accessory is one which is a main item of a radio set. Naturally, of course, a

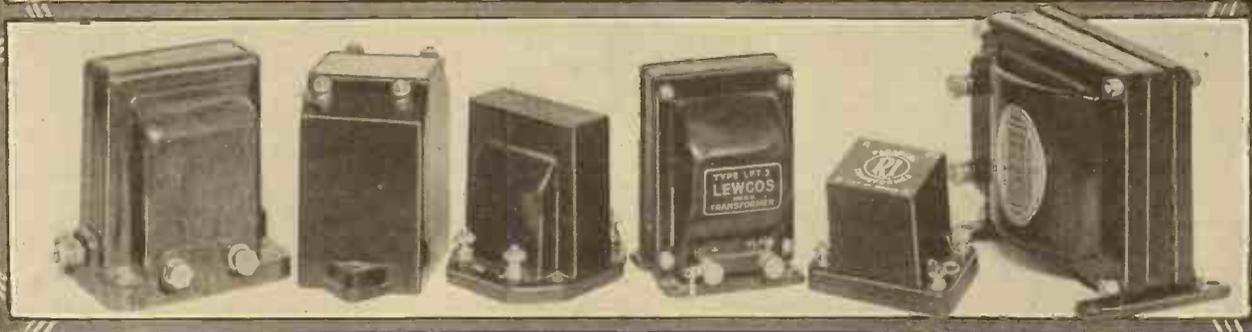
vast section of the Exhibition will be devoted to key components and accessories, but there will be so much to look at that we are endeavouring in this supplement to break up the Show, as it were, into sections so that you may more easily obtain a picture of what is being presented.

Exhibits Deserving Special Notice

We have already discussed in another article some of the chief things to look out for at the Show, and amongst those mentioned, of course, are many important components, such as the famous Extenser, the Varley coil, the R.I. Parafeed, P.J. and P.V. coils, some new valves, and so on, but it leaves us quite a lot that we have not mentioned, and indeed it is difficult to cover in any adequate way even the main things to be seen down at Olympia.

Perhaps it will be of assistance if we run briefly through a number of main components and accessories which should attract interest. You can then look up the firms concerned on your list of stands and go along and visit them should you so desire. An early firm on the list is Auto Electric Devices, Ltd., responsible for the A.E.D. pick-up, which will, of course, be shown at the Exhibition and which is well worth examination, along with the A.E.D. volume controls and faders. In addition they may be showing their self-winding

From left to right are Telsen, Varley, Lotus, Lewcos, R.I., and Ferranti Transformers



Key Components & Accessories, contd.—Special Coils and Condensers

gramophone motor, which will be worth close scrutiny, and they are almost certain to be showing P.J. and P.V. coils and coil quitois.

New ranges of speakers and speaker units by the British Blue Spot Co., and, of course, an extremely interesting array of variable condensers by Sydney S.

The Magic Lamp of Radio



A group of well-known two-volt valves, including Cossor S.G., Osram H.2, Six-Sixty and Eta L.F. valves, and Mazda pentode.

Bird & Sons, and the new pentode output chokes manufactured by Atlas (Clarke & Co., Ltd.), of Manchester, should also receive attention.

The .04-mfd. non-inductive condenser which has been put on the market by Dubilier specially for use with the Varley coil, of which many thousands have already been sold, is another interesting product, as, of course, are the P.J. and P.V. coils which are now being introduced into their range by Messrs. Ferranti, Ltd. Extensers will be seen on the Formo stand, while super-hets and the new Inductor speaker are in evidence on the stands of the General Electric Co.

Good Value in Mains Transformers

If you are interested in transformers, either L.F. or mains, and apparatus for mains working, you will spend a certain amount of time at the stand of Heayberd & Co., who have a lot of cheap, but thoroughly efficient, power transformers to show; and also Ferranti (who have transformers and condensers); Formo, Igranic, R.I., Varley, Telsen, etc. The Igranic Company also have an interesting super-het kit, but perhaps it hardly comes under the title of a component.

The special ganged condensers for use with the Varley coil, however, do come under that title, and these will be seen on Utility, Lotus, Polar and J.B. stands, and for the Extenser version of the Varley coil condensers will be found on the stand of Sydney S. Bird.

Although loud speakers are undoubtedly a key accessory, there are so many new models on the market that we must leave you to pick these things out for yourselves.

Notable examples, however, which you may like to look at are the new Magnavox moving-coil, the B.T.-H.

permanent-magnet speakers, the G.E.C. Inductor and a new range of Amplion and Celestion.

We have said a good deal about valves from time to time in MODERN WIRELESS, and there are many new types to look out for at the Show. These valves are mainly interesting to the man who is concerned with mains working or with super-het receivers, but in addition certain new power valves have come out and a couple of new screened-grid types, so that the "straight" battery set user has not been neglected.

Steady Development in Design

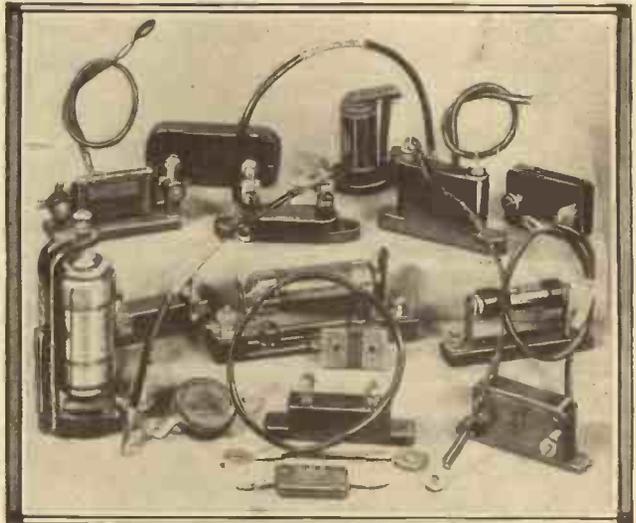
Few things startling in the way of radio surprises has occurred during the year, and so one must expect to find evidence of steady development rather than revolutionary breakaway from standard practice. A tremendous number of new dry batteries have made and are making their appearance, most of them having been introduced during the "summer," proving that the battery set is still a long way from dead.

This, of course, is due to the fact that there are still vast areas where mains are not available to listeners, and so the mains unit, of which you will see the latest examples on the stands of Ekco, Atlas, Regentone, Lotus, Tannoy, etc., has still a long way to go before it finally ousts the dry battery.

Radio has enjoyed a record summer season this year, and so we may expect not only unusual keenness at the Show, but also a still greater degree of cheerfulness, besides a record attendance.

The Exhibition only lasts for eight days, from the 18th to the 26th September, and it is definitely to the

Worming Their Way to Success



A collection of Spaghetti and anode resistances, grid leaks and fixed condensers. Among them can be recognised Varley, Telsen, Formo, T.C.C., Graham Farish, Ready Radio, Sovereign, Igranic, Lewcos, Bulgin, Magnum, and Ferranti components.

interest of every wireless constructor and listener to get along some time between those dates.



EVERY year the National Radio Exhibition at Olympia gets bigger and more unwieldy; and though an excellent indication of the popularity of radio, the show is by no means an easy thing to "do."

A Large Exhibition

There are something like 160 firms exhibiting this year, so that it will take some considerable time just to visit each stand, let alone examine the contents. How, then, is the average man, who has probably got only one visit to spend at Olympia, going to get anything like a true idea of what the exhibition contains?

Three Ways

There are three ways of visiting an exhibition of this kind; one is to go thoroughly round, avenue by avenue, looking at each stand and probably come away with merely a hazy idea of what was on show; the second method is to pick out the firms in which you are particularly interested and make a point of visiting them, and seeing

How to make the most of your time at Olympia, and ensure you see everything worth seeing.

what they have got before going on to any other firm; and the third is to make a list of the types of components in which you are particularly interested, jot down the firms that make that class of component and then go round and see them.

The Component Basis

Thus if you want to see if there is anything new in transformers one would naturally go to Telsen, Varley, R.I., Ferranti, Lewcos, Igranic, etc., while for variable condensers one would visit Cyldon, Formo, Polar, J.B., Lotus, and so on. This latter method necessitates a certain amount of knowledge as to what firms make which components, but if it can be done this is a very useful way of going round the show.

Probably, however, the second method is best in the majority of

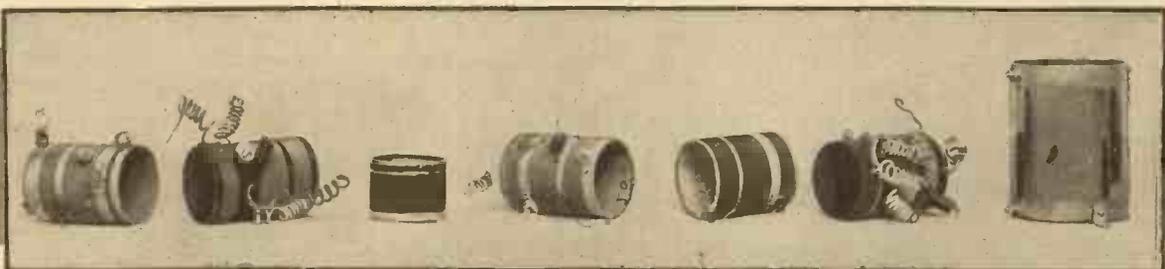
cases, for we all have our own ideas as to what firms make the best stuff and what firms are leading in certain articles, and if we simply jot down who they are and then go and visit them we may feel pretty sure that we have seen most of the leading developments.

Easiest Method

Then if we have any time to spare, as we probably shall have, we can just have a brief run round the parts of the show that we have not already seen.

It is a method which comes easiest to the average man. He cannot be expected to know exactly who makes valve holders, and who does not, or who makes reaction condensers, and who does not, but he does know that such firms as the G.E.C., Ferranti, Ward & Goldstone, Peto-Scott, Osram, Mazda, B.T.-H., Lotus, Cossor, Varley, R.I., Telsen, Ready Radio, Westinghouse, etc., are among the names most frequently on the home-constructors' lips, and as such are most likely to provide him with examples of the latest ideas.

A Selection of the Famous P.V. and P.J. Coils



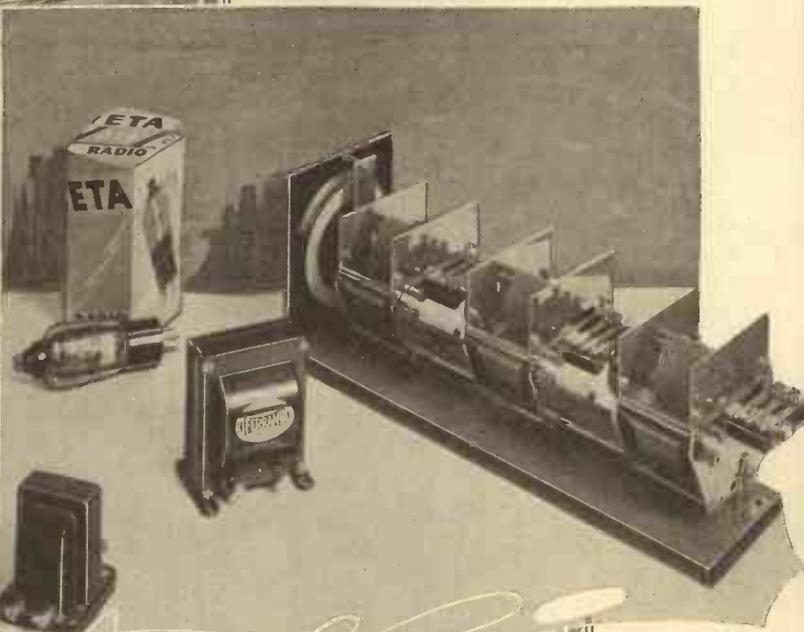
SOME LEADING LINES

*A Selection of Attractive
Components at
Popular Prices*

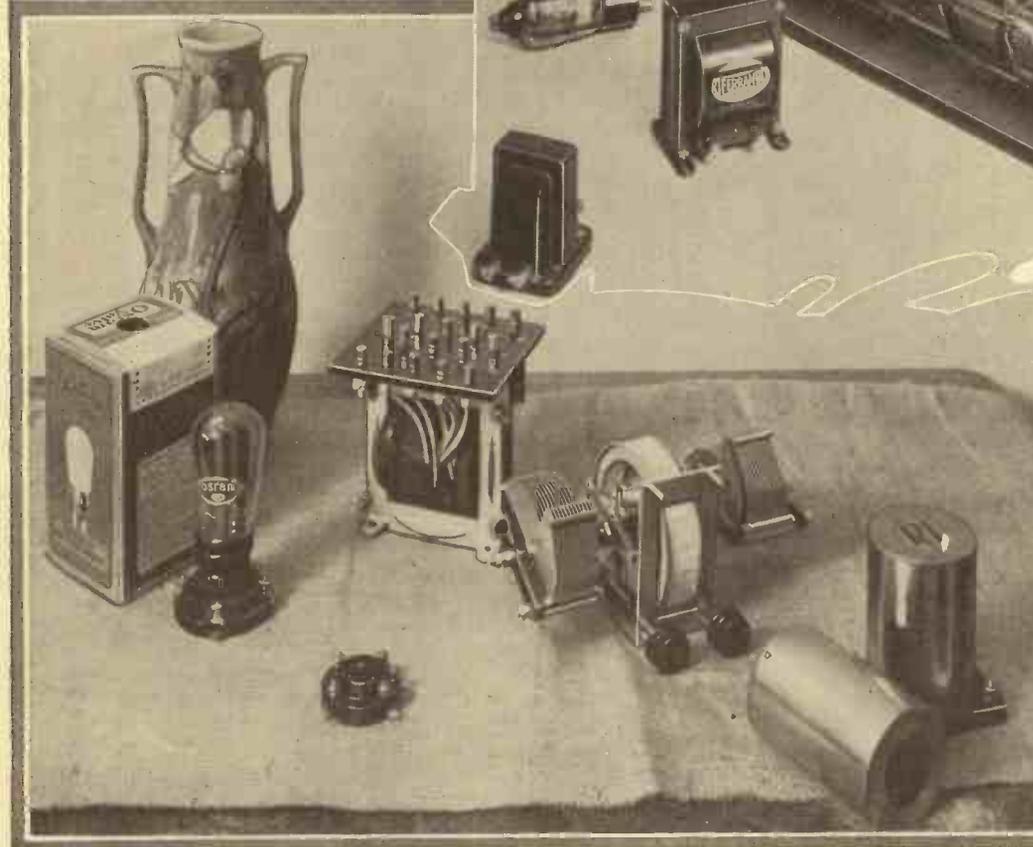


Below is a particularly interesting group consisting of the Cyldon triple-gang Extenser, an Eta valve, and Ferranti and Lissen L.F. transformers.

Three important accessories. The frame aerial, which covers long and medium waves, is a Wearite, the speaker is a Blue Spot, while the name of the H.T. battery is self-evident.



Another collection of well-known components. In the foreground are examples of R.I. super-het coils, behind them a Formo double-gang condenser, while elsewhere you will recognise a Lotus valve holder, Osram valve, and Igranic mains transformer.



OUTSTANDING SETS AND SPEAKERS



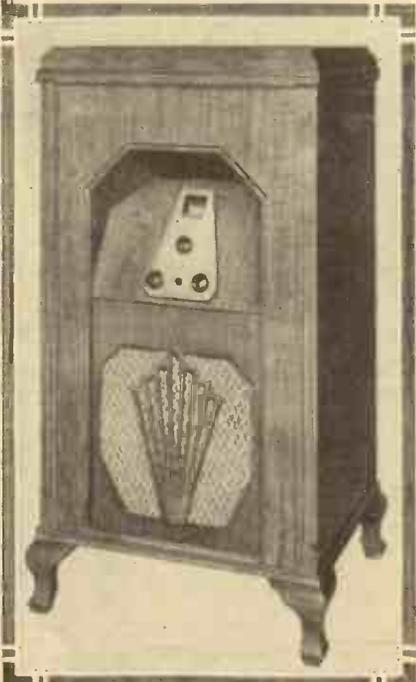
There are many complete sets and loud speakers of outstanding merit at the Olympia Exhibition this year. Here are a few for which to look out.

WITH a Radio Exhibition of the vastness of that opening on September 18th at Olympia, it is an exceedingly difficult task to pick out any particular sets or speakers for special attention.

A Hall to Themselves!

Especially is this so when one realises that some of the exhibits at the Show which will attract the greatest attention aren't actually in the Exhibition—if we may be excused an "Irishism."

An "A.C." Radio-Gram



This all-electric "A.C." radio-gram is one of the many handsome G.E.C. outfits.

In other words, The Gramophone Company (H.M.V.) have decided, owing to lack of space, not to exhibit in Olympia, but to have a hall of their own just outside, where they can give full-blooded demonstrations to their hearts' content.

And they have some very interesting items to bring before the notice of the public. Radio-grams of various description (and loud speakers, too), including an ingenious self-changing device which enables a number of records to be played automatically, or, should it be desired, changed at will.

Some Fine "Supers"

This scheme can also be obtained in a table model form for use with already existing radio receivers, and just containing the automatic changer, electric motor and new type H.M.V. pick-up.

Inside Olympia the R.I. Stenode Radiostat will attract a great deal of interest. Interest that will be all the more critical because of the present publicity being given to super-het receivers. For the Stenode has the reputation of being the King of Supers, and naturally this first general public appearance in a perfected form will be welcomed by numbers of "super" enthusiasts.

Remarkable Reproduction

The various G.E.C. receivers are also worthy of special mention, specially all-electric radio-grams and the super-het; while the G.E.C. inductor loud speaker is an instrument that should certainly be heard. It is capable of providing

remarkably faithful reproduction.

Other inductor type loud speakers, of course, will be in evidence at Olympia, including the Ferranti, while the new B.T.-H., Magnavox, Amplion and the Celestion moving-coil loud speakers are sure to collect a crowd.

For Leisurely Listening



One of the "self-changing" electric gramophones just introduced by H.M.V.

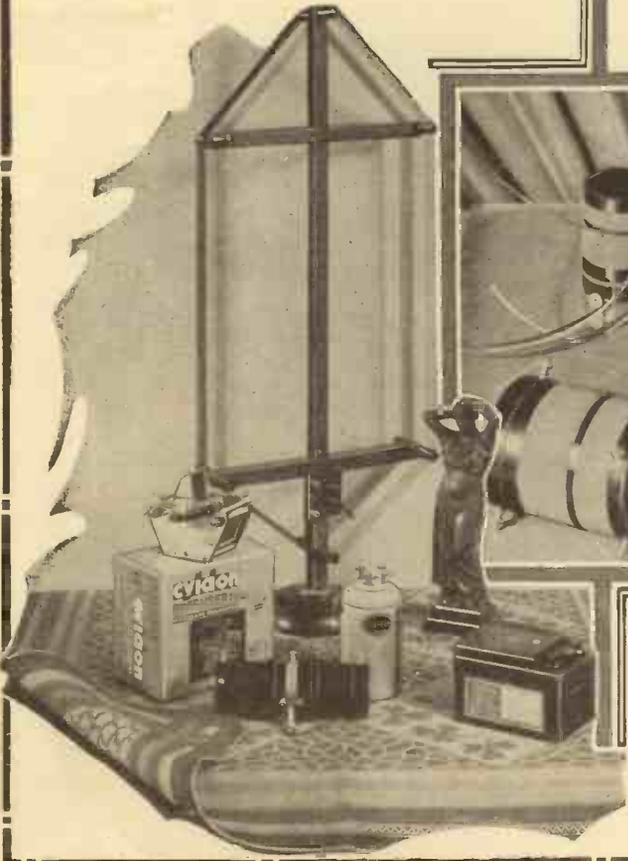
Components and Accessories for Every Set Builder

Look out for them at the Show



An interesting group comprising the Heyberd trickle-charger, Bulgin filter choke, Six-Sixty pentode valve, Lewcos H.F. choke, and Telsen output transformer.

Another group of well-known components. Readers will recognise Cossor and Mazda valves, Jackson condenser, and R.I. L.F. transformers.



Most of the components depicted in these two illustrations will be well known to readers.

In the upper photograph a collection of Lewcos P.V. and P.J. coils is shown, together with a Formo Extenser. The other illustration includes the Cyldon Extenser, Varley Square Peak coil, Exide portable L.T. battery, and Eelix frame aerial.

OUR STAND TO STAND REVIEW

AMALGAMATED PRESS, LTD.

Stand No. 87.
The "A.P." Stand at the National Wireless Exhibition is that at which is to be found the three leading radio journals, MODERN WIRELESS, and our contemporaries, the "Wireless Constructor" and "Popular Wire-

Below you will find useful details concerning the exhibits of the most important firms that are showing their goods at the Wireless Exhibition

are offered to the home constructor by this well-known Ponders End firm. There are cheap types of terminals of the indicating type, there are spades and clips, and there are the more expensive insulated terminals and terminal mounts. Terminal mounts especially, which we often use in our sets, are valuable



A well-tried and trusted sprung valve holder.

less," and it is rapidly becoming the rendezvous for all home constructors who visit the Show.

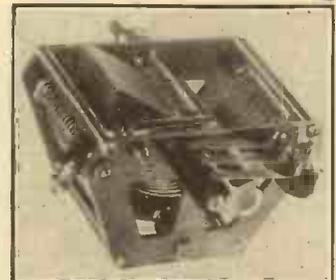
Last year we were near the main entrance in the National Hall; this year we are near the main stairway in the Empire Hall, so that it is easy to find us, and once more we hope you will make our stand your meeting place for your friends. "Meet us at the 'M.W.' Stand" has long been a sort of slogan at the Wireless Show, and this year as before we extend to all our readers a very hearty invitation to come and see us—to come and more than see us—to ask questions, for there will be a special technical staff in attendance all day to answer queries concerning all sorts of radio problems and receivers.

Moreover, here you will see examples of some of our latest sets, together with those of our contem-

poraries whom we have just mentioned, but our main object in having a stand each year at the Exhibition is not just to show a few sets, but to enable our readers, and, in fact, all interested in radio, whether they are readers or not, to come along and have a chat about their problems.

We like to meet our readers and this is the one time in the year when we can do it. For fifty-one weeks

now their chief selling proposition, and apart from drawing your attention to it we have nothing to say here about it. Chief among the selling lines, however, is the A.E.D. pick-up and the A.E.D. volume control and fader. These are excellent. The pick-up is certainly one of the best we have come across, and those readers interested in radio-gram reproduction would do well to have a good look at it on this



The "Cylton" Extenser, made by Sydney S. Bird.

Why Not Use the Mains?



Here is an A.C. mains unit using a metal rectifier and made by H. Clarke & Co.

and attractive gadgets. They fix anywhere, vertically or horizontally on the baseboard, and only cost about 8d. each. The Belling & Lee spades are also well worth attention.

BENJAMIN ELECTRIC, LTD.

From terminals we pass on to valve holders, and here we have one of the oldest firms in the valve-holder business—a firm which knows its job from A to Z and has been turning out components for many years. Naturally one would expect their valve holders to be good, and a visit to this stand will prove that one's expectations are in no measure disappointed.

SYDNEY S. BIRD & SONS, LTD.

This is one of the most interesting stands in the whole Show, for a distinct breakaway from the con-

we have to write to you and talk to you from the columns of our papers, but this week of the Show we can meet you face to face and have a real good talk about things; so come along and visit us—you are assured of a hearty welcome.

AUTO ELECTRIC DEVICES, LTD.

It is some years now since we first mentioned the tests which we carried out with the A.E.D. electrically-wound clockwork gramophone motor, and since that motor was first introduced to the public the firm who conceived it have also taken up a number of other lines.

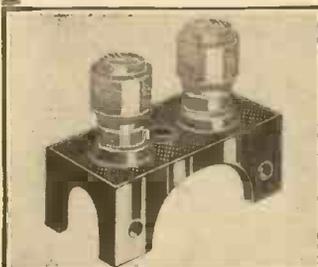
The gramophone motor is not

stand. It is ingenious in its design, and as far as we understand is quite unlike anything else on the market.

The A.E.D. volume control is an ingenious logarithmic potentiometer device which can be obtained in all sorts of values and which has a remarkably smooth and definite action. In addition, Messrs. A.E.D. are marketing the famous P.V. and P.J. coils and coil quits, new ideas which have been introduced in the "M.W." sets this season, and which have already proved extremely popular.

BELLING & LEE, LTD.

A surprising variety of terminals



A multi-purpose terminal mount—Belling & Lee



The Burton valve holder—an extremely neat moulding.

ventional is the keynote of the exhibits. In fact, Messrs. S. Bird & Co., manufacturers of the famous Cydon variable condensers, are going "all out" on the new Extenser introduced by our contemporary, the "Wireless Constructor," a few months ago. This is the first appearance of the



Special spring clips enable the capacity of this Lissen valve holder to be kept remarkably low.

Extenser at a radio exhibition, and it is certain to attract great crowds.

All sorts of models will be shown, from the ordinary single-dial-drive Extenser to the disc-drive triple-gang model useful for band-pass sets or multi-stage H.F. receivers. You will also, we understand, be able to see some of these Extensers in sets ready-built from home-constructor designs, and further sets using Extensers will, of course, be available for visitors to see on our own stand.

The Extenser is not a stunt, it is a genuine attempt (and a successful one) to achieve a definite simplification in radio set control, and as such Mr. Bird has shown great foresight in arranging his exhibits in the manner he has.

BRITISH BLUE SPOT CO., LTD.

The home constructor who is a real enthusiast wants to build his own loud speaker as well as his set. This, of course, is hardly possible when it comes to moving-coil speakers, but he can build a very fine cone type speaker remarkably simply. Readers who have been following MODERN WIRELESS for some time will know that we have been recommending what is known as the "M.W." inter-axial cone, and this makes a remarkably fine speaker, especially when used with such units as are provided by the British Blue Spot Co. All sorts of

units can be obtained from this firm, from 25s. upwards, whilst speaker chassis and even complete speakers are available.

In addition—and this is an extremely popular line—the Blue Spot pick-up is in evidence, which, complete with its self-contained volume control, costs only 63s. It is a remarkably good pick-up and matches up extremely well with a loud speaker made by the same firm.

BRITISH EBONITE CO., LTD.

There are over three million licensed listeners in this country, and that means that there are over three million sets; in other words, over three million panels of some sort are used. But as many of these listeners are home constructors and reconstruct their sets from time to time, using new panels, the total number of panels in use during a year must come to an astounding figure.

Ebonite is not an easy subject to exhibit at a show, but the British Ebonite Co. have made their stand at Olympia extremely

BRITISH GENERAL MFG. CO., LTD.

One of the most interesting exhibits here is the British General tuner, which is an extremely neat little unit incorporating two-wave-band switching and reaction, and providing a number of different selectivity points so that the unit can be fitted to any aerial in any location whether near or far from a broadcasting station. In addition we have the British General transformer and output chokes and a number of other interesting items of value to the home constructor.

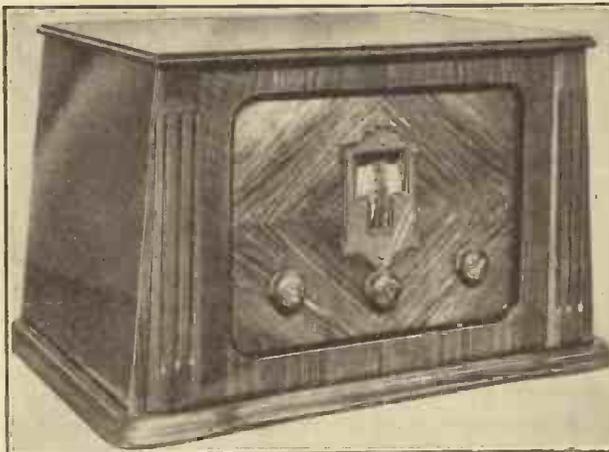
BRITISH HARD RUBBER CO., LTD.

A rather uninspiring thing, the panel, perhaps, at first glance, but the composition of rubber and sulphur which forms ebonite from which the panel is made is a really most interesting and valuable product. All sorts of panels and ebonite work are being shown at the Exhibition this year on the stand of the British Hard Rubber Co., Ltd., whose "Permol" panels are often used in the MODERN WIRELESS Research and Construction Dept. "Permol" takes its name from



One of the fine range of receiver cabinets made by Camco.

All from the Mains



This three-valve Varley A.C. receiver is an excellent example of up-to-date design.

attractive. All sorts of ebonite and various mouldings are being shown, covering all the ranges of shapes and sizes necessary for any task the home constructor may be likely to undertake.

"permanent colour," for a "Permol" panel is claimed never to lose its colour.

You will remember that many of the cheaper panels placed on the market, especially those of a few years ago, went a horribly greeny-yellow after a few months. This was due to the coming out of the sulphur in the ebonite compound. "Permol" panels never do this, and if you care to call at this Company's stand the assistants in charge there will be only too pleased to explain why it is that these can retain their colour in such a marvellous fashion, although the insulating properties are high and the price remarkably low.

BROWNIE WIRELESS CO. (G.B.), LTD.

Cheap sets at competitive prices are the chief items to be seen here, for the Brownie Company has long been in the forefront of the wireless trade in the manufacture of receivers at popular prices. Sets of all descriptions are on view, from the small, cheap set to the more expensive but still remarkably low-priced A.C. and D.C. models.

BULGIN & CO., LTD.

Bulgin wireless products have earned for themselves a reputation that is second to none. It is not the policy of the firm to go in for sets

or complete receivers of any sort, but more to limit their activities to the design and production of useful gadgets and important accessories for the home constructor.

Such things as mains switches have long been included in the Bulgin list. Many things to do with mains in the way of components are available from their catalogue. Chokes (both L.F. and H.F.) are available, the special screened-grid valve choke being a remarkably efficient little unit, then we have special resistances for use with the new indirectly-heated D.C. valves, of which the M.W.I. used a few months ago in our "New D.C." Three, is a good example. These units are extremely well constructed, perfectly safe in use and have a very large margin of safety.

Special mains plugs and fuses are being shown in abundance, while, as we indicated before, switches are one of the star lines of A. F. Bulgin & Co., and therefore are to be expected in vast quantities on their stand at the Exhibition.

We must not forget, however, the Bulgin resistance links, generally known as Spaghetti resistances, which have three main features to be emphasised here. The first of these is that all the links are spot-welded at each end, while large surface area tags are fitted, and, thirdly, each link is individually tested on a Wheatstone bridge. The prices vary from below 1s. to 2s. 9d., the resistances being obtained in values from 300 to 100,000 ohms.



The Pertrix non-sal-ammoniac H.T. battery enjoys great popularity.

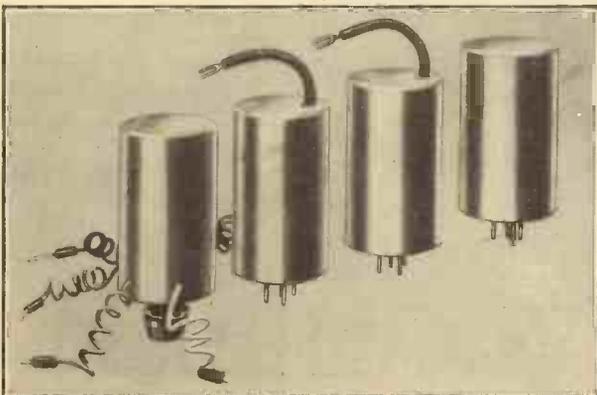
BULLPHONE, LTD.

This year we understand that this firm is not only continuing the manufacture of loud-speaker units, but is also selling complete sets, so that at the Exhibition we shall have quite a new Bullphone range to look at.

C. F. & H. BURTON, LTD.

Few wireless constructors are not familiar with the Burton valve

For Your Super-het



A "family" of Lewcos super-heterodyne coils—oscillator, two intermediates and filter.

holder, switches, terminals, condenser dials, H.F. chokes, etc., but we have by no means completed the vast range this Midland firm manufactures. Complete sets of all types, and at knock-down prices, are to be seen on this stand, and home-constructor kits are also included

Some Interesting—



The Red Diamond switches (as above) are exceedingly neat little components.

in the Burton set programme. Particularly attractive (reverting to components again) are the drum-drive condensers, which are not only efficient and robust, but remarkably inexpensive.

CARRINGTON MFG. CO., LTD.

This season is seeing the Carrington special "Melodee" cabinet push; and, indeed, "Melodee" cabinets are rapidly making themselves known all over the country. No doubt you have seen the advertisement of the fellow and the girl pointing to a "Melodee" cabinet with the words "Practical Yet Beautiful" underneath.

These words describe the cabinet very well, but the "Melodee" loud-speaker cabinet is not the only one in the Camco list, by a long chalk, as you will see if you have a look at the stand at the Exhibition. Loud-speaker cabinets of widely different types are available, including Console model radio-gram cabinets, ordinary plain cabinets, wonderful works in wood to hold complete outfits, including loud speaker, gramophone, and mains unit. Everything available at surprisingly low prices. Nearly all the

designs are registered, and Messrs. Carrington intend to protect their goods in every way possible.

If, however, you cannot get down to the Exhibition and see the cabinets on show there, Messrs. Camco extend a cordial invitation to visit their showroom in Hatton Garden and to see the latest examples of cabinet workmanship. There is truly a cabinet for practically every purpose, and all goods are delivered carriage paid anywhere in England, Scotland and Wales. You will be surprised when you see the Camco products and what can be obtained for quite a small sum of money.

And Useful—Components for the—



The Parex H.F. choke is popular and inexpensive.

CELESTION, LTD.

Many new speakers, including the new permanent-magnet moving-coil speakers, are to be found on the Celestion stand. These R.P.M. models, as they are called, are said to surpass anything previously in the Celestion list, while the new model enables a greater musical range to be covered than ever before.

The shallow cone gives a wider distribution than is usual with moving-coil speakers, and resonant peaks are claimed to have been entirely eliminated. The speakers are said to be extremely sensitive, and are available in numerous forms from £3 10s. and from £6, two models being available. The differ-

ence between the two is in dimensions and coil impedance, the R.P.M.8 being the smaller and the R.P.M.12 being the greater of the two.

In addition to these speakers, Messrs. Celestion, Ltd., are showing the new W.5 model pick-up which utilises an unusual form of damping by which the needle is able to follow the record groove and produce frequencies as low as 25 cycles. Record wear is said to be practically non-existent and the type of damping employed is largely responsible for the marvellous response obtained.

The price of this pick-up, com-



All sorts of ebonite formers are turned out by the British Ebonite Co.

plete with tone-arm at the correct setting, is £2 17s. 6d. In addition to these lines, of course, Messrs. Celestion are showing their well-known range of loud speakers, commencing with model D.10, sold at £3, and going on up to model D.50 at £7 15s.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD.

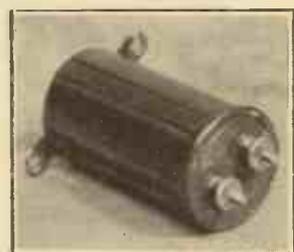
Foremost among the batteries of both wet and dry types to be seen here we must mention an improved design of the Exide "mass" type battery of the low-tension D series. Exide mass-type batteries are specially designed for long, slow, or intermittent discharges, and are particularly serviceable in places where recharging is only necessary at infrequent intervals.

They will hold their charge when not in use for long periods, even though partially discharged, without any detriment, and embody many outstanding features in design, including non-interchangeable terminals, moulded acid level line and a moulded identification label.

The non-interchangeable terminals are of great value because they preclude any danger of the terminals inadvertently being changed over and the positive terminal being placed on the negative pole, and so forth, thus causing the battery to be connected up the wrong way round.

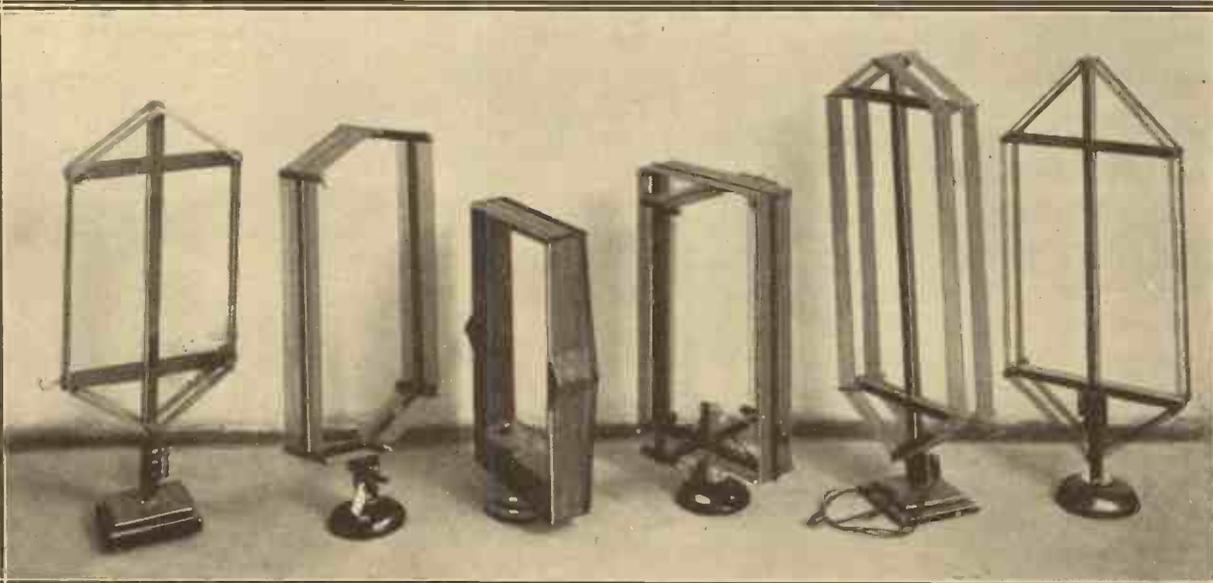
The acid level line is an interesting feature in that it is moulded on all four sides of the glass case, so that one can tell at a glance how the electrolyte is getting on. The third point which we have mentioned is the identification label, which consists of a label on which can be written the name of the owner, and is covered by a thin sheet of celluloid. This feature ensures that the correct battery is returned from the charging

—Home Constructor

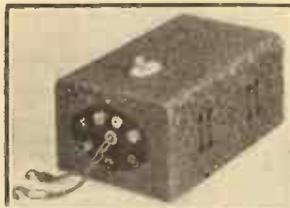


Specially for band-pass sets—the Dubilier .04-mfd. condenser.

Take Your Choice from this Fine Array of Frame Aerials



From left to right we see the Ready-Radio, Wearite "Popular," Rolls Caydon, Wearite "Senior," Peto-Scott, and Eelex frames.



A neat Tannoy mains unit.

station, and as the identification label is embodied in the moulded lid it cannot be washed off or disfigured.

In addition to the low-tension batteries, of course, the famous "Drydex" high-tension batteries are giving a very good show, and all types of batteries from those smaller H.T.90's for portables up to the super-capacity for big sets will be on view.

It is only comparatively recently that the "Drydex" battery made its appearance on the British market, but it has made itself felt in every corner of the country where battery sets are operated, and has proved one of the most popular dry batteries ever produced.

H. CLARKE & CO., LTD.

Atlas was the gentleman who was supposed to be holding up the world, according to the old Greek mythology, and in modern day practice Atlas has turned his activities to furthering radio progress, for Messrs. H. Clarke & Co. are a firm which never rest on their laurels.

One of their latest products is the pentode output choke which enables about nine variations of ratio to be obtained, and which can be had in either shrouded or unshrouded form. The resistance to D.C. is extremely low, while the impedance is of a suitable value for a pentode. The inductance with no D.C. is 48 henries, and at 60 milliamps it only drops to 35 henries. Wound in an ingenious manner, it provides the maximum of wire on a small size, and the windings are sufficient to deal with two pentodes in parallel, while the inductance is intended to give full reproduction of bass notes of 50 cycles.

Another interesting "Atlas" component which you must look at while you are at Olympia is found in the range of H.F. chokes. This choke is wound in two sections, and has an inductance of 90,000 microhenries and a self-capacity of only 5 micro-microfarads. Used in conjunction with a screened coil of modern design it is claimed that its average efficiency is 85 per cent on the long wave-band. On the medium waves the average efficiency is 96 per cent.

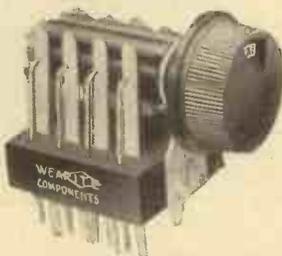
In addition, of course, there is a large range of "Atlas" L.F. chokes, power transformers, and reaction condensers, mains units, resistances, etc.; in fact, the stand is simply crowded with interest.

E. K. COLE, LTD.

Messrs. E. K. Cole have become a byword for anything to do with a mains unit; in fact, it is pretty safe to say that "Ekco" have done more to popularise mains set operation than anybody else, and their phenomenal success during the last two or three years proves that their popularity is not based on mere low price, but on quality as well.

The "Ekco" stand at Olympia is sure to be crowded, so if you are interested in mains units it is just as well to get to that stand early to avoid the crush. Everything for mains operation in its complete form are to be found here. D.C. units for portable sets, larger units for larger sets, A.C. mains units, complete mains receivers, trickle chargers, and so on—all are included in the vast "Ekco" programme at knock-down prices.

There must be thousands and thousands of satisfied "Ekco" users all over the country, and the number is rapidly growing. No matter what your mains, whether D.C. or A.C., no matter what sort of output you want out of your mains unit or the type of set with which you are going to use it—Messrs. E. K. Cole can supply one that will suit.



One of the many Wearite change-over switches.

The only thing necessary in fairness to yourself, your set, and the manufacturer, is to state exactly the type of set you are going to use the unit with, and also exactly what you expect out of your unit, and the voltage and type of your mains. Given these data you can be sure of being thoroughly satisfied with any "Ekco" product. But we will say no more—just go along to their stand at Olympia and see for yourself.

COLVERN, LTD.

It is some years now since Colvern coils made their first appearance on the market and attained such great success. Since then Messrs. Colvern have been going steadily ahead and have produced many components on the H.F. side of intrinsic value.

This year we understand they are going in for the super-het market, and that at the Exhibition examples of the Colvern super-het coils will be shown. In addition, a very useful and well-made component is the Colvern wire-wound potentiometer for screened-grid H.T. potential control. It is an extremely well-made component, and is undoubtedly one of the best on the market.

Colvern have always restricted their attention to the H.F. side of radio and so have become one of the leading coil manufacturers. It is from this point of view that most of our readers will approach their stand and examine the various attractive lines being displayed.

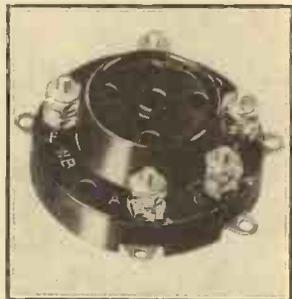
A. C. COSSOR, LTD.

Since the introduction of the original "Melody Maker" in 1927,

Cosor's have consistently gone ahead. With the remarkable record of 350,000 "Melody Makers," the new Empire Model 234 is expected to be the biggest success of all.

It includes the very latest and up-to-the-minute developments, such as internal wave-change switching, series aerial condenser, variable selectivity, completely screened coils and the new Cosor metallised screened-grid valve. It is undoubtedly a remarkably fine little set, and in kit form only costs £6 15s.

In addition to this new kit set, Messrs. Cossors, of course, are making a big show of their valves, especially the metallised valve such as the S.G.215 and the S.G.220, and their new mains pentodes. The

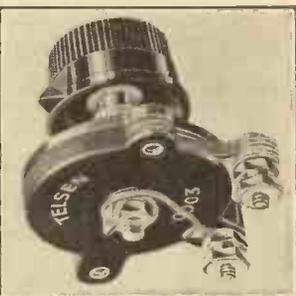


Neatness and efficiency are features of this W.B. valve holder.

Cosor range of valves is an extremely complete one and now numbers among its range the new double-grid valve which has been specially designed for super-het work; what will probably attract the most attention among the valves on this stand will be this double-grid valve just mentioned and the metallised S.G. valves, which have been specially designed to simplify screening in either battery or mains-operated sets. The metallising process, which consists in spraying zinc on the bulb, is a patented Cosor process necessitating very expensive plant.

DAYZITE, LTD.

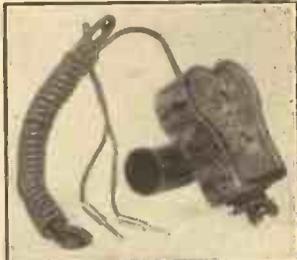
On this stand is an extremely interesting portable talkie picture



This inexpensive reaction condenser is one of the many Telsen products.

outfit which is selling well in every direction. It comes out at a reasonable price, costing about £300 for the complete outfit, comprising a projector fitted with a Will Day sound head of which Messrs. Dayzite have been granted a full patent, a back amplifier, a main amplifier, and either a "logarithmic" or moving-coil type loud speaker.

In addition all the latest makes of sets and parts are being shown, the whole making an extremely attractive exhibit. The stand will be in charge of Mr. Eric Day and two other assistants, and every home constructor is extended a specially hearty welcome and invitation to visit the stand.



The Wates "Star" pick-up is provided with plenty of flex—a valuable point.

DONOTONE LOUD SPEAKERS.

As the name suggests, loud speakers are the main product of this company, and speakers of all types and sizes are being shown at Olympia. In addition to their loud speakers which are built on the tuned gong principle, Messrs. Donotone have of late been very active in the public address system world. The Donotone stand every year at Olympia is assured of a considerable crowd, because there are some very interesting exhibits shown, and the unusual appearance and design of the Donotone loud speaker itself draws considerable attention.

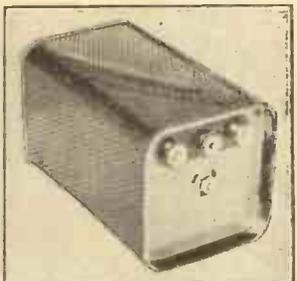
DUBILIER CONDENSER CO., LTD.

One of the most interesting products produced by the Dubilier Condenser Company during the last few months is the special 04 non-inductive condenser which has been designed for use with the Varley square peak coil. It is an interesting-looking little condenser, and as it is designed specially for use with this coil it will create quite an attraction at the Exhibition. This, of course, is not the limit of the Dubilier Company's activities; they have, of course, extended and modified their range of ordinary condensers both in the Mansbridge and the small fixed type. All condensers above 01 mfd. being of the same size and shape as the new 04.

Variable condensers are still being manufactured, but the high-voltage condensers for mains sets and mains units form the most important proportion of this particular exhibit. These condensers are sold in the 4-mfd. size at 8s. 6d. and are tested at 800 volts D.C.

J. DYSON & CO. LTD.

This firm is probably more widely known under the name of its products, for the name of "Godwinex" has long been an outstanding one in the radio trade. The majority of the exhibits here consist of mains units, of which a very fine array are being shown. They cover all sorts of capacities, sizes and requirements, and form a most comprehensive list. Crystalline-finished metal boxes are



Metal rectifiers are enjoying great popularity. Here is the Westinghouse model H.T.8.

**COME AND SEE
US AT
OLYMPIA**

Our Experts will
give you

FREE

Advice on all your
Radio Problems

At the "MODERN WIRELESS"

STAND No. 67.

September 18th to 26th.

important features in their construction, while all the mains units comply with the I.E.E. regulations governing the operation of radio apparatus from supply mains.

They can be had in the following types for D.C.: two tapplings, output 15 milliamps, £1 7s. 6d.; three tapplings, £1 15s. 0d.; and with three tapplings (one of which is variable), £1 17s. 6d. The heavier-duty model gives 25 or more milliamps, according to type, and costs up to £3 10s. 0d.

Many A.C. types are available, and some of the mains units are arranged to trickle-charge 2 volts at 5 amp., a switch being incorporated from the H.T. to L.T. change-over; 50 milliamps at 200 volts seems to be the maximum size in the standard unit supplied, while A.C. models for 25 or 30 cycles, instead of the standard 50 cycles, can be obtained at a small extra charge.

J. J. EASTICK & SONS, LTD.

At first sight we are liable to think of the name of Eastick merely as the manufacturers of the famous Eelox terminals, battery plugs, etc., but during the last few months they have turned their attention to a new frame aerial designed for superhet receivers. This is an extremely interesting product and will take a prominent place at the Exhibition. Sold for £1, it represents remarkable value for money, and has been extremely well thought out.

It has polished oak woodwork, heavy oak base, lined underneath to protect polished surfaces, sockets to take standard plugs, and heavy insulated spacers which are brass lined, so constructed that they cannot become displaced.



The A.E.D. volume control is ingeniously constructed.

EDISON BELL, LTD.

Gramophone pick-ups have for a long time taken the attention of this firm, so we are not surprised to find a number of these pick-ups in various models being shown at Olympia. But in addition there is an extremely interesting moving-coil loud speaker of the permanent-magnet type which is being made in two models. The model 456 is supplied with a tapped transformer adjusted to suit various power valves, and the 456A is fitted with a transformer suitable for use with a pentode or small power valve.

It is an extremely interesting speaker and the firm make very high claims for it. It is said to be completely free from blast or rattle, and yet to be so sensitive that excellent results are obtainable from small sets having an output as low as 150 milliwatts, while the instrument is also capable of handling very large power output without distortion.

EDISON SWAN ELECTRIC, LTD.
There is so much to be seen on

the Edison stand, which, of course, also includes B.T.-E. and Mazda, that it is impossible to give but a bare outline of the main things to look out for in this section of the Show.

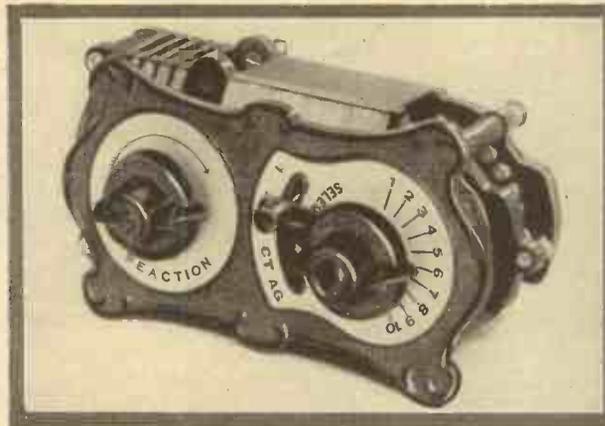
complete with a transformer matched for the particular output valve with which the speakers are to be used.

Then we come to the Mazda section in which the various valves

be a new pick-up, not in place of the famous B.T.-H. pick-up, but as a luxury model to this. The present pick-up is being retained, and the new pick-up will be a more luxurious model with still further improved characteristics.

Gramophone motors, of course, also form a portion of the Edison programme, and, in fact, practically everything required for a really efficient and up-to-date radio receiver can be obtained from the Edison factory.

To Help You Pick Your Programmes



This British General Tuner is extremely efficient and well made. It covers long and medium waves and has selectivity and reaction controls "on board."

All sets of various descriptions will be there, including mains sets and battery sets to suit every pocket and every home, one of the receivers being particularly interesting. This is called the Edison Power Pentode Two. It is an extremely economical little set, being of the all-mains type, capable of getting the main stations and giving excellent tonal quality. It employs, of course, one of the Mazda A.C./Pen. valves.

In addition to the mains receivers, however, a new programme of moving-coil loud speakers is presented to the public, these, of course, coming under the B.T.-H. R-K. patents. The new range includes speakers priced between 31s. 6d. and £7 15s. 0d. and covers practically every requirement. The lowest priced is the junior D.C. model, and after this comes the permanent-magnet type which is capable of handling outputs up to 2 watts and is priced at £2 10s. 0d. Then there are the senior models, both permanent and for mains drive, including, of course, an A.C. model complete with rectifier and costing £7 15s. 0d. All these loud speakers can be obtained

are being shown. These include a wonderful range, having many new valves among them, for Mazda's have closed up many of the gaps between impedances and mutual conductances of their battery valves, and have also added to their mains valves. Chief among these latter, of course, the new D.C. valves will attract a great deal of attention, as these are of the indirectly-heated cathode type and thus place the D.C. owner on a par with the A.C. mains man as regards possible efficiency in his mains-driven receiver.

The D.C. valves available now are of four types, the S.G., the H.L., the power and the pentode. Mazda valves have long enjoyed a well-deserved popularity and every set owner should make a point of examining very thoroughly the various products on this stand. Readers will be surprised at the efficiency of the latest modern valves, which are no better illustrated than on the Mazda stand.

Small components are also to be seen in the Edison Swan exhibit, such things as transformers, condensers, and grid leaks being in evidence. There will also probably

EVER-READY CO. (G.B.), LTD.

No matter what type of battery the home constructor or wireless enthusiast may require, Ever-Ready will be able to supply it to you, from wet L.T. batteries of 2-, 4-, or 6-volt varieties, to single grid-bias cells for H.F. stages, small grid-bias batteries, small H.T. and large H.T. pocket flashlamp batteries, etc. Ever-Ready, as their trade name suggests, are ever ready.

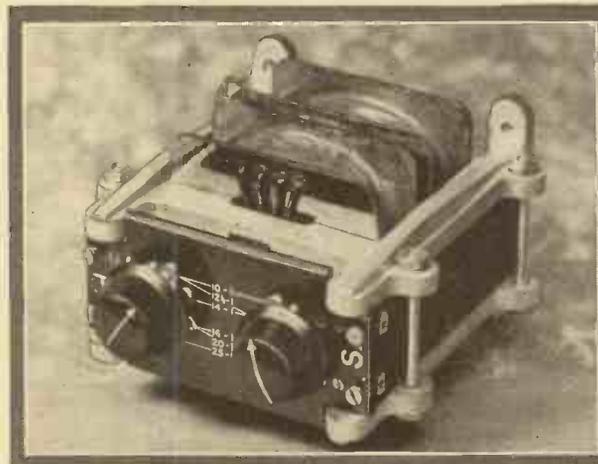
This season several new models of H.T. batteries will be making their appearance, and no matter what the wireless listener may desire, whether it be an ordinary 60-volt H.T. or a super-capacity battery for running a large receiver, Ever-Ready can supply it, and, what is more, it does not matter whether he lives in the remotest part of the country his nearest radio dealer is sure to stock Ever-Ready batteries. This not only enables excellent service to be maintained, but the very fact that these batteries are so popular means that the consumer is sure of a fresh supply every time he wants a battery.

The batteries may have a long "shelf" life, but they are not on the shelf for any length of time. In use every satisfaction is obtained



A neat 50,000-ohm potentiometer (Sovereign).

Match Your Loud Speaker With This



The new Ready-Radio "Instamat" (instant matching) output transformer.

from them, and to the battery set user there is no doubt that this stand will be one of the most important in the whole Exhibition.

FERRANTI, LTD.

Naturally the main objects of interest here are the audio transformers which are such a well-known feature of this company's products and of which a very goodly array are being shown. Included in these are the push-pull transformers, notable among which are those in which the secondaries are wound in separate halves to enable the amplifying valves in push-pull to be biased separately.

These can be obtained at the same price as the standard push-pull audio-frequency transformers.

Some additions have been made to the range of output transformers, by the way, the O.P.M.5 has ratios of 4 to 1, 6.7 to 1 and 10 to 1, while the O.P.M.6 incorporates ratios of 15, 22.5, and 45 to 1. A new product is a straight output transformer type O.P.M.8, in bakelite case, similar to that housing the A.F.8 transformers, and the price is tentatively fixed at 12s. 6d., though this awaits confirmation. Also a small

popular-priced choke in a moulded bakelite case will be placed on the market, retailing round about seven shillings, and known as the D.8.



Small, but "mighty," the Igranic Midget output choke.

Several additions to the range of condensers have been made, and it is hoped that the Ferranti moving-coil speaker, known as the type M.3 permanent-magnet moving coil, will be available in time for the show; it will be retailed at three guineas. The condenser "packs" are sure to create considerable interest, not only because they are peculiarly advantageous particularly to the mains unit constructor, but also for their competitive prices. For instance, the No. 1 pack, containing 20 mfd., with a test voltage of over 1,000 D.C. is listed at 28s., while the No. 2 pack, of 14 mfd., with the same test voltage, costs somewhat less.

A further noteworthy addition to the Ferranti range of components, which, as will be seen, is quite cheap, is an improved form of inductor speaker priced at £3 10s. Ferranti's are remarkably candid about their inductor speaker, for in their brief descriptive matter concerning it they state that "Whilst we do not consider that any inductor or reed type speaker can give a performance equal to our moving-coil speakers, we would emphasise that this inductor speaker is not only capable of a similar performance to the moving-coil type selling at a near price, but gives an even better performance than such speakers." Boiled down, that means that this inductor speaker is better than the cheap moving-coil speaker, but is beaten by the more expensive types of moving-coil reproducer.

We have said nothing about the meters for which Ferranti are already famous. The same range of D.C. radio meters as hitherto will be available, the prices remaining unchanged, but certain alterations have been made with regard to the A.C. rectifier types, which are now available in one type having a resistance of 1,000 ohms per volt, the

medium-resistance type having been discontinued. We thus have a very comprehensive range of milliammeters and voltmeters in flush, portable and projecting types available in all classes.

In addition, a further range of 2½-in. moving-iron instruments, suitable for use on either A.C. or D.C., are being shown while a range of 2½-in. electro-static voltmeters, in similar pattern to the standard moving-coil thermo and rectifier type instruments, are available. These traverse 450 volts up to 2,500 volts maximum, and all models cost the same price (£3 5s.). These are suitable for D.C., A.C., or radio frequency.

H.T. supply units also occupy a prominent place on the stand, while mains transformers naturally are included in the show. A range of rejectors has been brought out to cope with the main British stations, and also Dublin, while A.C. mains receivers are continued as before with one addition, which has an inductor type of speaker incorporated and retails at 22 guineas.

Further, Messrs. Ferranti in the future intend marketing the famous P.V. and P.J. coils, and also a super-heterodyne set, though full details of this are not available at the moment of writing, but we are informed it will be fitted with two controls and will incorporate an inductor speaker and cost probably somewhere about £28.

FORMO COMPANY, LTD.

Since their removal from Cricklewood to Southampton, Messrs. Formo have been busier than ever on all sorts of lines. As readers will know, variable condensers (either of the air-spaced type or of the pre-set variety) are their main products, and a large collection of these is to be exhibited at Olympia this year.

Foremost among them, of course, is the Extenser, which has been put up in a particularly efficient form with vernier drive and excellently designed and made switch contacts.

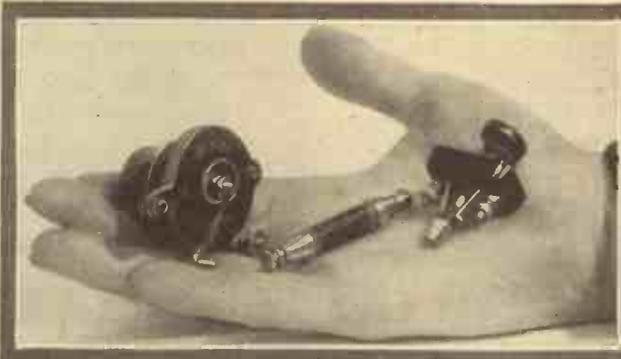


The Formo mains condenser has a working voltage of 400 D.C.

Moreover, it is remarkably compact and should be given a very close study by every home constructor.

FULLER ACCUMULATOR CO., LTD.
Special wet batteries of out-

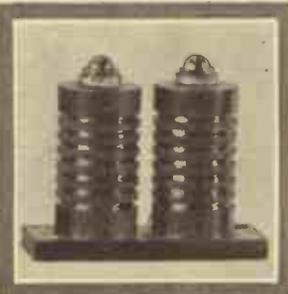
A Useful Little Handful



Three components that are often used—Telsen reaction condenser, Graham Farish grid leak, and Goltone on-off switch.

He can, by the way, should he so desire, see this type of condenser actually in a set on our own

standing design are the main products of this firm. The Fuller block L.T. and H.T. batteries have long been recognised by consumer and trader alike as thoroughly reliable and efficient, and consequently these batteries have become exceedingly popular. Many new types will be seen at Olympia, where Messrs. Fuller will be pleased to discuss their construction and explain their advantages to anyone who cares to call at the stand.



This dual H.F. choke is made by "Atlas."

GENERAL ELECTRIC CO., LTD

There is hardly a branch of radio which this gigantic firm does not cover. So vast, indeed, is their organisation that it is necessary for the Osram valves—which, as everybody knows, are an offshoot of the G.E.C.—to have every year a separate stand at Olympia. So we shall not be dealing with the valves in this particular section of our review.

But there are plenty of other things to see. Sets and loud speakers are the main things to attract the visitor to their Stand and of these the new D.C. mains all-electric set will be particularly attractive. Already D.C. users in all parts of the country have hailed this new Geophone set with the greatest enthusiasm, and, indeed, it is a thoroughly efficient job.

It consists of a four-valve all-mains set—you will remember we have reviewed it in our pages—with single-dial tuning, two matched high-frequency stages, with super-power pentode output, and, including valves and royalty, sells for £25.

That is not the only set, however; there are two-, three-, four-, and five-valvers, and a super-het which

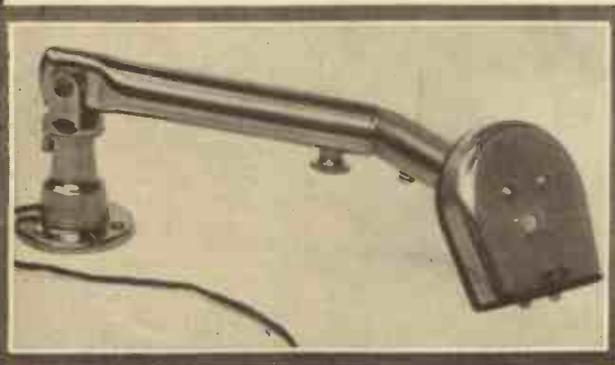
stand (No. 67). This will enable him to get a very good idea of how the Extenser works, and by close examination on the stand of Messrs. Formo to see exactly how it is constructed.

In addition to the Extenser the pre-set condenser will occupy quite an important position, and we understand that several new models are making their appearance. There is also a particularly neat and ingenious ganged condenser with an adjustable trimming device, which is so arranged that it will throw a shadow on the illuminated drum, so that one can see at a glance exactly how the trimmer is set, and immediately visualise how much out-of-step the two sections are. This condenser has been designed for band-pass working, and we understand that a three-ganged condenser on these lines is also available.

Dual-range and P.V. and P.J. coils, and other inductances, are also being shown by Messrs. Formo, while their mains condensers, which have created quite a sensation in the radio world, certainly must be mentioned. These condensers are some of the finest on the market, as those of you who have followed our own test reports and articles have gathered.

Formo's have other developments, of a somewhat surprising nature, up their sleeve, but we are not able to say exactly what these are at the moment. If they are completed in time they may find their way to the stand at Olympia, but whether they do or not you should not miss an opportunity of going along and examining what is being shown.

A Well-Tried Favourite



One of the B.T.-H. pick-up models sold by Edison-Swan Electric, Ltd.



The "Stork" loud speaker (G.E.C.).

A Useful Quick-Action Switch



Messrs. Wilkins & Wright, Ltd., turn out some very good components, of which this switch is an excellent example.

will be one of the outstanding receivers in this show.

In addition, there is a good range of loud speakers, and especially attractive is the new inductor dynamic Geophone speaker which is being sold at the low price of £3 10s. for the chassis. Complete in solid oak cabinet it is to be obtained for £5 10s., and there is no doubt that it is a really good job.

GRAHAM AMPLION, LTD.

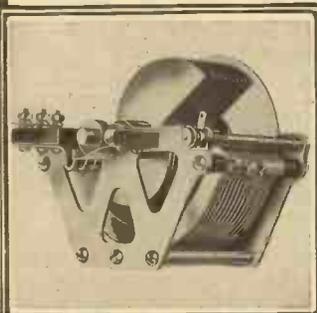
Apart from a range of sets and loud speakers, the most interesting of the exhibits on this stand are undoubtedly the new moving-coil speakers, selling at the astounding price of 67s. 6d. They are highly sensitive permanent-magnet types, complete with transformer having high, medium, and low ratios, and already mounted in a cabinet or on a baffle board. In a cabinet, £5 10s. for oak and £5 19s. 6d. for walnut are the prices of the M.C.6 unit.

There is a larger one, however, called the M.C.9, which retails at £6 for the chassis and nine and ten guineas for oak and walnut cabinets respectively. This is also of the permanent-magnet type, and will handle enormous volume with faithful reproduction. Both loud speakers, of course, are available on the deferred payment system, and there is no doubt that they will attract a considerable amount of attention.

GRAHAM FARISH, LTD.

A very large range of components indeed are being put on the market by this little firm, whose stands at Olympia have always been

The "Extenser"



Several firms are now turning out the Extenser. This one is made by Jackson Bros.

and Triple Red Line. The ordinary Red Line is the cheapest, the 120-volt battery being 14s. Next comes the Brown Line, 17s. 6d. for 120 volts; then the Blue Line, 25s. for 120 volts; and the Triple Red Line, 27s. for same voltage. The batteries are available in voltages of 120, 89, 66, and 9 volts in the case of the Red; the Brown Line, 120, 108, 99, 66, and 9 volts, and the same in the Blue Line; while the Triple Red Line in 120, 105, 99 and 60.

F. C. HEYBERD & CO., LTD.

This firm are exhibiting on their stand at Olympia an extensive range of all-electric units, H.T. mains units, and several kits of mains unit parts. An outstanding offer will be the announcement of a guarantee of two years against breakdown with all the units shown. Heyberd complete mains units have been marketed only twelve months, although their mains components have been widely known for the last six years, but such remarkable success has been achieved with the units that the makers feel confident in giving this unique guarantee which is absolutely unequalled in the radio world.

The all-electric units will comprise models D.150 and D.220, being for outputs of 25 and 30 milliamps respectively, with trickle-charging for four- or two-volt batteries. The H.T. mains units comprise five models, providing a wide choice, and there will also be a large display of kits of mains parts. Three kits are available, models C.150 and C.200, which proved so popular last year, and a new model, C.250, which has an output of 60 milliamps at 250 volts with four H.T. tapings, two of which are variable. The L.T. tapping gives 4 volts, and can be obtained if required, and the price is only £6 17s. 6d.



A fine example of British workmanship.

prominent. This year they include the "Litlos" bakelite dielectric condensers, which they are offering to the public for the first time. They are similar to those which have been sold in many hundreds to set manufacturers.

Differential condensers are also available, while a volume control for use in grid circuits for pick-up work and audio input control has been designed to sell at 3s. 6d. Antiphonic valve holders, switches, L.F. transformers, and L.F. chokes are also being shown, as are the new Spaghetts. By-pass condensers, grid leaks, resistances, H.F. chokes, R.C.C. units, and a lot of other things all figure in this amazingly comprehensive display.

We should like to draw attention particularly to the Audion gramophone pick-up, which is said to be so arranged that it gives a reduced output at needle-scratch frequency, otherwise giving an even response over the whole musical range. Outputs as high as 2 volts R.M.S., making it necessary to employ only two valves for an output energy up to 1,000 milliwatts. The pick-up is entirely enclosed in a rosewood case.

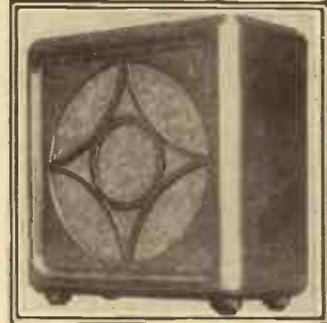
GROSVENOR ELECTRIC BATTERIES, LTD.

This stand is limited to batteries of various types, though some very great improvements have recently been made in these already thoroughly efficient batteries. It is claimed that the Grosvenor battery shows a 12-watt-hour capacity of 20 per cent over standard. A special test was recently carried out, and the battery was found to give this high percentage even though the particular sample had been in stock for several months.

A long line of Grosvenor batteries is available under four headings, the Red Line, Brown Line, Blue Line,

IGRANIC ELECTRIC CO., LTD.

This is the stand of one of the test-known and longest-established



No doubt you will recognise this loud speaker at sight. It comes from the Blue Spot factory.

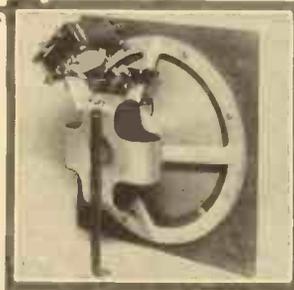
radio firms, and consequently one expects here to find steady progress in all directions. That is exactly what their exhibits show this year. New types of switches, transformers, output chokes, and various parts are being shown, and in addition there is a super-het kit which comes into line, with its 126-kilocycle intermediates with several of the other makers.

This is an important feature, because there is far too much individuality, if we may use the term, in super-het kit parts, and if the same kilocycle range for the intermediates could be standardised we should be much better off from the point of view of the home constructor.

A great display of mains transformers, to which the readers of MODERN WIRELESS have already had an introduction, and Mansbridge-type condensers, are being shown, the Universal mains transformer being a particularly fine job. A new model of pick-up is being shown together with a number of other very interesting items. Messrs. Igranic Electric, Ltd., have a large factory at Bedford which is capable of turning anything out in the form of radio apparatus from terminals up to power transformers, and even larger stuff, for it must not be forgotten that Messrs. Igranic do not restrict themselves entirely to radio.

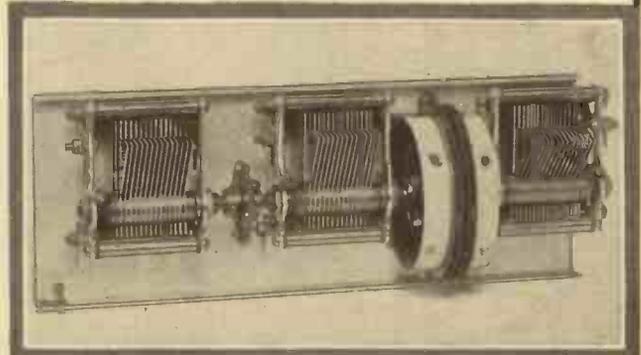
JACKSON BROS., LTD.

J.B. Precision condensers need no introduction to MODERN WIRELESS readers, for whether it be a tiny No. 2 condenser, a universal type condenser, or some of the more complicated double- and triple-



The W.B. moving-coil loud speaker is renowned for its excellent reproduction.

A Real Engineering Job



This ganged condenser comes from a famous British factory, noted for their sound workmanship.

ganged types, every "M.W." reader knows that the J.B. condenser will give the utmost satisfaction and efficiency. Their condensers and dials have long enjoyed a high reputation among most manufacturers and the home-constructing public.

A particularly interesting new line is to be introduced in the double-ganged condenser, which has been specially prepared for use with the Varley square peak coil. This is of a drum-drive variety with knob control and mounts parallel with the panel in such a way that it does not take up very much room. A valuable feature is the mounting plates, which are perforated so that the condenser can be mounted on the baseboard so that no strain whatever is imposed on the panel.

JEWEL PEN CO., LTD.

Lead-in tubes, permanent detectors, push-pull switches, coil mounts and coil holders of various types are among the many useful gadgets that this firm manufactures. Red Diamond components have long been known to the home constructor and you will find this stand full of interest.

JUNIT MANUFACTURING CO., LTD.

All types of terminal blocks and small accessories are manufactured by this firm of high-class radio goods. They are also the manufacturers of a very neat soldering outfit which has met with great popularity among home constructors.

S. A. LAMPLUGH, LTD.

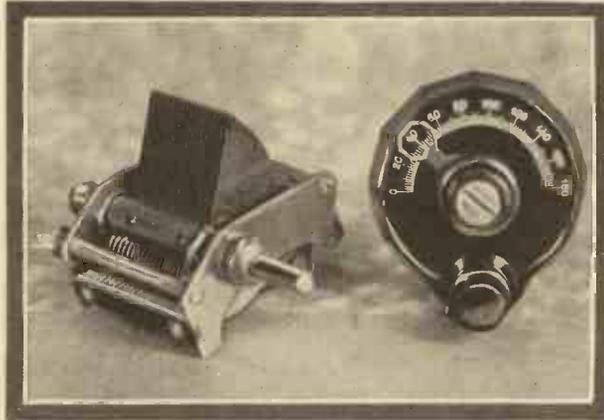
Complete sets, loud speakers and

terminals—an extremely useful and compact little kit. Further new lines include a panel terminal, a "non-short" accumulator protector, an anode connector (horizontal or vertical) for screened-grid valves.

this country to bring out a needle armature pick-up, and this still is remarkably popular.

Cheap transformers of excellent workmanship are also offered. Valve holders, fixed condensers.

A Practical Pair



The "Astra" condenser and slow-motion dial are essentially practical pieces of apparatus.

comprising a solid pin tag for permanent fixing, panel type valve holders for four or five pins, an aerial insulator, and many other little gadgets.

There is nothing large in the way of components to be seen on the Lectro-Linx stand, but all the tiniest of gadgets there require careful examination and you will find it a most fascinating display to visit.

LISSEN, LTD.

There is hardly anything in the way of radio components, sets, mains apparatus, etc., that Messrs. Lissen, Ltd., do not manufacture. The rise of this firm has been one of the outstanding features in the radio industry of this country, and it has been a rise based on results, with a reputation which is well deserved. Well deserved because the firm has never once looked back, and has never once stood still.

New developments are always coming along, and so one looks forward each September to the Radio Exhibition to see what new things this amazing concern has to offer. They were one of the first in

variable condensers, kits of parts, loud-speaker units, all of excellent manufacture, are turned out in great quantities by this firm.

But in addition to an array of components, the full list of which we could not possibly publish here, this firm goes in for the manufacture of valves, so that on this stand not only will you find components of various types, but also the valves to use with those components. In fact, practically everything for a complete set is available and it would be quite possible to build a complete receiver, including batteries, from Lissen Foods.

Well worth a visit, isn't it? You will be missing a most interesting exhibit if you do not go along to this stand and give yourself plenty of time for an examination of it.

W. & T. LOCK, LTD.

Many new lines are included in the coming season's list of cabinets made by this enterprising Bath firm. These include the "Beaufort" radio-gram cabinet, the "Kelston" receiver cabinet, the "Modern" and "Classic" transportable

cabinets, the "Lincoln" pedestal loud-speaker cabinet, and the "Utility" gramophone and pick-up cabinet. The complete range of these cabinets is to be on view in various finishes of oak, mahogany, and walnut, with the addition of one or two further new lines, including another model radio-gramophone.

The "Utility" is in particular a useful idea, consisting of a table-type gramophone pick-up cabinet allowing ample accommodation for both receiver and pick-up, and a record cabinet with four compartments for storage of approximately 150 records. Each section is self-contained and can be supplied separately if desired. The price in oak is five guineas for the largest size with complete unit, £3 2s. 6d. for the record cabinet by itself, and £2 7s. 6d. for the pick-up cabinet. The idea is a very good one, and Messrs. Lock should find a ready sale for it.

LONDON ELECTRIC WIRE CO. & SMITHS, LTD.

Under this somewhat bulky name readers will recognise the famous "Lewcos" concern. Lewcos H.F. chokes and coils have been a byword in the radio world for a long time now, and their excellence has never been in the slightest doubt. As manufacturers of coil units of all descriptions and of very high efficiency, Messrs. "Lewcos" have now turned their attention, like many other firms, to the construction of the P.V. and P.J. coils and of super-het units, and the Lewcos super-het kit of coils is now available to the public, and will be shown at the Exhibition.

There is also a highly efficient frame aerial for use with the super-

DON'T FORGET STAND 67

transformers are among the very interesting range of wireless apparatus to be found here.

LECTRO-LINX, LTD.

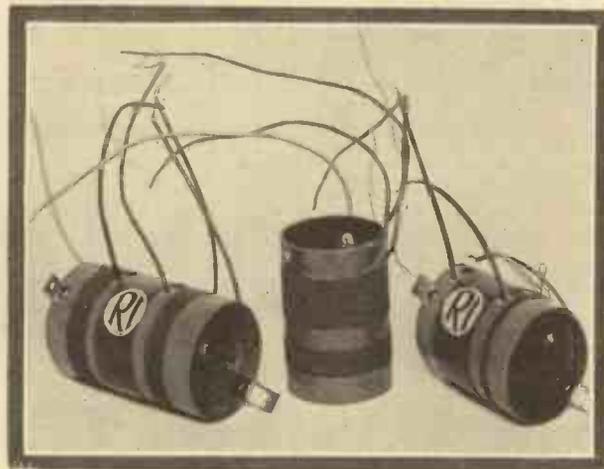
Here will be seen an amazing display of those little objects which make so much difference to the home constructor and set builder in the adaptability and efficiency of receivers. For instance, everybody knows that Clix spade terminals and wander plugs are almost essential in a set if stray whiskers of flex are to be avoided; and stray whiskers of flex are very dangerous things to have about.

No matter what type of connector is required, Messrs. Lectro-Linx, the manufacturers of Clix products, can supply them. Here are just a few of the present amazing list they offer to the home constructor—spade terminals, hook spade terminals, coil pins, plugs with lock-nuts, plugs without lock-nuts, pins and sockets, terminals, valve sockets, spring plugs, accumulator knobs, terminal brackets, valve holders.

And here are some new lines which will be of great interest. There is a Clix constructor's kit retailing at 3s. 5d., containing two slip-on spades (L.T.+ and L.T.—), six Clix wander plugs, two parallel plugs, two engraved sockets, and seven

"MODERN WIRELESS" WILL BE THERE

Have You Tried These?



Here we see the R.I. versions of the famous P.J. coils. (Left to right) : P.J.3, P.J.2 and P.J.1.

bet, while, of course, Glazite, and braided wire as used by home constructor and manufacturer alike, will be seen. Glazite is certainly one of the biggest boons the home constructor has ever had, and Messrs. Lewcos must have supplied many hundreds of miles of this to the public.

So far we have mentioned only the H.F. activities of the firm, but we must remind you that really good L.F. transformers and chokes are marketed also by them. The London Electric Wire Co. is a firm which never rushes into a job and never turns out a "shady" component. Everything is thoroughly investigated before the public is allowed to know anything about it, consequently one can always have the greatest faith in a "Lewcos" component, and when visiting this stand at the Radio Exhibition you can be sure of it being full of interest.

LOTUS RADIO, LTD.

The Lotus programme for the next few months will partly consist of a three-valve all-mains set for A.C. and D.C. mains, and will be self-contained, including a Magnavox moving-coil loud speaker, with Mazda screened-grid, detector, and super-power valves. The set will

also be available for battery operation for those readers who have no mains.

In addition, a large number of gadgets will be shown, including the Lotus relay, the remote-control unit, the antiphonic valve holder, and the new miniature differential condenser. The well-known Lotus wall jack (one of the necessary components for the remote control unit) is being shown, and numerous other plugs and jacks.

Audio transformers, three of which are made by the Lotus con-

of moving-coil speakers, of particularly interesting design.

They are extremely rigid in construction, and although the diaphragm is small and the pot is certainly one of the smallest we have seen, the results are very good. Readers should make an effort to see this stand, as they will find that the various models of moving-coil speakers on view are of particular interest.

NATIONAL ACCUMULATOR CO. LTD.

The exhibit of the National Accumulator Co. consists of low- and high-tension accumulators of all sorts for radio purposes. The majority of the types are fitted with the well-known tell-tale device which instantly indicates the state of the charge in the cell, at all stages from full charge to complete discharge.

Up to now this has only been available in the low-tension batteries, but the device has now been extended to the popular fixed plate type of low-tension accumulator, and also to the glass high-tension



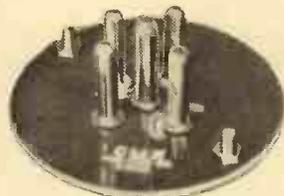
One of the best—a Dubilier H.T. battery.

cern, are being marketed during the coming season, one of the smallest retaining the same shape as the Lotus transformer marketed during the past year and being sold in the ratio of 1 to 3 at 5s. 6d. A useful Lotus disc drive, which can be fitted to all condensers, and a new completely screened coil unit are also making their first appearances. Drum drives, drum condensers, ganged condensers, introduced to the public for the first time, while a novel universal switch which embodies entirely new principles in design, will also be seen.

All the contacts of this switch are self-cleaning, and it is the simplest type of switch possible, and enables a large and varied range of switching schemes to be employed. The few points we have mentioned by no means cover the complete Lotus programme, or even the exhibits on the stand, but it gives a good indication of the aliveness of Lotus Radio, Ltd., from whom we may expect great things during the coming season.

MAGNAVOX (GT. BRITAIN), LTD.

The Magnavox loud speaker, as constructed in the United States, has been well known in this country for some time, but here is a British firm which is making a new line



A Clix valve holder for under-baseboard mounting.

battery. In the latter case only two floats are used instead of three—one for fully charged and one for the discharged condition. The only low-tension accumulators in which the tell-tale device is not available are those made up in moulded composite containers and jelly acid type for portable sets, the reasons being obvious.

NEW LONDON ELECTRON WORKS, LTD.

The well-known Superial aerial wire, of course, takes pride of place with the ordinary electron wire and insulated aerial pins on this stand, while in addition a strip method of wiring is sure to create considerable interest. It consists of a simple strip of metal which obviates soldering and is said to reduce construction time; besides being available for making such

things as earthing strips, grid-leak supports, emergency valve holders, strapping for grid-bias batteries, and so on.

The strip conductor is supplied in 12-ft. lengths and is slotted to slip over No. 4 B.A. screws and terminals. The length of the slot and the distance between slots has been calculated so that no matter what distance apart any two terminals may be the strip will always be found to slip over without bending.

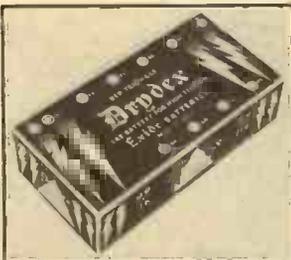
A few bends, which can be made with the fingers, of course, are necessary in the wiring up of a set if a neat job is to be made of it, while T joints are made by bolting through two pieces of strip. This strip connection scheme is well worth having a good look at.

CLIVER FELL CONTROL, LTD.

Better known as the manufacturers of Varley components, this firm has been well to the fore during the last few months owing to the introduction of that excellent coil, the Constant Square Peak band-pass coil. Consequently, we must expect to find that this coil is very prominently displayed on their stand.

But though they have been developing this new coil, Varley's have not been idle in other respects. A very large range of new components has been prepared, though, of course, the majority of these have to do with the L.F. side of the receiver, in which section the firm has specialised for many years.

Spaghetti resistances and cheap tag resistances, with a new line in ordinary anode resistances of



A newcomer from an old firm.

the wire-wound variety, will be welcomed by the home-constructor. Also some very interesting new transformers, such as the Niclet, and the small Niclet output choke, are to be seen.

The Niclet transformer is a useful little fellow, specially designed for shunt-feed purposes, though it is claimed that it will stand 3 milliamps direct current; so that, if necessary, it can be used direct in the anode circuit of the detector valve.

Reverting a little, an interesting point about the Square Peak coil which we should mention is that this can be obtained in two forms, either with a push-pull switch arrangement or with terminals for use with Extensers, and it will actually be seen in this form in sets on our own stand.

Messrs. Varley, as our readers probably know, also do a great deal in the power transformer line, and where the home-constructor wants to build a mains unit or an A.C. set he can be pretty sure to find what he wants in the way of transformers, chokes, potentiometers, etc., in the Varley list.

ORMOND ENGINEERING CO. LTD.

Many new lines have been introduced by the Ormond Engineering Co., Ltd., including three loud-speaker units, a moving-coil loud speaker, and several other useful gadgets. A new twin-drum control



A big-voiced speaker—the Amplion Lion concert model.

has also been introduced, and is available for slow-motion or "plain" condensers.

The moving-coil speaker, which is of the permanent-magnet type and sells for 70s., is very robustly constructed, the whole being mounted as a complete chassis. The cone, speech coil, and suspension are arranged to give parallel action, and the speaker will handle heavy input without distress. A speech transformer is incorporated with terminals provided for alternative ratios, so that the output valve can be matched up correctly

CHAS. A. OSBORN.

Various types of radio cabinets of extremely good workmanship are on view here. These can be obtained ready to assemble, completely assembled and ready to polish, or completely polished and finished for practically every set on the market. There are also cabinets for loud speakers. No matter what type of receiver you have built or contemplate building, Osborn can supply a suitable cabinet for it.



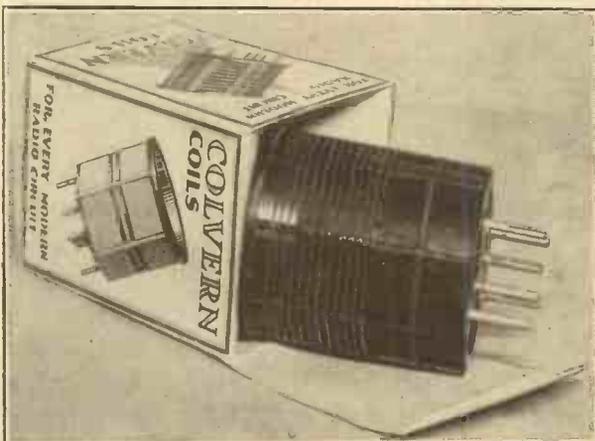
One of the neatest valve holders on the market (Bulgin).

OSRAM VALVES, LTD.

There are over fifty valves of one make available to the home-constructor or complete set user during the coming season emanating from the Osram factory. These include a very generous 2-volt range, several pentodes, the new 2-volt double-grid valve, large power valves such as the L.S.5 and L.S.5A, etc., a big range of indirectly-heated cathode valves for A.C. mains, and some new indirectly-heated cathode valves for D.C. working.

These latter are especially interesting, as they have a heater consumption of .25 of an amp., the characteristics being similar to those of the same types of valves

Down Below 100 Metres



One of the six-pin Colvern short-wave coils that have proved so successful.

A Sturdy H.T. Accumulator



These handy accumulators are supplied in blocks of 20 volts and are very strongly made.

for A.C. In addition we have a large variety of rectifier valves giving outputs of from 45 to 250 milliamps.

An interesting newcomer to the mains valves is the M.P.T.4, an indirectly-heated cathode pentode valve for A.C. work taking a heater current of 1 amp. at an anode voltage of 250, and having an amplification factor of 100. The impedance is given as 33,000 ohms, so that here is a very interesting and useful valve.

E. PAROUSSI, LTD.

This stand will be devoted to a hundred and one little odds and ends which the home-constructor requires when building a receiver. Such things as valve screens have long been turned out by Messrs. Paroussi, as also have horizontal-mounting valve holders for screened-grid valves.

These and other such items may seem to be small as compared with some of the mains stuff marketed by other firms, but they are just as important and the need for efficiency in them is just as great. Parex valve holders and screens are too well known to need any description, for there must be many thousands

of them used during the course of the season in this country alone, and this stand will give you a chance of seeing, as it were, the home of these goods.

PARTRIDGE & MEE, LTD.

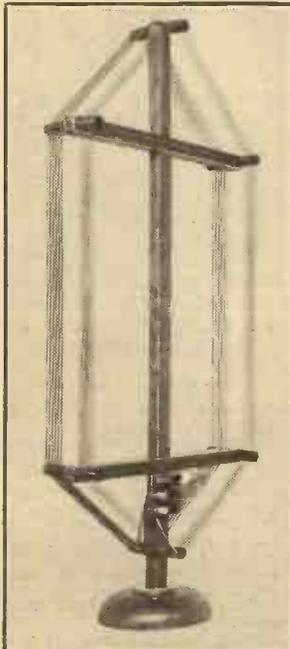
High-quality mains apparatus, famous under the trade name of "Parmeko," will be found here.

PERTRIX, LTD.

Who has not heard of the famous non-sal-ammoniac Pertrix H.T. batteries? Very few home-constructors and not many listeners, we expect. But here is a chance for them to examine them closely, and to ask questions about them, as well as to see and examine the lines of L.T. accumulators which are also being put on the market by this firm.

Pertrix batteries are British-made, and though they have not been on the market for very long, they are rapidly earning a reputation for consistency, quality, and for long life. They can, of course, be had in practically all the standard sizes, both in the wet batteries and in the case of the dry H.T. or grid bias, and we are giving no secrets away when we say here that we are of the opinion that the price list quoted at the Show for Pertrix batteries will surprise you.

"Selex" Frame



A very useful frame aerial which covers both long and medium waves.

PETO-SCOTT CO., LTD.

This is the exhibit of one of the most popular kit suppliers in the country, and so kits of parts or details about kits of parts naturally take up a large proportion of the stand. Another important feature to be looked out for is the frame aerial, which can be obtained in various types and at various prices, and has been brought out specially to cope with the recent heavy demand for frame aerials for super-heterodyne receivers.

A feature which will naturally interest MODERN WIRELESS readers is the coil quots, which are being shown in moulded bakelite form, and it will be remembered that this firm was the first to take up this fascinating little unit.

P.R. PRODUCTS, LTD.

A large range of receiving valves at extremely popular prices are marketed by this firm, and also the famous wireless mast which has supported so many amateur transmitting aerials.

RADIO INSTRUMENTS, LTD.

At this stand one of the things which will create the greatest interest will be the 1931-32 model Stenode receiver. This is a seven-valve instrument, and one of the chief improvements of this model is the substitution of four ganged tuning circuits instead of three, thereby eliminating second channel interference, which is such an undesirable feature.

But although Messrs. R.I., Ltd., are going in for large receivers of

this order they have not forgotten their Madrigal A.C. Three receiver, which is a transportable set operating entirely from the electric light supply and incorporating a moving-coil speaker. In addition there are a large number of components which will be of utmost interest.

An entirely new transformer called the "Dux" has been introduced with a primary inductance of 30 henries and a maximum D.C. current of 5 milliamps. This is being sold at a remarkably low figure. Then, of course, there is the famous "Parafed" transformer, which has only recently been placed on the market, employing a nickel core having a much greater percentage of nickel than has formerly been used.

Potentiometers, valve and metal rectifier transformers, low-frequency filter and output chokes, all go to make up a most interesting and fascinating display in this part of the Show. In addition, of course, R.I. are showing the P.V. and P.J. coils; they were one of the first firms to recognise their value and to place them on the market, and super-hot coils will also form part of the programme for next season. We believe also that band-pass

indicating switch arrangement six different ratios are available, ranging from 10 to 1 to 25 to 1, and the switch positions for each are clearly indicated. It is of sound construction and handsome appearance, and no pains have been spared to produce a really sound and reliable instrument.

A quality component at a popular price is the standard H.F. choke, which is completely enclosed in a protected case, and has highly efficient sectional windings almost entirely air-spaced. It has a low D.C. resistance—only 230 ohms—and is effective even down to 20 metres. Another H.F. choke which will meet with acclaim is one specially designed for use in the modern super-heterodyne, for excluding the intermediate-frequency currents from the low-frequency circuit. It is stated that it will effectively block H.F. currents up to a wave-length as high as 3,500 metres, and, of course, can be used whenever a choke of high inductance is required.

Another special instrument is a volume control for L.F. circuits, being completely enclosed, and having a special type of resistance element constructed of reliable material, and so arranged that there is no rubbing action thereon. A snap switch and a panel light are also interesting new components, the latter being an extremely ingenious little device, giving a clear and unmistakable indication when the set is switched on. It shows the word "ON" glowing red instead of merely a red light, and is attractively finished in nickel-plate. The size for 2-volt working takes only '06 amp., while suitable bulbs for A.C. mains can be obtained.

REGENTONE, LTD.

Hundreds of visitors will flock round this stand to see what is claimed to be the cheapest mains unit on the market. It provides 12 milliamps at 120 volts, and has three fixed tapings for S.G., detector and power valve, and costs only 47s. 6d. Messrs. Regentone have been in the mains unit business for a long time, and besides building complete units, provide quite a number of valuable components for home-constructor use in mains sets.

One of these is a particularly nice and useful wire-wound potentiometer for use in controlling the screening voltage of an S.G. valve. Having a resistance of 50,000 ohms, it is smooth in action and noiseless in operation.

PLEASE NOTE.

Owing to the inclusion in this review of a considerable amount of "last minute" information regarding the exhibits at Olympia, it has been found impossible to restrict all the descriptive copy to this special art supplement. Fortunately, however, we have been able to preserve an alphabetical order, and if you will please turn to the end columns of this issue you will find the remainder of this article in a full and unabbreviated form.



Three batteries from a well-known firm of long standing.

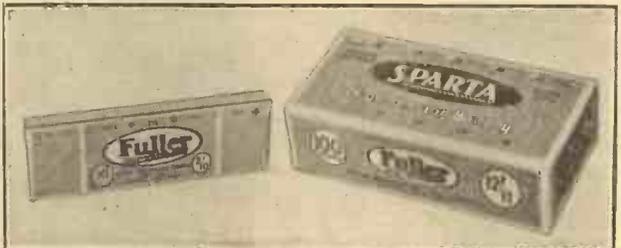
units are not escaping the attention of this go-ahead Croydon firm, and it will not be long before we have something new in this line from the Madrigal works.

READY-RADIO, LTD.

Apart from a large range of small components, the majority of which are well-known to our readers, Ready-Radio are putting on the market some extremely interesting new components which will be making their appearance for the first time at the Show.

One of these is called the "Instamat" output transformer, and is specially designed for the instant matching of the valve and loud speaker. It is the first output transformer at a reasonable price capable of carrying satisfactorily the heavy anode current of modern valves, and is for use with low-resistance moving-coil speakers only. By means of a very simple

The "Long Life" Battery



The batteries illustrated above are manufactured by the Fuller people, of accumulator fame.



EVENINGS -IN THE- STUDIO

Some intimate and human glimpses of famous microphone personalities as they appear in the studio.

By Our Special Correspondent.

JACK PAYNE, Stravinsky, Sir Henry Wood, "Stainless Stephen," and all the other popular broadcasters, are even more interesting folk than they appear to listeners. An evening in the studio is for that reason an education in itself, for very often one is lucky enough to see things that the microphone can't reveal.

the red light flashes and it is time to begin again.

I saw him at the Queen's Hall recently, directing the making of a gramophone record by Jack Hylton of one of his (Stravinsky's) compositions, and he seemed to be ultra-particular. I don't think he likes gramophones.

Jack Payne is an interesting broadcaster. He has an office near to one of the main entrances to Savoy Hill, and here he works until a minute or so before he is due to appear.

Jack Payne Sprints

The attendants have already put the instruments in Number Seven Studio (the one practically always used) and the members of the band are waiting in the ante-room. Jack

Just the Difference

Stravinsky, for instance. At the Queen's Hall he is the lean, immaculate Russian; but you wouldn't know him when broadcasting or when making a gramophone record.

He comes into the studio cloaked in a huge astrakhan coat reaching down to his feet, accompanied by a manager who effects the same style of coat, plus a fearsome Russian beard of the Emil Jannings variety! And when Stravinsky takes off his coat—lo, he is dressed in a tennis shirt with open neck, and a gay woollen pull-over!

During the Intervals

He has a wonderful memory, and often conducts without a score; and, difficult as his music is, he has no pity on the unlucky member of the B.B.C. Orchestra who makes a slip. Even if there is an interval of only a minute or two, he puts on the huge coat and waits very impatiently till

REHEARSING FOR A RECENT BROADCAST



Before any particular item is "put over" on the radio quite a number of rehearsals have to be gone through to ensure absolute perfection. Here you see a number of artistes preparing themselves for the microphone.

Some Famous Broadcasters as Seen in the Studio

often has to make a last minute dash down the passages to the studio, and he calls out "All right, boys," as he gets near the door.

In all probability the red light is already on, and in the space of thirty seconds or so everything is ready and they are plunged into the opening bars of "Say it with Music"—the tune with which they begin and end each broadcast.

The announcer touches the button and "Control" in the control room downstairs tunes down the volume so that the announcer can be heard above the band. The announcement

better without. He reads practically everything he broadcasts, which is no detriment, and excels in little comedy sketches rather than in "solo" turns.

At the Last Moment

His little tongue-twisting Spoonerisms are, of course, affected. Really he is quite a serious individual in private life.

Leonard Henry often has no idea what he is going to speak about only half an hour before he is due to broadcast. On the way up to Savoy Hill he collects together various scraps of

His "real" voice sounds strangely different from his "broadcast" voice, as listeners hear it on the loudspeaker. Actually it is much deeper-toned.

I have discussed only one conductor, Stravinsky. Dr. Adrian Boult, Sir Henry Wood, Nicolai Malco, Percy Pitt, Leslie Heward, Sir Landon Ronald and many others act quite differently in the privacy of the studio from the way they appear in public.

Dr. Boult usually appears in evening attire, but discards his dinner jacket before the end of the performance. Leslie Heward likes green shirts, and also often conducts without a coat.

THE B.B.C. SYMPHONY ORCHESTRA IN NO. 10 STUDIO



No. 10 studio is used for nearly all of the big broadcasts, having accommodated many famous people in its day. The above photograph shows the B.B.C. Symphony Orchestra during a rehearsal.

is over, and then up comes the volume and the broadcast really starts.

Jack, by the way, has a very clear voice, but one which is very soft. He sings only three or four inches away from the "mike."

The well-known humorists—"Stainless" Stephen, Tommy Handley, Leonard Henry, Gillie Potter, and the rest—are always worth watching.

Some Like Audiences

"Stainless" likes an audience in the studio, and generally has quite a large one. Tommy Handley seems

paper in his wallet—and there is his broadcast manuscript!

Every new joke or funny event he hears or sees is jotted down on these scraps of paper, and several L.H. broadcasts have been compiled from this handy "scrap book."

I have seen Gillie Potter on the stage, at the B.B.C., and when making gramophone records; the only difference is that on the stage he wears a comic, broad-brimmed straw hat. Quite a lot of his patter is impromptu, and I think he tells better tales of "Hogsnorton" when there is no audience in the studio.

"High" and "Low"

Sir Henry and Sir Landon do not often appear in the studio, and when they do they are always very "concert-hall-ish" and formal. And yet Sir Henry Wood did once accompany Tommy Handley on the piano when he sang "Constantinople" (at a private concert given by Sir Henry), and I have actually heard Sir Landon play something which everybody knows, but which few realise that he composed—"Down in the Forest."

Nicolai Malco, the Russian, likes to work in his shirt sleeves, and sits down when he conducts—at the start. At the first loud passage he jumps up in an assumed frenzy; and later he may bounce up and down on the chair to mark the tempo—an amusing man to watch!

Big soloists are sometimes amusing when they broadcast. I can think of Soloman, Backhaus, Pouishnoff, Marcel Mayer, Harriett Cohen, Cyril Scott, and Bela Bartok, the modernist.

All these have their own little peculiarities and characteristics, for instance, Soloman is a great sportsman, and several times has been in danger of being late because of the attraction of the Great Outdoors; but, of course, he never is late. He forgets sport when he plays, shuts his eyes when playing softly, and appears to go to sleep.

Pouishnoff takes a great interest in the technicalities of microphone placing and studio acoustics. It was because of this that he happened to be in the studio late one evening when there was a gap in the programme.

He was not due to broadcast, but, unannounced, he filled in the gap. Hundreds of listeners wrote in about it, and so he earned the title of the "mystery broadcaster."

USING TRANSFORMERS



THEORETICALLY, the greatest amplification results when the ratio of an L.F. transformer definitely fits in with the impedances of the circuits that it couples. If the secondary impedance, which is invariably that of the grid circuit of a valve, were infinitely high, the transformer ratio could be increased indefinitely and an enormous voltage amplification achieved.

Impossible in Practice

In practice there are numerous limitations. In the first place, the secondary impedance never will be anything approaching "open circuit" dimensions. Always there will be some small power drain even when the proper grid bias is arranged.

But even when you take this into account you are up against constructional difficulties. For example, an L.F. transformer to couple a detector valve having an impedance of nine or ten thousand ohms to an L.F. valve having a grid circuit resistance (based on the power drawn from the secondary of the L.F. transformer) of eight or nine hundred thousand ohms should theoretically have a turns ratio of one to nine or ten to give the maximum amplification.

However, such a ratio is quite impracticable. It could only be attained by having an extremely large secondary winding, for the primary winding must not be reduced below some fairly high figure of inductance. Let us take 100 henries as the inductance for the primary.

A Tremendous Inductance!

Retaining this and building to a ratio of 1 to 12 means the secondary must have an inductance of $12 \times 12 \times 100$, and that equals 14,400 henries.

The wire used, even with a core of high permeability, would be considerable, and the self-capacity resulting would provide a nasty shunt for the higher frequencies.

The popular 1 to 3.5 ratio is a fine compromise, and enables very good results to

Practical pointers regarding the operation of L.F. amplifiers.

By D. GLOVER.

be obtained, providing certain simple precautions are taken. For one thing it is important that the minimum of power should be absorbed in the circuit in which the secondary winding figures.

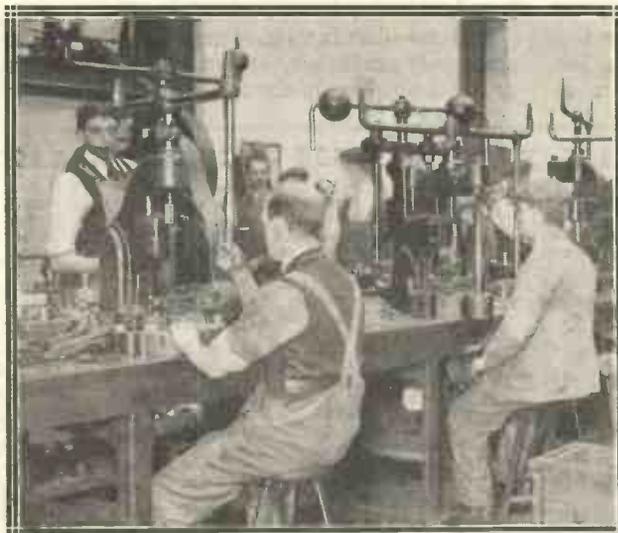
It should be remembered that the whole aim of an intervalve L.F. transformer coupling is to develop voltage. The grid circuit of the coupled valve must be kept at as high an impedance as possible.

You do this by making sure that appreciable grid current does not flow. The valve must be given ample grid bias and kept free from overloading.

Output Transformers

So far we have been dealing with the coupling of valves, the coupling of an output valve to a loud speaker concerns power as against voltage only. Thus current plays its part, for power represents the product of voltage and current.

CUTTING OUT THE CORES



These machines stamp out those thin plates of iron of which the cores of L.F. transformers are built up. (Ferranti.)

It is very easy indeed to arrive at the ratio that an output transformer should have in order that the greatest power transference from the anode circuit to the loud speaker takes place.

This condition results when the valve impedance equals the anode circuit impedance.

The Correct Ratio

This latter can be regarded as the impedance of the loud speaker multiplied by the ratio of the transformer. Now you see the connection between the various factors.

Supposing at a certain frequency the impedance of the loud speaker is 10,000 ohms, and that of the valve 2,000 ohms. The desirable transformer ratio is indicated by the ratio of the two impedances. That is to say, if a 1 to 5 transformer is used the conditions are fulfilled. According to the rule in the preceding paragraph, $10,000 \times \frac{1}{5} = 2,000$, which is, correctly, the valve impedance.

If the speaker were of low impedance, say, 100 ohms, a step-down transformer would be necessary. In this case the ratio works out at $2,000/100$, i.e. 20 to 1. (Speaker impedance, $100 \times$ ratio, $\frac{20}{1}$, equals valve impedance, 2,000 ohms, correct.)

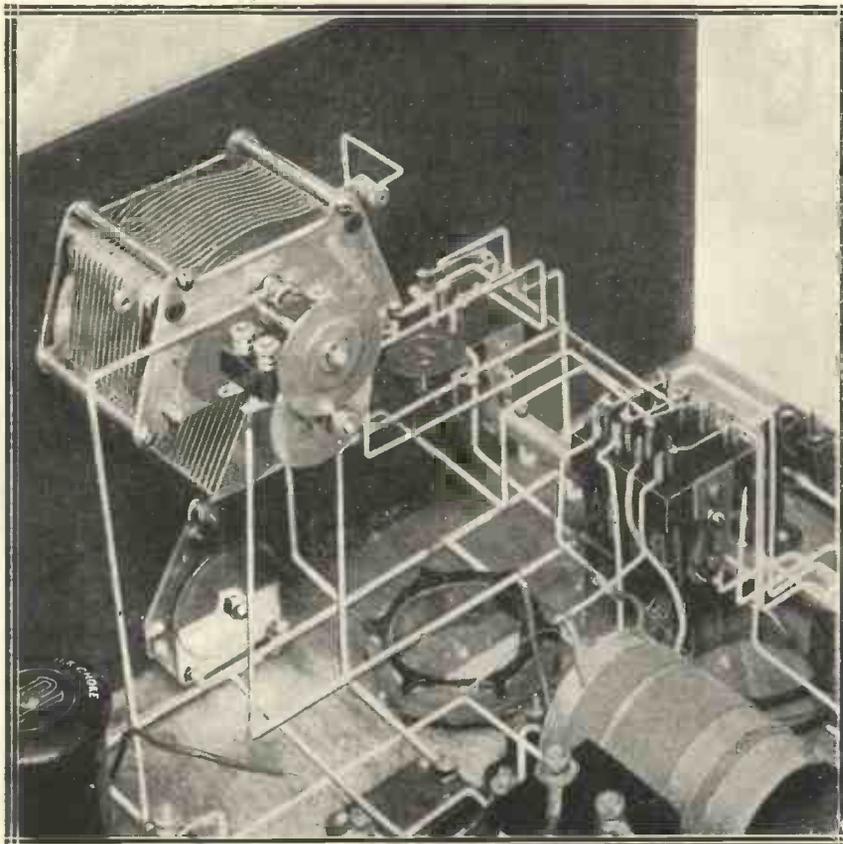
Now, all the above applies to the greatest power output.

Maximum Power

For the greatest undistorted power output you generally work to an anode impedance of twice that of the valve, in which case the above ratios would be 1 to $2\frac{1}{2}$ and 10 to 1.

The mistake must not be made of confusing impedance with D.C. resistance. Impedance takes capacity and inductance into account as well as resistance, and when either or both the first are present the impedance will change with frequency.

The "Four"



Here you see the connections to the special transformation switch, which in an instant changes your dual-range Extensider broadcast receiver into an efficient dual-band short-waver, also using Extensider tuning.

This wonderful new universal receiver has a simplicity of control hitherto unknown in all-wave sets. It has only four controls and yet without so much as lifting the lid of the cabinet you can explore two entirely different short-wave bands, and also medium and long waves, as simply as tuning in your "local."

tinues. The use of the P.J. coil and long-wave coil quitoes fixes the medium and the long wave-bands, but the use of plug-in coils on the ultra-short waves means that it is possible if desired to make adjustments in this section of the circuit to cover practically any range you desire.

Adhere to the Design

We consider, however, that the bands we have already mentioned are those which are most useful, and it is strongly recommended that the set be used as indicated and that no attempts at changing them should be made.

Though we see no reason why the set should not work perfectly well on any band above 19 metres—it cannot be expected to work satisfactorily below that wave-length—at the same time we feel it would be a pity to go away from the original idea of the design in any attempt to make the set cover any weird and wonderful bands that may take the constructor's fancy.

It could be done, but we should like

HERE come true is the dream of every enthusiastic home constructor. We will let the secret out of the bag at once; it is a screened-grid detector set which covers all bands of wave-lengths. These are—two different ultra-short wave-bands, the broadcast band of medium waves, and the long wave-band.

Below the "100" Mark

The short wave-bands can be adjusted as desired to cover any two groups from 19 metres upwards, but we have primarily designed it to

cover wave-lengths ranging from 19 to about 75 metres, with sufficient overlap for the two bands to make sure that no stations are missed.

It's a bit of an achievement, isn't it? For here we have in one receiver, by just the turn of one control, which we will call the transformation control, a broadcast set capable of operating a loud speaker at good volume, and also of picking up programmes on practically any wave-length between 20 and 2,000 metres.

The wave-bands we have mentioned are purely exemplary, as you will see as our description of the receiver con-

THE FEW PARTS THAT PRODUCE SUCH REMARKABLE RESULTS

- PANEL**
18 x 8 in. (Peto-Scott, or Permcot, Goltone).
- CABINET**
Panel space 18 x 8 in., with baseboard 10 in. deep, and terminal strip 18 x 2 in. (Canco, or Osborn, Pickett, Lock).
- EXTENSIDER**
1 .0005 Extensider with vernier control (Wavemaster, or Formo, Cydon, J.B.).
- VARIABLE CONDENSER**
1 .0003 reaction condenser (Lotus, or Telsen, Ready Radio, Polar, Astra).
- SWITCHES**
1 Three-pole double-throw (Wearite).
1 Four-pole double-throw (Wearite), with baseboard-mounting bracket and ganging-extension rod.
- RESISTANCES**
1 .5-meg. volume control (Magnum, or Sovereign, Wearite, R.I., Varley, Igranic).
1 25,000-ohm Spaghetti resistance (Bulgin, or Telsen, Varley, Ready Radio, Peto-Scott, Graham Farish, Lewcos, Magnum, Lissen, Sovereign, Goltone).

- 1 150,000-ohm grid leak with terminals or connecting leads (Graham Farish, or Igranic).
- 1 250,000-ohm wire-wound anode resistance and holder (Varley, or Lissen, Ferranti, Mullard, Dubilier, Sovereign).
- 1 2-meg. grid leak and holder (Ferranti, or Telsen, Ready Radio, Mullard, Dubilier, Igranic, Ediswan, Watmel).
- VALVE HOLDERS**
3 Four-pin type (Clix, or Telsen, Igranic, Lotus, W.B., Bulgin, Wearite, Magnum).
- FIXED CONDENSERS**
3 .0003-mfd. (Telsen, Ready Radio, Formo, or Goltone, Ediswan, Ferranti, Igranic, Watmel, T.C.C., Graham Farish, Mullard, Dubilier).
1 .01-mfd. (T.C.C., etc.).
2 2-mfd. (Igranic, Formo, etc.).
- CHOKES AND COILS**
1 P.J.1 coil (Ready Radio, or R.I., Formo, Ferranti, Lewcos, Wearite, Peto-Scott).
2 Coil quitoes (A.E.D. and Wearite, or Peto-Scott, Sovereign, Redfern, Ready Radio).

- 1 H.F. choke (R.I., or Telsen, Ready Radio, Wearite, Varley, Lewcos, Peto-Scott, Lotus, Magnum).
- 1 Output choke (Igranic, or R.I., Varley, Telsen, Ferranti, Atlas, Wearite, Bulgin, Lotus).
- 6 Plug-in coils (see text).
- 6 Coil holders (plug-in low-capacity type) (Wearite, or Lotus, Lissen, Igranic, Magnum).
- TRANSFORMER**
1 L.F. (Telsen, or R.I., Varley, Lotus, Igranic, Mullard, Goltone, Atlas, Lewcos).
- MISCELLANEOUS**
9 Indicating terminals (Igranic, or Belling-Lee, Clix, Eelex, Goltone).
2 oz. 24 D.S.C. wire for Contradyne coil (70 turns).
2 oz. 30 D.S.C. for long-wave coil quito (4 ozs. required if P.J.1 coil is home-made).
G.B. and H.T. plugs, Glazite or Lacoline for wiring, 1 sheet copper foil 10 x 18 in. to fit baseboard, screws, etc.

Band" Three

Designed and Described
by the
"M.W." Research Dept.

readers to understand that in our opinion it is not advisable if really good results are desired.

And now to get down to the actual design of the set. How is this wave-band changing accomplished with only one switch, which, by the way, also works as the "on-off" control? The answer is simple—by the use of the famous Extenser.

The Extenser Scores

If you look at the photographs you will see that there is one tuning control with vernier adjustment. This is one of the models of the famous Extenser, with a capacity of .0005 mfd. and has been used in what we



NEW—DIGNIFIED—
EFFICIENT

think you will agree is a rather ingenious manner.

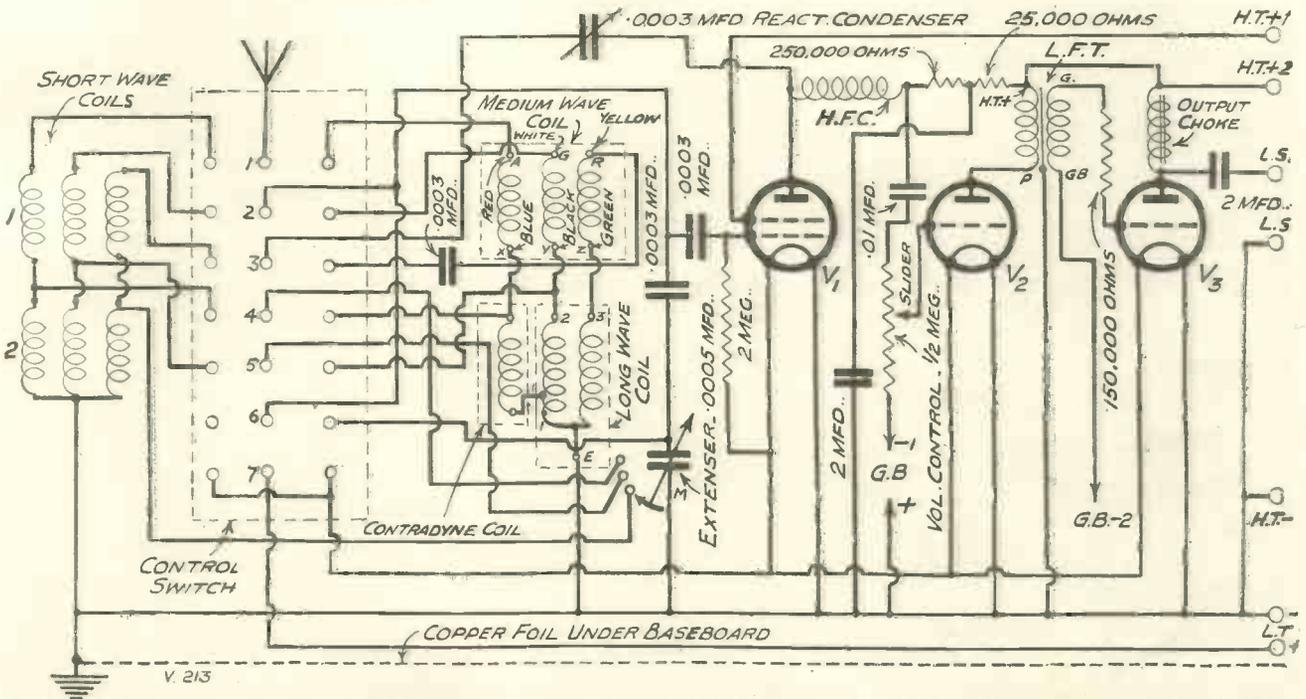
The circuit can really be divided up on the H.F. side into two complete sets, giving us really two receivers in one. On the left-hand side, looking at the theoretical diagram, we see two sets of tuning circuits divided by a switch. On the left of the switch is a short-wave section with plug-in coils; on the right are the medium- and long-wave sections.

Now, by the turn of that switch either the two short wave-bands or the medium and the long wave-band are made available, and the changing over from one short wave-band to the other, or from medium to long and vice versa, is carried out automatically by the Extenser.

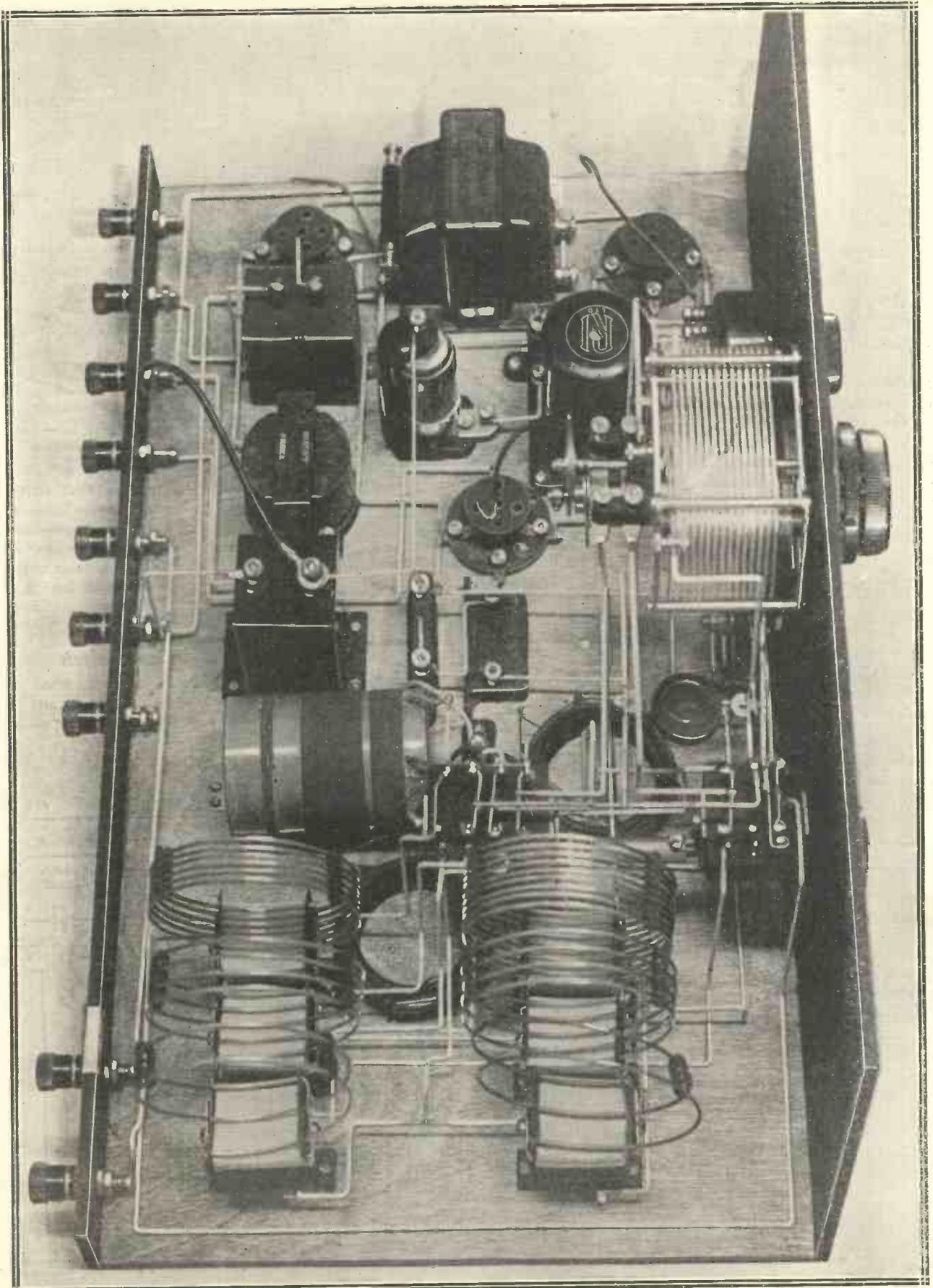
Only One Switch

So, in operating the set, what we do is to place the transformation control so that we are listening either

As Efficient As Two Separate Sets



No longer need you have a special short-wave set as well as a broadcast receiver to get good results on all waves, for this circuit of the "Four-Band" Three shows how you can turn in a moment to any station you like, and without changing a single coil.



A "full-length" view of the completed receiver, indicating the surprising simplicity of its design. The sets of coils for the two short-wave bands are seen in the foreground, and behind them is the special two-section transformation switch.

Three Valves, Four Controls and Four Wave-Bands

on the ultra-short waves, or on the medium- or long-wave bands, and we then do all the rest of the wave-changing necessary by means of the Extenser, which, as our readers are aware, carries out this little job quite automatically.

The method of tuning is also rather unusual, for use has been made of the transformation control to insert or short out a small condenser of

And now you have an idea of what the receiver consists, so let us have a look at the actual construction. It looks a rather terrifying business from the photographs and the wiring diagram, but it is not nearly so difficult as it appears, provided the layout and the wiring are very carefully copied. This is really most essential in a set of this description, because any deviation in the layout

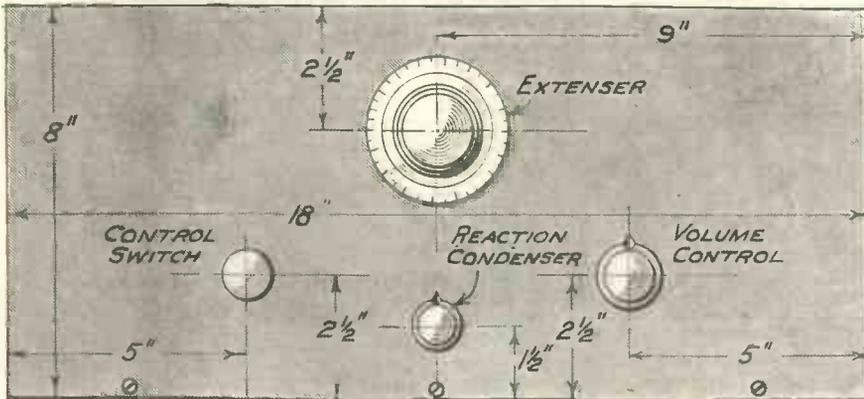
purpose—is the Contradyne coil, which prevents any break through of the medium waves on the long-wave band when one is listening between 1,000 and 2,000 metres.

A little farther along the baseboard one comes across the P.J.1 coil, and the coil quoit carrying the long-wave winding, while between these two is the .0003-mfd. fixed condenser which is included in series with the reaction condenser when listening on the medium- and long-wave band. Farther along comes the grid condenser and grid leak, and farther still the detector and L.F. portion of the set.

Simplifying the Tuning

One of the small "button" types of fixed condensers is employed for the series condenser in the tuning circuit when listening on the ultra-short waves, and this can be seen in the wiring diagram suspended from the lead which comes from the fixed vanes of the Extenser to the back portion of the control. This control

FOR ALL CONTINENTS IN THE WORLD



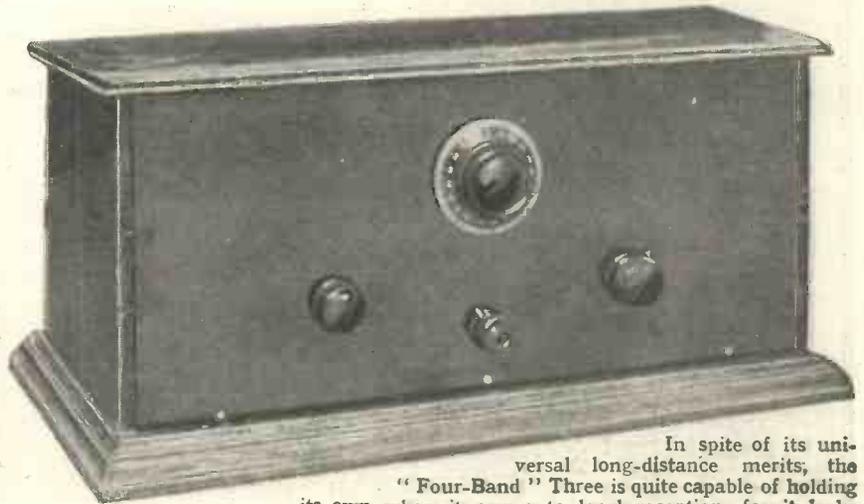
With slight movements of the conveniently grouped controls you can swish from one continent to another, and reach out to the farthestmost parts of the earth.

.0003 mfd. capacity, placed in series with the Extenser, so that the tuning on the ultra-short waves can become really easy. This small condenser is taken out of circuit when the medium and long wave-bands are being explored, while a series condenser in the reaction circuit is also automatically inserted.

"Screened-Grid" Detector

As well as the novel tuning system the set includes a special screened-grid detector, with reaction, resistance-coupled through a volume control, also acting as a grid leak to the first L.F. valve which is transformer-coupled to the output valve. The set is well decoupled and an output filter is used, thereby getting rid of any tendency to L.F. instability should the receiver be used with a somewhat "dud" H.T. battery.

It can, of course, be used on a mains unit, though this is not to be desired when listening on the ultra-short waves owing to the fact that mains units so often introduce rather serious hum when short waves are being received.



In spite of its universal long-distance merits, the "Four-Band" Three is quite capable of holding its own when it comes to local reception, for it lacks nothing in the way of quality.

might easily mean that the set would not oscillate properly on the short waves, while if the wiring were badly carried out losses might be introduced and have the same effect.

Systematic Layout

The short-wave plug-in coils, as will be seen, are placed in rows at one end of the set, then comes the transformation control, underneath which—for the control is mounted well above the baseboard on a bracket provided by the makers for that

is in two portions, one having three poles and the other having four, making a seven-pole switch in all, the two switches being linked together by a coupling provided for that purpose.

The panel controls merely consist of the Extenser and below that the reaction condenser, the control switch, and a volume control, forming an exceedingly neat and convenient layout. The convenience of control—which is essential in a set of this description—was kept in the fore-

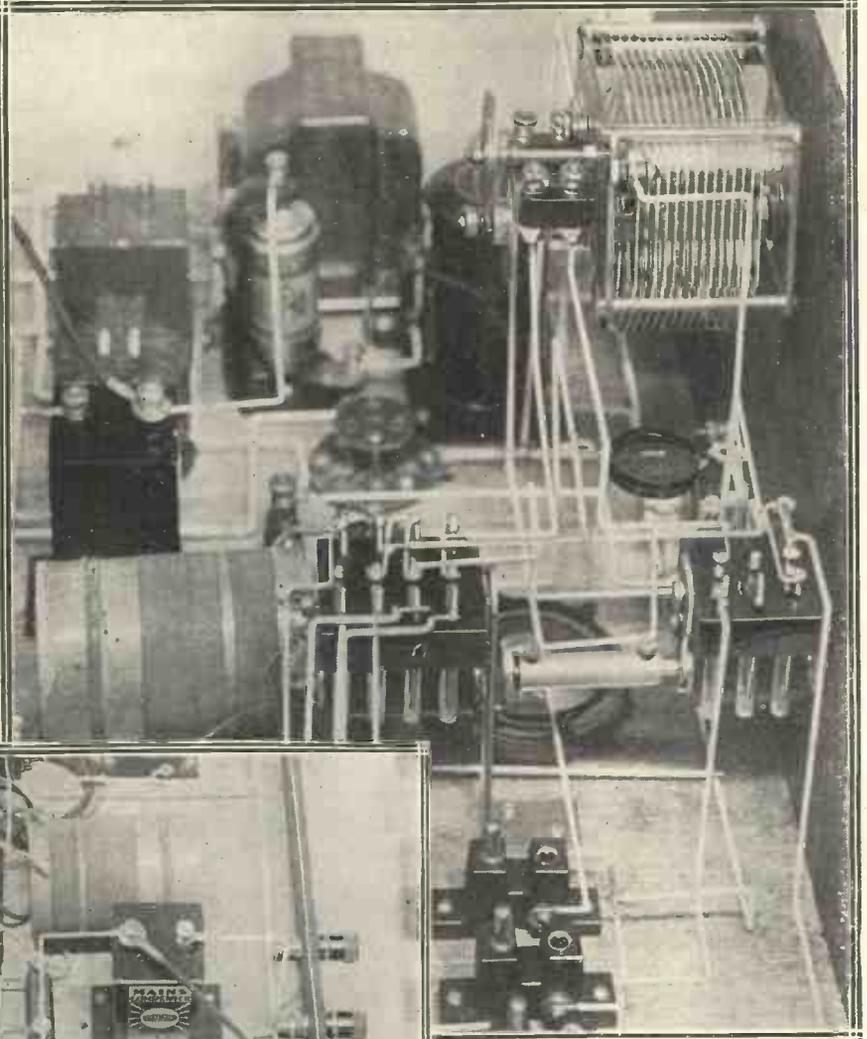
front of the designers when the set was first worked out, and by careful thought and placing of the parts, efficiency of operation, due in no small measure to the layout behind the panel, has been combined with really easy control.

The actual construction of the receiver is not really difficult, care having been taken in the design that the layout can be copied easily, but we must stress the importance of following this layout as closely as possible. Any deviation—especially at the H.F. end—is likely to upset the operation of the receiver completely.

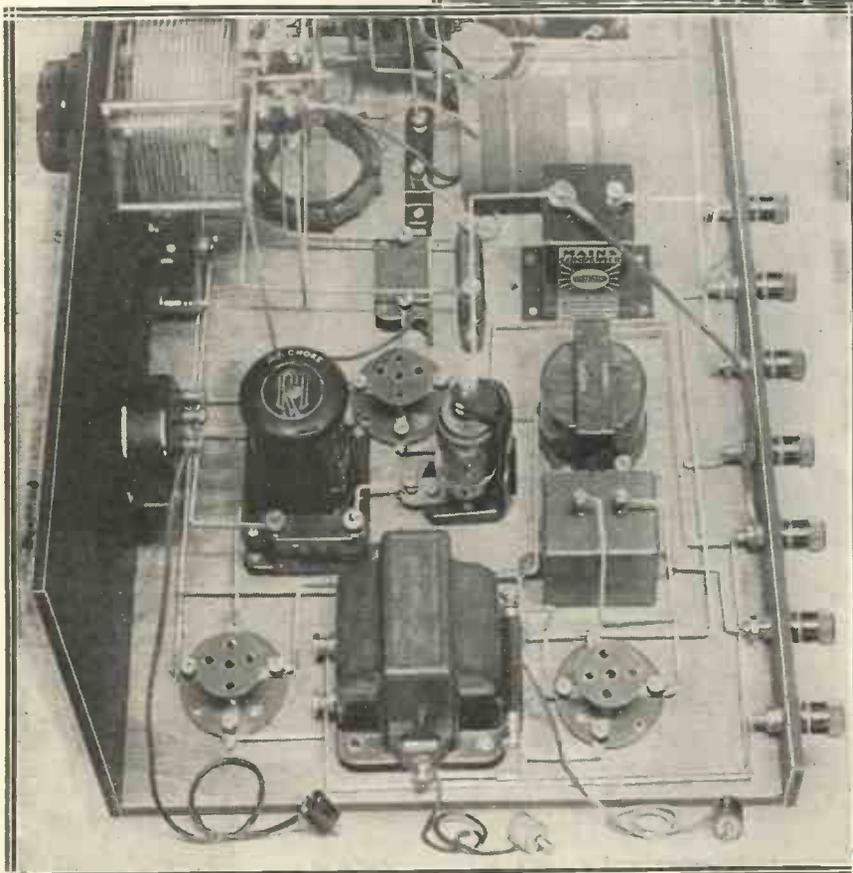
Special Switch

Naturally, when building the receiver the first thing to do is to tackle the mounting of the switch, making sure that it comes in the right position on the panel as marked on the panel diagram. The switch is held by an adjustable bracket at the rear end, and there is a long extension rod to the second portion—the three-

WHERE THE TRANSFORMATION IS CARRIED OUT



Here you see a close-up of the special switch and its wiring, which enables the set to be transformed from a broadcast receiver to a short-wave receiver. When the switch is in the centre position the set is automatically turned off.



This is the powerful L.F. end of the receiver, which, following as it does a screened-grid detector, builds up a tremendous volume of undistorted loud-speaker input.

pole section—which is mounted by the usual single-hole-mounting nut on the panel.

Opposite this, on the other side of

the panel, is the $\frac{1}{2}$ -megohm volume control, and between the two above one another is the Extenser and the reaction condenser.

Drill the panel first, and then make sure that the switch will mount up properly on the baseboard. Mark the position in which it will come, and mount on its bracket the rear portion, the four-pole section, of the switch. Then the panel can be removed from the baseboard and the components on the latter mounted, special care being taken that the coil-holder positions, which are best determined by mounting the coil holders and spacing them apart with the short-wave coils in position.

Mounting the Coils

Short-wave coils take up rather a lot of room, and so one must be careful that sufficient space, though not too much, between the coils is allowed.

When these have been mounted, the rest of the components on the

Alternative Bands for Alternative Programmes

baseboard can be fixed and the panel put in position.

The next job is the wiring, and it is best to do the filament connections first; these can be kept low and can be wandered all round the baseboard with the greatest of ease so that they will keep away from any grid or anode wiring which will have to be done later.

The Short-Wave Section

The next thing to do is to tackle the short-wave section of the set, and the connections to the switch. Here it is best to make the wiring as short and direct as possible, keeping it well spaced, especially where it joins the switch contacts. These must be soldered carefully, and all remaining traces of flux removed so that there shall be no capacity leakage across the switch

contacts, due to adjacent blobs of solder, and the positions of the wires should be tackled very carefully so that stray capacity effects should be

RECOMMENDED ACCESSORIES

Loud Speakers. (Amplion, Mullard, Celestion, Undy, B.T.-H., Blue Spot).

Valves. 1 S.G. valve (Cossor S.G.215), 1 L.F. valve (Six-Sixty L.210, or similar, Mazda, Cossor, Osram, Mullard, Tungram, Eta, Fotos), 1 power or super-power (Mazda P.220A, etc.).

Batteries. H.T., 120-150 volts (super-capacity) (Ever Ready, Drydex, Pertrix, Lissen, Magnet). G.B. to suit valves; if super-power is used, up to 18 volts (Pertrix, etc.).

Accumulators. 2-volt, to suit valves (Exide, Ediswan, Lissen, Pertrix, G.E.C.).

as small as possible. Certain small capacity leakages are bound to occur in the wiring of a short-wave receiver,

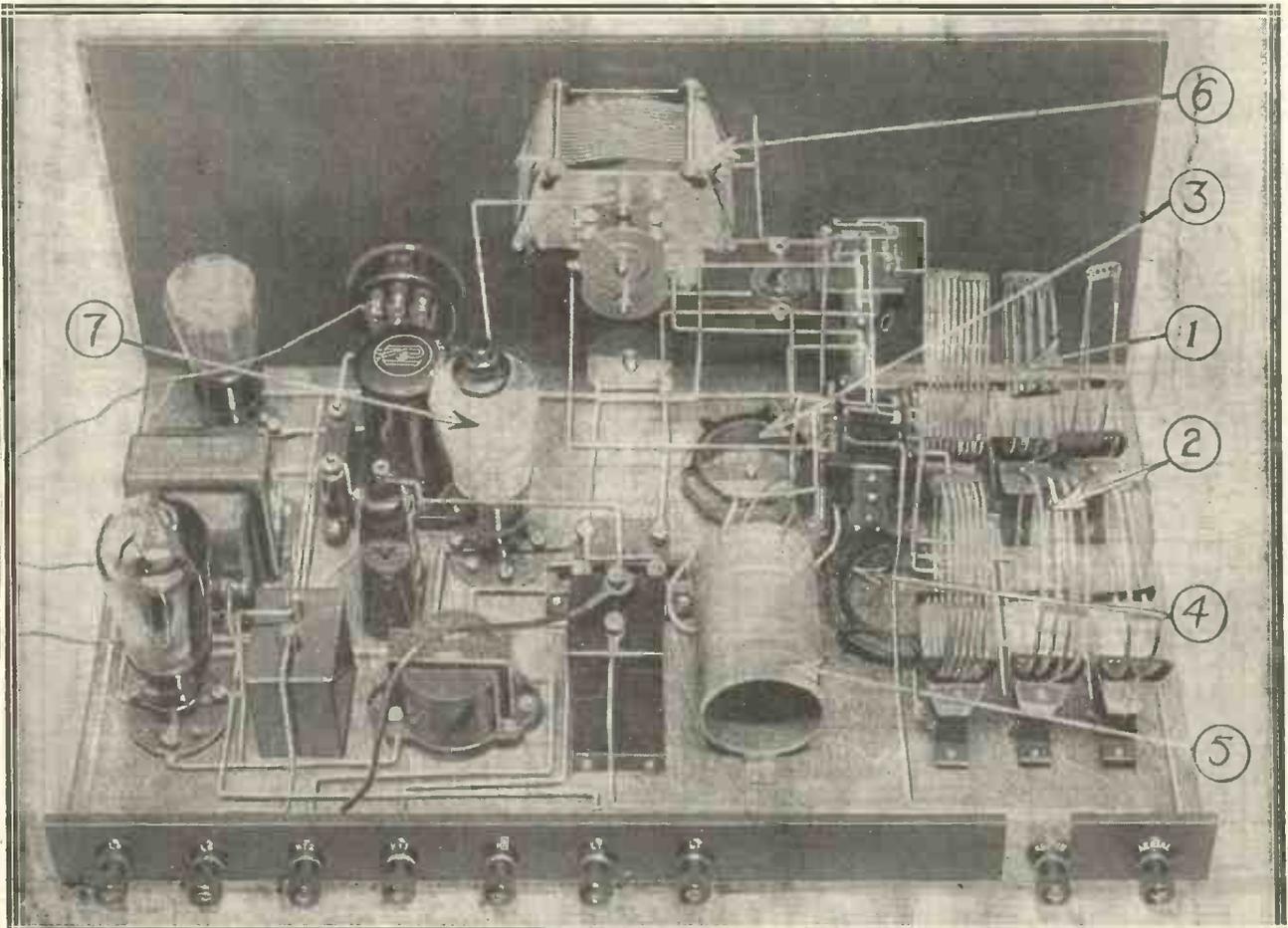
as in any other type of set, but with short waves any capacity existing between circuits is bound to have more effect than on the medium waves, and consequently the unwanted capacity must be kept to a minimum. This is why it is so essential that the wiring on the short-wave side should be done slowly and with the greatest of care.

It is impossible to over-emphasise the importance of wiring the switch contacts to the coils or the points with the greatest of thought, making sure that no two wires run parallel at all closely, otherwise serious losses are bound to occur.

An Important Point

It should also be noted how the sockets and plugs of the coil holders are positioned, for if these are put the wrong way round and the wiring

Seven Centres of Concentrated Sensitiveness



Some of the items which account for the set's remarkable effectiveness. (1) and (2) are the two short-wave grid coils, of which (1) acts as loading coil; (3) is the long-wave coil; (4) the Contradyne coil, and (5) the medium-wave coil; (6) is the Extenser which does the tuning for all bands; while (7) is the S.G. detector valve.

It Uses a Screen-Grid Valve as a Detector

is not changed to counteract the effect of the alteration it is likely to upset reaction on the short waves.

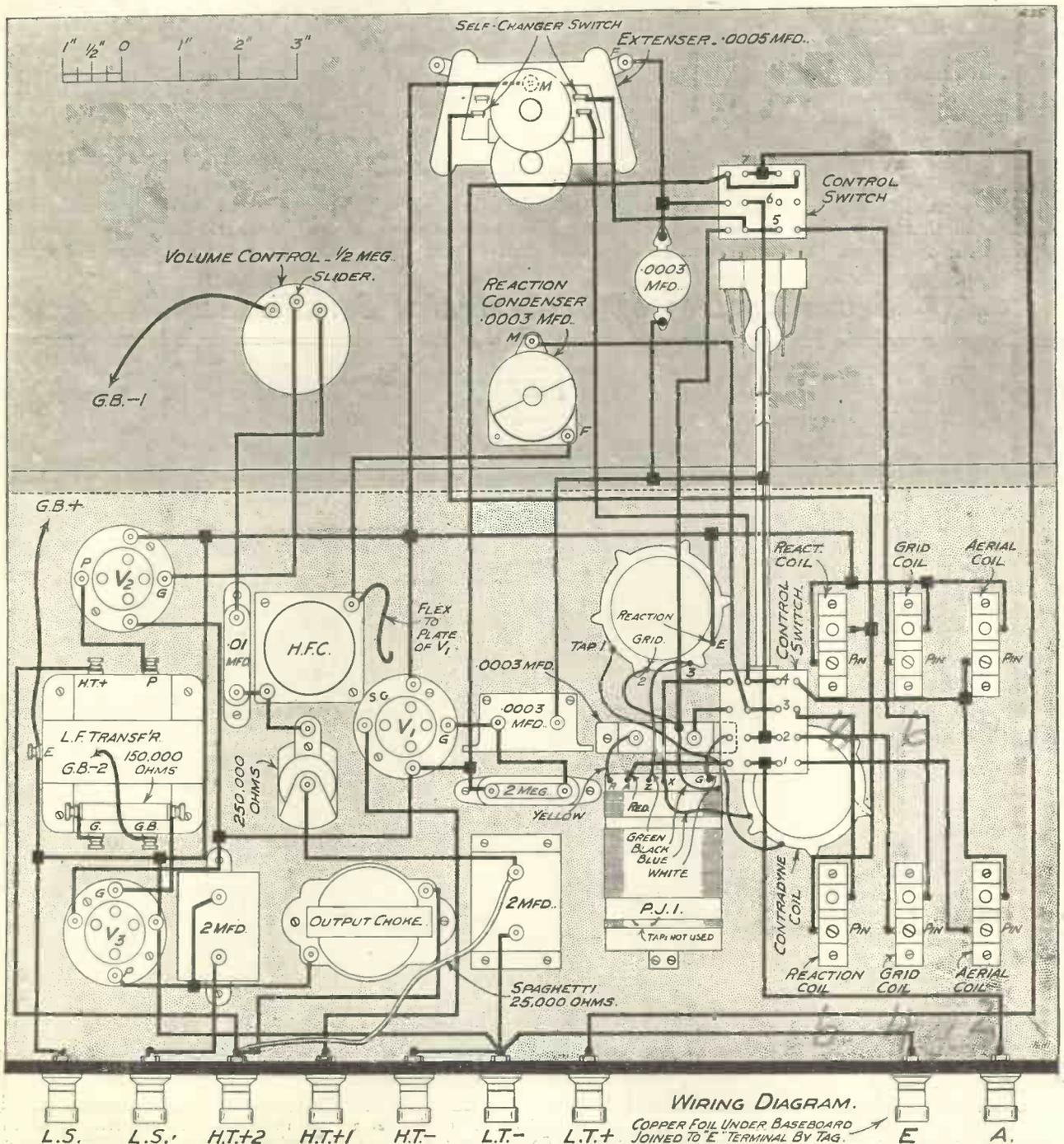
In the case of the reaction and grid coils the high-potential ends should be diametrically opposite, so that the earthed ends of the

reaction and grid coils should be respectively plug and socket on the coil holder. You should also notice that the two reaction coils, the two grid coils and the two aerial coils are in series when the higher bands of the short waves are being used, and are shorted out when the lower

bands on the short waves are being employed. This is important because it modifies very greatly not only the wiring, but also has an effect on the choice of coils used for the short waves.

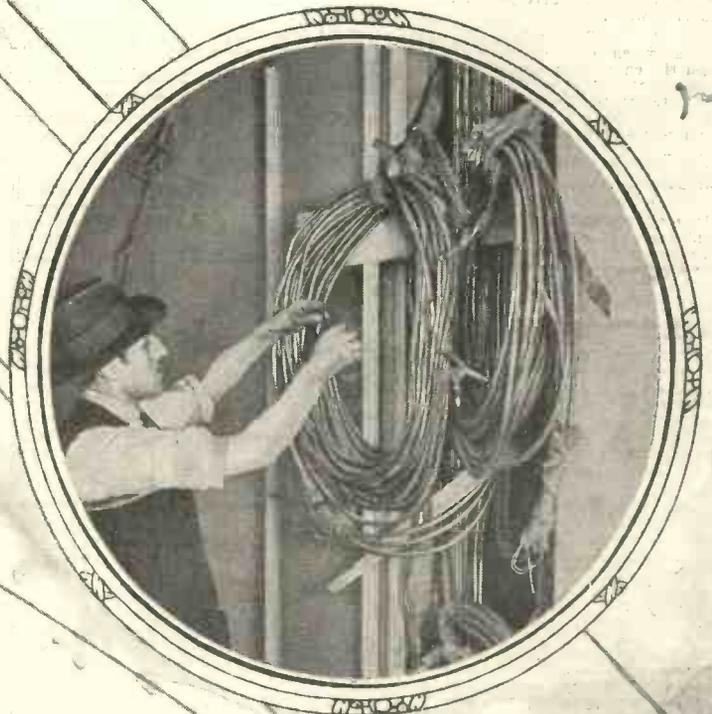
(Continued on page 406.)

Just as Easy to Wire as a Normal Three-Valver



You will not meet with any difficulties in the wiring if you follow this diagram carefully give the connections a check over when the set is completed and before putting it on test.

THE WORLD'S PROGRAMMES HOW, WHEN AND WHERE TO HEAR THOSE FOREIGNERS



The picture in the circle above shows an electrician at Broadcasting House, Portland Place, London, W, wiring up the new control room.

CONTENTS OF THIS SPECIAL SUPPLEMENT

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GETTING BETTER RESULTS

Some practical hints for improving long-distance reception on your set.

unnecessarily at the switch, but arrange so that it "calls" at the switch contact, and continues on its way without being broken.

Do not forget that the earth plate itself (or the water-tap connection, if this is used instead) plays a most important part in the strength of reception. You probably know the principle—that a large, damp metal surface should be in good contact with damp soil.

This means that if you are using a water-pipe as an earth you must have a good connection between your earth wire and the water pipe, using one of the clips sold for this purpose in preference to a twisted joint. The ideal way is

possible, and pay the same regard to absence of joints as in the aerial circuit.

And watch the lead-in closely. Don't let it wander all round the house before it gets to the set—along the picture rail, down the door post, or across the ceiling. But keep it short, direct, and clear of all obstacles.

Unless you do this you are losing programme strength all the time. And it is because of these losses that you are always recommended to keep the set as near the lead-in as possible—it shortens the lead-in that way, and improves reception.

Perhaps you are either satisfied



If you discover they are low you have found the trouble.

With a milliammeter you can tell what anode current each valve is taking, and if a valve "goes off" you can trace it immediately. Incidentally, too many people expect valves to last for ever. They don't!

An old valve "loses its emission," and although it still works in this condition it is really useless. It is unable to give enough anode current even when H.T. and L.T. are O.K., and that is where a milliammeter (which measures plate current) is more helpful than a voltmeter in tracing trouble.

And apart from batteries and valves there are many things which affect strength of reception. Particularly contacts.

Dirty, rusty-looking wires screwed under equally dirty terminals will discourage the weak programmes. Clean contacts and terminals, screwed down tightly, especially earth and aerial terminals, will often make an immediate difference to reception and strength.

Reaction, too, must work well for good long-distance results. Don't forget to try the detector's H.T. in different tappings, as often there is all the difference in the world to smoothness of reaction when H.T. is moved from, say, 60 to 45 volts.

And if your reaction is critical to handle, why not try using a larger dial for it? You probably have a spare one somewhere, from an old tuning condenser, and once you have tried this type you will wonder why ever you used a little dial which could not be adjusted easily and accurately.

DO YOU HOLD YOUR DIAL CORRECTLY?

When searching with a receiver which has one of those 4-in. plain dials, you should hold the outer bevel, as this will make fine adjustments more easily accomplished.

Every listener must have noticed that sometimes his set seems to be working much better than at other times. The stations are heard more easily, they are clearer, and stronger, and easier to find. Have you ever wondered why?

Often when this question is raised the enquirer is put off with vague talk about "local conditions." It is quite true that conditions vary a lot, and that day-and-night and summer-and-winter differences are very marked indeed. But generally speaking it is not "conditions" that matter so much as "condition."

Is your set in condition? If results are not absolutely tip-top at the moment look over the following remedies and see if you can cure its sluggishness by a timely tonic.

First of all, let us tackle the "externals." Aerial and earth, for instance. They are very important, especially with the smaller and simpler sets, including the crystal types.

Of particular importance is the height of the aerial. If this can be improved it certainly should be done, as ultimately the strength of the set will depend on how much it is able to pick up from a broadcasting station, and this depends on the efficiency of the aerial and earth system.

One of the very best aerial arrangements is to use No. 7/22 copper wire, running it straight from the aerial itself to the aerial terminal on the set, without a break at lead-in tube or switches. That is to say, do not stop the wire at one end of the lead-in tube, and then fasten it at the other end of this, but open the tube and push the wire through in one piece.

Similarly, with an earthing switch, do not break the wire

FAVOURITES OF THE MONTH

Some of the Foreign stations which are now coming over well.

Wave-length in metres	Name.	Wave-length in metres	Name.	Wave-length in metres	Name.
239	Nurnberg (Germany)	298.8	Hilversum (Holland)	331	Lwow (Poland)
257	Horby (Sweden)	304	Bordeaux-Lafayette (France)	385	Toulouse (France)
263	Moravska (Czechoslovakia)	322	Goteborg (Sweden)	403	Sottens (Switzerland)
270	Bremen (Germany)	325	Breslau (Germany)	441	Rome (Italy)
276.5	Heilsberg (Germany)	332	Naples (Italy)	459	Beromunster (Switzerland)
279	Bratislava (Czechoslovakia)	339.2	Brussels No. 2 (Belgium)	466	Lyons La Doua (France)
296.3	Turin (Italy)	345	Strasbourg-Brunaath (France)	509	Brussels No. 1 (Belgium)
		360	Muhlacker (Germany)	517	Vienna (Austria)
				550	Budapest (Hungary)

to get a plumber to "sweat" a joint on, but this is not always possible, of course.

If the earth is an external one, make sure that it is not buried right under the wall of the house where the soil is continuously dry. Try to keep the wire to it as short as

possible, and pay the same regard to absence of joints as in the aerial circuit. And watch the lead-in closely. Don't let it wander all round the house before it gets to the set—along the picture rail, down the door post, or across the ceiling. But keep it short, direct, and clear of all obstacles.

Batteries are all-important. If they get in a low and run-down condition your foreign programmes will get weaker and weaker.

To keep a check on things you really need some sort of measuring instrument, like a voltmeter, or milliammeter. The former is the easier to use, but the latter affords probably the more valuable check though it needs a little care and knowledge in use.

With a two-range voltmeter you can check your L.T. and your H.T. voltages whilst the set is running.





HERE AND THERE

BARI, the new Italian station which is to be opened in April, will join the Rome-Naples-Palermo chain.

* * *

BARCELONA has been sending out special short-wave programmes addressed to America on about 31 metres.

* * *

LOS ANGELES has a station (K G F J) which claims to have broadcast for 24 hours a day for the past three years!

* * *

NOGINSK, the new 200-kw. Soviet station near Moscow, is to broadcast sometimes in English, as well as in other Continental languages.

* * *

HELSINGFORS has decided not to increase its power, but to establish twelve low-powered relays instead.

* * *

RIO DE JANEIRO is to have its huge statue of Christ unveiled by radio on October 12th. The statue, 150 ft. high, is on a mountain overlooking the city, and the

News Items for the Long-Distance Man.

unveiling will be done by Marconi, from his yacht the "Elettra."

* * *

GOLDACHOF is the actual site of the new Munich station, which should soon be on the air with a power of 75-150 kw.

* * *

CHEKIANG, the Chinese province, has organised a Five-Year Radio Plan for establishing a broadcasting service of its own.

* * *

BUDAPEST. The University short-wave transmitter which operates on Tuesdays, Wednesdays and Saturdays, between 6.30 and 7.10 a.m. B.S.T., was recently temporarily installed on a boat to "report" a Budapest regatta.

* * *

COPENHAGEN uses the phrase "Glem ikke at soette antennen" when closing down. It means "Remember to earth your aerial."

CESKY BROD, the new Czechoslovakian station at Prague, which has been working on 487 metres, has a rated power of up to 120 kw.

* * *

LEIPZIG will be working on increased power in less than six months' time.

* * *

BUCHAREST, at present the only Roumanian station, is to be supplemented by provincial stations as soon as possible.

* * *

WELLINGTON, N.Z., which previously had one "silent night," now radiates a recorded programme from overseas instead.

* * *

AUSTRIA. At a recent workers' congress in Vienna it was proposed to erect a central short-wave station for spreading labour propaganda throughout the world.

* * *

LANGENBERG listeners had a shock some time ago when a

Communist lecture was partly broadcast by unauthorised persons who tampered with the land-line. It was soon discovered and interrupted.

* * *

VIENNA. Although the contract for the new 100-kw. station has been given to a German firm, it is to be built with Austrian labour. The opening date will probably be about May, 1932.

* * *

RADIO PARIS Sunday programmes will not include the regular broadcasts by the clown Bilboquet after September 20th.

* * *

ESSARTS LE ROI. The new Radio Paris station at Essarts le Roi has a power of 85 kw., and will be brought into full operation during October.

* * *

DAKAR. Tests have recently been carried out on Wednesdays, Fridays and Sundays, at 7 p.m. B.S.T., from the Dakar, French West Africa, station. Wave-length, 35 metres.

SYDNEY, N.S.W. The VK 2 ME station, Sydney, has inaugurated Sunday broadcasts on 31.28 metres (same wave-length as Eindhoven) for long-distance reception. Times: 6-8 a.m., 10.30-4.30 p.m., 8-10 p.m.

* * *

V K 2 M E. This call-sign is used for any one of eleven transmitters at Pennant Hills, Sydney.

* * *

THE ALPS. Portable short-wave sets are to be installed in every refuge-hut in the Austrian Alps, for SOS purposes in mountaineering emergencies.

* * *

CAPE TOWN. It is expected that Cape Town and other South African listeners will be able to hear the new Soviet station now being erected at Noginsk.

* * *

G 5 B Y. In the Fourth International Relay Competition for Amateurs this famous British station beat the whole world, with a score of 11,872, against the highest



feast days at 11 a.m. liturgical and spiritual letters are read for the sick."

* * *

PONTOISE. This new French Colonial station is already finding it difficult to meet the programme demands of its overseas listeners. It was only put into service a few months ago.

* * *

LISBON. In conformity with the latest fashion, Portugal now has a short-wave station to link the Mother Country with her overseas possessions. Every Friday, from 10 p.m. to midnight, G M.T., C T I A A, Lisbon, broadcasts a Colonial programme on 42.9 metres.

Announcements are in French, Spanish and English, as well as in Portuguese. The power employed is 2 kilowatts.

SHORT-WAVE SHORTS

American score of 4,374 points.

* * *

INTERNATIONAL RELAY. To gain the above points, Mr. H. L. O'Heffernan, of Croydon, owner of G 5 B Y, exchanged messages with all Canadian and American districts.

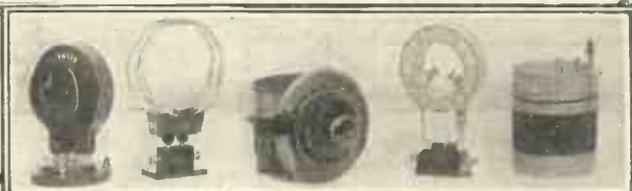
* * *

VATICAN. The following announcement was recently made:

"We do not and will not have regular broadcast programmes. Hours have been

fixed for transmissions at 11 a.m. (British summer time) on a wave-length of 19.84 metres, and at 8 p.m. on a wave-length of 50.26 metres. At these times the station will send out news, notices, and letters addressed to the missions.

"On Sundays and other



Quite apart from the actual strength of reception which has marked the past few weeks, there have been numbers of interesting programmes to reward the searcher on the medium waves. Trieste, for instance, the Italian station situated on the Adriatic, has been testing out on 247.7 metres. There is every indication that this will be a well-received programme when it settles down to regular transmissions.

Near the other end of the medium-wave dial, on 487 metres, the new Prague station has been taking the air, and this also looks as though it will be a well-received and popular Continental programme in future.

Algiers Reception

Numbers of readers who have been trying out the selectivity of their sets by attempts to receive Mühlacker, the German on 360 metres, have instead landed surprisingly loud signals above him, from Algiers, North Africa. This station works on 363.4 metres, announces in French, and frequently puts out good programmes.

At times reception of Algiers has been marred by a whistle, apparently caused by the Bergen station, which should be working up on 493.4 metres, but has left these pastures for the 360's.

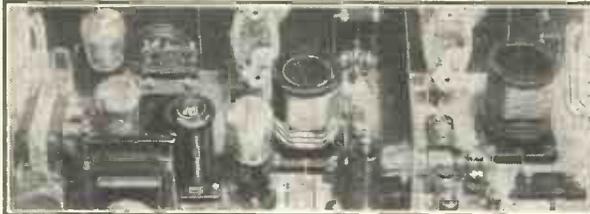
All things considered, there appears to be every promise of a remarkably good long-distance season this winter. Already numbers of foreigners simply shout to be tuned in, the insistency and consistency of Rome, Langenberg, Stockholm, Beromunster, Brussels No. 1, Brussels No. 2, and Prague, being particularly noticeable.

Strong Programmes

Besides Stockholm, another Scandinavian programme which is generally well worth listening for is Goteborg, on 322 metres, whilst way down south we have Turin and Toulouse developing very powerful punches.

Both of these stations unfortunately have been heterodyned a good deal of late. Although there are a few too many wave-length wobbles in the European ether, it is not now such a serious matter as is inferred

**ON THE MEDIUM WAVES
OPERATING NOTES AND NEWS**



in some quarters, because so many really good foreign programmes come over at good strength and quality.

Those Germans are really wonderful, and Hamburg, Heilsberg, Breslau, and Frankfurt all call for special mention. So also does Mühlacker, although in another direction, for he is still making a thorough nuisance of himself to London listeners by the persistence with which he infringes on the Regional programme if one is slightly mistuned. And sometimes when one is not!

As a matter of interest it may be worth noting here that the idea that foreign stations cannot be heard until darkness has really set in, which is popularly held in some quarters, is quite erroneous. You will probably find that any time after sunset or thereabouts is quite sufficiently good to attempt long-distance reception on some of the more powerful foreigners, and, as a matter of fact, owing to the tricks of the Heaviseid layer, it is often possible to tune in quite small and

unimportant long-distance stations long before darkness has really set in.

As this is the season of the year when a good many new readers will be making acquaintance with modern reception conditions, we should like to say a word about fading. Some people imagine it is a fault in their set, and others simply do not know what fading means.

Better than all the explanation in the world is a simple test. Turn your set to some hitherto unfamiliar setting until you pick up a foreign station. Preferably a really long-distance one, and not Hilversum, Brussels, or Paris, and preferably not on the long waves. And then settle down to study that programme for a little while. The probability is that it will not let you do so!

That Fading

All very long-distance reception is liable to fluctuate in strength. You may, for instance, tune in a station like Prague with some difficulty and hear the announcement: "Hallo, Radio Praha" by

keeping your ear fairly close to the loud speaker. If you do not touch the set at all, but simply listen carefully to what Prague is doing, you may find that he will get stronger and stronger until within five minutes of the time you tuned him in he is quite at enormous strength, leaving you wondering however you experienced any difficulty in not hearing before.

Exercising still a little more patience and still not touching the controls of the set, you will shortly find that Prague is not all you thought him to be! For presently he will decide to fade out. And nothing that you can do will stop him.

Reflected Rays

Your splendid loud-speaker programme, so good only a minute or two ago, may fade right away and vanish altogether, if fading happens to be bad at the time. What is the cause of this queer effect?

It is something quite out of our control. Somewhere between here and heaven there is a reflecting layer which, on receiving upcoming waves from a wireless station on the earth, bends them down to earth again.

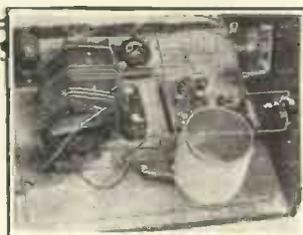
The surface of this layer is not perfectly smooth and its position is not permanent relative to the earth, so that the reflective effects are erratic. Consequently reception, which depends upon them, is erratic also.

No Real Drawback

Although all long-distance listening is affected more or less in this way, many stations prove steady enough for really enjoyable listening for hours together, especially on the long waves, where fading does not seem so prevalent. It might be thought that such a vanishing trick would destroy half the pleasure of long-distance reception, but as a matter of fact it is quite the reverse! There is an unexpected charm about it, a touch of temperament, and a foreign waywardness which is an exhilarating change from the almost irritating efficiency of the local programme.

HOW MANY MILES?

SOME DISTANCES				—FROM LONDON			
Algiers	1040			900	Budapest		
Barcelona	720			306	Cologne		
Belgrade	1055			594	Copenhagen		
Berlin	580			358	Cork		
Beromunster	480			288	Dublin		
Bordeaux	487			396	Frankfurt		
Bratislava	800			813	Gleiwitz		
Breslau	743			675	Goteborg		
Brno	752	Brussels	200	Bucharest	1300	764	Graz



BELOW 50 METRES

Some really practical notes on short-wave reception to-day.

WHAT a different atmosphere seems to pervade the American broadcast programmes nowadays! One hears no blatant advertising, the quality of the programmes as a whole is distinctly good, and *variety* is the keynote of their whole get-up.

One can be assured of at least five different programmes from the States if one waits till midnight nowadays, unless a very bad night is struck.

At 10 p.m., W 2 X A D, on 19.56, is the only strong signal, but by 11 p.m., W 8 X K, on 25.25 metres, begins to rival him. By midnight the latter is very strong and "X A D" has probably faded right out or settled down to one of his bursts of very quick fading. The latter is rather embarrassing, and provides singers, instrumentalists, and announcers alike with a tremendous vibrato.

W 3 X A L, on 49.18 metres, has a convenient harmonic on 24.59 which enables him to be tuned in a few degrees below W 8 X K. The harmonic is astonishingly strong and sometimes outstrips the main carrier-wave on 49.18 for strength and clarity.

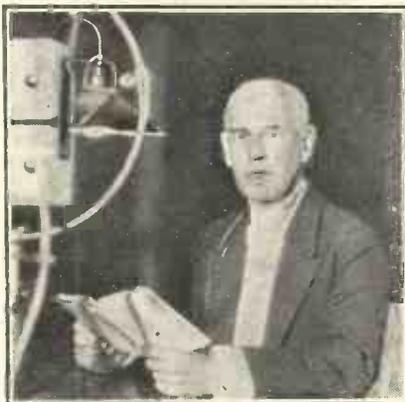
The famous W 2 X A F station, on 31.48 metres, is not really strong until midnight, or after, nowadays, but through the small hours he makes up for it. For reliability from day to day he probably has all the others beaten.

I was amused and rather surprised to notice one night recently that

when W 3 X A L went over to an outside transmission by a dance band the band struck up "Say It With Music" in the familiar style that we all associate with Jack Payne. The question of the moment is: "Who had the idea first?"

W 2 X A D's "Musical Ad. Men" are to be heard immediately after the news bulletin at 10 o'clock every

DID YOU HEAR HIM?



This is Mr. John Galsworthy, whose works are greatly admired in Germany, and who recently broadcast a talk from the Munich microphone.

night. They are a very popular feature of his programmes, and are well worth hearing.

The News Bulletin itself I find far more interesting than our own broadcasts. It takes the form of very short, concise items prefaced by the words: "From London, England," "From Cape Town," "From Spitzbergen," etc. Incidentally, the announcer made a bad

slip one night when he alluded to the latter place as "Spitzenberg."

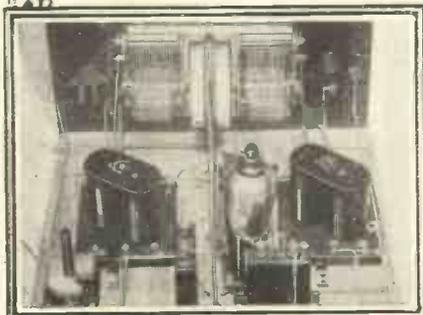
One gets the idea of a real live personality behind even the News Bulletins. This is heightened by the occasional remark: "Your announcer to-night is Corbett Ford," or whoever happens to be at the "mike."

The musical items, too, are introduced with *short* but interesting comments, and, more desirable still, we are told at the end of an item what it is that we have just heard. The B.B.C. used to do that in 1923, but they don't deign to do so now. I distinctly remember the well-known phrase: "That was

What an enormous number of running commentaries they seem to provide, too, on the other side. The most interesting of late was the launching of the "Akron," the world's largest airship, at Akron, Ohio. Here again the announcements and comments are just informal enough to give that little friendly touch that means so much.

F Y A, the Pontoise station that is intended by France to be used for broadcasts to the Colonies, seems to have two working waves. One of these is just below W 8 X K, on 25.25 metres, and the other just above G 5 S W. He switches from one to the other in a rather disconcerting manner.

The French-speaking station a little lower than F Y A is F Z R (Saigon, French Indo-China).

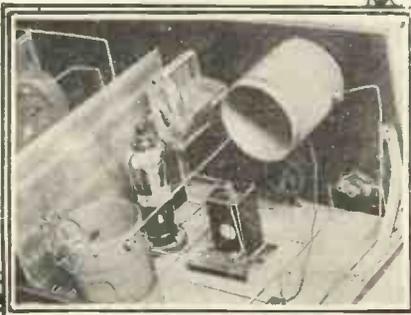


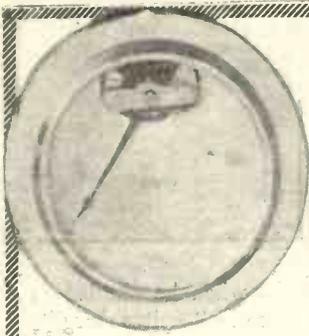
NEXT MONTH

The November "M.W." will be on Sale October 31st.

ORDER NOW

and make sure of it!





RADIO'S REAL SURPRISES

Some striking notes from an amateur's log-book.

By G6QB.

Anyone who has been working on the short waves for seven years, as I have, knows just what peculiar things can turn up on occasions, and how well the words "Romance of Radio" may sometimes apply.

Calling to mind some of my earlier experiences, the first that comes into my head is the way in which a humble domestic cat was of service to an expedition thousands of miles away!

Cat-Calls!

The said animal, accustomed to sleeping snugly in a felt-lined box indoors, decided to have a night out, with the result that the family refused to play about in the garden after midnight, and left him out! His piteous wails at 3 a.m. roused me, and, after opening doors on a cold morning, I felt wakeful enough to listen round on the receiver before turning in again, and heard some ultra-weak signals emanating from the party in question.

Contact was made with very little trouble, and the operator at the other end said: "What's brought you up, old man? Have been trying to raise England for hours, and they're all in bed. Here is message No. —." Thus a gratifying long-distance contact and the handling of an urgent message were brought about.

Was He Listening?

On another occasion I was talking to a friend about a certain voice, formerly to be heard every night, but recently silent. It belonged, in fact, to one of the earlier amateur transmitters whose name was, and still is, a household word.

During the reminiscences and the discussion the receiver was switched on, and the first thing heard was—no, not the

gentleman in question, but two others, over the air, using almost the same words we ourselves had been using, finally "capped" by the arrival on the scene of the subject of the discussion!

And so one might go on, enumerating *ad lib*, and almost *ad nauseum*, the strangest of coincidences that have befallen one. Doubtless, too, most of the real old-stagers have had similar experiences.

"Yank." This only occurs when an interested relative is present at the demonstration.

Radio Accents

Then there is the French amateur transmitter with a telephony transmission like a pencil-sharpener in action; the "hullew, hullew, hüllew!" from an Englishman with the true "monocle and spats" voice; in contrast the "ullo, Bill, wotcher doing of to-

might mention Uncle Charles' face on being informed that the American broadcast he is listening to is being received on two valves. "What, and I don't get London any louder than that on three!"

Q.S.L. Wall-paper

Likewise worthy of mention is the amazed, and slightly pitying, expression on the faces of visitors to the den to see for the first time the array of Q.S.L. cards all over the walls. Strangest of all, perhaps, is the cordiality of greetings from total strangers from Japan, China, Hawaii, Libia, Morocco, Sumatra, and wherever you like to mention. The amateur is "o.m." (old man) to all of them.

Coming down to some individual cases of peculiar happenings, I might mention some of the first work done on the wave-length of 10 metres. Thrilling was a mild word to use in connection with the reception of the first transatlantic signals on this "useless" wave-length.

An Exchange

But stranger still was the afternoon when a near neighbour was receiving South Africa while I was receiving shoals of Americans. Then, as my Americans commenced to fade out, I logged the South African myself. Running round to tell my neighbour so in person, I learned that the South African had just disappeared from his ken, but that a whole crowd of Americans were beginning to come in!

Wide variation in conditions, one would think, for a distance of under a mile, but only too well known to the short-wave man.

YOUR OVERSEAS FRIEND

Why not send him "Modern Wireless" every month, to keep him in constant touch with all the latest radio news and developments?

Post his name and address with 17s. to the Subscription Dept., Amalgamated Press, Ltd., Fleetway House, Farringdon Street, E.C.4, and "M.W." will be sent every month for a year.

We must, however, come more up to date. In the style of a famous American critic, perhaps one may be allowed to give a disjointed series of ideas that arrive when one thinks of strange experiences.

Taken-in

There are for instance, the thrill of listening to "an American," and finding he is a German strayed off his proper wave, giving a musical programme that is drowning the

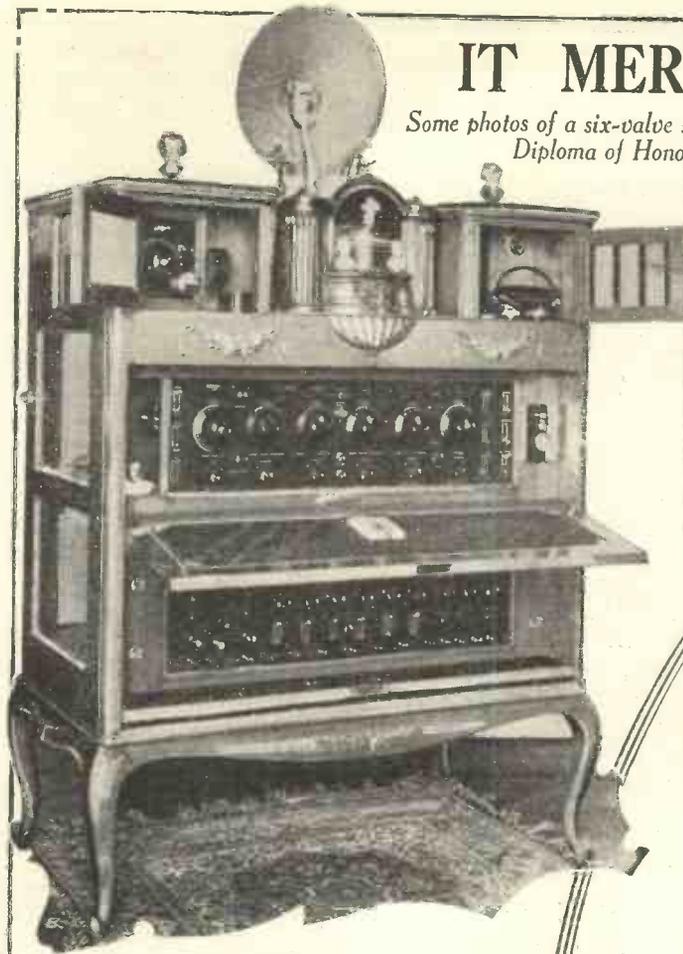
night?" from one of the old boys on the lightship transmitters; the station speaking perfect English that turns out to be a Dane or a Finn; the startling outburst of three cuckoos from the station in Honduras at 49 metres; violent "red" propaganda just above, from Moscow, on 50; and the ludicrous effect produced on W2XAD's performers by the quick fading that he sometimes suffers from.

In this latter connection we

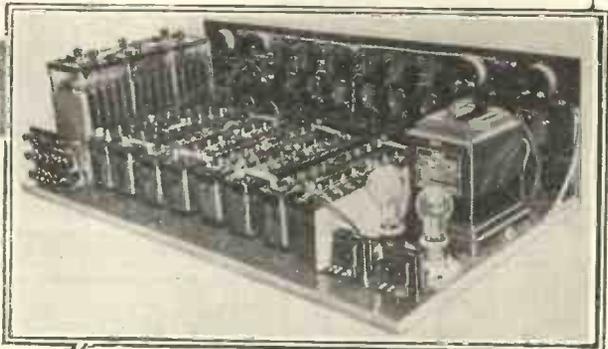


IT MERITED A MEDAL!

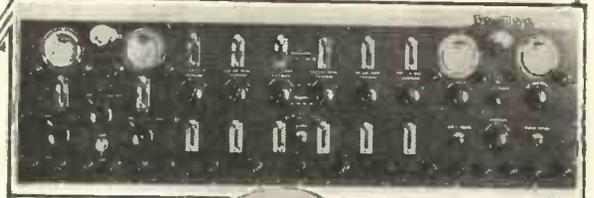
Some photos of a six-valve set, built around one of our circuits, which was awarded a Diploma of Honour and a Gold Medal at the Cairo Industrial Exhibition.



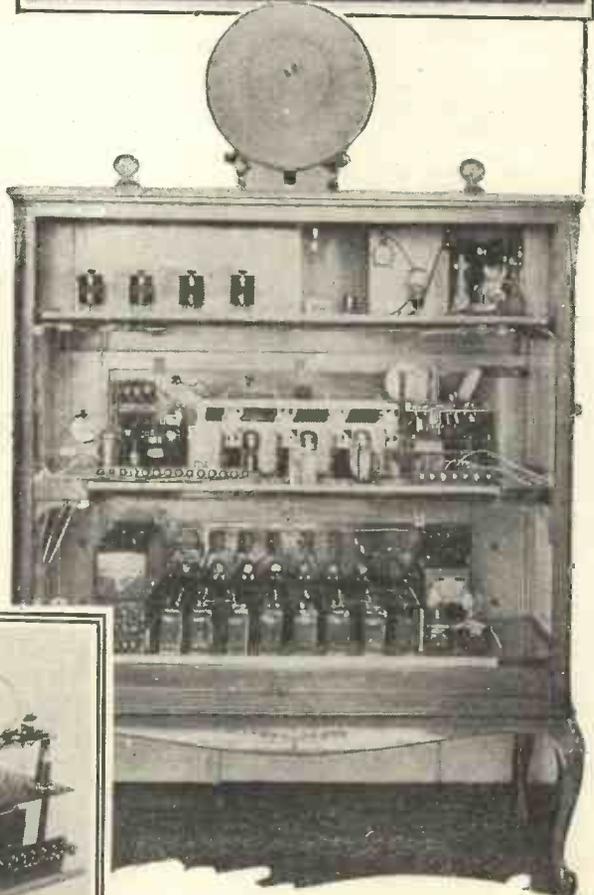
The complete receiver presents a very striking appearance, as can be seen from this photograph. In the top left-hand corner there is an accurate wave-meter.



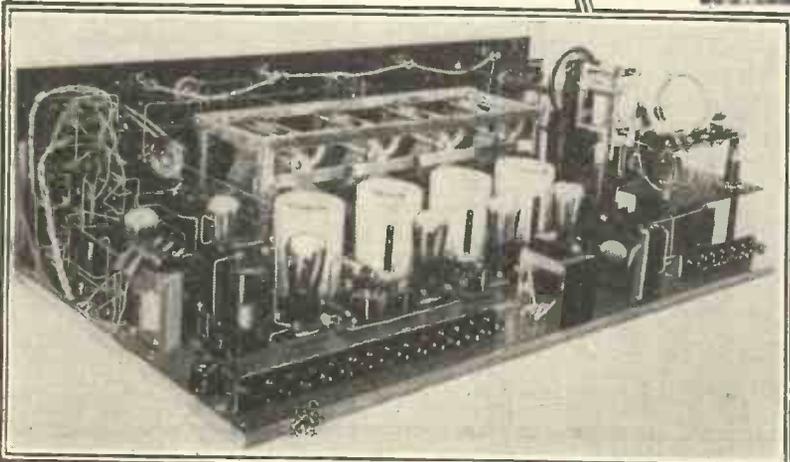
Two views of the power panel. An H.T. voltmeter and milli-ammeter, switches for connecting them in the various circuits, and an L.T. voltmeter and ammeter are included.



These two photographs show the control panel and the back of the receiver. The first dial from the left is the short-wave tuner, the next four belong to the medium and long wave-lengths, and the one on the extreme right is the reaction control. The short-wave coils can be seen at the far end of the bottom photo.



From this back view you should be able to recognise most of the items referred to above. All the components are British made, including the loud speaker on the top. Note the big H.T. accumulator battery.





**ABOVE
1,000 METRES**

With the exception of the tests from the new transmitter of Radio Paris there have been no outstanding or exciting events on the long waves during the last few weeks; and yet that wave-band has been full of interest.

Perhaps, on second thoughts, Radio Paris has not provided the only excitement, for there have been several mysterious programmes reported—some at good strength. One of these, on about 1,070 metres, seems to have been one of the new Soviet stations.

We shall hear them very plainly when the dark days really close in on us. In the meantime there is another rather mysterious pair of programmes in the neighbourhood of 1,250 metres which will bear close investigation by listeners, and another queer one on about 1,800 metres.

It is too early to say much about the Radio Paris tests, but many readers of "M.W." report him as very loud indeed, and of good quality. We shall be able to judge more accurately when the tests are over and the station settles down to regular work.

If you have not listened lately on the lower part of the long-wave dial, try your luck there to-night. Oslo and Kalundborg have both come on so well that it is a shame to miss them, and Motala is no weak little whisper these days.

Warsaw and Königs Wusterhausen have both benefited by the autumnal nip in the air, and these two, and those named above, can often be found in daylight where a good H.F. stage is in use.

**NOTES ON
NEUTRALISING**

When an H.F. amplifying valve (not of the S.G. type) is not pro-

Set the reaction control and the neutralising condenser in their "minimum" positions. Adjust the tuning condensers to be exactly in tune at some point near the middle readings on the dials.

Now slightly increase the capacity of the neutralising condenser. (In the case of such condensers as the Gambrell "Neutrovernia," this means screwing downwards.)

Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate, and will not recommence even when the tuning dials are slightly readjusted. So far, so good.

Next, increase the reaction a little until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to

BETWEEN 600 AND 2,000 METRES

Wave-length.	Name of Station.	Power in Kilo-watts.	Wave-length.	Name of Station.	Power in Kilo-watts.
1935	Kaunas (Lithuania)	—	1200	Reykjavik (Iceland)	21
1875	Huizen (Holland)— (Hilversum programme and announcements)	8.5	1153	Kalundborg (Denmark) (relays Copenhagen)	7.5
1796	Lahti (Finland) (relays Helsinki)	54	1116	Novosibirsk (Russia)	—
1725	Radio Paris (CFR)	17	1103	Moscow, Popoff (Russia)	75
1635	Königs Wusterhausen (Zeesen) (Germany). Relays Berlin.	75	1083	Oslo (Norway)	75
1554.4	Daventry National Station (Great Britain)	35	1073	Rostov-Don (Russia)	—
1538	Ankara (Turkey)	—	1060	Tiflis (Russia)	—
1481	Moscow (Old Komintern) (R A 1) (Russia)	—	1000	Leningrad (Russia)	—
1445.7	Biffel Tower (FLE) Warsaw No. 1 (Poland)	15	937.5	Kharkov (Russia)	—
1411	Warsaw No. 1 (Poland)	158	840	Nijni Novgorod (Russia)	—
1350	Kasbah (Tunis)	—	800	Kiev (Russia)	—
1348	Motala (Sweden) (relays Stockholm)	40	778	Petrozavodsk (Russia)	—
1304	Moscow (Trades Union)	—	770	Ostersund (Sweden) (relays Sundsvall)	7.5
1229.5	Boden (Sweden)	75	760	Geneva (Switzerland)	1.5
1200	Istanbul (Turkey)	—	720	Moscow (Experimental)	—
			700	Minsk (Russia)	—
			680	Lausanne (Switzerland), H B 2	—

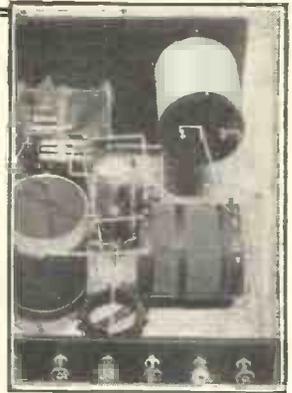
perly neutralised the set generally oscillates when both tuned circuits are exactly in tune. As this "in step" condition is essential for maximum sensitivity, the set should be neutralised as follows:

make sure that the set is completely stable once more.

Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been "over-shot." Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation, but cause it to become stronger.

The object is to find the adjustment of the neutralising condenser that permits the greatest setting of the reaction condenser to be used without producing oscillation. It will then be observed that when the two tuned circuits are in step and the set is brought to the verge of oscillation, a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

(Where a reaction condenser is spoken of, any form of reaction control may be understood in the preceding notes.)



**THE "R SCALE"
OF STRENGTH**

Reports of short-wave reception usually quote the strength on what is known as the "R Scale"—R1, R2, etc.

This scale probably gained its great popularity during the Great War, when it was used extensively to record signal strength in the various radio logbooks, both ashore and afloat.

There are several versions, the lower numbers always being for weak reception, and R9 for maximum strength. The following is usually accepted as a fair description of the various degrees of intensity.

- R1.—Just audible at times.
- R2.—Audible, but quite unreadable.
- R3.—Very difficult to read.
- R4.—Mostly readable, but uncertain.
- R5.—Readable.
- R6.—Fair strength.
- R7.—Clear and good.
- R8.—Very strong.
- R9.—Very strong indeed—wipe out.

**INSERTING AN
"ANTI-MOBO"**

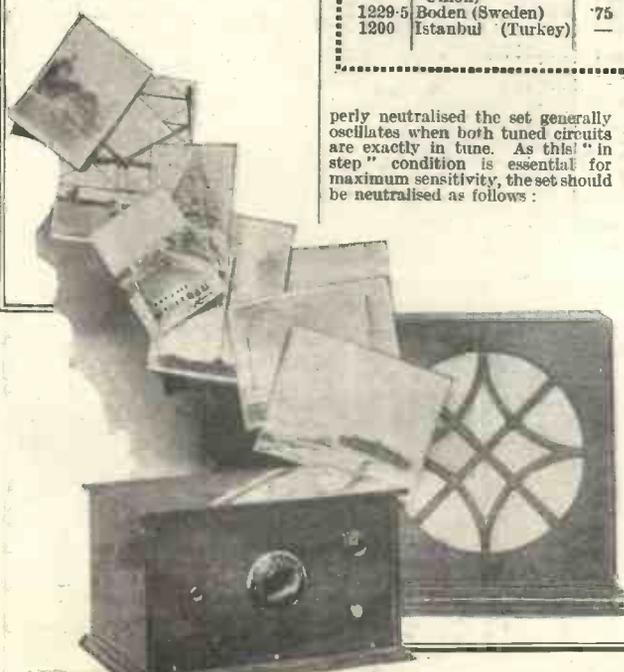
Old-fashioned sets which are liable to instability can very often be improved by inserting a decoupling or "anti-motor-boating" device. In virtually all cases the procedure is as follows:

The lead which goes from the detector valve H.T.+ terminal on the set to the primary of the L.F. transformer should be broken.

A resistance of 20,000 to 40,000 ohms is now inserted between this H.T.+ terminal and the L.F. transformer primary terminal.

A lead is then taken from the side of the resistance which is joined to the primary terminal to a 4-mfd. condenser. The other side of the condenser is connected to H.T. —

(This scheme can be employed externally to the set by those who do not wish to interfere with the wiring of the receiver.)





STATION INFORMATION

Interesting news items from all over the world.

PORI is the official name for Bjorneborg, the Finnish station who works on low power on 218 metres.

CAMPHIN is the site chosen for a new 60-kw. station to be erected in Northern France.

SCHWEIZERISCHER LANDESSENDER is the correct official designation of Beromunster, the Swiss Regional station that operates on 459 metres.

ITALY. The increases in power, etc., planned for the autumn are going through according to schedule. The anniversary of the Fascist revolution (October 28th) will probably be marked by radio improvements, including the raising of Bolzano's power (on 453 metres).

PRAGUE'S new station has been heard at great strength in this country.

LILLE has increased its power from one to two kilowatts. Wave-length, 265.4 metres.

BERNE claims to have the youngest broadcasting Director in Europe—M. Vitali, who is twenty-four years old.

MONTE CENERE, the Italian-speaking Swiss Regional station, is to be opened in about six months.

U.S.S.R. One of the new Russian stations has been testing on about 1,050 metres.

ROCKHAMPTON. Despite Australia's financial difficulties it is hoped to open the Rockhampton and Corowa relay stations before Christmas, 1931.

NEWCASTLE, AUSTRALIA, is the only station to

materialise up to the present of the twelve or sixteen relay stations which were planned to be in operation by the end of 1932.

RADIO PARIS marks with a special sign those pro-

gramme items suitable for adults only on the lists it sends to newspapers.

FLORENCE. The new Italian 20-kw. station at Florence is due on the air on October 20th, 1931.

LEIPZIG. The new Leipzig station is to be one of the most powerful in Europe, its rating being 150 kw.—more than double that of our present "Regionals."

TRIESTE, which has been trying out its new station on 247.7 metres, uses a bell (gramophone record) as an opening signal. Being linked with three other stations, the call is usually "Radio Milano — Turino — Genova — Trieste."

BOLZANO is to try out its new transmitter at the end of October.

GENOA will be using 10 kw. soon, instead of 1.5 kw. (probably from November 1st onwards).

BRESLAU is to have its power increased next February.

MONACO, Europe's smallest "country," aims to have a "powerful" broadcasting station of its own!

BRUSSELS recently dedicated its evening programme to the sun. But whether in hope, or in desperation, nobody knows!

BOSTON short-wave Broadcasting Corporation is proposing to build a 15-kw. short-wave station to rebroadcast American programmes to Europe.

DAVENTRY 5 X X is reported to be destined to have a 100-kw. transmitter, instead of its present meagre 35 kw.

FRANKFURT listeners are to have their local station's power increased early in 1932.

PACKED ON HIS BACK

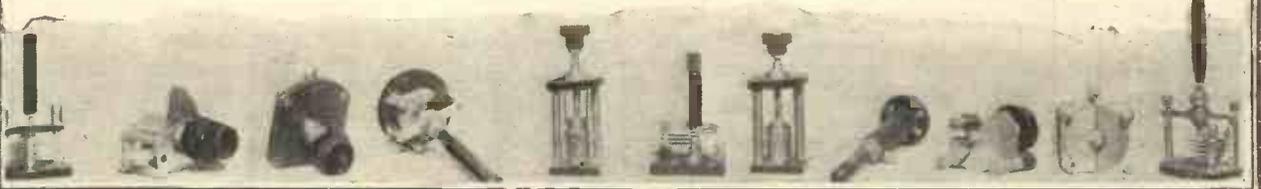


This is how the American Outside Broadcast authorities get over the difficulties of reporting sporting events. They are able to follow runners and even mix with the crowd while transmitting.

gramme items suitable for adults only on the lists it sends to newspapers.

BAVARIA. The new Bavarian regional high-power transmitter is now on order from a Berlin firm. It is to be crystal-controlled, with a power equal to Mühlacker's and Heilsberg's (75 kw.).

ROME. A special station for the telegraphic dispatch and reception of pictures has



IF your set has any pretence at all to long-distance reception it will have anything from two to twenty places on the dial where you can listen in to music from Germany. And between the items you hear the pleasingly characteristic, if somewhat guttural, call: "Achtung, Achtung"—which is German for "Attention."

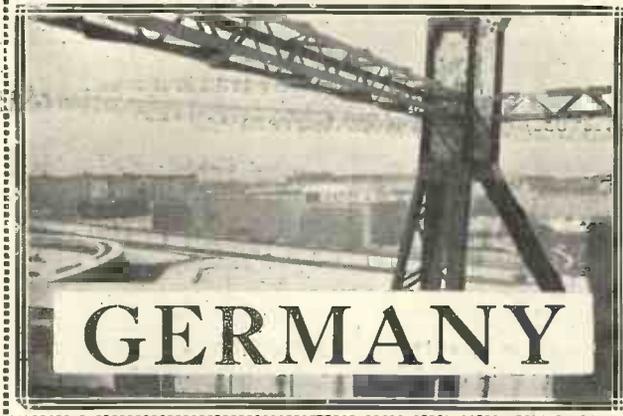
The German programmes, when you listen attentively to them, sound very much like our own. The main feature of the programme is music, and you hear all kinds, from ambitious symphony renderings to the lightest of light solos. And, of course, you hear the talks. Great talkers are these Germans. Great talkers and hard workers.

Before Breakfast Broadcasts

They begin the talks at break of day, usually with gymnastic and physical culture hints, and statements of the weather—as it is, and as it probably will be! And all day they are hard at it, with news bulletins, topical talks, light music, lunch music, serious music, concerts and community singing, backed up by a really strong stiffening of serious talks on economics, financial policy, philosophy, literature, religion, art, science.

Many German racial characteristics are clearly traceable from a study of their broadcasting as heard in this country. Wave-length wobbling, for instance, is almost unknown in Germany, because conscientious and painstaking frequency-fixation is carried out with characteristic technical ability and thoroughness.

COUNTRIES TO LISTEN FOR—



Berlin is a matter of 580 miles from London. Yet despite the wounds of war the German seems very much like ourselves. Have you ever wondered what sort of country it is where those German stations are situated?

Have you ever speculated about the vast track of territory which lies between Heilsberg in the East and Aachen in the West, between Hamburg in the North and Munich in the South?

Centred in the very heart of Europe, Germany holds much of the civilisation and culture rooted in that continent. Situated on the great European plain, it connects Russia with Southern Europe and Scandinavia with Switzerland.

The greater part of the country, and virtually all the north, is flat. But nearer Switzerland in the south there are regions of great beauty and high hills.

Much Larger Than England

The total area of Germany is 171,910 square miles. It has a comparatively short sea-coast frontier of 1,200 miles, of which the greater part faces the Baltic sea and about one-third the North Sea.

By land its immediate neighbours are Poland, Czecho-slovakia, Austria, Switzerland, France, Belgium, Holland, and Denmark.

Its climate is more extreme than our own, and the country is much more thickly forested; this being considered a very important branch of agriculture.

In the wilder districts pines and firs grow thickly.

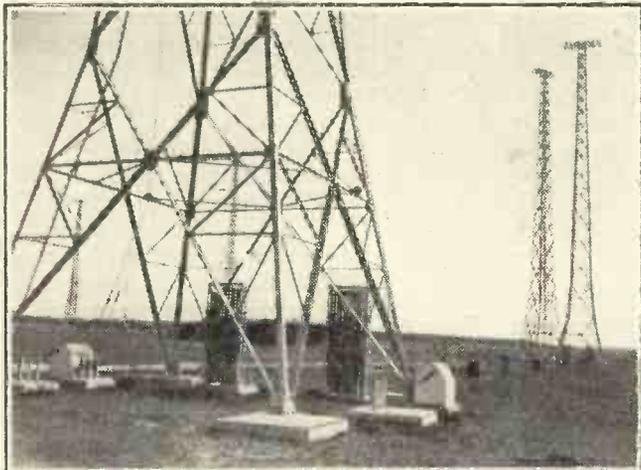




And wolves and wild boars, wild cats, badgers and martens are still to be found.

The broadcasting authority in Germany developed out of private enterprise, very much like our own B.B.C.; and the two systems still have much in common.

GERMANY'S GREATEST RECEIVING STATION



These are some of the newly erected masts at Berlitz, where the entire overseas reception of Germany is centred in what is claimed to be the world's greatest receiving station.

The German Regional scheme, for instance, followed ours quite closely, and it is an open secret that their technicians were loud in their praise of the British twin-wave stations at Brookmans Park and Moorside Edge, which were considered "one up" to Britain; no other country having been confident enough to follow the Eckersley ideal of twin high-power programmes!

So far as licence-numbers go, Germany is the only country in Europe that can compare with Great Britain; the present situation being that both countries have about three and a half million licensed listeners each. And while Germany has the greater population, the British licence is cheaper.

Which will win the race to the four million mark is an interesting speculation, but the latest official figures at the time of writing indicated that we were forging a little ahead of Germany. No other country in Europe gets near these figures.

At present Germany is still developing her Regional scheme, which began with Mühlacker and Heilsberg, and includes high power for Langenberg, Königswusterhausen, Munich, Frankfurt, Breslau, and Leipzig. It will not be completed before 1932.

CROWDING THE SHORT-WAVERS

By "Britisher Abroad."

It is evident that under the present distribution of short wave-lengths to broadcasting we are before long to experience a similar cramming of stations into narrow channels as that which to-day exists on the medium wave-lengths in Europe.

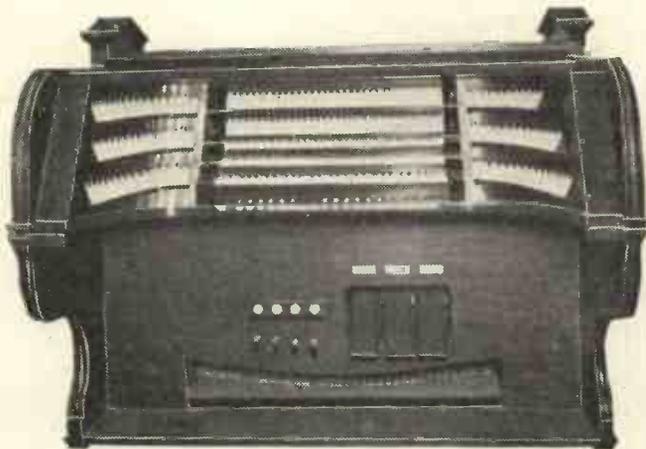
Theoretically, there should be room for a far greater number of stations in these channels than already exist, but this, unfortunately, is far from the case practically, as it has been found that the side-bands from some of the more powerful broadcasters, even on the most selective of sets, badly interfere with one another.

Taking, first, what is commonly known as the 25-metre band, we find the following stations in regular operation, and all of which, at one time and another, will be found to be working at the same times:

Pontoise (Paris)	25.20	(12 kw. aerial)
W 8 X K (Pittsburg)	25.25	(10 " ")
3 R O (Rome)	25.40	(9 " ")
5 S W (Chelmsford)	25.53	(16 " ")
Pontoise (Paris)	25.63	(12 " ")

From which can be readily seen that we have five powerful transmitters, all within the narrow margin of 0.43 metre, endeavouring to reach the distant listener. This in itself is bad enough, but when we have to add to

HEARD FROM HAMBURG

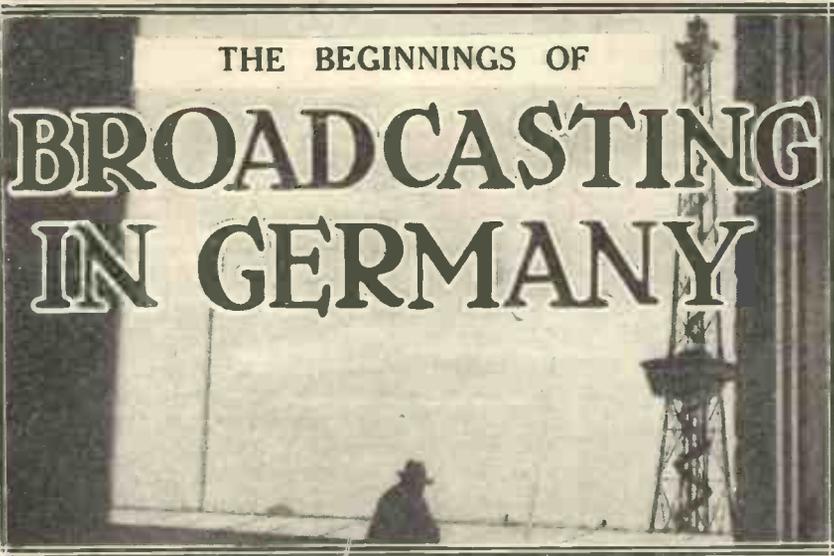


This is the manual of the large organ often heard from Hamburg on a wave-length of 372 metres.

these the commercial telegraph stations endeavouring to push themselves into this self-same wave-band, we have at times such a confusion of Morse and programmes that little pleasure can be derived from the *bona fide* listener's point of view.



THE BEGINNINGS OF BROADCASTING IN GERMANY



From a Special Correspondent.

A very interesting and illuminating account of the development of Radio in the Fatherland.

THE first German broadcasting service was started by the German postal department in 1919, some Press information being transmitted telegraphically every day from the Koenigswusterhausen radio telegraph station to about eighty post-offices in various parts of the country, in order thence to be passed on to subscribers either by telephone or special messengers.

Shortly afterwards systematic tests of wireless speech transmission were started from an impromptu transmitter installed at Koenigswusterhausen, instrumental music sent out therefrom being for the first time received all over Germany and in other countries, including England, on December 22nd, 1920. The opening of a public wireless broadcasting service in England early in November of the same year gave a powerful impulse to the development of German broadcasting.

Berlin's Baby!

A German general broadcasting service was started on October 29th of the same year, from a 0.25-kw. transmitter at the Voxhaus, Berlin. I shall never forget my first visit to the more than modest headquarters of German broadcasting at this initial stage, when a few small rooms on the third floor of the building were all that was available for the new service.

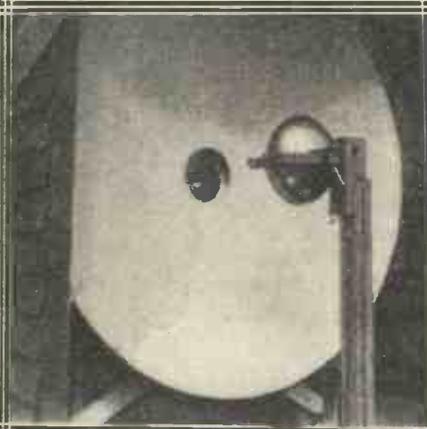
The first studio, about 11 ft. long and 12 ft. wide, was hung with silk paper and rags, so as to smother the sound as far as possible. While this station was growing and developing other transmitters were installed in Leipzig, Frankfurt-on-Main, Munich,

Hamburg, Stuttgart, Breslau, Koenigsberg, Muenster, to cover the various parts of the country, with relay stations in several other towns.

Making the Marks!

Stringent measures were soon taken against unlawful listeners, and the fee was reduced from 60 marks a year to 2 marks (about 2s.) a month, which has been kept unaltered ever

A "ONE-INCH" AERIAL!



Here you see the tiny aerial, together with the giant 10-ft. reflector, used by the International Telephone and Telegraph Laboratories in their recent cross-channel telephony experiments on extremely short wave-lengths.

Further additions to the network of German stations and relays were made in 1925.

In the same year the various local broadcasting companies were combined under the Reichs-Rundfunk, or German Broadcasting Corporation. The first international re-transmissions were made about the same time,

and the first million subscribers were recorded early in January, 1926. Two high-power transmitters (Langenberg and Koenigswusterhausen) were put into service in the following year, and a new relay transmitter was installed in Augsburg.

The two million mark had been exceeded by January, 1928, and while new relay stations were opened at Aix-la-Chapelle, Cologne, Kaiserslautern, those of Elberfeld and Dortmund, having been made useless by Langenberg, were stopped. A frequent exchange of programmes between German stations and those of other countries, including England, was first arranged for in 1928.

Television Tests

The first German short-wave transmitter was started on August 16th, 1929, on an experimental basis, at Koenigswusterhausen, and was soon used, among other things, for the exchange of programmes with the United States. Another event of far-reaching importance was the starting of experimental television from the Berlin radio transmitter on September 23rd.

Another interesting event of the same year was the creation of an Interference Committee, working in conjunction with a chain of local committees of radio assistants. A Central Bureau of School Broadcasting was founded in 1930, and the 3,000,000 mark was passed in the same year.

Higher Power Coming!

The network of cables connecting the various German stations was improved and supplemented, and the mutual exchange of programmes between these stations was further developed and placed on a solid basis. Finally, a thorough reorganisation of German broadcasting was undertaken by planning a chain of nine high-power transmitters to be substituted for those so far in existence, and of which those of Mühlacker and Heilsberg have already been completed.

Also, it is hoped in the near future to extend and improve international exchanges, making all European programmes a regular feature.

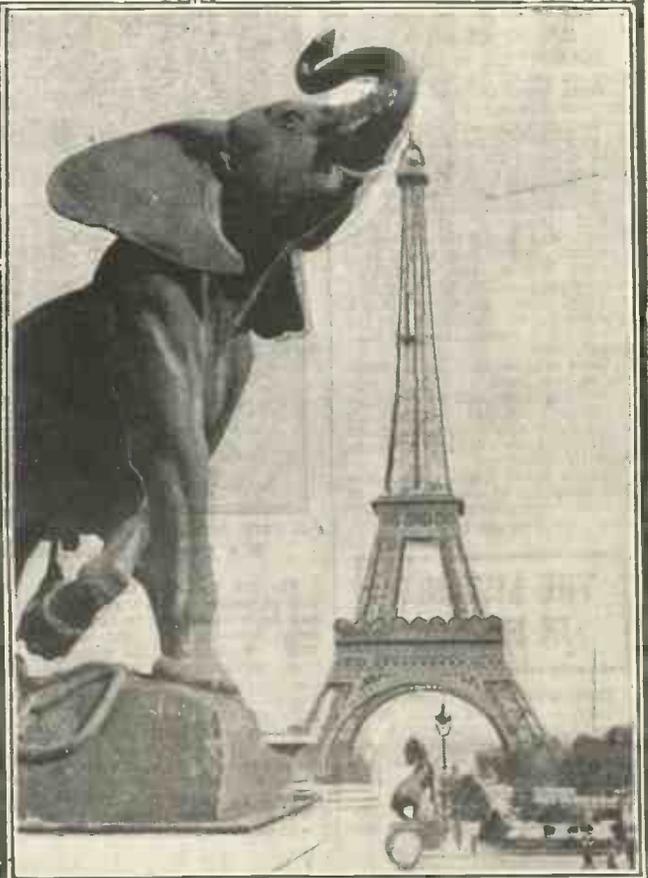
The question has often been raised whether wireless broadcasting should in any way be allowed to deal with politics. Being a means of approaching all classes and parties, it is, of course, likely to be used even by a democratic government in proclaiming its programmes and intentions.

VIEWS OF THE MONTH



(Above) Mr. O'Hef-fernan, the Croy-don amateur who beat the world in open competition for long-distance working. (Left) Turin's announcer.

The automatically-controlled radio set at Earl Haig's Homes, Morden.



(Left) The latest type of American radio mast is shown in the foreground with an older type behind it. It is 430 ft. high and weighs 20 tons.

(Above) An unusual view of the Eiffel Tower, Paris.



**SHORT NOTES
ON
LONG WAVES**

Do you ever explore the band between 600 and 1,000 metres? Although apparently full of "odds and ends," it is interesting enough when one knows what they all are.

From 600 to about 750 metres we have mostly ships and shore stations, using interrupted C.W. or spark. Their conversations alone are greatly entertaining to those who can read Morse.

On the fixed wave-length of 900 metres, Croydon Airport and the Cross-Channel 'planes may be heard all using telephony. Lympe and Pulham also work here as additional observers.

You will not, as a rule, hear much of the 'planes without a good stage of H.F. Even then probably you will not find a trace of some of them when Croydon seems to be receiving them well. Incidentally, if you live near one of the fixed stations, do not listen on this wave with an oscillating receiver, or you are liable to receive a severe "ticking-off."

RADIO BEACONS

Just above this, on 1,000 metres, may be heard the various radio-beacons round the coasts. These are mostly situated in lighthouses or on lightships, and simply come on at predetermined times, sending their call-sign for a minute with a musical J.C.W. note. The strongest to be heard in London are M.M.L. (North Foreland), M.M.C. (Cromer), G.D.M. (Dungeness), G.S.M. (Start Point), and G.C.M. (unknown at present). If you hear M.S.G. your receiver is doing well, as he is up somewhere in the Shetlands. G.G.M. and G.G.G. are also fairly distant. The sending of the call-sign is followed by a one-minute or half-minute dash.

Many of these beacons are working in conjunction with a submarine oscillator, and by reception of the two, and also of an acoustic under-water signal, ships can make reliable estimates of their distances from the beacons.

Just a shade above these are a few examples of another type of beacon, sending a single letter very slowly for long periods.

**THE LISTENER
IN FRANCE**

There is one topic over which listeners in all parts of the world seem to meet on equal terms—the question of arrangement of programmes. Certainly the French listener is no exception. Oh, dear, no; quite the reverse!

Each week, as regular as clock-work, you will find articles on the

subject in the "Radio Magazine," his counterpart of the "Radio Times." However do they get in there, did you ask? Well, you see, this paper is run not by any broadcasting concern, but is issued by an independent publishing company.

Of course, the "Radio Magazine" is not half so well known in its own country as our "Radio Times" is over here; but then, broadcast listening is by no means so developed over there. I saw some recent statistics that estimated that there were only about 1,000,000 sets in use in the whole country!

And that figure is supposed to allow for all the "pirates," or unlicensed receivers, of which there is a surprisingly large number; the Post Office having track of something like only 600,000 of the million. In fact, quite a large percentage of the population is entirely unaware that radios should be registered in any way!

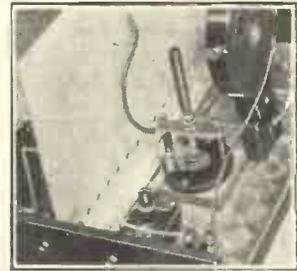
foreigners completely cutting out their best stations.

The chief way in which conditions differ is that service is by no means so uniform throughout the country. This is undoubtedly due to the fact that French broadcasting is not entirely in the hands of one company, or of the Government.

The net result is that the various concerns operate quite largely in competition with one another, and, naturally, those who can, want a station to serve their capital, Paris. It is thus that there are so many stations for this one town, which brings me to something that will "make your mouths water."

Anyone living within a radius of 30 or so miles of Paris often has a choice of about five different programmes. And without such a very sensitive set, either. Yes, put that in your pipe and smoke it!

And what's more, this applies practically throughout the whole of



on the upper band. This refers, of course, mainly to the northern part of France, but whether the increase in the power of Radio Paris will alter things or not remains to be seen.

Probably due to the rather flat nature of Northern France, stations of only 1 kilowatt seem to give phenomenal results, even up to 40 miles or so. That is, when atmospherics don't upset the apple cart!

In the summer "X's" are sometimes very bad, often much worse than ever we get them over here. I know of one place where it is impossible to listen at all for weeks on end.

MAN-MADE STATIC

And, strange to relate, as though not satisfied with more than its fair share of natural static, man-made static is many times worse than one would expect. A fact which seems rather common in France.

No doubt it is largely due to the bad wiring to be found in the country towns. Nevertheless there is quite a campaign against it, and schemes somewhat similar to those going ahead in Germany are being tried to quieten trams, electric motors, etc.

Toulouse is the mainstay of the south of France, which is by no means so well served as the part we have been considering, but this will no doubt be remedied in the future. So what do you think? If you had your choice, would you choose to be a listener in England or in the land of our neighbours?

Personally I would "plump" for England every time! Still, the facts of the case are very interesting.

**RADIO IN
EAST AFRICA**

Sir,—Reading of Major Sharpe's experiences of reception in West Africa, I am sure some experiences of reception in East Africa would be interesting to other readers.

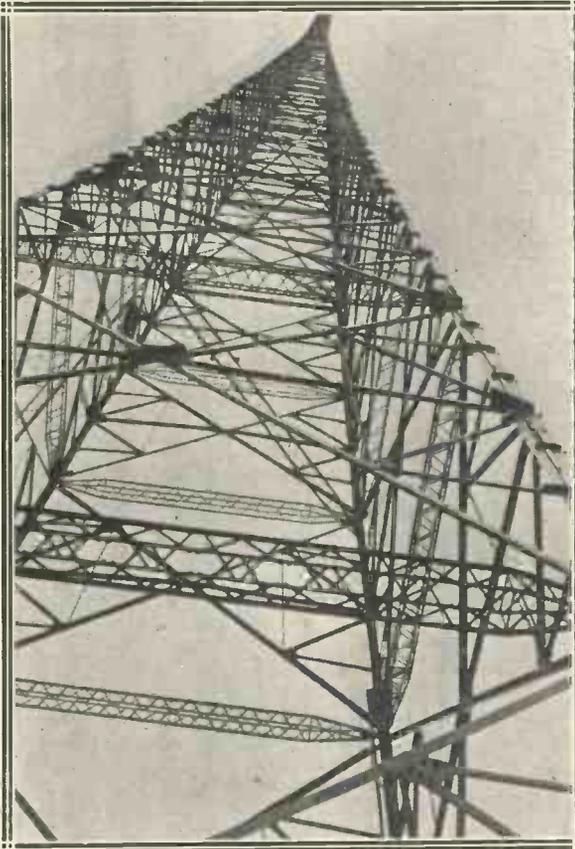
Our bungalow is situated over 7,000 ft. above sea level, and the surrounding country is practically open except for some hills at a distance of about five miles on one side. But I should not think this would affect reception, as we are at a greater altitude.

I have a 10-ft. aerial, and my set is a straightforward home-made three-valver.

Reception from the local station, Nairobi, which is about 80 miles away as the crow flies, is excellent when that station functions properly. I also receive Chelmsford, Rome, Paris, Eindhoven, Moscow, and several other foreign stations, all at good strength. Reception from Chelmsford is very good some nights, but I presume the weather affects reception other nights.

Yours faithfully,
Njoro, J. W. SPIERS,
Kenya Colony.

FROM THE FOOT OF A BIG MAST



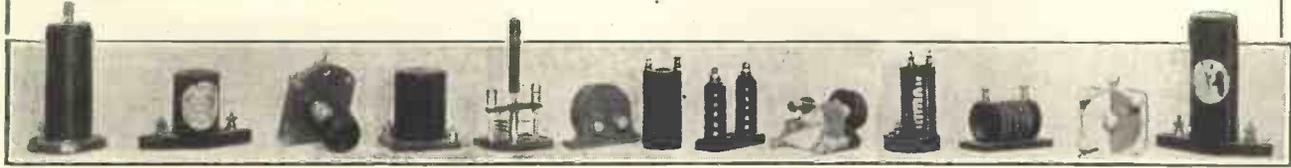
A very peculiar view, showing the lattice-work construction of a 300-ft. high mast at the Brussels No. 1 station.

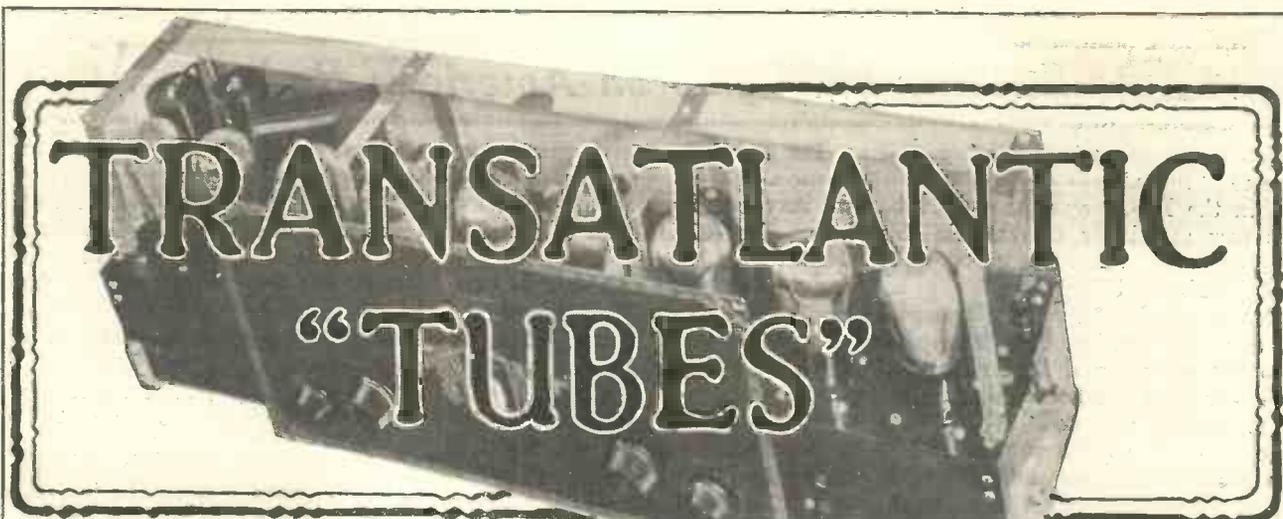
The law requiring the registration of radio sets is a very old one, and dates right back to before the Great War—in fact, right back to 1912. It calls for the noting of every installation at a post office, the fee charged for this being six francs (somewhere around one shilling). Cheap enough!

But let's turn to the actual reception conditions, which in some ways are not so very different from ours. The residents near powerful stations have difficulty in removing their local much as we do; and those out in the country often find

Sunday, during which day music of some sort can be picked up at almost any old time. The only drawbacks seem to be that occasionally one has to listen to a few adverts, that help to keep the stations going; and occasionally an item may be missed because the published programmes not being official, it is possible that things may get a little ahead of the stated times.

It is an interesting fact that, on the long waves, Daventry is the Frenchman's best "foreigner," just as to us Radio Paris is the star turn





THE average radio "fan" in the Old Country probably has the idea that American radio receivers are enormously powerful and sensitive contraptions, and that the valves employed are quite different from the British products. A little definite information in this line may be of interest, and of use in clearing away any misconceptions of the radio "wonders" on the American side of the Atlantic.

American Sockets

It is a sad, but by now unchangeable, fact that the bases of American valves—"tubes," they are known as over this side—and, of course, their sockets, have been developed differently from the British style.

Instead of the four pins of a D.C. type of valve being unequally spaced, for the purpose of ensuring correct placing in its socket, American practice is to space the pins equally, but to make the filament pins considerably thicker than the plate and grid pins. Also, the five-pin (A.C.) type, instead of, as in British practice, being the same as the four-pin with the addition of a fifth pin in the centre, has its five pins arranged in an unequally-spaced pattern, and all of equal diameter.

Two Types

The four-pin style as now universally used for battery and other filament types of valves is generally known as the "U.X.," and the five-pin as the "U.Y."

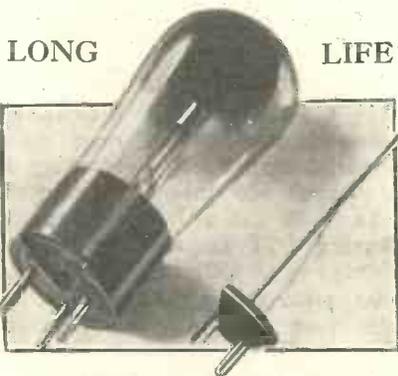
However, as many manufacturers have from time to time branched out into originality in the designation of their products, the "U" has been replaced by many other different letters of the alphabet; the "X" and "Y" only being retained in practi-

Much has been said vaguely about American radio valve technique, but here are some really practical details of the valves themselves, and the conditions governing their use in the U.S.A. and Canada.

From a Canadian Correspondent

cally all cases as denoting whether the type designated is of the four- or five-pin type.

It is rather unfortunate that the figures used in the naming of American valves do not have any significance as is the case of nearly all British types.



The "Great idea" in this American "tube" is to cheapen radio reception by allowing filament replacements to be made easily. It is the invention of a lady scientist.

One would naturally, bearing in mind the British style of designation, expect a "210" valve to have a 2-volt filament, drawing .1 ampere.

This particular American valve, however, is actually a (now obsolescent) large power valve, having a filament demanding 7.5 volts, A.C., and drawing 1.25 amps. Here again, also, the competing makers have

from time to time introduced changes in the first figure; each maker using his own figure, so that it denotes, if anything, merely the particular make of valve.

Therefore, it is now becoming customary in the radio Press to designate valves by the last two figures only, using a hyphen to replace the kaleidoscopic first digit, thus -10 would be, in full, either a U.X.210, or C.X.310, or merely 410, according to the taste of their respective manufacturers.

An "Eight-Tube" Effort

Now to proceed to actual characteristics of the American "tubes" of to-day. The modern radio receiver on this continent is becoming fairly well standardised as to general type, and we will look into the average type of home receiver and see what we will find in the way of valves.

We may take it for granted that it will be what British practice would call a "mains" receiver, and for operation from a 110-120-volt 60-cycle A.C. supply. It will be got up in the form of a "console" cabinet, containing the receiver, a moving-coil (i.e. "dynamic" in the American language) speaker, and power unit. Three stages of tuned H.F., a power detector (reaction, *never*), a resistance or transformer-coupled first L.F., and a push-pull pair of power valves, may be taken as typical.

Rectifier Included

The selling price, here in Canada, will be about \$200. The rectifier valve, by the way, will always be included when stating the number of "tubes" in the receiver, as the

Striking Sidelights on American Radio

public taste seems to be for more and more "tubes."

In the H.F. stages the -24 tube is now practically universal in this season's sets. This is a heater type, the cathode being heated by an element rated at 2.5 volts, 1.75 amp.; 1.5 volts negative bias is applied to the control grid by means of a resistor in the cathode lead, and the screen grid is biased at 75 volts positive. The plate voltage is 180, it has an A.C. resistance of 400,000 ohms, the plate current being in the region of 4 milliamperes. The voltage amplification factor is nominally 420.

Older "Tubes"

Some of the new sets, and most of the older types, have in place of the screen-grid valves the -26, which is a three-electrode valve, with a heavy filament taking 1.05 amp. at 1.5 volts. With 6 volts negative grid bias, and 90 volts on the plate, a plate current of 6 m.a. is indicated, and an amplification factor of 8.2. The -26 tube has also been used to a considerable extent as L.F. (1st only) amplifier, but is now rarely used.

AN AMERICAN RECEIVER



This Console model, with its large cone speaker mounted at the side, has been very popular with U.S.A. householders.

In the detector socket we will probably find another -26, used here as a "power" detector, with the same voltages as above. However, there are still a large number of sets using as detector the indirectly-heated -27, whose characteristics are as follow: Heater, 2.5 volts, 1.75 amp.; grid bias, -2.5 volts; plate 45 volts, 2 m.a.; amplification factor stated as 9.

The first L.F. stage is pretty sure to use a -27, though, as noted above, we may possibly find a -26 in use here. The -27 is found to give less trouble from hum, however, and also has the advantage of using the same heater voltage as the rest of the valves—unless, of course, -26's are employed in the H.F. end.

Queer Types

Until quite recently the choice of valves for the output L.F. stage has shown considerable variation, but the -45 tube, when it appeared on the scene, rapidly displaced all other power types for use in the ordinary home type of receiver.

The -45 tube is designed for use with raw A.C. on the filament, rated at 2.5 volts, 1.5 amp. The plate voltage is usually 250 volts, and a bias resistor makes the grid 50 volts negative. Plate current will be about 32 m.a., the A.C. resistance being 1,900 ohms, and the voltage amplification factor 3.5. The maximum undistorted output of this valve is 1.6 watts.

Push-pull output is now practically universally used in this continent, the present fashionable demand by the buying public being for about enough volume from the moving-coil speaker to almost burst out the doors and windows of the average home!

"Squashing" the Pentode

In the case of a few "de luxe" receivers we find an even more powerful output stage, consisting of a pair of -50 tubes in push-pull.

The -50 has a 7.5-volt filament, drawing 1.25 amps.; uses a plate voltage up to 450; the grid bias at that plate voltage being -84 volts; plate current, 55 m.a., and it handles an output of 4.65 watts.

The pentode was "discovered" by one of the U.S.A. tube manufacturers about two years ago, but was promptly "squashed" by the tube manufacturers' "ring," who did not wish to see any further advance in valve efficiencies just yet to upset their elaborate sales plans!

Recently a new line of battery-operated tubes was brought out, so as to provide for those homes which are not served by electric supply. These are three in number, with 2-volt filaments, and intended primarily for use with a special

"air-cell" semi-dry battery, put on the market at the same time.

These are the first and only 2-volt tubes ever offered to the American public, and judging from samples which we have tested are much inferior to the British products. Microphonic trouble is particularly prominent.

BLINDED BY ELECTRICITY



He is Senator Schall, of Minnesota, who since being blinded by an electric shock has served his State five times as a member of the Senate.

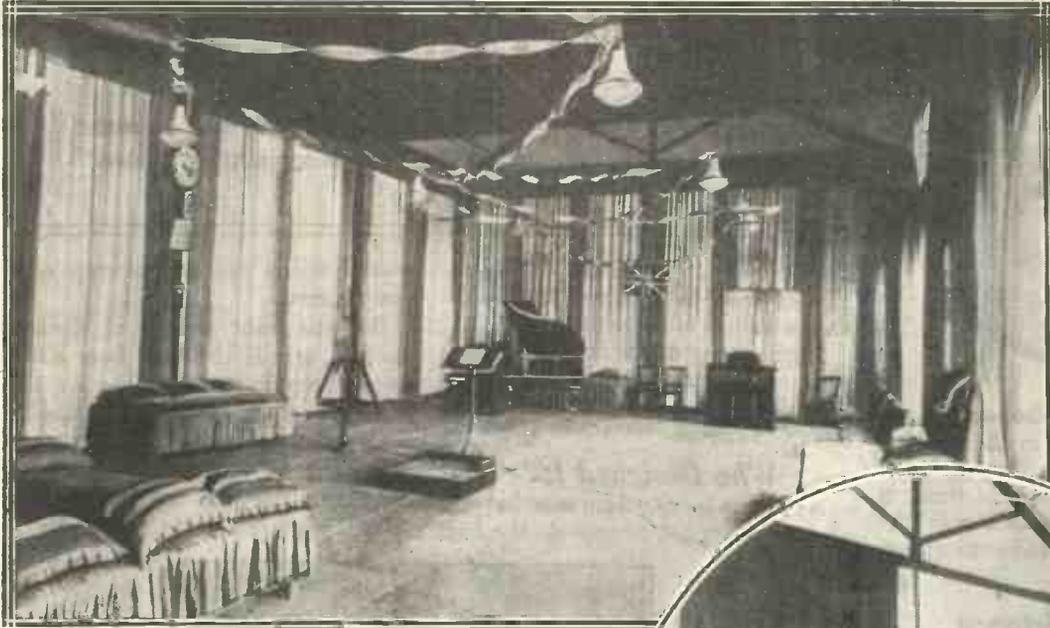
In all cases the filament rating is 2 volts, the consumption being .06 amp. in the case of the -30 and -32 types, and .13 amp. for the -31. Other characteristics are as follow: The -30 tube is of the so-called "general-purpose" type—i.e. can be used for H.F., detector, or L.F. amplification. The plate voltage specified is 90 volts; grid bias, -4.5 volts; plate current at these values being 2 milliamperes, and voltage amplification factor, 8.8.

A Poor Show

Type -31 is a power output valve, using a plate voltage of 150 (maximum); grid bias, -22; and the A.C. resistance being 4,000 ohms; plate current is 8 m.a.; amplification factor is 3.5, and maximum output is stated as 170 milliwatts.

The -32 is an S.G. tube, having characteristics very similar to the -24. Plate voltage, 150; grid bias, -3 volts; plate current, 1.5 m.a.; and amplification factor, 440.

HOW RADIO IS RUN IN BOMBAY



Bombay works on a wave-length of 357.1 metres, and the photograph above shows its well-appointed main studio.

* * *

In the circle to the right is a view of the general waiting-room, on the lofty ceiling of which big fans are fitted, to keep it as cool as possible.



The "Number Two Studio" of the Indian State Broadcasting Service, Bombay, is shown above, from which lectures, news, and gramophone items are transmitted.

* * *

To the right is a view of the main transmitter, which is of British manufacture, and greatly resembles some of the older B.B.C. transmitting plants. But except from an engineering point of view, Bombay's broadcasting problems are entirely different from ours, including as they do the difficulties of languages and of castes.





SELECTING A SET

One disadvantage of our rapid radio progress is that it makes set-selection very difficult—as this article amusingly shows!

HERE are those who say that the hardest thing in the world is the diamond. They are quite wrong. By far the hardest thing in the whole universe is for a man who knows but little of radio to choose a new set.

B.B.C. Assistance

Although he pays a sum of money every year to the Post Office, he will receive negligible assistance from the counter hands at his local branch. If he turns to the B.B.C. in his hour of need, what will they do? Probably turn his steps in the direction of the South Kensington Museum, wherein he will find various fossil remains of neolithic man, an excellent collection of mechanical models, and a huge radio receiver that uses transmitting valves and a loud speaker quite as big as Winston Churchill's hat ought to be.

The Super-Blooper

Armed with valuable information culled from the museum guide, our hero wends his way to the nearest wireless shop. "Certainly, sir," says the gloomy-faced savant, "we'll make up an exact model for— (He mentions a figure that causes the inquirer to go deathly white.) But if you feel that that is just a wee bit more than you can pay, what about this Super-Blooper at five pounds down, or three shillings and elevenpence three farthings per week—no ink-wiries made, and delivered to your home address in a plain wrapping?"

It is in the hope that I can short-circuit dreadful happenings of this character that I take up my pen—I

assure you that it has a nine-carat gold nib—in order to inscribe a few words on the subject of set selection.

Maybe many of you intend to build your own outfits, but are hesitating, bewildered as your eyes roam from circuit to circuit.

Who Designed It?

Now there is one golden rule that can always be applied to provide the first

around which you are to wrap your components.

Do you want dozens of distant stations, or will the two local alternative programmes supplied by the B.B.C. satisfy you? Before you finally decide, let me point out one very important fact. This is that local conditions vary so much, and the ether is so unstable, that a very power-

THE WORLD'S BIGGEST

This is a view of one of the control rooms at the Rugby station, which keeps in touch with ships the world over, and acts as telephone link between Europe and the U.S.A.



sifting of the wheat from the chaff. Put the originators of the circuits under the microscope. Ask yourself whether or not that one can rightfully claim to be a radio authority. Root out all the hook-ups evolved by butchers or chimney-sweeps or garage hands that choose to style themselves wireless experts.

Distance or Local?

You are now reduced to a mere score or so circuits. They all are, of course, of this year's vintage. You realise, I hope, that quite a few changes in technique have occurred during the past ten or fifteen years. And pre-war circuits are completely *démodé*.

There remains only for you to fasten on to the *type* of hook-up

ful instrument is needed to guarantee all-the-year-round reception of even a handful of foreign stations.

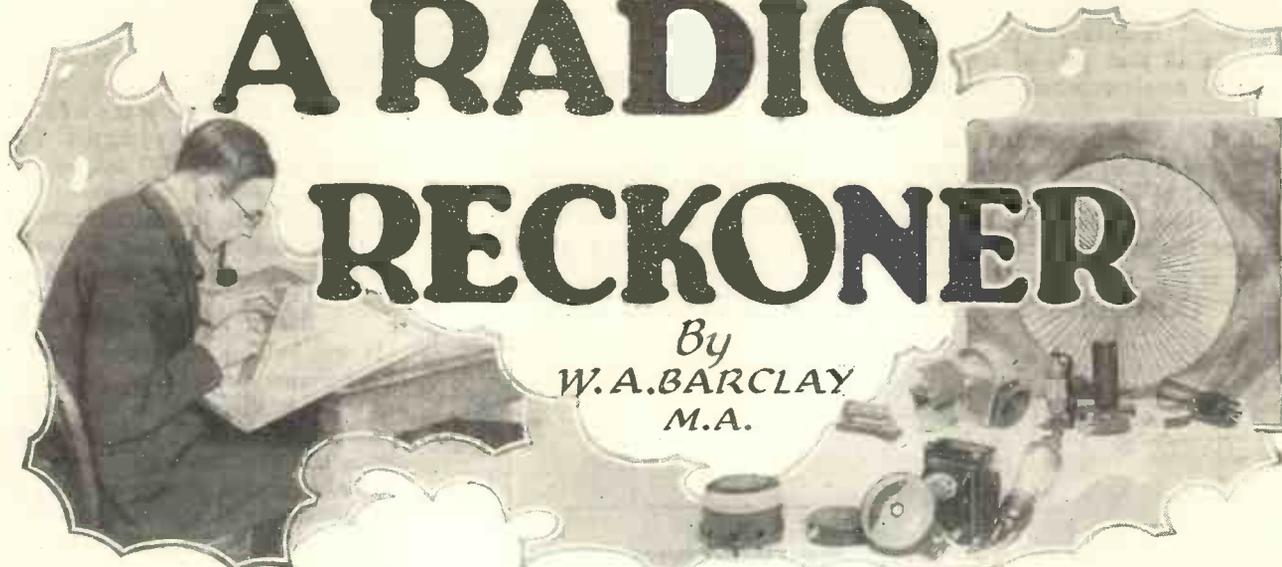
Those Test Results

The conscientious designer never over-rates his radio circuits; rather does he give most conservative estimates of what the various sets embodying them will do. If you don't see as many tabulated test results of sets as you think there should be, let me point out that these don't mean as much as you might think. It sometimes happens that the simplest of sets will often give better results under certain conditions than a much bigger set operating elsewhere. I'd like to amplify this point, but I fear space forbids.



A RADIO RECKONER

By
W. A. BARCLAY
M.A.



Here is another of this enlightening series of N-Diagrams, and this month we present a pair of diagrams which will help you to find the reactance of various condensers and inductances at radio frequencies.

IN the last section of this series we discussed the nature of "reactance," and showed how this conception is similar to, though in many ways it differs profoundly from, a pure resistance.

For H.F. Problems

We saw that reactance arises from the presence of either inductance or capacity whenever alternating currents are flowing, and showed how the amount of reactance can be readily derived when the amount of the inductance or capacity in question

FOUR USEFUL SYMBOLS

RESISTANCE REACTANCE CONDENSER INDUCTANCE

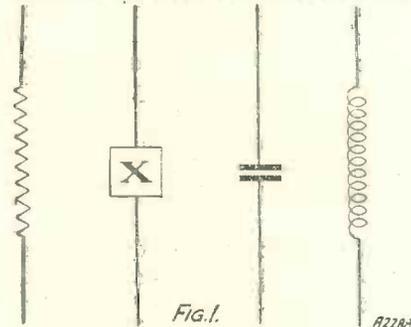


Fig. 1.

A2283

The four items indicated above are used considerably in radio and electrical engineering. If their symbols are not already familiar to you, bear them in mind for future use

and the frequency of the current oscillations are given.

The two N-Diagrams which accompanied last month's article enabled this information to be derived at sight in the case of audio-frequency currents; that is, for the alternating

FOR FINDING COIL REACTANCE

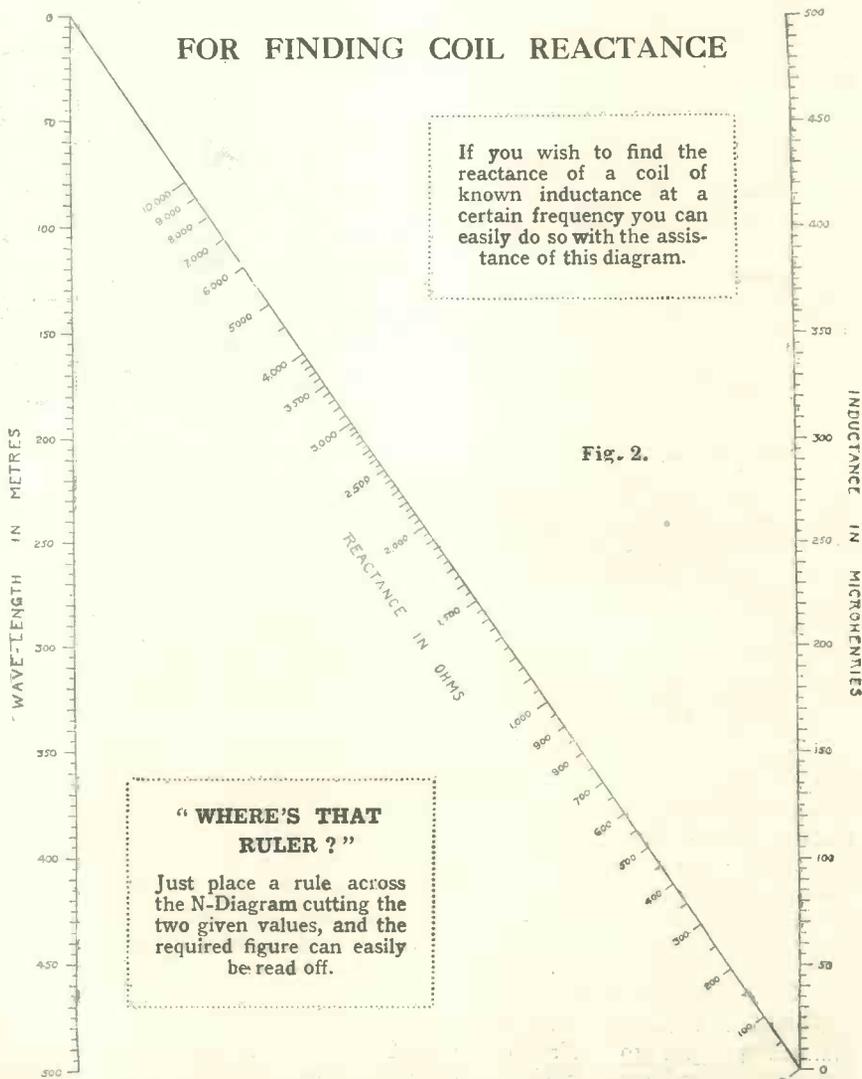


Fig. 2.

If you have not yet been interested in "N" Diagrams—like the one above—you ought to get acquainted with them. They are very interesting and absurdly easy to understand and to use.

currents of comparatively low or "speech" frequency which are met with in all that part of a straightforward receiver subsequent to the detector valve.

There is, of course, no essential difference in kind between alternating currents of audio-frequencies and those which oscillate at the vastly greater frequencies of radio. There-

between the two appeared in the June issue of MODERN WIRELESS.

We now present two further N-Diagrams by means of which reactances at radio-frequencies may be no less easily obtained by simple inspection.

The Pictorial Symbols

Before doing so, however, it may be well to digress for a moment to

pictorial symbols for these being also shown in Fig. 1.

The first chart, Fig. 2, relates to the values of inductance, wave-length and reactance over the medium band of broadcast wave-lengths. The wave-lengths up to 500 metres are given on the left-hand scale, the inductances up to 500 microhenries on the right-hand scale, while the reactances in ohms appear on the diagonal.

Mere Millionths

It will be noticed that the values of inductance provided in this chart are much smaller than in the corresponding diagram for audio-frequencies in last month's issue.

This, of course, is only natural, as the inductance of a coil suitable for use on the broadcast wave-lengths is very much smaller than that possessed by the heavy "choke" coils which are used for speech frequencies in output circuits. Accordingly, the inductance of these "radio" coils is specified in microhenries, $1\mu\text{H}$. being, of course, the one-millionth part of a henry.

As an example, suppose we wish to ascertain the reactance of a coil of $180\mu\text{H}$. when tuned to the London National station. The corresponding wave-length of this station being 261.3 metres, a straight line placed across the two values readily shows the required reactance to be 1,300 ohms.

Left and Right Scales

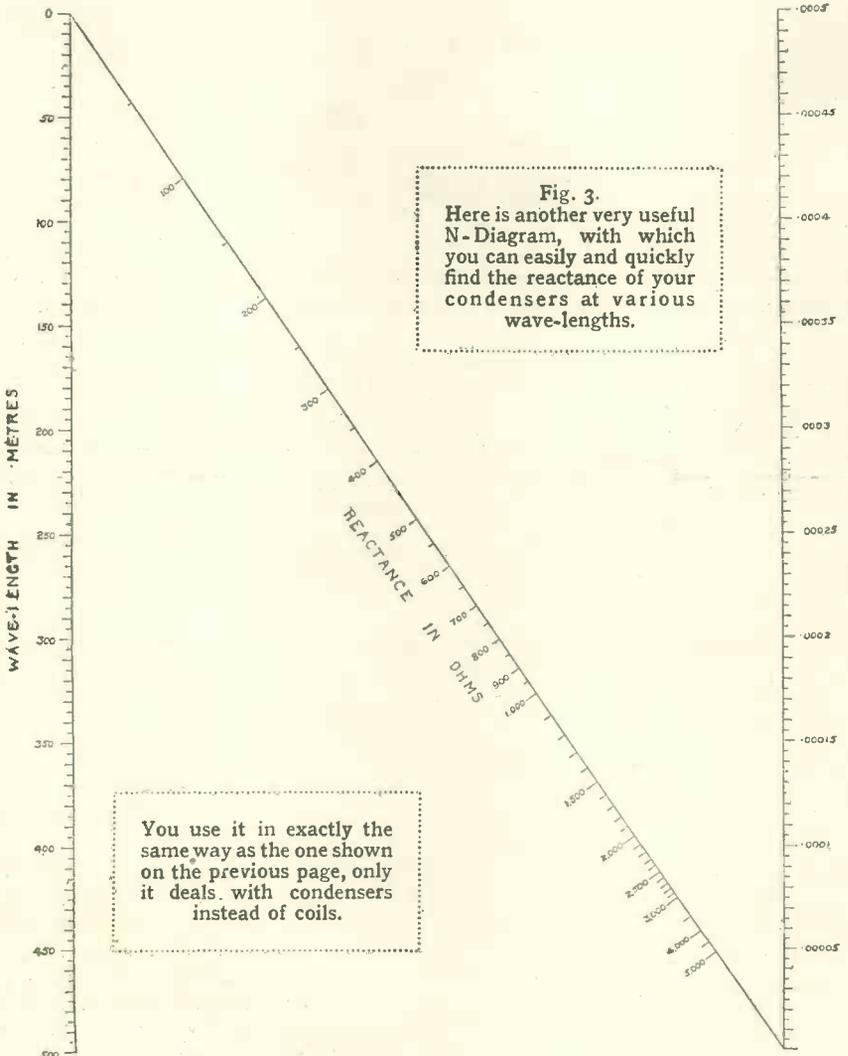
In the same manner, the N-Diagram of Fig. 3 has been prepared to yield the reactance value of a condenser at the medium wave-lengths. Here, as before, the left-hand scale contains values of wave-lengths up to 500 metres; the right-hand scale has values of capacity up to 0.0005 microfarad, while the diagonal is again graduated with values of reactance ohms.

Let it be desired to find the reactance of a condenser of 0.00025 mfd. at the London Regional wave-length of 356 metres. By a simple application of a ruler to Fig. 3 the required value of 750 ohms is easily read.

The Other Way Round

As is the case with all such alignment charts, the present examples may be used "backwards" to find other unknown values when the required reactance is known to start with. Thus we may use these charts to find, say, the values of inductance of capacity which will have some desired reactance value at a given wave-length.

CONDENSER REACTANCE AT A GLANCE



fore, we may expect to find that when a radio or "high-frequency" current passes through a coil or condenser a certain amount of reactance will be encountered which would not be present in the case of D.C.

No Complicated Calculation

We have seen, too, that it is common practice to refer to the frequency of radio waves either in terms of kilocycles, or in terms of the more old-fashioned wave-lengths. A simple diagram showing the relation

point out that there is no generally recognised pictorial symbol for a reactance comparable to the wavy indented line which represents a resistance (see Fig. 1). Whenever it is necessary to show that a numerical value of reactance is in question the fact can be indicated by a square inscribed with the letter X, as shown in the diagram.

This procedure, however, is seldom used, as for all ordinary purposes it is much better to show the actual condensers and coils which give rise to the reactance, the well-known

By-Pass Calculations Made Really Easy for All

An Interesting Case

An interesting case of such a use of Fig. 3 arises in connection with the anode circuit of most detector valves. If such a detector valve (which may be arranged for either grid or anode detection) be connected by resistance coupling to a following L.F. amplifying valve, as in Fig. 4, it will happen, unless due precautions are taken, that a certain amount of H.F. current will pass into the L.F. amplifying system.

That is to say, unwanted H.F. current impulses will, unless somehow prevented, pass through the coupling resistance in the same way as the desired L.F. currents, and, being magnified in turn, may give rise to very undesirable "howling."

To overcome this difficulty a very interesting and useful dodge is employed. We have seen that one and the same condenser has different reactance values at different frequencies. Moreover, the condenser reactance is low for H.F. currents, but is high for L.F. currents.

Frequency Filtering

What is done is simply to insert a condenser C, as shown in Fig. 5, between the anode of the detector and the filament supply. Then since the value of the resistance R is great compared with that of the H.T. supply, we may neglect the latter altogether and consider R as in parallel with C.

Now at high frequencies C possesses a low reactance, and H.F. currents will prefer to pass through it rather

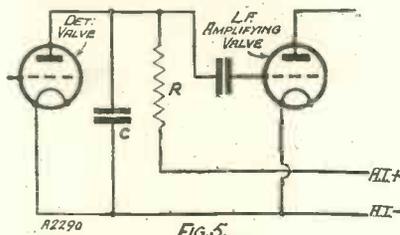
will prefer to pass through R as desired.

The question now arises, how large should this condenser be?

The answer depends in part upon the value of the resistance R. A possible value for this will be 20,000 ohms.

Let us suppose that the wave-length to be received is in the medium wave-band, say, 400 metres. Now, in order to divert the H.F. currents away from

THE COMPLETE CURE



Here the H.F. currents are prevented from getting into the L.F. circuits by providing the by-pass condenser C. The correct value for this can readily be calculated with the help of the N-Diagram on the previous page.

the resistance it will be evident that the condenser reactance to them must be much less than 20,000 ohms, which is the value of R.

The Alternative Paths

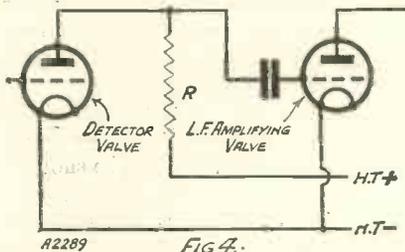
For instance, if it were about 1,000 ohms this would be only one-twentieth of R, and the condenser would by-pass the H.F. quite efficiently. By means of Fig. 3 it will be easily seen that the value of the condenser necessary for this purpose is in the neighbourhood of 0.0002 mfd.

When we come to consider the behaviour of a condenser of this size to currents of audio-frequency, we find that over most of the "speech" frequencies the reactance is much greater than 20,000 ohms.

For instance, the reactance of this same condenser of 0.0002 mfd. to a note of pitch 1,000 cycles per second will be about 800,000 ohms, or forty times the value of R. The pitch of this note is roughly that of "top C" on the musical scale (i.e. two octaves above "middle C"), while for lower notes the reactance will be even greater.

Thus 0.0002 mfd. will be quite a suitable size for this by-passing condenser, and when connected as described it would greatly improve the Fig. 4 arrangement.

CAUSES INSTABILITY



In the circuit shown above, quite a considerable amount of H.F. is liable to get through from the plate of the detector valve to the L.F. circuits and so cause instability.

than R. At the same time, if C is suitably chosen, its reactance to low frequencies will be much greater than R. Consequently, L.F. currents

AN "ANTI-PONG" DEVICE

This useful dodge works wonders with microphonic valves.

Quite a good idea for getting rid of that unpleasant "pong" every time you happen to touch the detector valve of your set, or every time anything happens to jar or vibrate it, is to dab a little Plasticine (or even chewing gum) on the top of the valve, and then to place a small nut or some other suitable metal article on top of this.

The result will be that the natural period of vibration of the valve and its filament will be altered, so much so that the chances are that the unpleasant microphonic effect will be eliminated.

This little notion costs nothing to carry out, and it is as effective in results as many an "anti-pong" valve-holder. It can be applied to L.F. valves as well, of course, but generally the detector will be found to be the guilty one.

A "NUTTY" IDEA FOR A VALVE THAT RINGS



If you are troubled with microphonic valves, try the idea mentioned above, using an ordinary nut fixed with Plasticine. It is often a complete cure for this annoying complaint.

By the
Technical
Editor

On the



Simplifying Set Assembly

YET a further model of the "Cyldon" Extenser has been produced by Sydney Bird & Sons, Ltd. It is illustrated on this page, and you will see that it is a triple-drum assembly.

There are three '0005-mfd. sections, each of which corresponds with an ordinary variable condenser, and each of which is fitted with a self-changer for automatically wave-changing a circuit.

Two of the sections are definitely ganged and are controlled by one of the drum drives. The remaining section is independent and has its own drum, although this is placed close against the other so that the pair can be operated simultaneously by one hand.

It is important to note that all three sections of this Extenser assembly are electrically independent, and that the moving vanes are not metallically joined via a common spindle or frame structure. If you look closely at the photo you may just be able to see

that the frames are held away from the back-plate by ebonite pillars.

This is a very useful feature, for it means that special band-pass and other such circuits can be employed. If necessary it is, of course, a simple matter to make all the moving vanes "common"; that can be done with a few short leads.

This particular Cyldon Extenser lends itself very readily to efficient multi-valve designs, for the sections and their self-changers fall in most convenient places for scientific screening and wiring and component layouts.

It will not be necessary for us to point out that quite a deal of wiring is saved and the effectiveness of a set vastly increased by the use of an Extenser of this nature, for that is very obvious. The economy in wiring through the elimination of wave-change switches is a decidedly attractive one when it comes to three tuned circuits.

Three wave-change switches is an almost unthinkable alternative, but the only way of escape, barring recourse to an Extenser, is to gang switches!

It should also be quite unnecessary for us to deal at length with the soundness of design and construction of this particular "Cyldon" Extenser; suffice it to say that the sections correspond with single

models in every way, and that they are linked and mounted in the true Bird manner.

The rotation of the drum drive controlling two sections gives no hint at all that two sets of moving vanes and two self-changers are being operated; the movement is as silky as the silkiest ordinary drive.

What Are Coil Quoits?

This is Exhibition time, and that means a large influx of new readers. Many of these will not know what coil quoits are, and they cannot be blamed for that, for the things were introduced in the middle of the summer!

In passing, it must be mentioned that, despite their arrival in the radio

VERY POPULAR GADGETS



Peto-Scott Coil Quoits are neatly packed in coloured cartons, which, in their turn, are boxed in dozens for dealers.

"off-season," they proved so immensely popular that great business in them has been recorded by the various people who are making them.

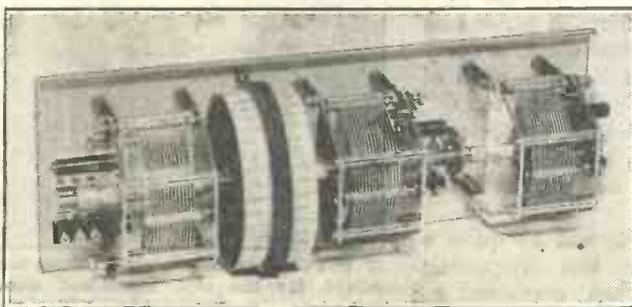
Coil quoits are small formers for coil winding. Their design is such that you merely have to "wrap" the wire on. And they can be mounted on a baseboard in the easiest possible manner.

Making Inexpensive Tuners

There is a lip one side and a shoulder the other, so that any number of coil quoits can be fitted together and complete tuners and H.F. transformers arranged.

Above all, coil quoits are cheap; they only cost sixpence each, so that dual-wave units are possible for but a shilling or two. "M.W." uses coil quoits in practically every set design. We originated the idea and designed the things for the express purpose of simplifying and cheapening set

ANOTHER NEW "CYLDON" EXTENSER



One of the several multiple Extenser assemblies due to Sydney Bird & Son, Ltd.

Test Bench

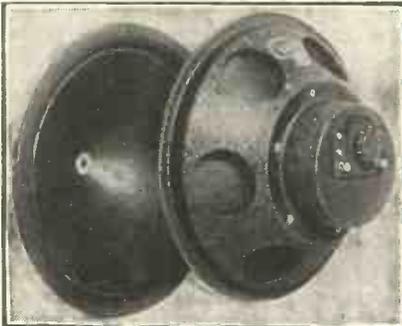
Cyldon, Peto-Scott, Graham Farish, and Formo components form the subjects of our impartial reviews this month.

construction, and we will be using them more and more as the months pass, for they have proved every bit as useful and attractive in practice as they ever did in theory.

One of the first firms, the very first in fact, to realise the possibilities of coil quois was Messrs. Peto-Scott, and it is their version of the device which is illustrated in these pages.

The Peto-Scott Coil QUIT is moulded from bakelite, and a very clean and nice moulding it is, too; the one fits into any other as snugly as possible. A special feature is that provision for easy mounting on baseboards is made in the one solid structure.

A NEW CHASSIS SPEAKER



The Graham Farish A.C.4 chassis is suitable for either transportable or cabinet sets, or for inclusion in a separate speaker construction.

And the material is of the highest grade, so that the Peto-Scott Coil QUIT has electrical qualities to match its mechanical attractiveness.

A New Loud Speaker

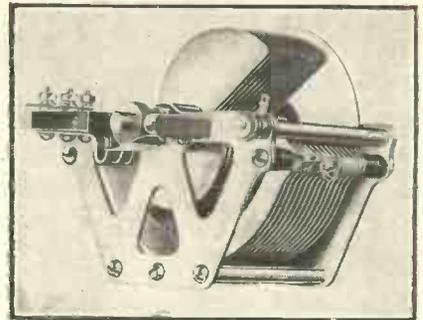
We have been able to test samples of the new Graham Farish Chassis Speaker. This comprises a 4-pole unit having a cobalt-steel magnet system built into chassis form, with a diaphragm of new fabric material suspended in accordance with a special patented system.

By the use of aluminium in the frame and the above-mentioned cobalt-steel magnet, lightness has been achieved without sacrificing performance, and the instrument is particularly suitable for transportable sets, although it is, of course, applicable to normal cabinet constructions.

The price is 21s., and at this it should prove a popular line this season.

It gives good results, and is as sensitive as any speaker we have had on the test bench. It will operate satisfactorily with the smallest of sets, although, on the other hand, it will handle creditably the outputs of the larger kinds of outfits.

The response is clear-cut and quite free from that muzziness so often associated with loud speakers of this pattern.



A new component whose success is assured—the J.B. Extenser, which appears to be an exceptionally fine piece of apparatus.

Another point which will appeal to constructors, both from artistic and operating points of view, is that a translucent scale is provided, and that this is illuminated from behind.

The resulting effect is that the indicator moves over the scale as a sharply defined shadow and the read-

WILL READERS, MANUFACTURERS, AND TRADERS PLEASE NOTE ?

We are prepared to receive samples of radio apparatus of any description from anybody for the purpose of preparing test reports for this page. Nevertheless, the Technical Editor reserves to himself the right to select only those items of most general interest when space limitations prevent all the submitted material from being dealt with.

Also it should be noted that we cannot accept responsibility for goods forwarded to us for this free service inasmuch as it is frequently essential for components, accessories, etc., to be completely dissected in the course of our examinations.

Finally, it is pointed out for the benefit of our more technical readers that the reports are based on tests carried out with the most modern gear under strictly impartial laboratory conditions.

A Fine Condenser

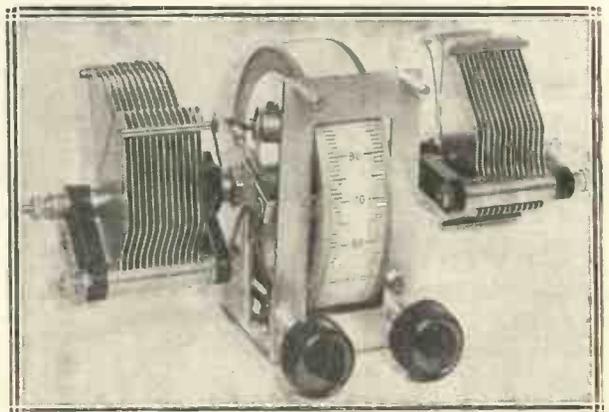
The Formo gang condenser illustrated in this page is one of the best of Formo's new season's components, which constitute a very attractive range indeed.

There are two control knobs, and the one functions as an ordinary gang drive and simultaneously rotates both sections. The other knob applies a rocking movement to the fixed vanes of the one section and supplies a trimming effect. The scale remains unaffected by this adjustment, so that it can be said that this Formo product combines the advantages of both the dual and gang idea, with none of the disadvantages of either!

ings are wonderfully clear and microscopically sharp.

The action both of the "direct" and the trimming drive are completely smooth, with no hint of harshness or irregularity at any one point throughout the whole range of the scale.

ONE OF FORMO'S FEATURED COMPONENTS



This Formo gang includes several ingenious and useful points of novelty.

MY RADIO FAVOURITES

By PHILEMON

How would you like to be able to choose your own artistes for a vaudeville programme, and who would you pick? It's quite a fascinating theme, isn't it? Read these selections of a regular listener.

I LISTEN-IN a great deal. In course of time, therefore, I have come to have my favourites in the programmes. I mean the vaudeville programmes, of course; for these are the only places where one dares to have favourites.

I am not presumptuous enough to have favourites among the high-and-mighty. I admire Suggia, for example, or Dame Ethel Smyth, or Professor Malanowski; but I hesitate to speak of them as favourites. They are made for reverence, not for love.

A Good Start

Every now and again I get that fever which attacks lovers of cricket at certain seasons of the year, and drives them to compose their ideal team; the team they would back to win the Ashes or make mincemeat of any other eleven in the world. I take a pencil and a sheet of paper and compose the perfect vaudeville programme; the programme which would make me perfectly happy at my own funeral. I pick my favourites. I hand them their "blues." I double their salaries, and give them a contract for the duration of the world!

I want a dozen items. The first few are easy. I mean to say that, for instance, in announcing my programme to the listening universe I simply must be able to say: "and the whole to be accompanied by Jack Payne and his Band."

The Feminine Side

That is my first, obvious, irrevocable choice. Just as you would write "Bradman" for cricket, or "Lindrum" for billiards, or "M.W." for your newsagent's list. Jack Payne and his Band seem to me to embody the very spirit of vaudeville. It's not only what they do, but the way they do it. Slick, bright, bubbly, and on the spot all the time.

Then I want a girl to sing to me, another to talk to me, and another to sing and talk. That's three wanted.

Greta Keller—forward, please! You are the girl to sing to me!

Mabel Constanduros is the girl to talk to me. Nobody can do it quite so well, or with quite such subtle touches, as Mabel can. She creates her parts—and they are many. She makes them live. Mrs. Buggins is just as real as Mrs. Gamp. I rank Mabel among the great artistes. If Michael will forgive me, I love her!

And if I want a song with patter, let Cicely Courtneidge sing it.

I want an impersonator, and I choose Ann Penn. She is a great caricaturist. Nobody in her class has quite the same sure and faultless touch as she has; and there is originality and distinction in all she does. Ann, Cicely, Mabel,



Mr. E. H. Shaughnessy has now retired after 44 years' service with the G.P.O. He was Assistant Engineer-in-Chief, and contributed a great deal towards the development of the international radio telephone.

Greta—that is my vaudeville heart's harem!

As a stepping-stone between the feminine and the masculine, and

because I love folk-songs and the English countryside they smell of, I will have Ernest Butcher and Muriel George in my programme of favourites.

Now I am safe on the masculine side! Come along, Gillie! I don't know if that is your right name, or if you ought to spell it with an "h," but come along!

A Real Entertainer

I like a man who doesn't point his jokes; who takes it for granted that I shall see them all. That does me honour. It also sharpens my wits. I am sure that I miss some of Gillie Potter's jokes, but that is only because the bowl is so full of them that some are bound to slop over when I quaff greedily at it.

I get enough to last me till he comes again. It is my day-to-day hope—that he will come again soon. And I will have Leonard Henry, too. He is different. He laughs at himself, as if he himself were his best joke, which he probably is, and a very good joke, too.

The "Chorus"

I like Leonard because he is so infectiously merry; he has a giggle which makes me giggle more than the joke he is giggling at. He is evidently so thoroughly enjoying himself. The perfect programme wouldn't be perfect without him.

Now the choice becomes harder. I want some sort of an instrumentalist, somebody playing a concertina or a xylophone, or—yes, Mario Pietro is my man for this item.

And I want some sort of chorus, group-singing; the sort of thing the Wireless Singers do, but I doubt if either they or The Roosters are eligible. They are occasionals. So give me the Bayan Singers, who for tone, balance, variety, and dramatic quality in singing can't be beaten.

Inevitable!

And I must have some back-chatters. What would a vaudeville programme be without those men who, before wireless days, used to set each other conundrums and slap each other's faces on the music-hall stage, but now do it in words, and with more refinement, in the studio? This is a sort of fun which particularly appeals to me, so I will have two pairs in my programme. I will have Alexander and Mose, and Clapham and Dwyer.

Then there is Will Hay—but I think I have had my dozen, although there are many others I would like to put down.

MY BROADCASTING DIARY



Our own Broadcasting Correspondent records the progress of the British Broadcasting Corporation, and frankly comments on the policies in force at B.B.C. headquarters.

The B.B.C. and Economy

ALTHOUGH there is perhaps not much room for the B.B.C. to retrench greatly, a policy of characteristic prudence at Savoy Hill has revised commitments, and there are likely to be some important "cuts" next year.

Broadcasting House will be completed as contemplated; so will the Scottish Regional transmitters at Westerglen. The West Regional station, however, may be on a less elaborate model than the others.

Of course, the construction of the new Empire station and the reconstruction of Daventry will be held up for the time being. I would not be surprised to see the early demobilisation of the Adult Education work, which now entails a good deal of expenditure that is not vital to the entertainment service.

There has also been some talk of further centralisation of programme activity in London; but I profoundly hope that the B.B.C. will not pursue the suggestion. Centralisation has gone quite far enough, and the development of the Regional scheme should imply more and not less scope for Regional initiative.

The salaries of B.B.C. staff are not likely to be reduced; on the other hand, they will probably be stabilised permanently at their present level. Whether it will be possible now to proceed with the contemplated Provident scheme in lieu of a Pension scheme remains to be disclosed.

Nevertheless, B.B.C. staff have no real grievance. They are not paid as highly as in industrial concerns; but their jobs are fairly safe and their conditions of work excellent.

Orchestral Problems

The imminent disappearance of the National Orchestra of Wales marks the end of the little group of B.B.C. provincial orchestras which meant so much not only to the programmes, but also to musical life outside London.

The station nonettes which have replaced the B.B.C. provincial orchestras are not satisfactory for public performance, their scope and repertoire being limited. It is felt that, short of the re-establishment of the station orchestras, it is still possible for the B.B.C. to take a decisive part in maintaining worthy orchestras in Manchester, Birmingham, Edinburgh, Belfast and Cardiff.

The Belfast situation is, in fact, solved now, various local organisations contributing to a common fund which

enables the B.B.C. to keep an all-the-year-round orchestra going economically.

The B.B.C. Regional Directors believe that broadcasting and concert-giving are necessarily complementary, and that they could evolve schemes of co-operation which, like that at Belfast, would keep good orchestras in being and would not impose on the B.B.C. any additional expenditure.

It seems to me that this proposal should have the most serious and sympathetic consideration; it would be a godsend to the musical profession if applied.

"The First Prom." for the Studio

It is over thirty-seven years since Sir Henry Wood conducted the First Promenade Concert in London. This autumn the B.B.C. will ask Sir Henry to conduct the B.B.C. Symphony Orchestra in a Broadcasting House

THE MIKE IN POLITICS



Recent events have emphasised the importance of the microphone in politics as never before. This picture shows the broadcasting arrangements during a speech by Mr. Lloyd George

Inside News of Programmes and Procedure

studio, and give exactly the same programme as that with which he began the memorable Promenade series in 1894.

A Talks Tangle

The first jubilation over the new talks arrangements of the B.B.C. has rapidly given way to doubt and irritation among many thousands of listeners. It was all very well to release the Regional waves from rigid commitments, and particularly from talks; but that was hardly a justification for what was done to the National programme on 5 X X.

From the First News at 6 p.m. until 8 p.m., except for the Foundations of Music Recital, there is nothing but talk on the National. What the B.B.C. appeared to forget

OPENING A TELEVISION STATION



This is Mayor Walker, of New York, in front of the transmitter during the first television programme broadcast from station W 2 X A B

was its country listeners who are entirely dependent on 5 X X, and with whom there is no question of the luxury of a contrast or alternative programme at any time.

All such listeners, and their number is very great, are condemned for the time being to a real mass of uplift and instruction just when they most want good entertainment.

Incidentally, it is also very bad luck on the British radio trade which looks so much to 5 X X. Something will have to be done about this, and the sooner the better. Make the National as flexible and as free from commitments as the Regional; that is the solution, and the uplifters must take the consequences.

Broadcasting House

A good proportion of the staff of the B.B.C. headquarters, including all the engineers, are now installed in their new quarters at Broadcasting House. Others are joining them as the various floors are equipped; but it is unlikely the move will be completed this side of December.

Baird Television

There are to be some changes in the B.B.C. transmission of Baird Television. I understand the present time allowance is to be decreased; but the new arrangements will allow for transmission at more convenient times; also the use of the portable is to be extended, and the Midland and North Regional may take television.

Clarence Raybould to Conduct

Clarence Raybould, the British conductor who has distinguished himself recording for Columbia and in other ways, is to take a special B.B.C. programme this autumn.

Strain of the Proms.

The strain of the Promenade season has been unusually severe this season. Sir Henry Wood, with phenomenal energy and apparently unlimited reserves of strength, sets a terrific pace and keeps the orchestra up to it.

The ten weeks uninterrupted playing is in itself a test; but perhaps this could be surmounted without undue exhaustion. Rehearsals, however, are the chief cause of fatigue.

And, a member of the orchestra was telling me, rehearsals have been more numerous and exacting this year than ever before. The B.B.C. will have to consider whether it is not expecting too much of the regular orchestra to carry through the Prom. season and then start at once with the regular symphony season, in itself a big test.

"What I Would Do With the World"

One of the talks negotiators at Savoy Hill was telling me the other day some of the interesting things that have been happening about this big series of talks.

Apparently Mr. H. G. Wells, the opener, has become a red-hot radio fan, and is working a lot to make the series a really outstanding success. The Aga Khan is also specially interested and has offered to do as much rehearsals as the B.B.C. will allow.

It is still hoped to include Mr. Winston Churchill. The talks people wanted Sir John Reith, but he declined with emphasis, which seems a pity, because he could have made a striking and interesting contribution.

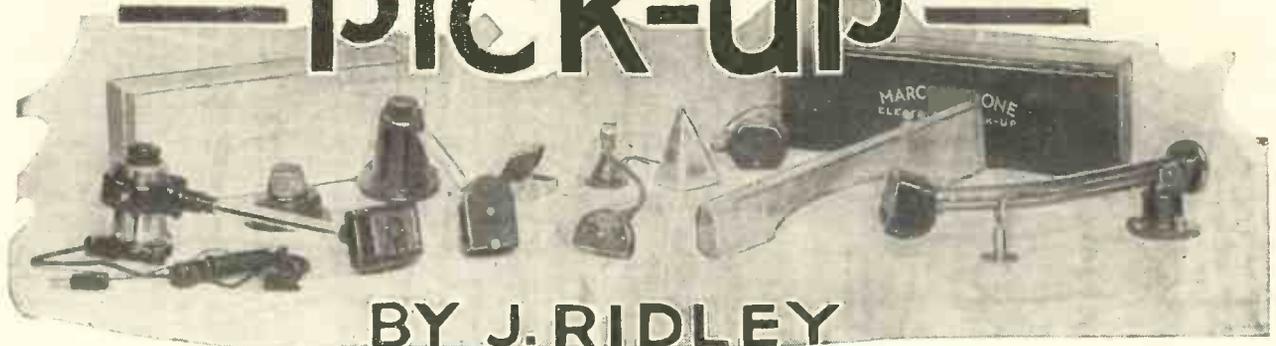
There was also a suggestion that Stalin and Mussolini should be included, but the machinery of getting hold of these celebrities was regarded as too cumbersome. There was also the obstacle of languages.

Wave-length Revision

The B.B.C. is fighting a desperate battle behind the scenes to bring about a revision of the distribution of wave-lengths internationally, in order to put an end to the almost intolerable winter interference on some of its best frequencies.

I gather that the B.B.C. would go some distance in sacrifice if only the other countries of Europe would agree a widening of the intervals between waves.

THE PERFECT PICK-UP



BY J. RIDLEY

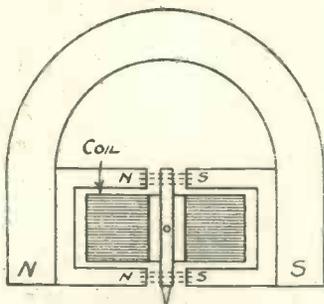
So much has been written on the subject of the gramophone pick-up that there seems to be no valid excuse for rushing into print on the same subject, yet it is a subject that is interesting from whichever angle it may be approached.

But be the point of view that of the much maligned "man-in-the-street," the set-builder, the technician, or the designer, one comes eventually to the essence of pick-up

The avoidance of resonance peaks is one of the most difficult problems of the pick-up designer. And in this account our contributor deals very fully with this matter, and also goes into the question of arranging the pick-up response in order to provide compensation for unequal recording.

grid and filament of the first stage of the amplifier and consequently greatly exceeds the voltages due to other frequencies. Therefore, even if this excessive peak does not overload the first stage, or some other part of the amplifier, it will most likely overload the output valves, and the loud speaker will deliver that particular note with much more volume than is generally appreciated.

A POPULAR TYPE



BALANCED ARMATURE UNIT SHOWING ABSENCE OF FLUX THROUGH ARMATURE WHEN AT REST
A2115 FIG. 1.

design, namely, the avoidance, or suppression, of armature resonance.

Natural Frequency

It is a natural phenomenon that most things have a natural period. That is to say, if we subject almost any article, from the Tower Bridge to a teapot, to a frequency test we shall find that there will be one particular frequency which will cause that body to vibrate in sympathy with the applied frequency; and, furthermore, if we carry the experiment to extremes and increase the amplitude of those vibrations to a sufficient extent we shall be able to shatter that body, no matter of what it may be composed.

Thus it will be gathered that in a

gramophone pick-up the same state of affairs exists, inasmuch as the armature is being subjected via the record and the needle to a source of varying frequency, some particular note of which is likely to strike the natural period of the armature, with the result that it will respond far more readily to that note and so develop an excessive amplitude.

Abnormal Amplitude

Now the effects of resonance, especially when associated with a device which is used for providing a musical input to an amplifier, are far reaching. Consider for a moment just what happens when such a condition is encountered. A pick-up having a fairly pronounced resonance point at, say, a frequency of 1,500 cycles per second encounters, on the record, a note of that nature.

The armature—which has, for argument's sake, been behaving quite normally up to this point—immediately responds to a much greater extent to this note and vibrates with an abnormal amplitude.

Effect of Peak

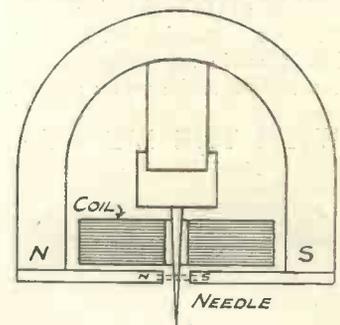
This causes a greater disturbance of the flux across the pole-pieces and through the armature, which results in a comparatively large voltage being developed in the coils of the pick-up.

This voltage is applied across the

Loss of Volume

The trouble, however, does not cease there. The user, not wishing to have this particular note more or less thrust at him, turns to the volume control to reduce the volume to a level at which the offence is less marked, with the result that the overall

USED BY THE B.B.C.



BALANCED ARMATURE UNIT NEEDLE ARMATURE TYPE SHOWING ABSENCE OF FLUX THROUGH ARMATURE WHEN AT REST.
A2116 FIG. 2.

volume is considerably reduced and, more often than not, is unsatisfactory.

Furthermore, it will be found that the walls of the record groove have been badly damaged in that particular position, due to the excessive amplitude developed by the armature.

It is a fundamental fact that the lighter the article, the higher will be

its resonant frequency; so it is imperative that the moving parts of a pick-up be as small and as light as possible, in order that the resonance may fall at a high frequency, if possible outside the range of recorded frequencies.

In the majority of pick-ups on the market the latter has been achieved by making more or less generous use of rubber to damp the armature and so to prevent it oscillating violently on certain frequencies.

Damping, as such, unless very carefully employed, has disastrous effects on the grooves of a record; for it prevents the needle following easily the minute variations of the recording—tending to drag over them, more especially on the lower frequencies, where the amplitude of the groove is comparatively large. This is almost without exception the cause of pick-ups jumping the groove.

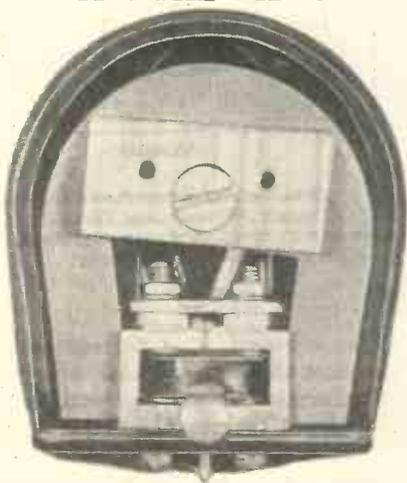
Groove Jumping

Damping must be considered in conjunction with the weight of the pick-up on the record; for if the damping be heavy, then the pick-up must be likewise, or else it will jump grooves of a far higher frequency than normally would be the case.

In view of the foregoing remarks it becomes obvious that in order to avoid resonance within the range of recorded frequencies it is absolutely necessary that the armature be of very small dimensions. (With the armature must, of course, be associated the needle, which always forms a portion of the moving parts.)

Looking at the question from a common-sense standpoint, it becomes obvious that in all instances we require a needle, and also an armature.

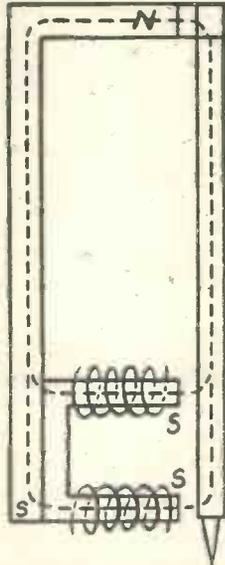
WITH THE LID OFF



This is a view of a modern pick-up with the top removed. Note the operating coil with the needle fixing-screw just below it.

Why not therefore come to the logical conclusion and combine the two, making the needle do both jobs? There are at the moment two makes of pick-ups which embody the needle-armature principle, one of which is

AN OLDER PATTERN



**UNBALANCED UNIT
SHOWING FLOW OF FLUX
THROUGH ARMATURE
WHEN AT REST.**

A2117 FIG. 3.

used by the B.B.C. for the transmission of their gramophone records.

Another highly important factor in the design of pick-ups is that of determining the width of the gap in which the armature has to work. The smaller the gap the more sensitive the pick-up becomes, for the simple reason that the gap acts as a sort of magnetic resistance, cutting down the total flux and therefore reducing also the flux variations due to the motion of the armature, and with it the voltage supplied to the amplifier.

Retaining Magnetism

There is another reason for keeping the gap as small as possible. It is well known that if a magnet be purchased it is always (or should be) supplied with what is usually known as a "keeper." That is to say, a short piece of iron is placed across the pole-pieces to prevent flux leakage.

To a certain degree the pole-pieces of a pick-up may be looked upon as a form of "keeper," for they serve to localise the flux across the gap. Therefore, it will be seen that in order to maintain a magnet in good

condition it is necessary to have as small a gap between poles as possible. There is a limit to all things, and so with a small gap it is necessary to increase by a very large extent the restoring force supplied to the armature.

This, by the way, should not be confused with damping; for though the same force may be utilised to fulfil both conditions, each is different in its function. Rubber is the most common form of damping and restoring force in use at the present moment, although one or two types of pick-ups use oil for the suppression of resonance.

Size of the Gap

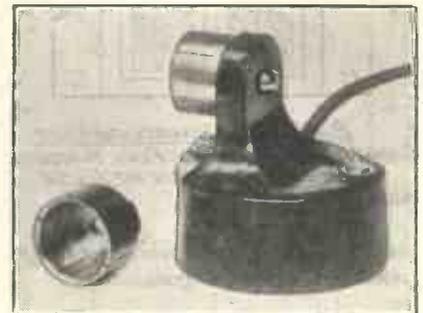
The gap has therefore to be determined very carefully, for a condition might easily occur when it is so small that the force necessary to maintain the armature in a central position is great enough to cause considerable wear on the record.

Perhaps the most important indication of the performance of any type of pick-up is that given by plotting a graph of its frequency response, and to show exactly how a pick-up should behave it is first necessary to study the conditions met with in recording.

The music track on a record consists of a spiral groove, being about 0.006 in. wide at the top and 0.0025 in. deep, whilst super-imposed upon this spiral as mean line there are lateral oscillations of wave-form equivalent to that of the original sound.

In order that the recorded oscilla-

FITS ON THE TONE-ARM



Where economy has to be studied, this type of pick-up is very useful. It fits on the tone-arm in place of the ordinary gramophone sound-box, and is quite effective.

tions may represent a constant intensity of sound over a range of frequencies, the system of recording must ensure constant vibrational velocity of needle point which necessitates the amplitude of recording being inversely proportional to the frequency.

So far so good, until we begin to look a little closer into the matter. The constant velocity method of

Some Points to Watch when Purchasing a Pick-Up

recording is quite satisfactory until the lower frequencies are approached.

Then it will be found that if the recording be carried on down to these limits the amplitude would be so great as to trespass into at least three or four adjacent grooves. So it is clear that some restriction must be adopted if the constant groove pitch is to be used.

It is overcome by allowing the

ledge that nothing is perfect, or, in other words, everything can be improved.

Careful Design Needed

Therefore, the design of the "perfect" pick-up might well be looked upon as a job for life.

The essence of good design is that each part is developed and constructed in such a manner that it in no way

impedes or adversely affects the functioning of the units which go to make up the whole. In other words, it is useless designing a highly efficient magnetic circuit if a part of that circuit is composed of iron of poor permeability.

Granting, however, that we are capable of maintaining a high standard of design, the following points are of

and so to correct to some extent for this additional defect it is desirable to obtain a slightly heavier bass than is technically required.

After approximately 5,000 cycles the curve should fall off rapidly to eliminate undesirable noises brought about by the needle running upon the material which forms the record, such noises being usually referred to as "needle scratch."

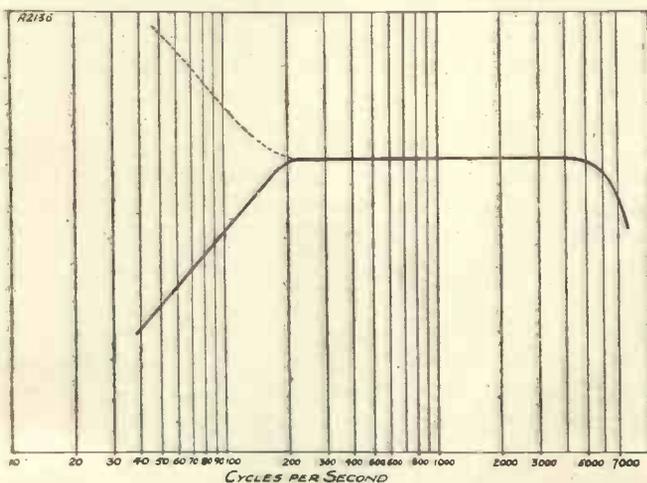
Secondly, the armature. The needle, its associated retaining screw, boss and pivots, are part and parcel of the vibrating system, and should be so disposed that they fall at the point of minimum inertia.

Thirdly, damping, which, as such, should not exist, for it indicates the presence of resonance. Restoring force, however, is tolerable because it retains the armature in its central position against the attraction of the pole-pieces. It should be as light as possible in order that the needle may respond easily to low frequencies and not inflict damage upon the record groove.

Fourthly, the magnetic system. The differential, or balanced, armature system is the most satisfactory from a technical and magnetic point of view, for when the needle is at rest there is no passage of flux due to cancellation.

This is a very desirable feature, due to the fact that the armature has only the flux variations to deal with, and therefore can, magnetically, work more efficiently. See Figs. 1, 2, and 3.

AS RECORDED ON THE RECORD



When making gramophone records it is not usual to get a straight characteristic. As can be seen from the above example, the curve falls away rapidly at the lower frequencies. To make up for this deficiency it is necessary to compensate the reproducing apparatus according to the dotted line.

constant velocity system to terminate at approximately 200 cycles when the characteristic falls away at constant amplitude. This unavoidable recording defect must be compensated for in a well-designed pick-up.

In addition to the lower frequency compensation it is also desirable that the pick-up should be capable of providing a slight rise at the upper end of the scale, in order that the higher frequencies may be powerful enough to overcome the losses introduced by stray capacities in the amplifier. A sharp cut-off in the neighbourhood of 5,000 cycles is necessary if pronounced needle scratch or surface noise is to be avoided.

Good H.F. Response

In one or two pick-ups at present on the market the high-frequency response is so good that it is desirable to use a scratch filter to reduce the scratch frequencies.

The attainment of the ideal is the ambition of most designers, yet at the same time it is common know-

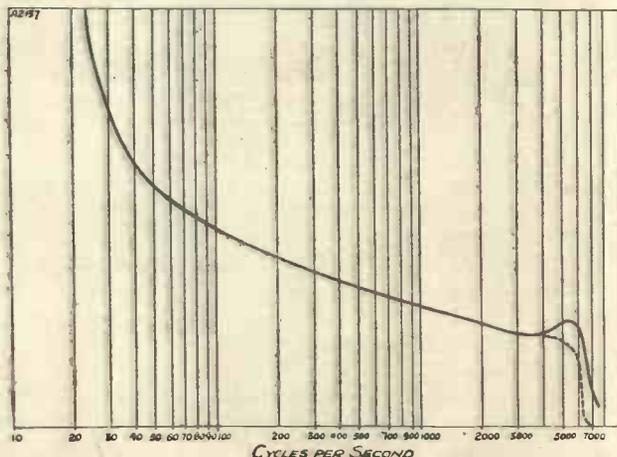
ledge paramount importance towards the attainment of the ideal.

Firstly, the frequency response. This has been dealt with in an earlier

part of the article, but as we are considering details it is necessary to amplify this point. The curve must show a rising characteristic (or rising output) from at least 200 cycles down to 50 cycles in order that the recording deficiencies may be corrected.

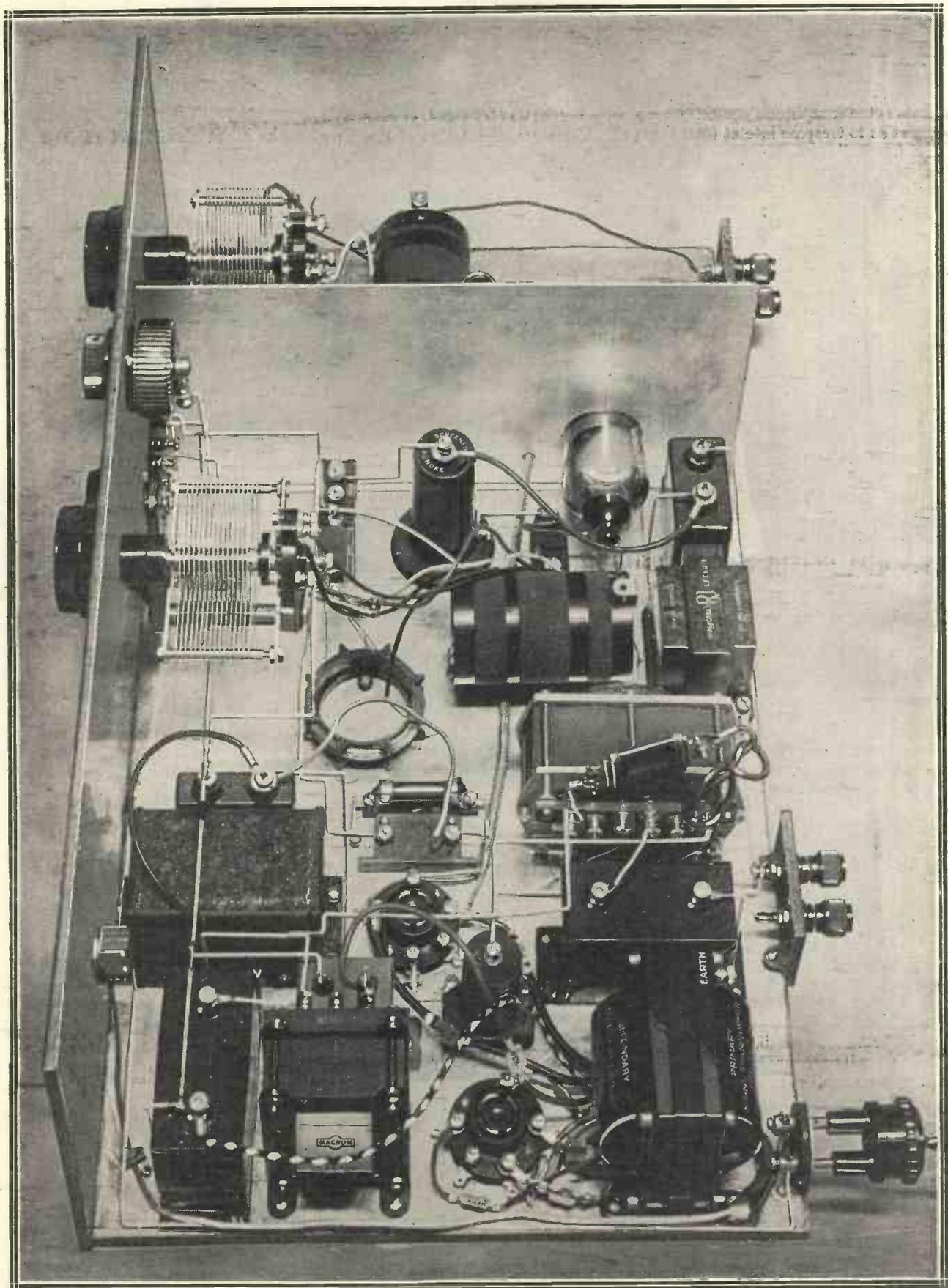
It is not always sufficient merely just to compensate for this fall-off, because the average loud speaker also falls off at that point;

THE IDEAL PICK-UP CURVE



To make up for the lack of bass on the record it is vital that the pick-up should have a rising characteristic at the bottom end. It should also fall off fairly sharply at the high-frequency end, to prevent needle scratch and other surface noises from being too prominent.

A Revelation in Realistic Reproduction



The M.W. "Pent-Ace"

IN presenting this receiver for the attention of our readers a little explanation is necessary concerning the reason why the set was built.

It is not the general type of set with which our readers are familiar, and neither is it in any way a stunt receiver capable of stupendous results that we are placing before constructors as the latest thing in radio set design.

Perfectly Straightforward

On the contrary, from the results point of view it is a perfectly ordinary sort of set, except that it provides peculiarly clear reproduction. Reproduction that is free from those little resonances and persistencies that so often accompany L.F. amplification.

The reason, if you look at the circuit diagram, is obvious—there is no L.F. amplification. The set was built during the course of some experiments into the question of distortion caused by one or more stages of L.F. amplification, and the results were quite a revelation in pure reproduction.

We would not like to say that distortionless reproduction was obtainable from it, for that would be mis-stating the set's properties. But due to the fact that absolutely no L.F. amplification, except that due to the detector valve itself, is employed, the audio-frequency distortion is at a minimum.

The detector, as you will have seen, is a pentode, and it is well known that these valves have little distortion tricks of their own. They are prone to generate what is known as transient distortion, and even used as a detector the valve does not give distortionless output.

Pentode Detector

Uneven rectification, a fault with all average detectors, is still present in this case, as in all radio receivers of anything like normal type, but this slight fault is not increased or exaggerated as well as added to by audio-frequency distortion and uneven amplification which so often takes place in an audio amplifier.

Transformer L.F. coupling is liable to cause peaks at certain places in the

musical scale, while resistance-coupling has a tendency to cause high-note loss. These causes of uneven reproduction are not present in this set, which is remarkably even in its response.

The clarity and crispness of speech and music it provides is rather fascinating, though naturally these qualities are lost unless a good speaker is employed.

As a receiver the "Pent-Ace" Two is not economical, if considered by ordinary standards. Valve for valve,

This is an unusually interesting two-valve all-from-the-mains set, using a circuit quite out of the ordinary. Its screened-grid H.F. valve precedes a pentode detector, and as there is no further L.F. amplification great clarity and crispness of speech and music are obtained. When linked to a good loud speaker it gives wonderfully realistic results from the local station.

judged against an A.C. H.F. and det., and a det. and L.F., the set is really a bit of each. It has fair H.F. amplifying powers, but owing to necessary use of so-called power-grid detection the detector is not a sensitive one.

Again, coupling it with a det.-L.F., using A.C. valves, we have better distance-getting powers, but less L.F. output.

As you see, then, the set comes between the two receivers just mentioned and so stands almost in a class by itself. It provides, however, quite sufficient power for all ordinary living-room purposes when one is listening to local stations.

The theoretical diagram and the photos show at a glance the peculiar nature of the receiver—a set that has H.F. amplification and a detector, but no L.F. side. True, the detector is a pentode, and it is due to the high amplifying powers of this remarkable valve that loud-speaker results are provided direct.

Valve Rectification

A third valve, the A.C. rectifier, is necessary and the usual smoothing circuits associated with A.C. circuits, though in a small set like this these need be in no way elaborate.

So much for a brief introduction to a receiver which is as novel as it is interesting.

The practical details make more ordinary reading, but before we go on to these let us have a look at the theoretical circuit.

We have suggested the type of

A FINE SET FOR LOCAL RECEPTION



With its power-grid-detector and absence of audio-frequency stages the set has none of the "peakiness" or high-note loss so often associated with post-detector amplification.

THE PARTS RECOMMENDED BY "M.W."

- PANEL**
21 x 7 in. (Wearite, or Permeol, Lissen, Goltone, Red Seal, Parex, Becol).
- CABINET**
Panel space 21 x 7 in., baseboard 12 in. deep (Pickett, or Osborn, Camco, Lock, Gilbert, Kay).
- EXTENSERS**
2 .0005-mfd. Extensers (Formo, or Cydon, WaveMASTER).
- VARIABLE CONDENSER**
1 .00015-mfd. or other differential reaction (Ready Radio, or Telsen, Formo, Lotus, Igranic, Polar, Ormond, J.B. Dubilier, Magnum, Lissen, Parex, Burton).
- SWITCH**
1 Mains on-off (Bulgin, or Igranic).
- RESISTANCES**
1 50,000-ohm potentiometer (Regentone Regentstat, or Sovereign).
2 600-ohm Spaghetti (Bulgin, or Ready Radio, Telsen, Varley, Graham Farish, Goltone, Lewcos, Magnum, Sovereign, Igranic).
1 50,000-ohm Spaghetti (Lewcos, etc.).
1 5,000-ohm Spaghetti (Bulgin).
1 20,000-ohm Spaghetti (Bulgin, etc.).
1 .25-meg. leak (Sovereign, or Dublier, Telsen, Ready Radio, Ferranti, Ediswan, Igranic, Graham Farish, Mullard, Watmel).
1 Grid-leak holder (Wearite, or Ready Radio, Dublier, Lissen, Graham Farish, Ediswan).
- VALVE HOLDERS**
1 Horizontal 5-pin type (W.B., or Parex, Bulgin, Junit).
2 Ordinary 5-pin type (Lotus, or Telsen, Benjamin, W.B., Igranic, Formo, Watmel, Graham Farish).
- FIXED CONDENSERS**
4 1-mfd. (T.C.C. and Franklin, or Dublier, Telsen, Igranic, Hydra, Mullard, Formo, H-lsby).
- 2 2-mfd. (T.C.C. and Helsby, etc.).
2 4-mfd. (Formo, or Telsen, etc.).
1 .001-mfd. (Ferranti, or Ready Radio, Telsen, Dublier, Mullard, T.C.C. Ediswan, Lissen, Igranic, Watmel, Formo, Goltone, Graham Farish).
1 .0001-mfd. (Telsen, or see above).
1 .01-mfd. (Igranic, or see above).
- CHOKES**
2 H.F. (Ready Radio and Bulgin, or Telsen, Lewcos, Peto-Scott, R.I., Varley, Parex, Dublier, Wearite, Magnum, Watmel).
3 Smoothing (Magnum, Bulgin and R.I., or Igranic, Wearite, Atlas, Ferranti, Lissen).
1 Output pentode type (Atlas, or Telsen, Ferranti, Varley, R.I.).
- TRANSFORMER**
1 Mains type (Ferranti type S.V.4).
- COILS**
2 (Home-wound) coil quots (Sovereign, or Ready Radio, Peto-Scott, Wearite, Tunewell, Goltone, A.E.D.).
1 P.J.2 (Lewcos, or Ready Radio, Wearite, Ferranti, Melbourne, Sovereign, R.I., A.E.D., Peto-Scott).
1 P.J.3 (Lewcos, or see above).
- MISCELLANEOUS**
1 Screen, 12 x 6 in. (Magnum, or Ready Radio, Parex, Peto-Scott, Wearite).
1 Sheet of copper foil, 12 x 21 in.
2 Terminal blocks (Sovereign, or Belling & Lee, Junit).
4 Terminals (Belling & Lee, or Telsen, Clix, Igranic, Goltone).
1 Mains plug (Bulgin, or Ferranti).
4 Crocodile clips (Goltone).
1 Foot of metallised cable or twisted flex (Lewcos).
Wire (Glazite, or Lacoline).
Flex, screws, etc.
4 oz. 30 D.S.C. for long-wave coil quot.
2 ozs. of 24 D.S.C. for Contradyne coil.

with an ordinary tuning condenser, but this would break away from one of the features that make modern wave-change sets so fascinating.

Selectivity control is supplied by tapped aerial and primary windings on the medium-wave coils, and auto-coupling taps on the long-wave units. But in most cases it will be found sufficient to adjust on the aerial circuits and to use maximum sensitivity in the intermediate circuit.

An A.C. S.G. valve is used to provide high-frequency amplification, and the amplified energy is passed on through a .0001-mfd. condenser to the detector.

Power-Grid System

This is arranged to act as a power detector, with a low value of grid leak, and, moreover, is not an ordinary three-electrode valve, but a pentode, the famous Mazda A.C./Pen being used for the purpose.

The output from the valve is then fed via a filter system, consisting of a 4-mfd. condenser and a tapped pentode output choke, to the loud speaker.

Beside the tuning and reaction adjustments and the tone adjustment mentioned later there is nothing to be varied except the volume control.

This is carried out by means of a 50,000-ohm potentiometer across the H.T. to vary the potential of the screening grid of the S.G. valve.

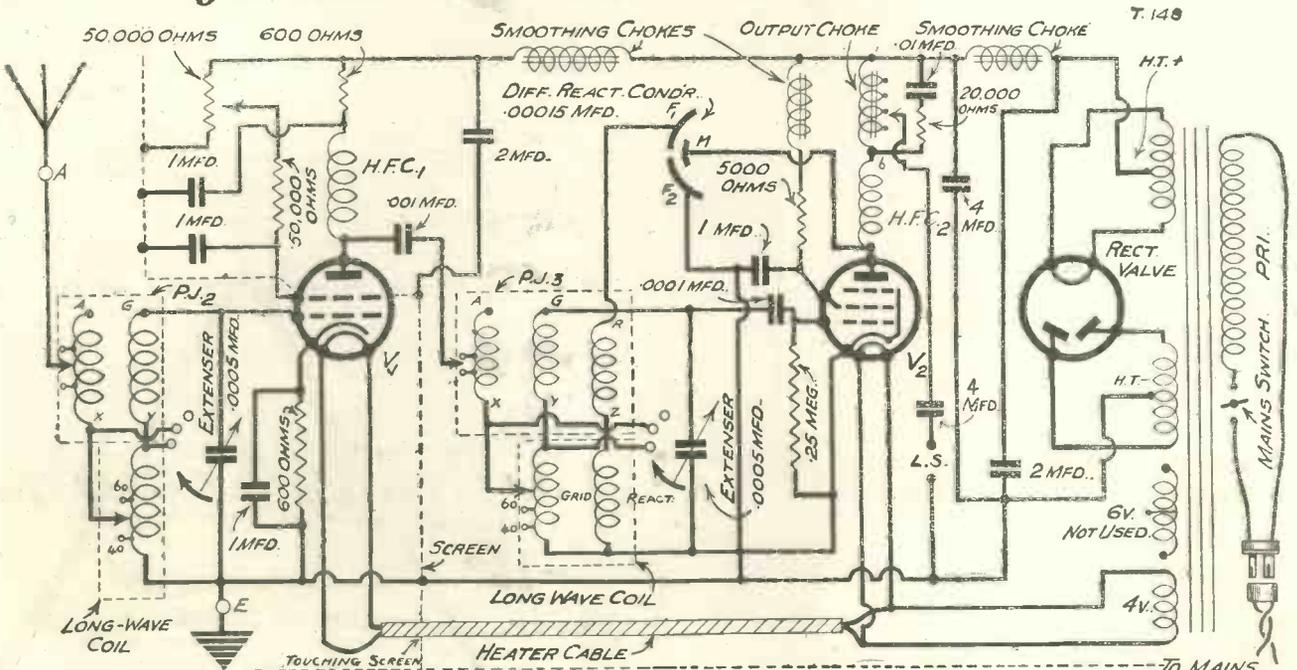
It enables very smooth volume control to be obtained, and also allows accurate adjustment of the

circuit that is employed, but now we must be more explicit and discuss some of the details.

In the first place, the Extenser in conjunction with P.J. coils is used

to enable automatic change-over from medium- to long-wave bands to be carried out. A two-point on-off switch in each case where an Extenser is employed could be used instead

You Have Never Seen a Circuit Like This!



The first valve is a screened-grid H.F. amplifier with "automatic bias," and it is followed by a pentode power-grid-detector. Full-wave rectification is employed, and the two-band wave-changing is simplified by Extenser tuning.



Tested & passed
G.P. Kendall
CHIEF ENGINEER
READY RADIO

THE "M.W." "SUPER-QUAD"

	£	s.	d.
1 Panel, 16" x 18", drilled to specification		5	6
1 Polished "oak" cabinet, 16" x 8", to specification, with 12" baseboard	1	7	6
1 Wavemaster .0005-mfd. double-gang Extensur with insulated cam	1	15	0
1 Wavemaster .0005-mfd. Extensur with insulated cam and S.M. drive	15	6	0
1 ReadRad three-point wave-change switch	1	6	0
1 Lewcos 25,000-ohm spaghetti resistance	1	6	0
1 ReadRad 2-meg. grid leak and holder	1	4	0
1 Sovereign 50,000-ohm potentiometer	4	6	0
5 Four-pin valve holders		2	6
1 Five-pin valve holder			8
1 T.C.C. .0002-mfd. fixed condenser, type 34	1	6	0
3 T.C.C. .001-mfd. fixed condensers, type 34	5	6	0
1 T.C.C. 2-mfd. fixed condenser, type 50	3	10	0
1 T.C.C. 1-mfd. fixed condenser, type 50	2	10	0
1 Dubilier .04-mfd. non-inductive type fixed condenser	2	0	0
1 Lewcos H.F. choke	6	0	0
1 ReadRad super-hot, choke	5	6	0
10 Belling-Lee marked terminals, type "R"	2	6	0
1 Terminal strip, 18" x 2", drilled to specification	1	6	0
6 Belling-Lee indicating wander plugs	1	0	0
2 Spade terminals	2	3	0
1 Packet Jiffilix for wiring	2	6	0
1 R.I. transformer, ratio 7-1, type G.P.	10	6	0
1 Varley square peak extensur coil	15	0	0
1 Lewcos oscillator coupler with base-board mounting bracket	12	6	0
1 Lewcos filter coil without pigtail, type I.F.P.	10	6	0
1 Lewcos "filter" coil with pigtail, type I.F.P.	10	6	0
4 Valves as specified: 1 Cossor D.G., 1 Cossor S.215, 1 Osram H.L.210, 1 Mazda Super-Power 250A	3	2	0
Flex, fixing screws, etc.		7	0
TOTAL (including Valves and Cabinet)	£12	13	0

KIT "A" (less Valves and Cabinet) or 12 equal monthly instalments of	£8	3	6
KIT "B" (with Valves less Cabinet) or 12 equal monthly instalments of	£11	5	6
KIT "C" (with Valves and Cabinet) or 12 equal monthly instalments of	£12	13	0

RECOMMENDED ACCESSORIES.

2 Fuller 60-volt triple capacity H.T. batteries	£1	3	0
1 Fuller 9-volt grid-bias battery	1	0	0
1 Siemens 1½-volt S.G. cell		9	0
1 Fuller 2-volt 40-amp. L.T. accumulator	12	3	0
1 Celestion loudspeaker, type D.10	3	0	0

Mr. G. P. Kendall, B.Sc., has now joined the staff of Ready Radio as Chief Engineer. He was for many years Assistant Technical Editor and Chief of Research in "Popular Wireless" and "Modern Wireless." Meet him at Stand No. 6, National Radio Exhibition, Olympia.

JIFFILIX

Wire every set you build with Jiffilix. They eliminate soldering and give perfect contact. Each packet contains 40 assorted lengths of insulated connecting wires fitted with gripfast ends. Ample to wire a large set. Easily shaped to any angle. Ideal for quick "hook-ups." Can be used over and over again. Price 2/6 per packet.

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Everything Radio can be supplied against cash. In case of doubt regarding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon delivery of the goods. All goods are very carefully packed for export and insured: all charges forward

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Your goods are despatched post free or carriage paid. Any component can be supplied separately.

THE "FOUR-BAND" THREE

	£	s.	d.
1 Ebonite panel, 18" x 8" x 3/16", drilled to specification		6	0
1 Polished oak cabinet with 10" baseboard	1	5	0
1 Wavemaster .0005-mfd. Extensur with vernier control	15	6	0
1 ReadRad .0003-mfd. reaction condenser	3	6	0
1 Wearite 3-pole double-throw switch, fitted with terminals			
1 Wearite 4-pole double-throw switch, with baseboard mounting bracket and ganging extension rod	10	0	0
1 Sovereign ¼-meg. volume control	4	6	0
1 Lewcos 25,000-ohm spaghetti resistance	1	6	0
1 Graham Farish Ohm (15),000-ohm grid leak with terminals	1	3	0
1 R.I. 250,000-ohm wire wound resistance and holder	9	6	0
1 ReadRad 2-meg. grid leak and holder	1	4	0
3 Four-pin valve holders	1	6	0
1 T.C.C. .0003-mfd. fixed condenser, type "M"	1	0	0
1 T.C.C. .0003-mfd. fixed condenser, type 34	1	6	0
1 T.C.C. .0003-mfd. fixed condenser, type "S"	1	3	0
1 T.C.C. .01-mfd. fixed condenser, type 34	3	0	0
2 T.C.C. 2-mfd. fixed condensers, type 50	7	8	0
1 ReadRad P.J.1 coil	3	6	0
2 ReadRad quito coils	5	0	0
1 ReadRad H.F. choke	4	6	0
1 R.I. output choke, type G.P.	12	6	0
6 Single coil holders	5	0	0
6 Plug-in coils, Atlas, 2 No. 2, 2 No. 4, 1 No. 6, 1 No. 9	15	7	0
1 R.I. "Dux" L.F. transformer	6	9	0
9 Belling-Lee marked terminals, type "R"	2	3	0
1 Packet Jiffilix for wiring	2	6	0
1 Sheet copper foil, 10" x 18"	1	6	0
2 L.T. made terminals	1	3	0
6 Belling-Lee indicating wander plugs	1	0	0
3 Valves as specified: 1 Cossor S.G.215, 1 Mullard P.M.1.L.F., 1 Mullard P.M.2.	1	19	0
Flex, fixing screws, etc.		11	0
TOTAL (including Valves and Cabinet)	£9	14	6

KIT "A" (less Valves and Cabinet) or 12 equal monthly instalments of	£6	10	6
KIT "B" (with Valves less Cabinet) or 12 equal monthly instalments of	£8	9	6
KIT "C" (with Valves and Cabinet) or 12 equal monthly instalments of	£9	14	6

RECOMMENDED ACCESSORIES.

1 Fuller 120-volt H.T. battery	15	3	0
1 Fuller 9-volt Q.B. battery	1	0	0
1 Fuller 2-volt 30-amp. L.T. accumulator	10	3	0
1 Amplion A.V.4. loudspeaker	2	10	0

To **READY RADIO, Ltd., 159, Borough High Street, London Bridge, S.E.1**

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Please despatch to me at once the goods specified for which I enclose payment in full of

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Please despatch to me at once goods specified for which I will pay in full the sum of

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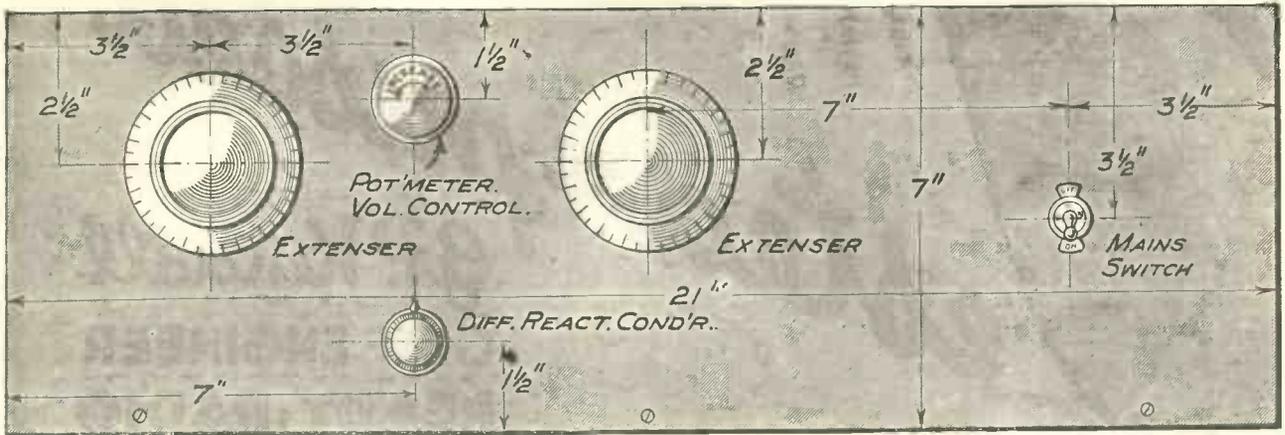
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It Uses the Famous "P.J." Coils



PANEL LAYOUT.

X.763

There is no wave-change switch, of course, because the Extensers automatically tune over the long or medium waves, according to the dial readings. (Below 100, medium waves; over 100, long waves.)

screening-grid voltage to be made, ensuring that the S.G. valve operates under the best conditions.

The pentode valve's priming grid is carefully de-coupled and the potential between this and the cathode is

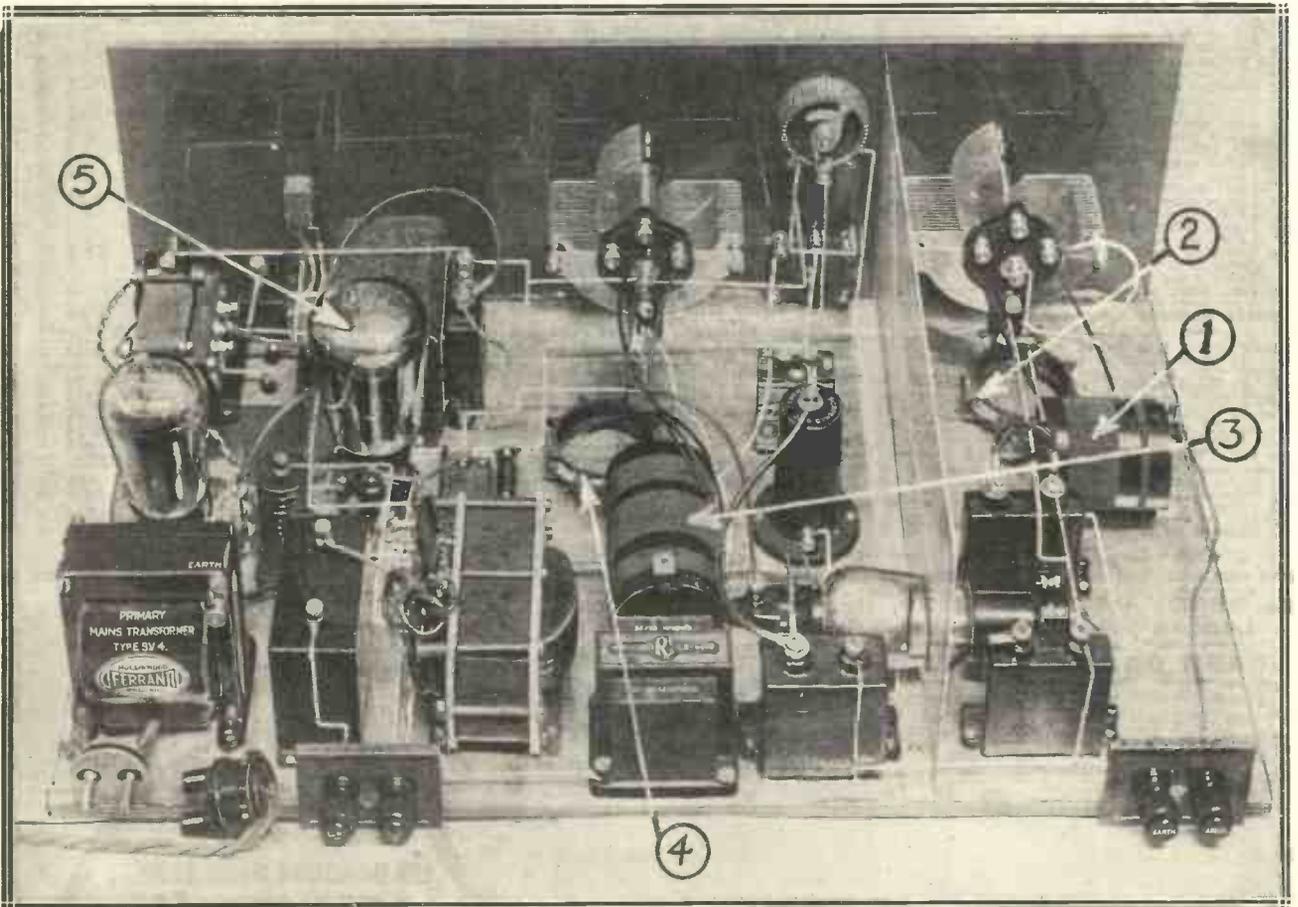
governed by the value of the resistance used for the de-coupler.

Care has to be taken that the pentode valve is never subjected to heavy "build-up" in A.C. potentials across its electrodes, and so the

tone adjuster mentioned later plays two roles. It prevents any damage being done should the loud speaker inadvertently become disconnected while the set is in operation.

Full-wave rectification is employed

Some Outstanding Features of the "Pent-Ace"



The P.J.2 coil unit is shown at (1), and (2) denotes the long-wave coil quoit. Similarly (3) and (4) show the medium- and long-wave interval couplings respectively. The pentode detector is seen at (5).

for the H.T. power supply, while 4 volts filament pressure is supplied to the heaters of the two valves and to the rectifier. Automatic bias for the S.G. valve is the used, and it is only necessary to plug the set into the mains, and connect aerial and earth and the speaker.

Plenty of Space

The construction of the set was carried out on generous lines so that it should be easy to carry out experiments with the circuit, and incidentally this makes it easy for any interested constructor to make a copy of the receiver should he so desire.

Plenty of space has been left between components, and this not only makes the layout a simple procedure, but also simplifies wiring to a very great extent.

In wiring, assuming that the mounting of components on the panel and baseboard has been completed, it is best to carry out the heater connections first. Those from the mains transformer to the rectifier and to the pentode are carried out with the flex attached to the transformer, but for the connection between the heaters of the pentode and the S.G. valve we used the metal-braided double wire.

Only about 10 inches are required,

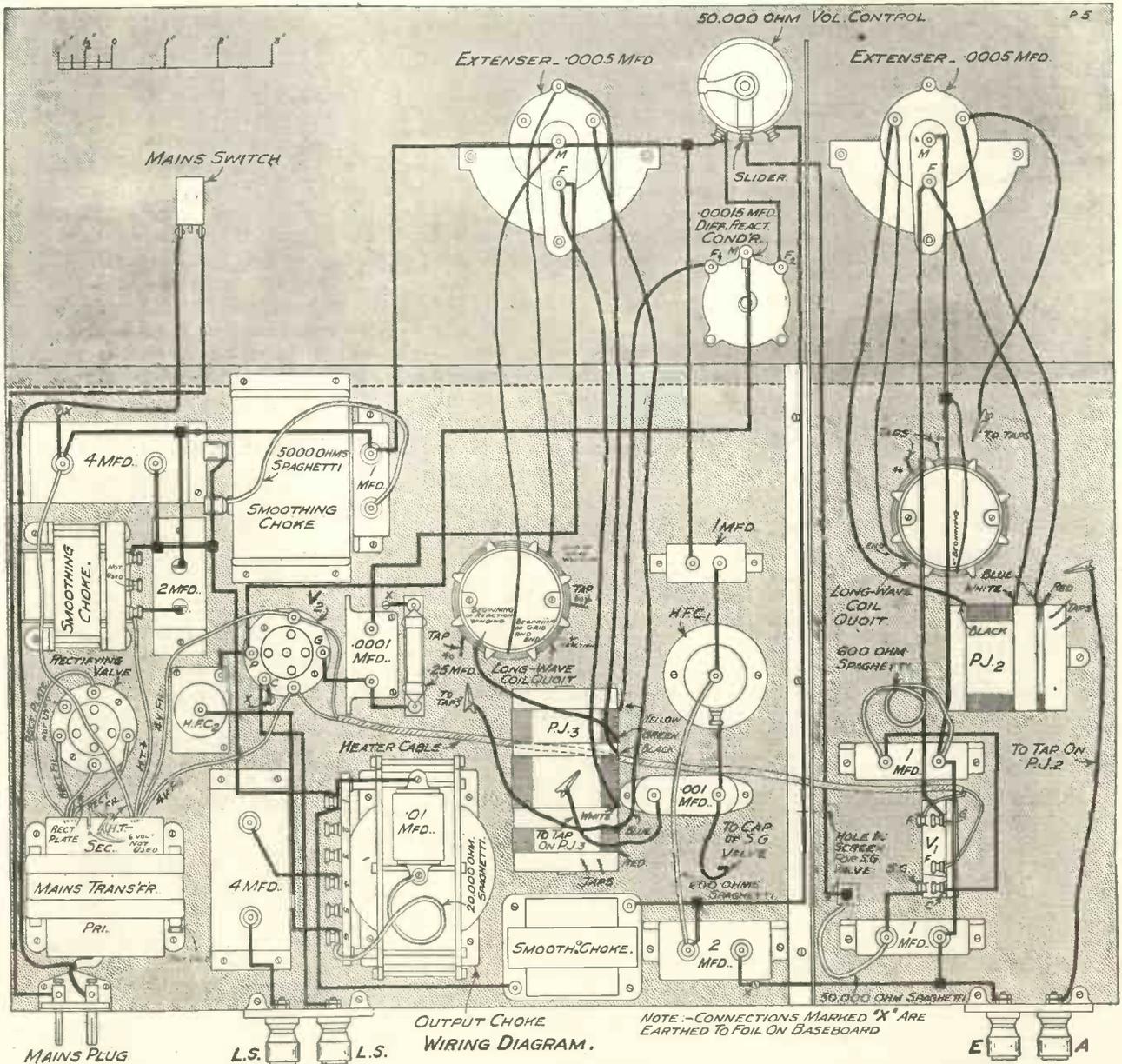
and with so short a length it is not really necessary for this wire to be used if you have none on hand. In such a circumstance ordinary twisted flex would do quite well.

Tapped Output Choke

The pentode output choke is tapped so that rough matching up of the anode circuit impedance to the requirements of the valve is a fairly simple job. The loud-speaker circuit, of course, is in shunt with the choke.

As the tapped choke also has across it a Spaghetti resistance in series with a .01-mfd. condenser for tone adjustment, the choke should be mounted so that it is easy to get at

How the Wiring of the "Pent-Ace" is Carried Out



All the connections are given in this diagram of the wiring, which should be compared with the various photographs during the construction. Note that the connections marked X are earthed to the foil on the baseboard.

The Screening is Completely Trouble-Free

the tappings. For this reason an Atlas unshrouded pentode output choke was chosen.

This has the tappings taken to terminals at the top of the instrument, whereas when the shroud is placed on the choke the whole thing is turned upside down and the tappings then come out to terminals at the bottom.

The wiring to this choke therefore will be of flex on the one side, while a

neglect this and just to take the markings for granted. Thus H.T. — need not be traced out as the centre-tap of the H.T. winding, or H.T. + as the centre of the rectifier filament winding.

Just take these leads to their correct points in the circuit and go by the colours and markings of the remaining leads for the connections that go to the ends of the windings.

and the long-wave into one or other of the long-wave coil tappings.

The detector circuit clips should be set as follow. Crocodile from 001-mfd. condenser connected to anode of S.G. valve should go to white, and the long-wave clip can then be neglected altogether. Only in very difficult cases need the medium-wave clip go to red in this circuit.

Finally, for the benefit of those who wind their own coil quito, the following data will be useful. Long-wave aerial coil quito: 150 turns of 30 D.S.C., tapped at 40 and 60. Beginning taken to end of grid coil (coloured black) and end to earth.

ACCESSORIES

Loud Speaker. (Amplion, Celestion, Blue Spot, Mullard, B.T.-H., Undy).

Valves. 1 A.C.S.G. (Eta, or Mazda, Mullard, Osram, Cossor, Six-Sixty).

1 A.C. pentode (Mazda A.C./Pen, or Mullard Pen. 4V).

1 Rectifier (U.10, or D.W.2, 506B.U. U.U.60/250, W.462).

small 01-mfd. fixed condenser, together with a suitable Spaghetti resistance, are best chosen for the tone adjuster.

The Tone Control

The latter has the effect of cutting down the proportion of high notes to low notes; in other words, it is a high-note attenuator, and the amount of attenuation is determined by the resistance of the Spaghetti. The lower the value of this the more are the high notes lost. For average purposes about 15,000 ohms seem about right.

A simple snap-action mains switch is used between one pole of the mains plug in the set and one side of the mains transformer, and this allows control of the set to be carried out independently of any power or electric light plug or switch. A single-pole break switch is quite sufficient.

The mains transformer used in the original set (Ferranti S.V.4) has no terminals, the connections to the windings being made by means of lengths of coloured flex.

Transformer Connections

There are four secondary windings: one for H.T., one for rectifier filament, one for the heaters of the valves, and the fourth for a 6-volt output valve. This latter winding is ignored and the leads from it (clearly labelled by the manufacturers) are coiled up and tucked safely away.

The leads from the transformer are clearly marked, but at first it is a little difficult to trace the windings from which they come. It is best really to

Coloured Leads

The leads are coloured distinctly, and H.T. + will have two more leads (probably marked Rectifier Fil.) of the same colour and marking, which will show that they are the associated ends of the same winding.

The operation of the receiver is perfectly straightforward, the tuning is easy to carry out, and as the receiver is an all-electric one, no H.T. or G.B. adjustments have to be made.

Reaction is controlled, as usual, by the bottom knob on the panel, and volume by the upper knob. It is impossible to give the screen grid an over-voltage owing to a limiting resistance in series, so that you can turn the potentiometer knob as you like. The maximum position will be fairly well marked.

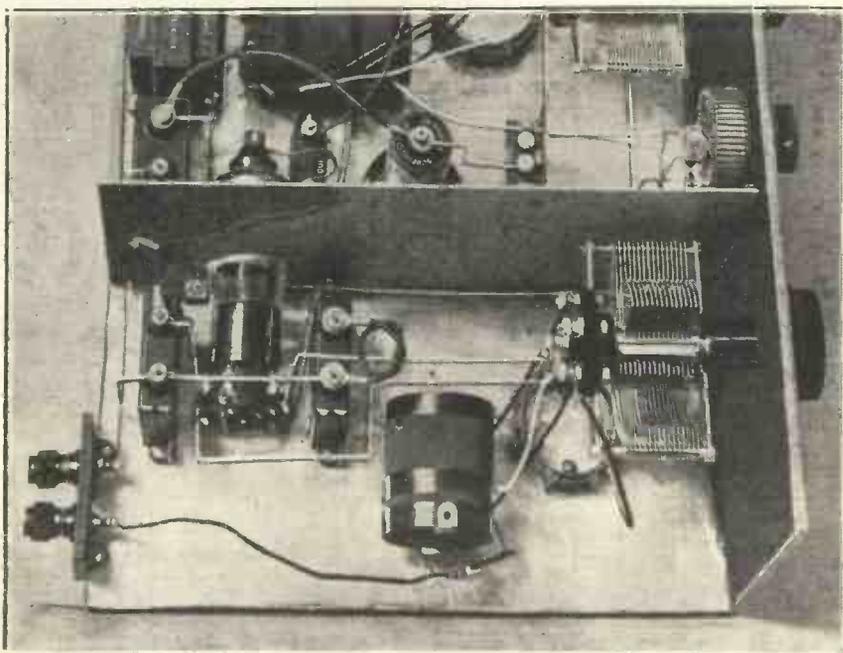
Selectivity is varied best in the aerial circuit by placing the medium-wave crocodile clip on to the red flex,

Long-Wave Windings

The long-wave quito for the detector has a reaction winding under the grid winding, and is made as follows: 30 turns 30 D.S.C., wound on and then covered with layer of Empire tape. End of reaction winding now joined to beginning of a grid winding, to be wound over the Empire tape, and to consist of 150 turns of same wire. The winding is tapped at 40 and 60 turns.

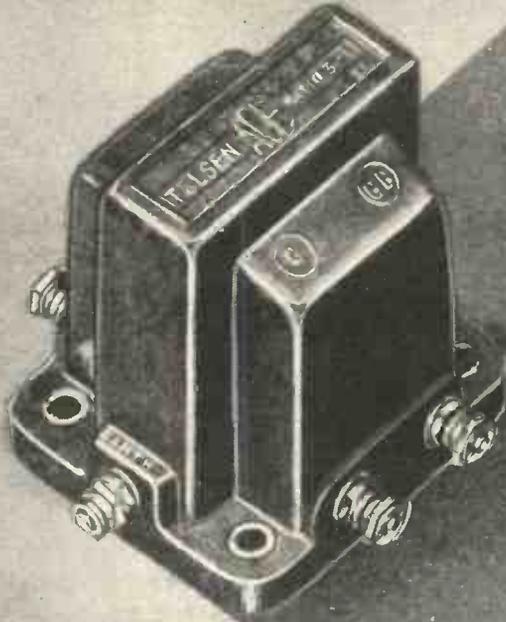
Connections are: Beginning of reaction to end of reaction winding on medium-wave unit (green flex), end of grid winding to bottom medium grid winding (black), junction of reaction and grid windings to earth.

PLENTY OF ROOM ON THE BASEBOARD



This photograph, taken from the "screened-grid end" of the set, shows the generous spacing allowed for the radio-frequency circuits. Apart from the stability thus ensured this makes for easier construction.

Telsen's first claim to fame



TELSEN L.F. TRANSFORMERS

From the commencement of the construction era, Telsen transformers have been pre-eminent. They have earned a wonderful reputation for long service and lasting efficiency.



It is an achievement which has been made possible only by careful design, meticulous methods of production, and stringent tests under actual broadcast conditions.

You are assured, therefore, that buying a Telsen transformer, for a comparatively small outlay, you are purchasing a precision instrument which will give a high standard of quality and performance over many years.

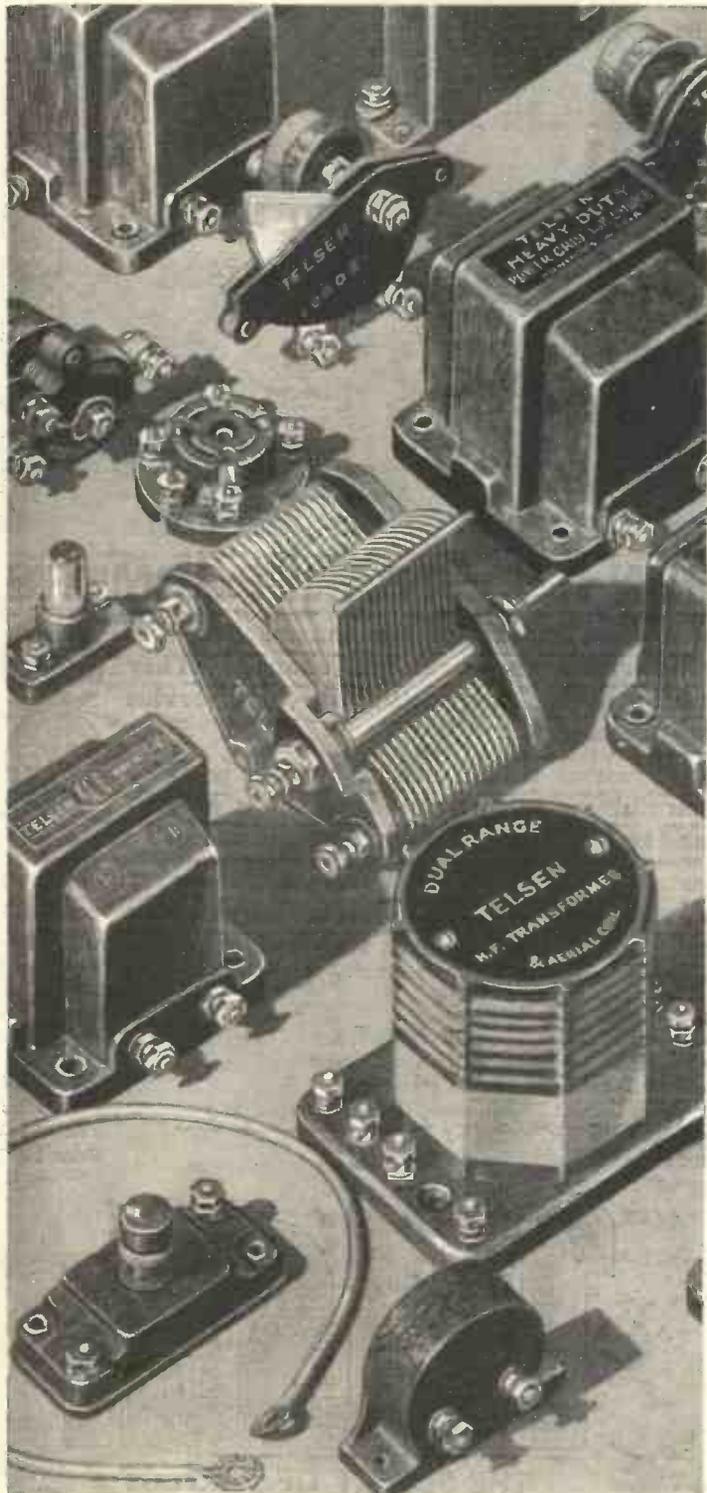
Telsen "Ace" Transformer, Ratios 3-1, 5-1	Price 5/6
Telsen "Radiogrand" Transformer, Ratios 3-1, 5-1	Price 8/6
Telsen "Radiogrand" 7-1 Super Ratio Transformer	Price 12/6
Telsen Intervalve Transformer, Ratio 1:75-1	Price 12/6
Telsen Multi-Ratio Output Transformer, Ratios 9-1, 15-1, 22 5-1	Price 12/6
Telsen Output Transformer, Ratio 1-1	Price 12/6
Telsen Pentode Output Transformer	Price 12/6

TELSEN

THE SECRET OF PERFECT
RADIO RECEPTION



BUILD BETTER WITH



The foundations of Telsens's amazing success were established long before Olympia. The crowds at Stand 19 are only the crowning achievement of years of patient research and careful planning, and the justification of the new Telsens Components and new Telsens prices announced in June of this year.

Experts and amateurs, mass constructors of radio sets, and enthusiasts whose keenness is confined to one home set—all have paid generous tribute to the construction, the finish and the performance of the whole Telsens range of radio components.

They build better than they know who build on Telsens.

- Valve Holders .. from 6d.
- Push-Pull Switches from 1/-
- H.F. Chokes from 2/-
- Transformers from 5/6
- Output Chokes .. from 8/-
- Power Grid Chokes .. 8/-
- L.F. Coupling Chokes .. 5/-
- Slow-Motion Dial 2/6
- Mica Condenser 6d.
- Pre-Set Condenser 1/6
- Variable Condenser .. 4/6

TELSENS

THE SECRET OF PERFECT
RADIO RECEPTION

TELSEN COMPONENTS

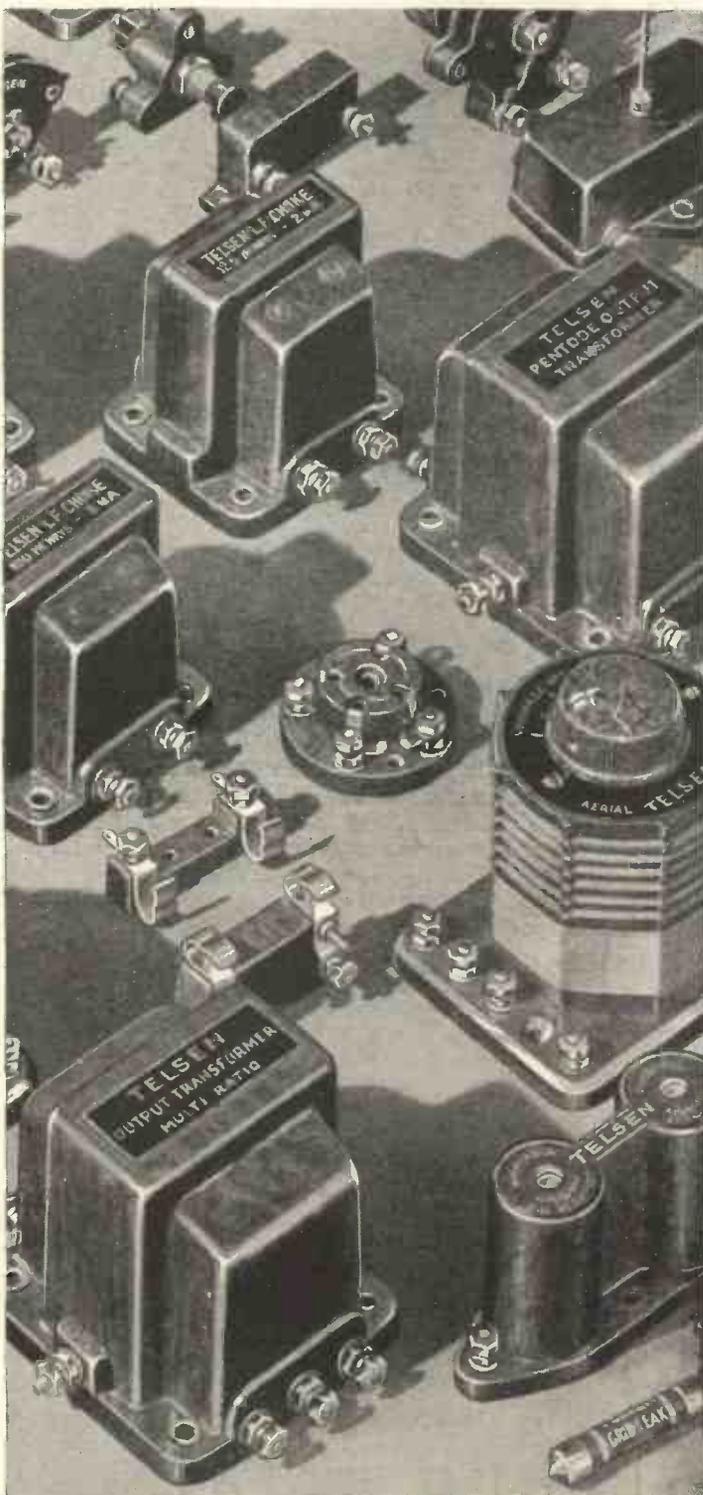
You can see for yourself at the Telsen Stand at Olympia that everything claimed for the new Telsen Components is, if anything, understated. Pick up these components, admire the solid construction—from smallest to largest, each one a work of real craftsmanship. Consider the handsome Bakelite casings and the grained finishing and marvel that such proud quality can be priced so modestly. Ask any questions you like and read the specifications for yourself—and finally put Telsen to the test of actual performance—you will be proud of the achievement of an all-British firm.

They build better than they know who build on Telsen.

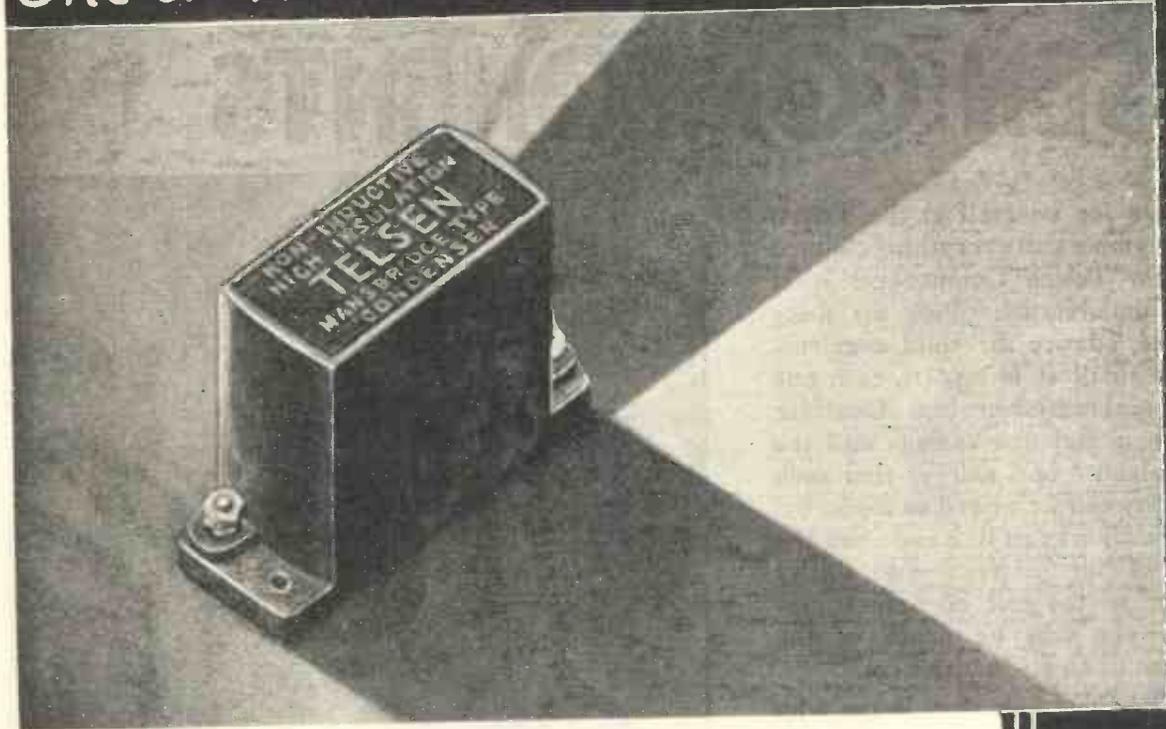
- Tuning Condenser 2/-
- Reaction Condensers from 2/-
- Differential Condenser . . 2/-
- Paper Condensers . . from 1/6
- Spaghetti Resistances from 6d.
- Loud-Speaker Unit 5/6
- Loud-Speaker Chassis . . 5/6
- Aerial Coils from 5/6
- Fuse Holder 6d.
- Grid Leak 9d.
- Grid-Leak Holder 6d.

TELSEN

ALL-BRITISH
RADIO COMPONENTS



One of Telsen's latest achievements



TELSEN MANSBRIDGE TYPE CONDENSERS

Telsen have installed the most advanced plant in the world for the manufacture of Mansbridge Type Condensers. Only genuine Mansbridge foil paper and the finest linen tissue are employed in the exclusive method of manufacture. Every Telsen Mansbridge Type Condenser is hermetically sealed from the atmosphere, and Post Office standards of insulation are adopted throughout.

The preliminary research, the most modern plant in the world, the finest raw materials, the latest methods of manufacture and the final test, all combine to give Telsen Mansbridge Type Condensers a high insulation over years of service with freedom from breakdown. The type of construction employed makes them genuinely non-inductive.

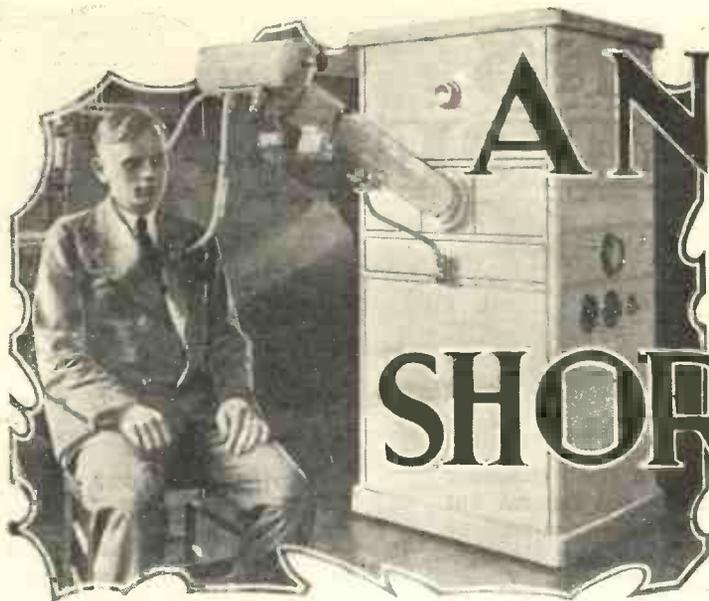
THE FOLLOWING VALUES ARE GUARANTEED WITHIN 5%.

Cap. mfd.	500 Volt Test		1,000 Volt Test	
	Cat. No.	Price	Cat. No.	Price
.01	W.83	1/6	W.90	2/6
.04	W.81	1/9	W.88	2/9
.25	W.80	2/-	W.87	3/-
.5	W.79	2/3	W.86	3/3
1.0	W.78	2/3	W.85	3/6
2.0	W.77	3/-	W.84	5/-

TELSEN

**ALL BRITISH
RADIO COMPONENTS**

Adv. of Telsen Electric Co. Ltd., Birmingham.



A NEW USE FOR SHORT WAVES

From a Special Correspondent who describes some fascinating experiments which are being conducted in Germany.

LATELY, electrical waves of only a few metres have aroused the interest of radio scientists in all parts of the world. In Germany, Professor Esau, working at the University of Jena, greatly enlarged our knowledge of the character of these waves by his investigations.

In the course of his experiments Professor Esau noticed that physiological effects of various kinds are caused by ultra-short waves. He believes these waves are destined to play an important part, not only in radio technique, but also in the medical field.

Distant Treatment

Encouraged by Professor Esau's work, Dr. Schliephake, of the medical university at Jena, has created a method of ultra-short-wave diathermy. The ordinary diathermy method works with wave-lengths of 300 and 600 metres.

The new ultra-short-wave treatment uses wave-lengths of ten metres and less. Another fundamental difference lies in the method of applying the electrodes. In ultra-short-wave diathermy the electrodes do not touch the body of the patient, while in the older long-wave system the electrodes must be placed directly on the member to be influenced.

They Penetrate Deeply

Dr. Schliephake found that the effects of ultra-short-wave diathermy go far into the depth of the body, and that the irradigation is largely attainable by changing the wave-length.

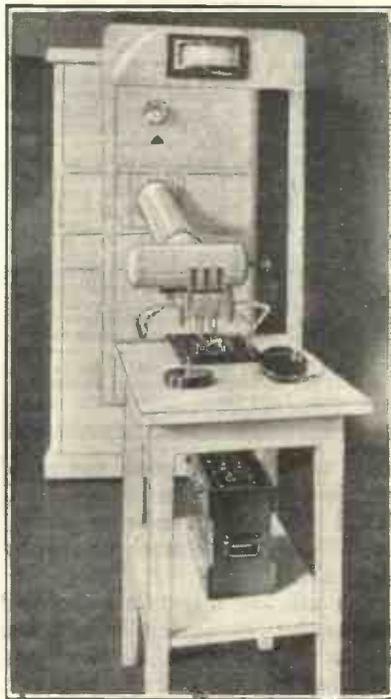
The apparatus developed for the new treatment consists in a valve-transmitter entirely screened from the

capacity effects of the human body by a metallic housing. The oscillations of this circuit go to the electrodes through lines of about three feet long arranged in movable arms.

The arms consist of silvered brass tubes, and carry at the ends the elec-

trodes between the two electrodes which form the conducting parts of a condenser. This condenser-field is of great therapeutic effect.

THE TESTING TABLE



An experimental outfit on which the newly discovered effects are being observed. The screened transmitter is at the back.

trodes of aluminium, that can have various forms adapted to the special treatment desired. In ultra-short-wave diathermy the body is not influenced by electro-magnetic waves.

It is placed into a condenser-field

AERIAL COUPLINGS

IF you are refurbishing up your old short-wave set and are dissatisfied with it in two ways, quite easy cures are available. First, if your signals are not strong enough, particularly if you loose-couple your aerial, try changing over to capacity coupling, and make it as tight as you can without "killing" the set.

The simplest form of capacity coupling is the connection of the aerial, through a small pre-set condenser or even a neutralising condenser, on to the grid end of the grid coil.

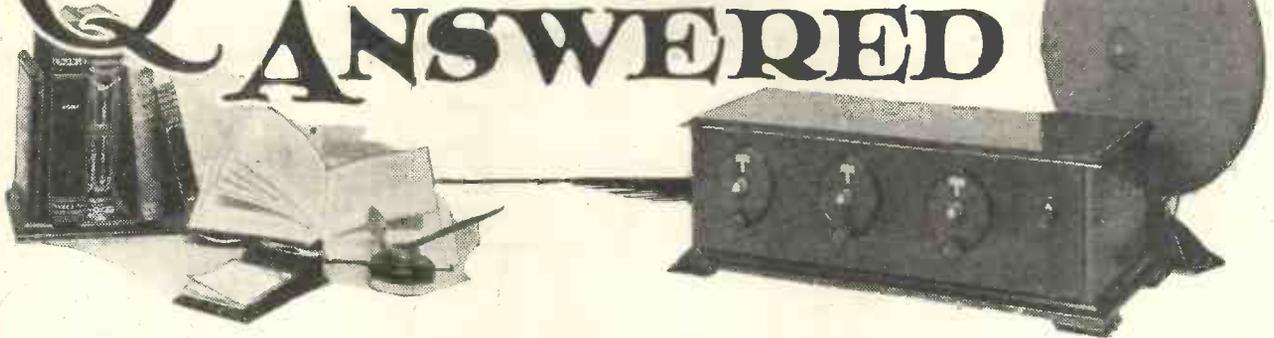
Too Many Noises

Secondly, if your signals are all right, but the set strikes you as bringing in too much in the way of extraneous noises, loosen your aerial coupling. If you use the capacity variety, simply make the capacity smaller, or change over to inductive coupling with a separate aerial coil of about six turns. If you are already on inductive coupling, loosen it off a little.

This must seem painfully obvious to "old hands," but I crave their patience and ask them to remember that they were novices once and probably thought that these and other obvious remarks were weighty words of wisdom!

J. R. P.

QUESTIONS ANSWERED



A "Mixer" Valve

"PUZZLED" (Norwich).—"I have been reading an American technical article in which I noticed the term 'mixer' valve. The circuit referred to was a super-heterodyne, and I am not clear as to the precise meaning of this term. Can you enlighten me, please?"

The term "mixer" is used to denote the first detector in a super-het. It is quite a good name, since this valve has to deal with the incoming oscillations which are at signal frequency, and the local oscillations which are super-imposed upon the incoming oscillations to produce the beat frequency.

So if we refer to the first detector as the mixer valve because it "mixes" the two sets of oscillations, we do not get confused between the first and second detectors. In fact, we can if we wish then speak of the second detector simply as *the detector*.

Detector Efficiency

M. K. L. (Surbiton).—"I was recently experimenting with my four-valve set, and in the course of my experiments I joined a .0001-mfd. fixed condenser from plate to filament of the detector. Immediately there was an increase in volume, and whereas previously there had been a slight 'sizzling' sound on loud signals now these same signals came through clear and undistorted. Was this due to some other factor, or is it usual to connect capacity across these two points?"

This is a difficult question to answer in your particular case, but it is a fact that a detector valve needs a plate to filament H.F. by-pass for its efficient operation.

In most sets this is supplied by the reaction condenser, as, for instance, the differential type, in which there is a constant by-passing capacity of whatever value the condenser happens to be. If reaction is not used it is

advisable to join a small condenser between the anode and filament, but the value of this condenser must be kept low so as not to effect the high-note reproduction.

Band-Pass Tuning

L. M. (Northfleet).—"I am desirous of building a three-valve detector and two L.F. receiver, and in

TECHNICAL QUERIES DEPARTMENT

Are you in trouble with your set?

The MODERN WIRELESS Technical Queries Department is in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical.

Full details, including the revised scale of charges, can be obtained direct from the Technical Queries Department, MODERN WIRELESS, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of MODERN WIRELESS should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problem.

London readers, please note: Inquiries should not be made in person at Fleetway House or Tallis House.

order to obtain a good degree of selectivity without loss of quality I should like to use band-pass tuning. Am I likely to lose much volume by doing this?"

You will lose a certain amount of volume by employing two tuned circuits arranged as a band-pass filter, but you must expect this with a det. and 2 L.F. if you wish to obtain the selectivity and freedom from side-band cutting that a band-pass filter gives.

You can use reaction to make up for the losses, but you must not apply too much reaction, otherwise the reproduction will suffer and nothing will be gained by using the band-pass scheme.

Pentode Output

N. K. C. (Cardiff).—"I am keen on using a pentode in your three-valve receiver, but I don't like the quality I get when I insert one of these valves in the output stage in place of my super-power type. The reproduction is high-pitched, but I am not employing a special output circuit. Could this be the reason?"

If you are connecting the speaker directly in series with the pentode then you must expect the quality to be high-pitched. You should try a choke-capacity filter, using a tapped output choke of high inductance. If necessary you can adjust the high-note response further to your liking by connecting a 50,000-ohm variable resistance and a .01-mfd. condenser in series across the choke.

Remember that in order to obtain perfectly stable operation with a pentode the screening grid must be de-coupled. A 10,000-ohm resistance and a 2-mfd. by-pass condenser should do this adequately.

D.C. Mains Units

A. J. W. (Horsham).—"Will you please let me know what precautions are necessary when using a D.C. mains unit for H.T.? Do I have to modify the set in any way?"

You must disconnect your earth lead from the earth terminal on the receiver and transfer it to the special earthing terminal on the unit. Alternatively, a large fixed condenser (about 2 mfd.) must be inserted in series with the earth lead. It is also advisable to place a .002-mfd. fixed condenser in series with the aerial lead and to use a choke condenser or transformer output to the loud speaker. When employing a D.C. mains unit it is highly important to isolate any parts of the set from the mains that may come into contact with the hands.

ANNOUNCING THE NEW RANGE OF J.B. PRECISION INSTRUMENTS

J.B. ENCLOSED GANG. (.0005) Extremely rigid. Totally enclosed. Units matched within 1% and fitted with .0001 "trimmers." Mounts on side or base. 2-gang, 20/- 3-gang, 29/5

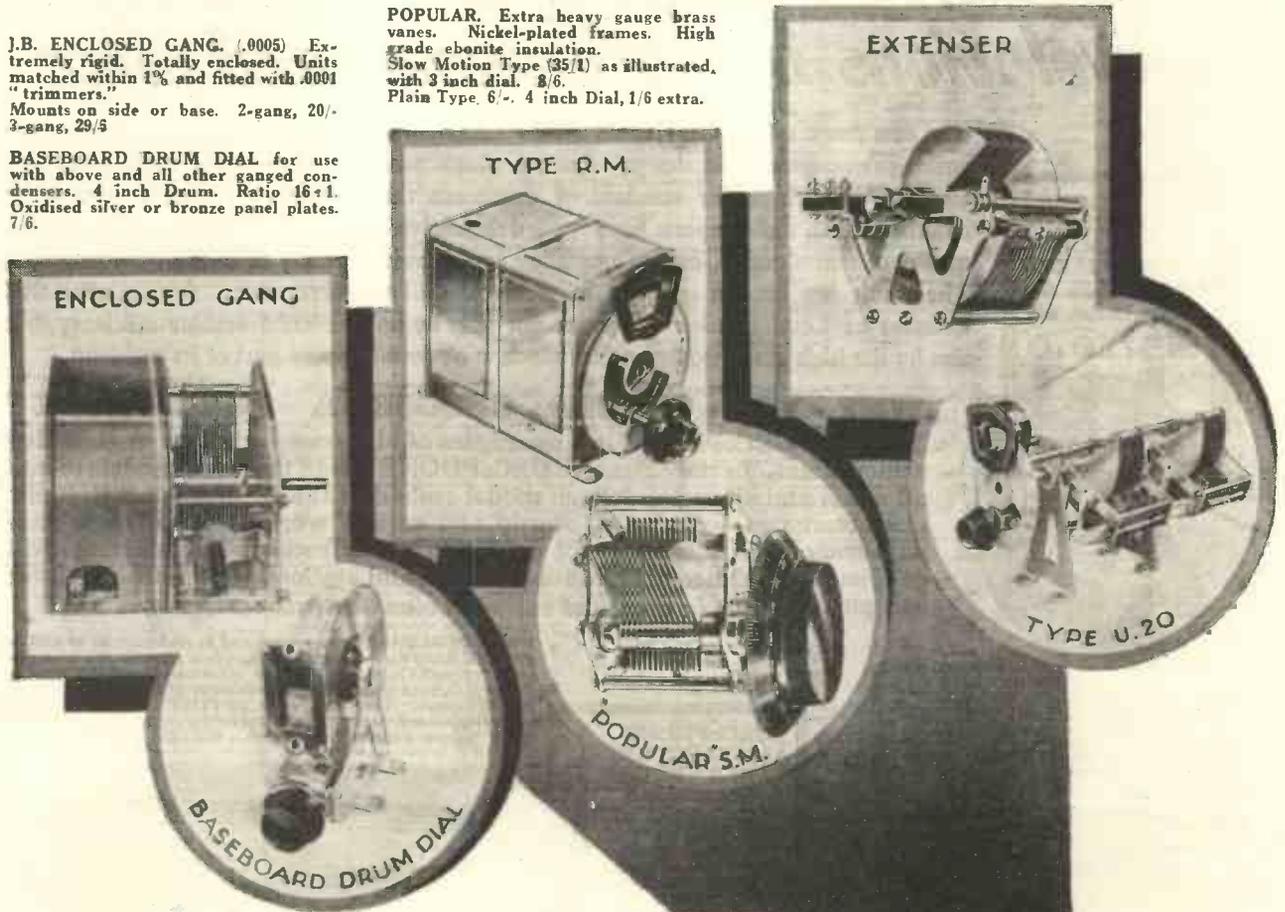
BASEBOARD DRUM DIAL for use with above and all other ganged condensers. 4 inch Drum. Ratio 16:1. Oxidised silver or bronze panel plates. 7/6.

TYPE RM SCREENED 2-GANG CONDENSER (.0005) used in "Radio for the Million" V3 Kit Set. Complete with Disc Drive and Panel Plate 22/-.

POPULAR. Extra heavy gauge brass vanes. Nickel-plated frames. High grade ebonite insulation. Slow Motion Type (35/1) as illustrated, with 3 inch dial. 8/6. Plain Type. 6/- 4 inch Dial, 1/6 extra.

J.B. EXTENSER. Individually adjustable switch contacts. Rigid 4-point braced frame. Highly finished. Complete with illuminated Vernier Disc Drive. .0005 mfd. 14/6.

TYPE U 20 2-GANG for use with "Square Peak" Coils. Complete with Illuminated Wavelength-calibrated Disc Drive. 24/-.
Type U.30 3-Gang 34/6.



For J.B., years of specialisation have been years of progress. J.B. have gone on from success to success, making tuning still simpler and still more accurate.

J.B. design ensures electrical and mechanical perfection. J.B. precision results in unfailing accuracy and balance. J.B. workmanship and J.B. materials perfect a range of Precision Instruments scientifically designed by practical engineers.

New J.B. products not illustrated on this page include Air-space Differential Condensers at 4/3, Baseboard Trimming Condensers at 1/-, etc., etc.

See them all at

STAND 62
NATIONAL RADIO EXHIBITION, OLYMPIA.

PRECISION INSTRUMENTS



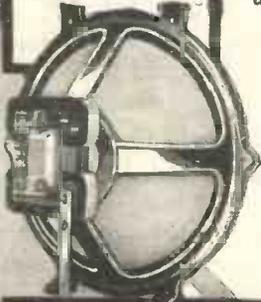
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your guarantee

GECOPHONE

New and improved models - revelations in performance and price

The new range of GECOPHONE Radio Receivers and Loud Speakers presents many striking developments in design—features which raise the pleasures of radio entertainment to a much higher standard of excellence than previously attained. For many months G.E.C. radio experts have applied themselves ceaselessly to the task of improving quality of reproduction, ease of operation and intrinsic beauty of cabinet construction. The result has been a triumph of technical skill and experience. A GECOPHONE Receiver or Loud Speaker impresses not only by its wonderful audible efficiency, but also by the high-grade workmanship which is obvious in every part of its make-up.

**GECOPHONE
INDUCTOR
DYNAMIC
LOUD SPEAKER**
(Farrand Inductor Pat.)
PRICE, Chassis only
£3.10.0

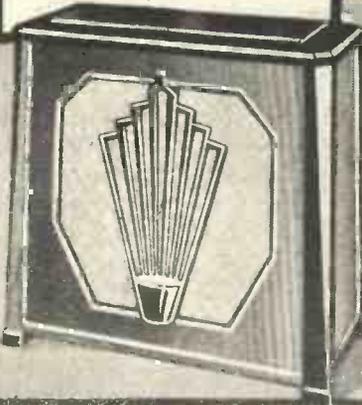


WHY YOU SHOULD CHOOSE A "GECOPHONE"

The name GECOPHONE is a guarantee of high-class wireless engineering achievement. In the extensive GECOPHONE range there are models to suit all needs and all tastes. Each model embodies the inherent G.E.C. Radio characteristics—reliability, sturdy and expert workmanship, high-class appearance and simplicity of operation. Any receiver in the range will get you a full choice of Home and Continental stations with amazing power and purity. *Fill in and post coupon below for full particulars.*

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**GECOPHONE INDUCTOR
DYNAMIC LOUD SPEAKER**
Unrivalled performance on all types of receivers. Attractive walnut cabinet.
PRICE . £5 . 10 . 0
HIRE PURCHASE: Deposit £1 and 12 monthly payments of 8/-



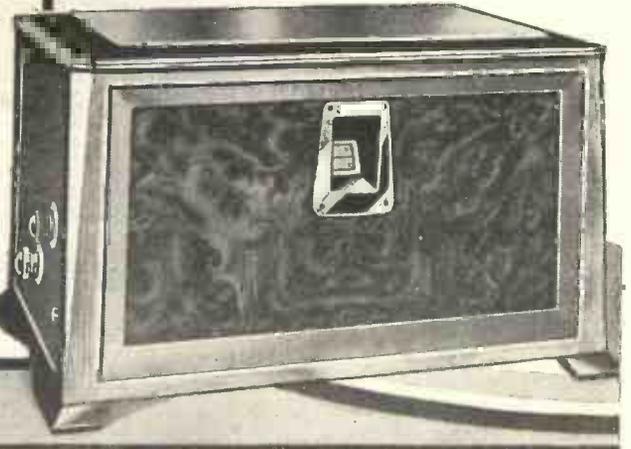
**GECOPHONE
ALL-ELECTRIC
TABLE "FOUR"**
(For A.C. Mains)

A really powerful Receiver giving the finest performances under modern broadcasting conditions. Cabinet medium walnut with front panel to match.

PRICE, including OSRAM VALVES and Royalty

20 Gns.

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Deposit £2 10s. od. and 12 monthly payments of £1 13s. od.
D. C. MODEL £25 0 0



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GECOPHONE CONSOLE ALL-ELECTRIC RECEIVER
(For A.C. Mains)

A self-contained floor cabinet type Receiver with built-in Inductor Dynamic Loud Speaker. Inlaid Walnut Cabinet.

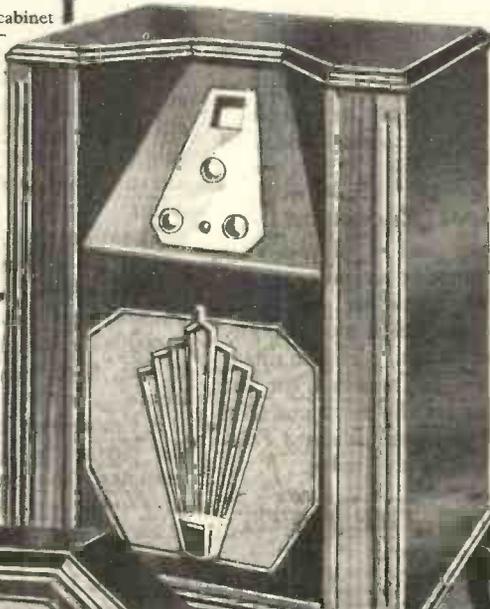
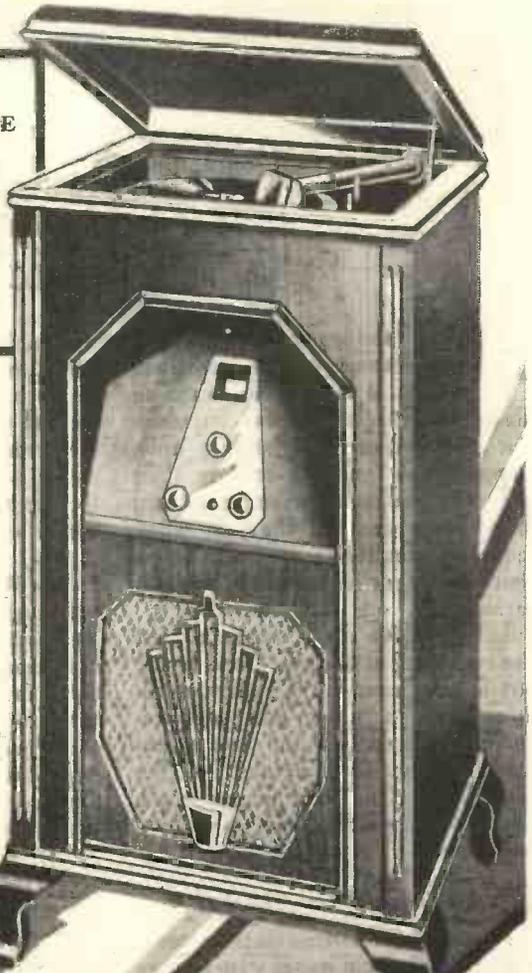
PRICE including OSRAM VALVES and royalty **29 GNS.**

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GECOPHONE ALL-ELECTRIC RADIO-GRAMOPHONE
(For A.C. Mains)

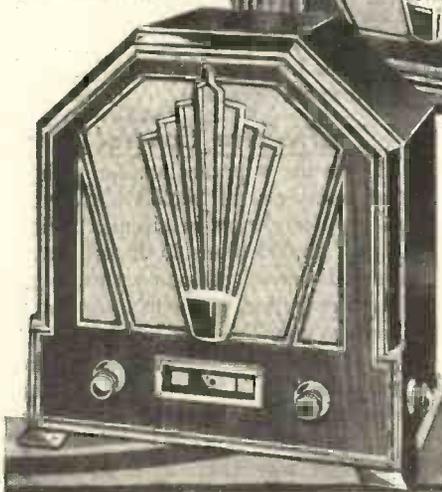
A model which sets a new standard of radio-gramophone entertainment. An enormous advance for this type instrument. Inlaid walnut cabinet.

PRICE including OSRAM VALVES and Royalty **40 GNS.**
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If you are visiting the NATIONAL RADIO EXHIBITION do not fail to see the GECOPHONE Radio Receivers and Loud Speakers on the 2 G.E.C. Stands and the Special Demonstration Room in the Gallery, National Hall.



GECOPHONE ALL-ELECTRIC "COMPACT" RECEIVER
(For A.C. Mains)

WITH BUILT-IN INDUCTOR DYNAMIC LOUD SPEAKER.

A new self-contained Receiver giving pure and powerful output from a wide range of stations. Handsome polished walnut cabinet.

PRICE including OSRAM VALVES and Royalty **18 GNS.**

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Please send me Folder No. B.C. 5958 giving particulars of GECOPHONE Radio Receivers and Loud Speakers.

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USING A FRAME AERIAL

With the increasing popularity of super-heterodynes frame aeri- als are coming more and more into the foreground. Here is an article which will prove of great interest and practical use to all readers employing this type of antenna.

By R. W. HALLOWS.

HANDY and convenient as it is, the frame is from the electrical point of view by no means an ideal collector of wireless impulses. For this reason sets relying upon frame aeri- als are apt to lose their apparent liveliness in summer-time, or at other times of the year when reception conditions are bad, unless there is a large reserve of H.F. magnification.

Let me give an illustration. At the beginning of this year I was trying out a new seven-valve super-heterodyne with a screen-grid high-frequency amplifier and two intermediate-frequency amplifiers of the same kind. The total magnification available therefore was something enormous.

An Auxiliary Aerial

I knew that American stations working on the medium waves were coming in particularly well, so that on the first night when this set was in use I sought for some of them, expecting to make a large capture. To my surprise I could not obtain so much as a whisper from any of them even when using headphones whilst tuning.

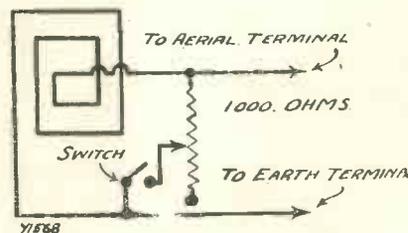
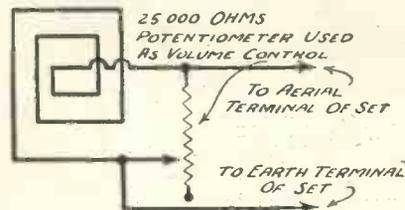
It occurred to me that the frame must be at the root of the trouble, though it was a particularly good one wound with 27/42 Litzendraht cable. Fishing out a reel of No. 22 double-cotton-covered wire and a couple of insulating pins, I rigged up a comic aerial some three yards in length between the curtain pole and a picture rail immediately above the set. The frame was left in position and the down lead was attached to the aerial terminal of the set.

In a few seconds I had found the first American station, and before I went to bed a couple of hours later over thirty had been logged. With the frame alone impulses were not powerful enough to get the set going; the tiny auxiliary aerial made all the difference.

Improves Reception

Readers may find it of the very greatest assistance to use an aerial of this kind with portables, transportables, or any sets which are normally operated from frames. The auxiliary aerial may not be required for the local station or for the more powerful foreigners. For more distant stations, though, it is invaluable.

REDUCING THE INPUT



A very good method of controlling the volume when using a frame aerial is that shown above. The variable resistance effectively adjusts the input to the receiver.

When an auxiliary aerial is used with a frame it is sometimes, though not by any means always, advisable to employ an earth connection as well. When this is done the frame ceases to work as a frame, almost if not entirely losing its directional properties.

There are some houses in which the frame works badly if used in the ordinary way. Should yours happen to be one of these the auxiliary aerial suggested may solve what has previously appeared to be a baffling problem.

Too Much Volume

Sometimes we can help the frame out in quite a different way. Most sets designed to operate from this kind of collector have, as has been said, a very great deal of high-frequency amplification.

For long-distance work this is ideal, but when an attempt is made to receive the local station at close range horrible distortion may result, particularly if screened-grid valves are used. Inefficient though it is as a collector, the frame in such circumstances is simply swamped and the grid swings reaching the H.F. valves are such that most undesirable effects occur.

There are several satisfactory ways out of the difficulty. The best is to use a volume control of quite an unusual kind. It consists simply of a variable resistance connected as shown in Fig. 1, directly in shunt with the frame.

A convenient form of resistance for the purpose is a wire-wound potentiometer. That end of the frame which goes to the aerial terminal of the set is taken to one end of the windings of the potentiometer, whilst the other end of the frame goes to the slider and to the earth terminal.

Effective Control

If you use a potentiometer with a total resistance of 25,000 ohms you can keep it always in circuit. With the full 25,000 ohms in it will have practically no effect upon your foreign station reception, and when you want to reduce your local station to reasonable strength you simply turn the knob of the potentiometer until quite a small amount of resistance remains.

Another way (Fig. 2) is to use a potentiometer with a total resistance of only about 1,000 ohms, arranging a switch which will cut it out when it is not required. The instrument is then used solely for cutting down the volume of the local station.

SQUARE

PEAK

(REGD TRADE MARK)

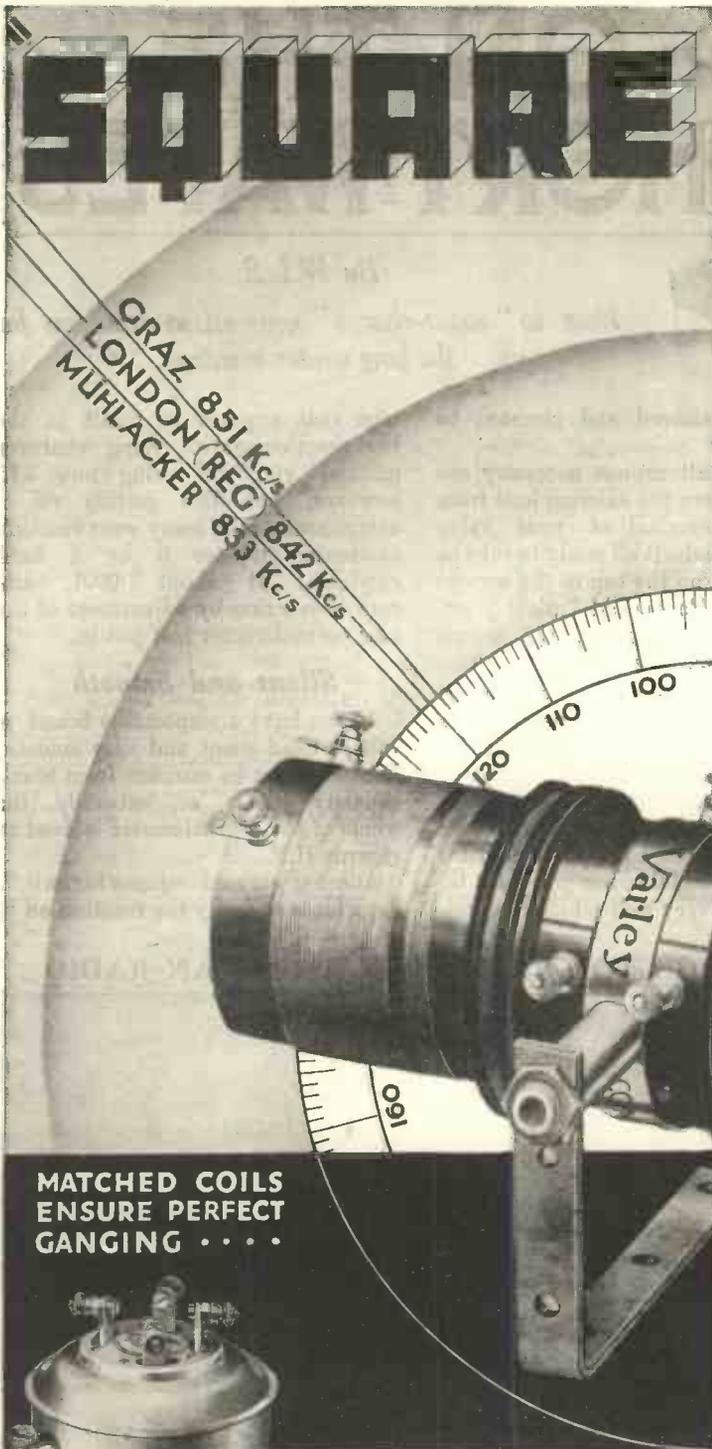
9 Kc. SEPARATION!

The Varley "Square Peak" Coil. Gives the sharp tuning of a Super-Het at lower cost and without "mush" or loss of quality. "Almost uncanny station separation . . . Full band-pass tuning on both wave-bands . . . windings extremely closely matched . . . undoubtedly one of the most successful components of its kind as yet produced." ("Modern Wireless," July and August, 1931.)

"For selectivity I have seen nothing to equal the "Square Peak" Coil, and although I have built dozens of receivers I have never obtained such wonderful tone. (F.A.G.)

The "Square Peak" Coil (Regd. design No. 763904, Patent pending), gives a constant square-topped peak and separation of substantially 9 Kc. over the whole of both wave-bands. Easily replaces most existing aerial coils. Needs no screening.

Illustrated is the new additional model BP7 with terminals instead of wave-change switch, enabling the coils to be used with Extensers or any type of remote control switch.



**MATCHED COILS
ENSURE PERFECT
GANGING**



H.F. INTERVALVE COIL. (Dual range). New model without switch, for use with the "Square Peak" Coil type BP7. Completely screened. Its inductance inside the screen is exactly matched to that of the "Square Peak" Coil to ensure perfect ganging.

List No. BP8. Price 8/6

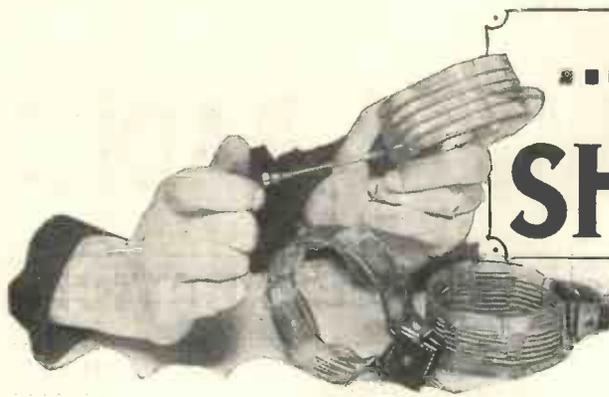
(Also supplied with wave-change switch. List No. BP6. Same price.)

15/- Supplied with Universal mounting bracket (Model BP5. Complete with wave-change switch. Same price).

THE "SQUARE PEAK" COIL

Varley

STAND No. 58 OLYMPIA



... ON THE ... SHORT WAVES

By W.L.S.

How to "super-charge" your set in readiness for the long winter evenings.

PERHAPS, as this should mark the commencement of the "live" season for radio, and particularly short-wave radio, I shall not be out of order if I indulge in rather more technicalities than usual.

First, however, it may be recorded that late August supported its record for bad weather with another one for bad radio conditions! There were occasions when everything looked quite rosy, but there were no long periods of even fairly good conditions.

The usually interesting 48-50-metre band of waves was a washout, except for European stations—mainly Moscow!—and the only band worth listening to at all was the "below 25" section.

Seize Your Chance

Now for a few hints for "super-charging" your short-wave set in readiness for the long winter evenings. It always strikes me as a pity that most of us, myself included, wait until conditions are good, and then lose half the good period by rebuilding our receivers! Surely it is more logical to fill up one's time by doing these jobs while we have nothing much to listen to.

The only difficulty is that it is so hard to tell whether we have made an improvement or not unless conditions are *uniformly* bad; one cannot say from one day to another whether a certain station has actually doubled its strength or whether it is the receiving gear that is providing the extra "push."

But we can be sure that there *will* be a good long period when listening is worth while, so set to now.

S.G. Detectors

First on the list of worth-while improvements that do not involve much trouble must be placed the screen-grid detector. This always results in a definite increase in sensitivity, and generally makes the set

more well-behaved and pleasant to handle.

The only alterations necessary are these. Remove the existing lead from the plate terminal of your valve holder and make it all ready to take to the terminal on the top of the screen-grid valve. To the old "plate" terminal (now, of course, the screen terminal) H.T. must be fed.

The best method, in my opinion, is a high-resistance potentiometer across the whole H.T., taking the slider to this terminal. Also by-pass it to earth—direct from the terminal—through 1 or 2 mfd. of paper condenser. There is no need to place the potentiometer on the front panel unless you want to.

You may very well set it to the vol-

tage that appears to result in the best reaction control, using whatever method you are using now. If, however, you like getting rid of components, take away your reaction condenser, replace it by a fixed condenser of about .0001, and control reaction by adjustment of the new potentiometer just put in.

Silent and Smooth

If you have a respectable brand it will be dead silent and very smooth. It should also be immune from hand-capacity effects, as, naturally, the whole of the potentiometer is dead as regards H.F.

Another workable scheme for an S.G. detector is to apply the reaction on to

SEARCH FOR REALISM IN AMERICAN RADIO

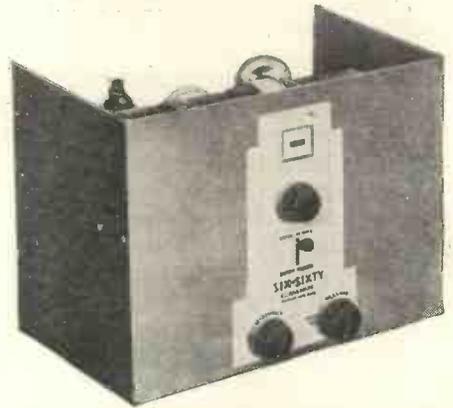


The broadcasting of a sketch entitled "Sea Tales" being carried out by the Columbia system in realistic surroundings.

The NEWEST in RADIO

Have you examined yet the new Chassikit principle of construction? Write NOW for the big beautifully illustrated folder. Intensely interesting—telling you how simply and without possibility of error you can build the complete all-metal chassis of the most modern 3-Valve S.G. Pentode Receiver. With these:—Pre-Selector band-pass tuning (*the most successful solution of selectivity problems*) . . . Multistat COMBINED Switch and radio and gramophone volume control (*also entirely new*) . . . Triple ganged tuning with ONE KNOB . . . latest metallised S.G. and Det. valves, and PENTODE output valve.

Examine also the wonderful scope it gives you to express your own individuality in housing it, your batteries or eliminator and loudspeaker. A simple table radio receiver may expand gradually, on small occasional outlay, up to a magnificent ALL-ELECTRIC Radio-Gramophone. There's the thrill of building without the risk! *All uncertainties eliminated.* The Six-Sixty Chassikit is "Radio-built"—really better than a completely factory-built four-valver. By all means SEND FOR THE FREE FOLDER TO-DAY.



The SIX-SIXTY Chassikit comprises three factory-built units—condenser assembly, coil assembly and the valve unit accommodating the remaining essentials. Screening is COMPLETE. Result an all-metal Chassis of the most advanced type. Each unit factory-tested. A variety of beautiful cabinets from 10/6 to 12 gns. Or incorporate it in cabinet of your own design. There is great adaptability.

Made by the makers of the renowned SIX-SIXTY (B.V.A.) Valves.

SIX-SIXTY CHASSIKIT

£6-17-6

Complete Chassikit, 3 Gang band-pass tuning-S.G.-Det.-PENTODE. Ornamental Oak Cabinet, 10/6 extra.

Get the FREE folder—YOU WILL BE GLAD → COUPON

To Six-Sixty Radio Co., Ltd.,
Six-Sixty House,
17/18 Rathbone Pl., Oxford St., London, W.1.
Please send me FREE and POST FREE the
Chassikit illustrated and descriptive Folder.

NAME _____
ADDRESS _____

M.W.

Some Practical Hints on Improving Reception

the screen, but to take the output from the anode. This means that your valve-holder wiring will remain as it is, but the following alteration will have to be made.

The New Connections

Disconnect the side of your L.F. transformer primary remote from the H.T., from whatever it goes to. (This will probably be the H.F. choke or reaction coil.) Instead, take the primary direct to the plate of the S.G. valve. The wire that you have disconnected from the transformer will now go direct to H.T.+

Thus, following up the imaginary circuit, you come off the screen, through the reaction coil and H.F. choke (if one is used)—the reaction condenser remains as before—and go off to H.T. From the plate of the valve you either go through the transformer primary or the headphones to H.T. positive.

derfully efficient A.C. screen-grid valves very much to your liking. They make the change well worth while, though it is certainly beneficial even in a battery-operated set as long as a good valve is used.

Incidentally, if you can afford the L.T., it is a good idea to use indirectly-heated valves, even if it means supplying the heaters from your accumulator. They are several streets ahead of the directly-heated variety I have always found, and, besides giving a huge rise in efficiency, are quieter in operation. Probably the equi-potential cathode is responsible for both features.

A Golden Rule

There is, or should be, no difficulty in converting the L.T. part of a short-waver for use on A.C. The golden rule is to keep the heater leads away from the other wiring as much as possible, and to screen them. This means

In the case of "chassis" sets trouble is very seldom met, whereas a chassis set in a metal box is dead easy. I was always sceptical about these "easy" descriptions until I tried it myself for the first time, but it certainly is.

Stopping That Hum

When one starts supplying the H.T. from the mains the trouble commences, although its solution really requires no more than a few grains of common sense. If the eliminator is well away from the set, and you are troubled with hum, the first thing to do is to make sure that your earth is good.

If it is, and the hum is more than just a mere whisper on the oscillation point, then the obvious cause is poor smoothing in the eliminator. There is no golden rule for the construction of the latter. Everything that you would put into an eliminator for a broadcast receiver should go into it, plus a few more microfarads "for luck."

A Final Tip

If the chokes are efficient and the microfarads all "mike," then it cannot fail to work. If you still get hum after you have looked at all these points, try the connection of two small fixed condensers in series across the mains, with the centre point earthed.

As a final measure, put two more, (also in series, with the centre point earthed), across the transformer secondary, i.e. the input to the rectifier.

If, after doing all this, you are still in trouble, then I am very sorry, but you are beyond the help of W. L. S. or any of his ilk!

"Creeping" Reaction

One more annoyance that may arise, quite apart from hum, is the fact that your set creeps steadily into and out of oscillation, owing to a fluctuation in the mains voltage, and corresponding movements in your H.T.

Here the cure is plenty of microfarads (that seems to apply to everything!) and a light load across the output from your eliminator. The best thing I can suggest for the purpose is the common-or-garden neon lamp, sold for nightlight purposes, which will take about 5 watts.

FOUR "MIKES" FOR A ROYAL BROADCAST



When the Prince of Wales broadcast not long ago no fewer than four microphones were used.

Personally, I prefer the first circuit, but in fairness to my fellow-writers I must mention that more than one of them have tried the second and written very complimentary things about it. Probably the characteristics of the S.G. valve one uses have some bearing on the matter.

Changing to A.C.

If you are running your short-wave set from A.C. you will find the won-

using either lead-covered wire or the copper-braided flex that is sold for the purpose nowadays. And don't forget to earth the metal sheath.

In the case of a "breadboard" set it is a good plan to raise the baseboard about half an inch up the panel and to do the heater wiring underneath. Then if there is any trouble from hum, a piece of copper foil, or even tin foil, can be fixed to the underneath of the baseboard.



COLUMBIA

A VARIED assortment of records comes from this famous firm this month. We have Clapham and Dwyer, Norman Allin, Norah Blaney, and, of course Jack Payne, to mention but a few of the popular broadcasters and platform artistes.

Clapham and Dwyer are a little disappointing in *The Royal and Ancient Game*, a skit on golf that will be familiar to a great number of radio listeners. It hangs fire rather badly and is not, in our opinion, up to their usual form (DB570).

Norah Blaney has contented herself (and no doubt many listeners) with a couple of real old favourites, *Our Lodger's Such a Nice Young Man* and *Oh, Mr. Porter!* (DB568); and we have Albert Sandler playing two Serenades on DB563. One is the *Millions d'Arlequin*, and the other one of Schubert's charming studies.

A 12-in. disc by Norman Allin, the famous basso, is occupied by *Asleep in the Deep* and *The Diver*, and this is an exceedingly fine piece of recording (DX270).

Another "selection" record, *Down Memory Lane*, by the J. H. Squire Celeste Octet, is worth hearing (DX267); and so is Reginald Foort's *Englandia*, played on the organ of the Regal Cinema.

The B.B.C. Wireless Military Band is always welcome, and this month Sinding's *Rustle of Spring* and *The Funeral March of a Marionette* have been recorded. It is excellent (DX269).

A Good Test

A good test for a radio-gram is the weird exposition of *Bolero* and *Entrance of a Little Faun*, by Jack Payne and his B.B.C. Dance Orchestra, on DX273. Both are peculiar, to say the least, but they are fine tests for pick-ups and should certainly be heard. Jack Payne has, of course, besides this 12-in. disc, recorded several more ordinary numbers, including *In Old Madrid*, *Let Love Take Care of You*, and *If I Could Turn Back the Clock*.

A fascinating new type of record we have received is one of the double-track records which we announced some months ago.

By placing the needle at (A) or (B) on either side one has a choice of four instead of the usual two items, those in this case being: (A) *The Washington Post* and *Stars and Stripes for Ever*, by the Royal Air Force Band; with (B) *Old Folks at Home* and *Bonnie Banks o' Loch Lomond*, by The Maestros. It is an exceedingly interesting and pleasing record, and will undoubtedly find its way into many libraries (DB567). Naturally, the items are only about half usual

Here is a brief selection of records that have reached us in time to permit of their review this month. Owing to our going to press early, however, it is impossible to give a complete review, and we hope to cover the remainder of this month's records in our next review.

length, but one gets four instead of two to listen to.

H.M.V.

We have received several enquiries from readers concerning the price reductions of H.M.V. records:

The following statement should clear any doubt on the matter.

From September 1st the following reductions in the prices of "His Master's Voice" records have come into force:—

12" red label	reduced from	8/6	to	6/-
10" "	"	6/-	"	4/-
12" black "	"	6/6	"	6/-
10" "	"	4/6	"	4/-
12" plum "	"	4/6	"	4/-
10" "	"	3/-	"	2/6

It will be seen that the prices of black and red label records are now identical, and therefore the issue of black label records will cease shortly.

Every pick-up user should hear

record No. B3917, a xylophone record, which has a definite value as a test disc, apart from its undoubted entertainment value. The artistes are the three brothers Nehring, playing *Piano Pastimes* and the *Bullfighter*.

Gracie Fields "breaks out" again in *Oh, Sailor, Behave!* a typical Gracie comedy number. This is doubled with a slightly different type of recording depicting poor Gracie's experiences at a sale, and entitled, *The Bargain Hunter* (B3912).

Holiday Hits

The special H.M.V. combination, the New Mayfair Orchestra, have recorded a lively and particularly tuneful record, *Holiday Hits*, in which medley we have our memories refreshed with such items as "Miss Elizabeth Brown," "Oh, Rosalita!" and "Reaching for the Moon" (B3910).

In the hands, or rather the voice, of Beniamino Gigli, the world-famous tenor, such old favourites as Tosti's *Goodbye* and *The Lost Chord* take on a new lease of life. They are accompanied by orchestra and organ, and form one of the Red Label celebrity series of 12-in. records (DB1526).

The Symphony Orchestra is excellent on a Plum label, *The Bartered Bride* Fantasia (C2241), but we have left the real plum of the selection to the end. This is undoubtedly the *Duo for Piano and Violin in A Major*, by Schubert, which takes up three of the Red Label discs (DB1465-67). The soloists are Sergei Rachmaninoff and Fritz Kreisler, and after stating that there is no more that need be said about the intrinsic musical value of the group except that they are H.M.V. recordings.

At the Show

Although H.M.V. are not exhibiting in Olympia (as they were unable to obtain sufficiently large space), they are arranging a series of programmes of their latest releases of records, which will provide the music distributed by the B.B.C. to the loud speakers on the various stands when suitable broadcast music is not available.

The programmes of records will be based on those that "His Master's Voice" have compiled specially for use in the "His Master's Voice" Modern Hall of Music, opposite Olympia. These records have been chosen specially in order that the capabilities of the various types of loud speakers may be demonstrated to the best advantage.



H.M.V. Show Surprises—Automatic Record Changers—The New Pick-Up—A Neat Motor—Home Recording.
By "TONE ARM."

ONE of the most interesting shows at the Exhibition is outside it—the H.M.V. special demonstration hall. In this fascinating place, where special sound-proof rooms and artistic alcoves have been arranged, a full array of the latest H.M.V. machines is being staged.

FOR RADIO-GRAM RECEIVERS



The 18-guinea H.M.V. automatic record changer and pick-up unit.

A Fine Show

There visitors will have an opportunity of seeing the new automatic record-changing unit in action. This unit, which sells complete with new pick-up, electric motor, record changer, and walnut cabinet, for 18 guineas, is an adjunct to a radio-gram receiver that should not be overlooked.

Useful "Accessory"

It is one of the most useful accessories—if I may call it such—that

has ever been devised, and at the price it is ridiculously cheap.

The electric motor (D.C. or A.C.) is really silent, and the new H.M.V. pick-up is certainly one of the finest instruments on the market.

We illustrate the unit on this page, where you can see that it is much the same to look at as the ordinary table grand model gramophone which used to be so familiar before the days of electrical recording.

Armchair Control

For those who want just the pick-up there is a useful extension volume-control device which enables armchair control of the gramophone side of the set to be carried out. The pick-up can be had to fit any tone-arm (as well as with its own arm), so that your original gramophone can be used.

Higher up the scale we have a varied assortment of receivers and radio-gram sets, until we get to the super-hot radio-gram at 70 guineas—an exquisite piece of radio engineering.

Loud Speakers, Too

Loud speakers, too, are in the H.M.V. programme, and all visitors to the Radio Exhibition should make a point of calling at the H.M.V. Hall. It is almost opposite Addison Road. All the buses from the City

and places east of Olympia will stop practically outside H.M.V.'s, and so there should be no question of being unable to find it.

There seems to be quite an epidemic of new gramophone motors lately. I suppose it is the new season that is bringing them out, and very ingenious some of them are, too.

The Wates is one of the smallest under-baseboard models I have seen, though some of the above-the-motor-board types are even thinner.

Quiet Operation

The Wates is a synchronous motor which is set for a constant speed of 78 r.p.m., and can be had to suit all sorts of mains voltages and periodicities. It is not, of course, available for D.C., its very operation depending on an alternating current supply.

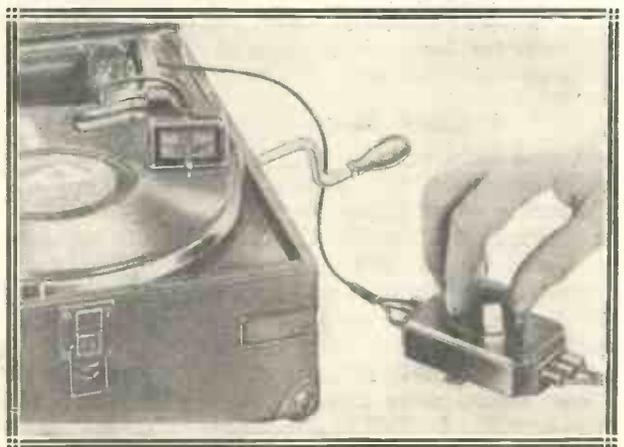
In operation it is beautifully quiet and smooth, and it should be a great success. Being free from the need of a governor or gearing, mechanical vibration is conspicuous by its absence, and the sweetness of running is very pleasing.

Home Recording

Readers will be interested to learn that the Kingston method of home recording, which was introduced some months ago, has been taken up by Messrs. Wright and Weaire, and is to be marketed as the Kingston-Wearite home recorder.

It is a neat little outfit, and though I have had no opportunity of testing it so far, I understand it is capable of providing really amazing quality for so simple and inexpensive an instrument. Both acoustic and electrical recordings can be made. Probably, however, I shall be carrying out some tests with it in the near future, when I will report progress and results.

DISTANT PICK-UP CONTROL



The new No. 11 pick-up, attached to a portable gramophone, with the armchair volume control.

Convert your
"M.W. EXTENSER POWER"
"NEW D.C. THREE"
"LOCK TUNE FOUR"

**TO AN AUTOMATIC RECORD-CHANGING
 RADIO-GRAMOPHONE OR AN ARMCHAIR-
 CONTROLLED RADIO-GRAMOPHONE**



In a handsome walnut cabinet of compact design is fitted the new "His Master's Voice" automatic record changing mechanism, pick-up and volume control. By connecting it to your radio receiver eight, 10 or 12 inch records (unmixed) may be played at one loading or a single record repeated up to eight times. A unit you have been waiting years for. A.C. or D.C. Model 117.

Price 18 guineas

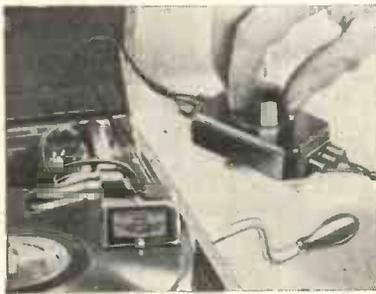
The new "His Master's Voice" pick-up, volume control, electric turntable motor and automatic start and stop, housed in an oak cabinet of pleasing design. By connecting it to a loudspeaker radio-receiver records may be played from one's armchair. Interchangeable resistances may be clipped in to the volume control to match the pick-up to any radio receiver. A.C. or D.C. Model 116.

Price 10 guineas



NEW "HIS MASTER'S VOICE"

RADIO ACCESSORIES FOR THE RADIO EXPERIMENTER



This pick-up is similar to the one fitted to all our new instruments. It can be attached easily to any type of tone-arm and is supplied complete with a logarithmic volume control and connecting leads. The weight of the pick-up is 5½ ozs.; it has an input of over 1 volt R.M.S., and a D.C. Resistance of 6,000 ohms.

Price Complete 2 guineas.

A permanent magnet moving-coil loudspeaker in an arched walnut cabinet of attractive design. It is extremely sensitive and will handle up to 3 watts without difficulty. A universal input transformer incorporated in the instrument enables it to be matched to receivers with triode, pentode or push pull output.

Price 5 guineas



★ See all the new "His Master's Voice" Models at the "His Master's Voice Modern Hall of Music," opposite Olympia, September 18th-26th. Admission free. Special measuring apparatus designed in the "His Master's Voice" Research Laboratory will be shown publicly for the first time.

"His Master's Voice"



AT YOUR SERVICE



by
**OUR TRADE
COMMISSIONER**

Better Batteries

IMPROVED designs of Exide low-tension batteries are promised for the coming season, many outstanding improvements being included. The terminals are non-interchangeable, so that you cannot get muddled between positive and negative owing to the terminals being inadvertently changed over at the charging station, and the acid-level line is moulded right round the battery, facilitating examination of the electrolyte.

P.V. and P.J. Coils

Two famous firms have recently joined the small army of manufacturers making the new P.V. and P.J. coils. These are Ferranti, Ltd., and the London Electric Wire Co. and Smiths, Ltd. (Lewcos), and we have recently received samples for test. The test reports will, of course, be dealt with under the Technical Editor's scrutiny, but we should like to draw readers' and dealers' attention to the fact that these coils are now available in the makes mentioned. The Ferranti coils are to sell at a surprisingly low figure. We believe that the P.J.2 coil is as low as 1s. 6d., while the others are correspondingly inexpensive.

A Warning

Messrs. Pertrix, Ltd., have discovered that "inferior foreign imitations" of the popular dry battery have been offered to the public with the explanation that they are a "foreign edition" of the Pertrix product. Attention, therefore, is being drawn to this fact and that all Pertrix dry batteries manufactured by Britannia Batteries, Ltd., at Redditch, are distinctly labelled "Pertrix Patent Super-Life Dry Battery (A British Product)," and that dealers and pur-

Here is some varied news of the trade that should interest all readers, whether or not they are connected with the radio industry. Manufacturers, dealers, home constructors and general readers are invited to send items of interest to be included under this heading.

chasers should take no "excuses" for the full Pertrix label being absent.

Decca Records

The Decca factory is to be moved to Malden, according to a recent report on the activities of the Decca Record Co.

Component "Push"

Messrs. Ward & Goldstone, Ltd., of Manchester, are inaugurating a "push" for the coming season, many new and attractive lines being placed

output choke. It is one of the most successful "lines" and, together with the Atlas H.F. choke, has already commanded big sales.

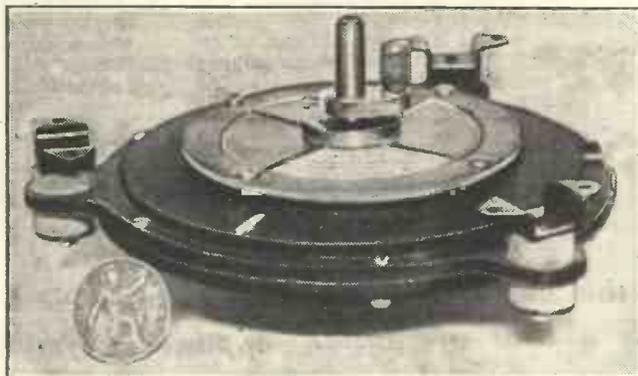
For Mains Units

The new Westinghouse rectifier, H.T.8, is a most useful piece of apparatus, and giving, as it does, 60 m.a. at 250 volts, will surely be in great demand among set owners. It is used this month in the three-valve A.C. set, together with a Heayberd transformer that has been specially designed for this rectifier. In fact, Messrs. Heayberd cater for all the various rectifiers with specially designed and efficient transformers of extremely low price.

Camco Catalogue

Have you got your 24-page catalogue of the new Carrington cabinets yet? If not, Messrs. Carrington Mfg. Co., Ltd., will be glad to send a copy free if you apply to 24, Hatton Garden, E.C.1. Or, better still, call at their stand at Olympia and see the numerous new models for yourself.

ONE OF THE SMALLEST MOTORS



The Wates Synchronous gramophone A.C. motor is one of the smallest yet devised.

on the market. These include a compression-type condenser, and though somewhat late in the field it should have a ready sale.

For Pentode Users

Do you use a pentode? If so, you will be interested in the Atlas pentode

Another Extenser

The latest arrival among the ranks of Extensers is the J.B., a specially fine example of modern condenser design by Jackson Bros. It is extremely neat, and will be welcomed by all enthusiastic home-constructors.

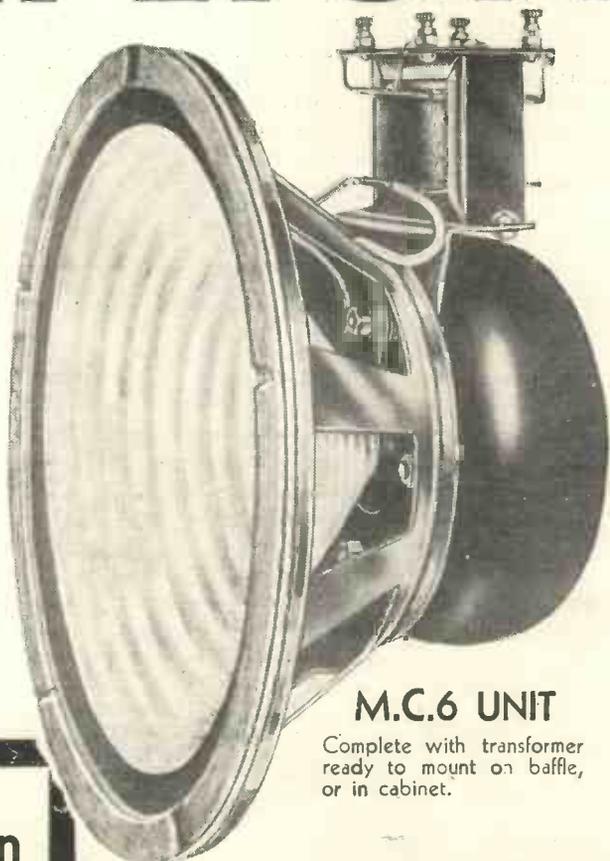
It is supplied complete with vernier dial, which gives very smooth control.

A MOVING COIL UNIT BY AMPLION

FOR 676

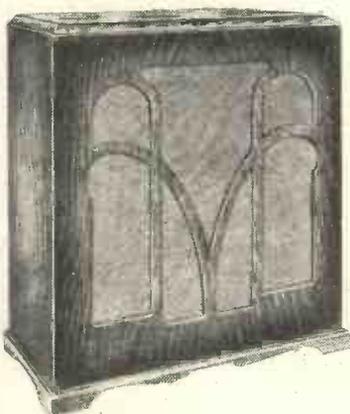
THE famous Amplion M.C.6 Unit is acknowledged as representing the best value and the greatest efficiency amongst small permanent magnet moving coil speakers. Its reproduction and sensitivity are really remarkable, and it will handle without distortion adequate volume for all normal requirements. It requires no external excitation and the universal transformer which is fitted, enables the speaker to be correctly matched to either Power, Super Power or Pentode output from standard British 2, 3, or 4 valve receivers.

Make a point of visiting the Amplion Stand No. 75 in the EMPIRE HALL, Olympia, during the Radio Exhibition, where all AMPLION Moving Coil Speakers will be working.



M.C.6 UNIT

Complete with transformer ready to mount on baffle, or in cabinet.



**Also in
Handsome
Cabinets**

(complete with transformer)

The M.C.6 Unit is also available in handsome cabinets of very modern and striking design. The oak model is illustrated here.

M.C.6 Oak £5-10-0

M.C.6 Walnut £5-19-6

Available on Deferred terms

Graham Amplion Ltd., 26, Savile Row, W.1

M.C.9 MODELS

The M.C.9 Unit is also a permanent magnet type, but is much larger and more powerful than the M.C.6. A suitable matching transformer for this model can be supplied at 15/- extra.

M.C.9 UNIT ONLY £6 - 0 - 0

M.C.9 OAK . . £9 - 9 - 0

M.C.9 WALNUT £10-10-0

All M.C.9 models are available on deferred terms. Both the Cabinet Models are fitted with matching transformers.

D.C. ENERGISED MODEL

A most efficient unit for D.C. Voltages 100/110, 200/240, very suitable for A.C. sets. Unit only. **29'6** Unit with matching transformer **42'6**

Write for folder W.L.61, which gives full details.

There is Every Prospect of a Record Radio Season

Short Waves as Well

This month we are describing the construction of a unique receiver that covers all wave-bands—the "Four-Band" Three. It is a piece of work that will appeal to a large number of constructors, as it gives plenty of scope not only for their constructional ability, but also for their operating skill, especially on the ultra-short waves.

Many, however, will have become thoroughly conversant with the tuning of receivers below 50 metres through the medium of the "Kelsey Short-Wave

Graham Farish rigorously test all their products to make sure that nothing dud or even the least doubtful shall leave their factory. It's the little things that matter.

"Full Steam Ahead"

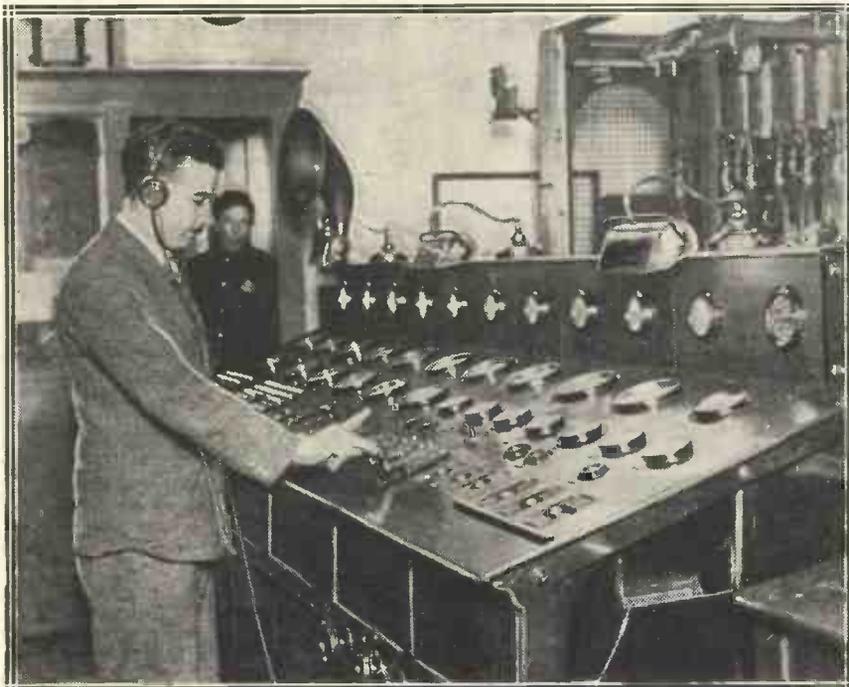
All the radio firms are now hard-at it behind the scenes getting ready for the season that is just beginning. The Radio Show is the signal for even greater activity than has been shown during the past summer, when a record "off" season's trading was done.

makes, while the Osram and Mazda D.C. valves will attract a great deal of attention during the next few months.

A Novel Choke

The new Lotus radio-frequency choke is a component that will interest the trade generally. It is specially designed for 150-2,500 metres, and has a flexible connection in the top for attachment to the anode terminal of an S.G. valve. This is a very ingenious idea, and proves that the technical staff behind Lotus Radio, Ltd., have their wits about them.

A TEST TRANSMISSION FROM A RADIO GIANT



Sending a test message at one of the large trans-continental radio telegraphic stations.

Adaptor," which, by the way, is obtainable C.O.D. from Peto-Scott Co., Ltd., for 37s. 6d., and which, without entailing any alterations in the broadcast receiver, enables that set to be used on the high frequencies at a moment's notice.

"It's the Little Things..."

Set builders often seem to pay too little attention to the "small lines" of their receivers. Such things as grid leaks, Spaghetti resistances, H.F. chokes, reaction condensers, are regarded only too frequently as "oddments" that do not matter. This view-point is quite unwarranted and, indeed, erroneous; they do matter very much, so much so that Messrs.

The things we see at Olympia are in nearly all cases the "first of the batch" of new products, and way back at the factories machines are humming and armies of men and girls are busy assembling and soldering, coil winding and valve sealing, all on feverish business to supply the huge appetite of the ever-hungry radio public.

New Valves

All sorts of new valves are being released during the month, valves that will delight the heart of every set owner. Tungrams have a complete new range, and Mullards have many most interesting new types. Double-grid valves are appearing in many

The Terminal Topic

The use of terminal blocks instead of strips is rapidly increasing, and the popularity of the neat little mountings is not to be wondered at. Some of the neatest are those made by Messrs. Belling & Lee, Ltd., the well-known terminal manufacturers, who have long been in the forefront of this section of the radio trade.

Talking about terminal mounts, we must draw attention to a slip which appeared last month on page 234, where in the list of components for the "Extenser-Power" we specified terminal mounts under the wrong name. These should have been specified as Belling & Lee manufacture.

* * * * *
**A GERMAN RADIO
 MUSEUM—THE WAVE-
 LENGTH SHORTAGE**
 * * * * *

I LEARN from Philips Radio Press Service that it is proposed to establish at Prague a radio museum, and to this end the authorities are now collecting documents and other matter relating to the development of radio engineering and the constructional work accomplished by radio pioneers.

* * *

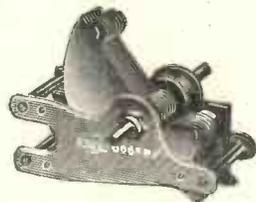
The shortage of wave-lengths which has arisen was recently discussed at Copenhagen, at a session of the Radio Committee of the Radio Telegraphic Union. It is expected that the results of the Union's deliberations will be the basis of the International Radio Conference at Madrid in 1932.



Announcing the IGRANIC 1931-2 PROGRAMME

Sensational Price Reductions

Prices become effective on September 18th, 1931



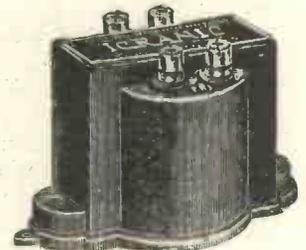
IGRANIC "LOKVANE" CONDENSERS

·0005 mfd. .. Price 5/9
 ·0003 mfd. 5/6
 ·00015 mfd. 5/-



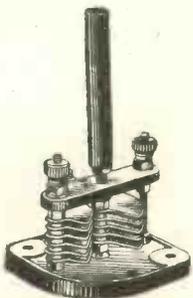
IGRANIC H.F. CHOKE

Price .. 4/-



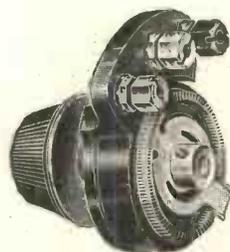
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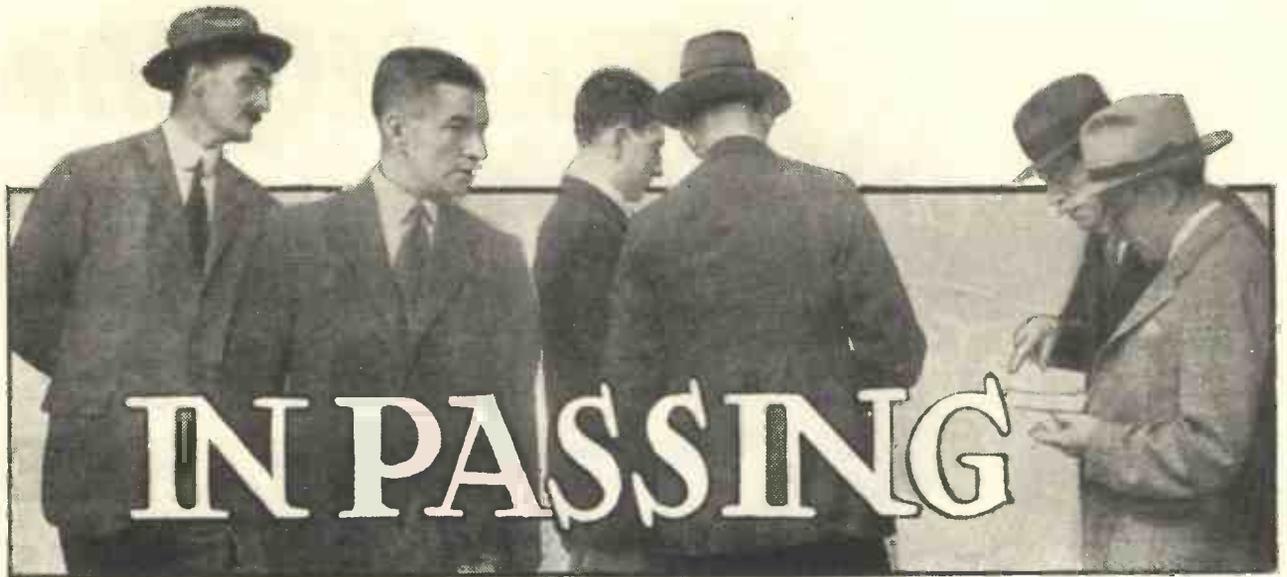
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The Rueful Reminiscences of a Hiker

I do not flatter myself that you remember or even read my September offering, but the stuff was there right enough when I came to look. I had harboured vague misgivings about it; couldn't for the life of me recall the subject of my prosody. Then a brief but convincing exhortation from the editorial stronghold set me right.

It seems that my scribbling was about as "full of meat as a starving vegetarian," and that what I had to say, if I did have anything to say, a point on which the Editor had scant doubt, "meandered like a spoonful of treacle down a tea-tray." I was bidden "get down to brass tacks and keep the nose to the grindstone." Righto! Plunge!

A Queer "Layout"

One of his trouser-legs was of blue serge and the other was like nothing on sea or land; call it a tartan corduroy! I observed that the serge indeterminately joined the main upper portion of the outfit, being fastened thereto with bootlaces. His jacket was a roomy garment which would have given Jack Dempsey no trouble; it hung down to his knees and the cuffs were rolled up. He wore a bowler hat of a model such as would have been the *dernier cri* in '65, no waistcoat, but the top half of a "pullover." I think his socks were constructed from the lower half.

His hands were presentable and he was beautifully shaved; but his hair would have formed an excellent bird sanctuary.

I had camped on the bank of the babbling Windover, which simply means that I had taken off the rucksack and camera, stuck my old Alpine stick in the turf and stretched myself beside it to smoke and be gloriously idle after ten miles of tortured blisters and prodigious perspiring. In the middle of a dream of fair women and threepenny income tax, behold this apparition, springing apparently from nowhere.

AN APPARITION ARRIVES



In the middle of a dream . . . behold this apparition, springing apparently from nowhere.

"Might I have a lend of a match, mister?" I produced a box of Lucifers. "Tah! Jist goin' to 'ave a bit er fire ter cook a negg. Old soldier, as yer might say!" He shuffled off and disappeared over the brow of a knoll, whistling "Onward Christian Soldiers." Presently he reappeared to return my matches.

Rather Poor Results

"'Aven't got such a thing as a bit er noosepaper, mister? Fire's playin' me up. Demp wood!" I

presented him with the financial page of the "Times," and again he passed from sight. He whistled "The Church's One Foundation," and I was sorry to see that the tartan trouser-leg looked a trifle insecure.

Twenty minutes later Harlequin entered yet a third time, requiring a pin because his pipe was stopped up, so I cut the cackle and offered him my pouch. He was very suspicious of my Latakia mixture, the fruit of twenty-five years of research. Was it strong? Did it burn the tongue? Or get me in the liver?

Making a Start

However, he filled up and lighted up. (Puff.) "Real smoker like me's pertikler. (Puff.) Seen better days, I 'ave, an' know what's real terbakker. (Puff.) Nothing like the nineties fer terbakker—afore these here rings 'an sinnikits 'nd kewpongs. (Puff.) Tah!"

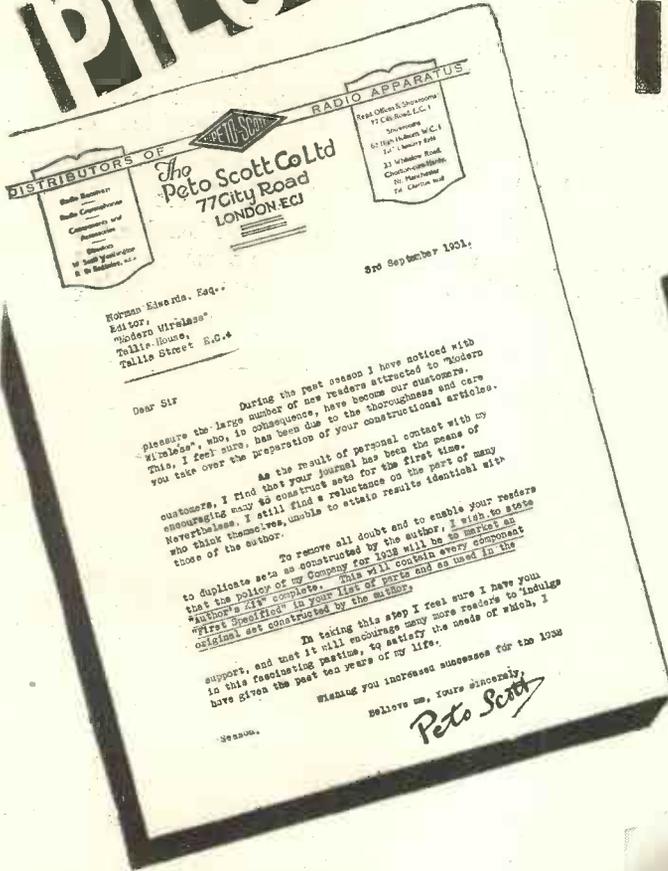
Hearing him say "better days" and also "sinnikits" and "kewpongs," I invited him to sit down and tell me all about it, and this is what I remember of his oration.

"'Slike this, mister. I was a selluf-made chap. Worked me way up from nothink! Yerse! Me mar 'nd dad used ter sing in the street, and when I was a nipper I used ter go wivvum ter look pitiful 'nd 'ungry. Used ter prectiss looking pitiful afore the looking-glawws in the scullery. That 'ud be in '94, eh? When the Tar Bridge was opened and whiskey were three and six. Yerse!

"Reckon we knocked up a pahnd a week, *eesy*. Dad and mar used ter

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1 Ferranti 2-mfd. Fixed Condenser	5	3	
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1 Dubilier '04-mfd. special non-in- ductor	2	0	
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The Trials of a Travelling Musician

sing 'Christian Soljers' and 'Churches one Fahndyshun,' 'nd I had ter look 'ungry-like and say tat-tahs ter the little gals at the winders. Reckon we was the star turn in Kennin'ton, barrin' the muffin-man.

KENNINGTON'S STAR TURN



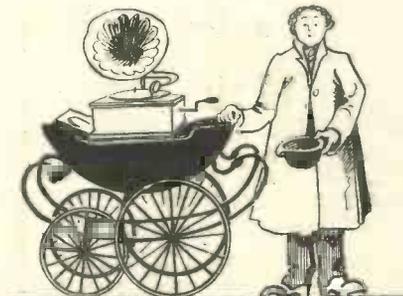
"Me Mar and Dad used to sing in the street."

"Our fam'ly alwis were moosical inclined, and after a time we made a fry-o of it and borrowed young Len Davis ter do the pitiful. But his nose wouldn't run proper, like mine; so we sacked 'im and borrowed young Alice Cooper, wot 'ad Sunt Viters dance. 'Orrible faces she pulled and it done the show more 'arm than good. Yerse!

Drowning Interference

"When Dad and Mar had a proper row about—er—beer, I think it were—I started out on me own, a whistlin' 'Misereer' and 'Christian Soljers' as a hencore. Häd ter toot like anythink ter drahn them barril-organs, too. But it was this yer wireless wot ruined me!

"THE MUSIC ALLUS PULLED"



"I got a grammerfone and used ter work the markets."

"Presently I worked me way up ter the cornet, but me marf run too well—like me nose—an' I 'ad ter go inter matches and studs while I learnt ter play the concertina. While

I was a learnin' of that I married my old gal. She were a one and no mistake. Treat 'er ter a small port and she'd dance a polar-bear orf 'is bloomin' pawsis. Yerse! Why, I've seen 'er on Black'eaf—"

"Those Grammerfones"

"But about this concertina?" I ventured.

"Yerse! Well, I played that outside all the pubs in—well, from the Elephant to the Green Man at Lee. An' made as much as free pounds on Benk 'Olldies. An' then I worked me way up ter a barril-organ, and blow me if those there grammerfones didn't come in and smash the perfesh. So the missus went a 'charin', 'cep' when she were a 'nursin' the kids, an' I 'ad ter go an' work. Yerse! Pot-boy at the 'George.'

"But the moosic allus pulled at me. So presenly I got a grammerfone and used ter work the markets. Fairish! But not so's it ud run ter meat on Sundis! Used ter eat fish. And taters. So the missus had sunnick cut art of 'er and pegged art. Years ago, nah! Yus, mister. And me wiv two nippers wot went into 'omes. But it were this 'ere wireless wot ruined me!"

I gave him another pipeful and a nip of brandy from my flask.

"Yerse! An' the 'ome were sold up, too. An' the parrit. Ju know? Thet parrit were more yuman than—than me! Talk? Talked a fair treat. While Ag—while the missus was waitin' fer a bed in the horespite-al she used ter lay an' teach thet bird ter say 'Gord bless 'Arry.' Fact! But he were sold up. All sold.

Harp Recitals

"My mates rahnd the Elephant clubbed up an' bort me an' 'arp. A tinklin' thing but better'n nuthin'. Used ter go down quiet roads—horespite-als and such—an' play it quiet-like. One ole gal, I remember, wep and gave me a bunch er lavender. All she 'ad ter give. I chucked it away, but I didn't 'alf feel rotten. Yerse! Pardon—those heggs rises on me!

"Then the wore came, an' I got a job in a band—a'playin' the flute. A narsty himstrermunt—full 'er spit an' wind. Not a *soljer's* instrer-munt, atall. An' they told me orf horrid. An' I did a bunnick and joined the East Kents an' copped a packet near a place called Loose—p'raps

you've 'erd of it, mister. Just 'ere—in the sholder—sometimes I carn't sleep along of it."

"But with that you ought not to be on the tramp," I remarked.

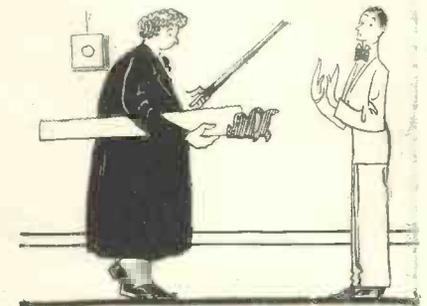
"Har! Ort not—p'raps. But I am—all along o' this radio."

"But I don't quite see—er—did the increased opportunities for hearing music make people over-critical of your style?"

Freak Radio Turns

"Oh, no, mister! I heard one of the radio artistis give a turn a-singing through her nose or ears or sunnick. It give me an idea because I could whistle free notes at once. So I ups and tries fer a job—an 'gits one. Made a pretty penny while it lasted, going from one stooodyoh to another, besides odd jobs on the 'alls an cetry.

"NOTHING BUT BARK"



"We've got all the Bark we require—an' a bit over."

"Then they gits tired o' my turn and don't seem to want me no more, but I 'ad seen a bloke playin' chunes on a carpenter's sore and I reckoned I could beat it.

"Well, I looks abart ter see wot sorter chunes ter learn and I sees a feller whose name were all over the programmes day after day. So I learns lots of 'is pieces. Pretty, they was, too. An' then up I goes agin fer a job and sees a nice young feller who got very essited abart me sore.

"Presenly he says, 'An' wot is your reppertwore?"

"Whadjermean, I ses! I'm selluf tort!"

"I means—whadder you play?"

"Nuthink but *Batch*," I says.

"Good gracious me," he says, in 'orror. 'Nothing but *Bark*. Then I'm afraid there is nothing hofferin' at the moment; we've got all the Bark we require—an' a bit over.' So I turned fair sick o' the 'ole biz and bunked."



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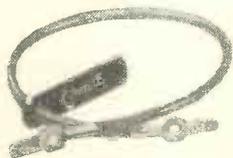
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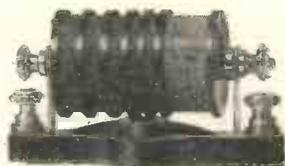
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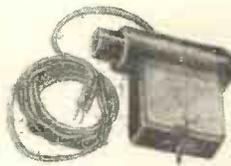
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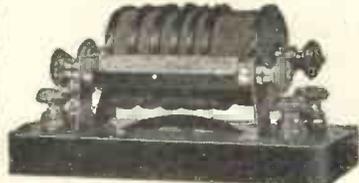
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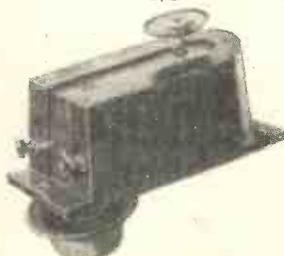
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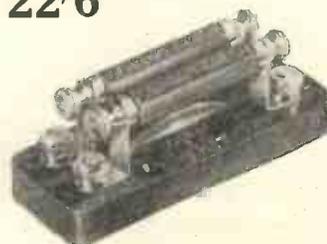
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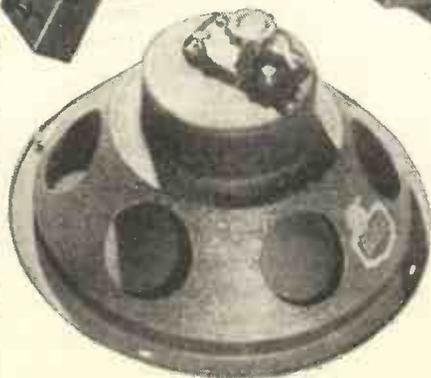
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HOW TO MAKE A PICK-UP CORRECTOR



A quick-to-make and very inexpensive little unit that will wipe out pick-up peaks and improve the bass of radio-gramophones.

By E. FORSTER and F. N. GANDON.

To most people the pick-up is of little consequence. It is bought, fixed to the gramophone, and promptly forgotten. Yet in reality it is the brain of record reproducing. The finest amplifier and loud speaker in existence would sound little better than a cheap gramophone if its attendant pick-up were a bad one. How much more important then that the pick-up in our own modest equipment should be of first-rate quality.

Avoiding technical details, which have been described before in this journal, we may say the function of a pick-up is to convert the sound track of a record into electrical impulses.

Imperfect "Pick-Up"

Therefore, if reproduction is to be as perfect as the limitations of recording will allow, these impulses must follow and be in proportion to the sound grooves of the record.

Unfortunately, the characteristic curves of most pick-ups leave much to be desired. They show that the "picking up" is not always true to the sound grooves. There is usually what is called a "peak" in the curve. This means that at a particular frequency, generally to be found between 1,000 cycles and 3,000 cycles, the pick-up accentuates certain notes. Sometimes in badly designed instruments a "peak" will accentuate notes to three or four times their normal value.

Distortion of this kind affects results in many ways:—

1. It makes reproduction sound shrill or "topy," because part of the middle or upper register is out of proportion.

2. Volume is not what it might be, owing to the peak overloading the output valve long before the general level of music has reached that point.

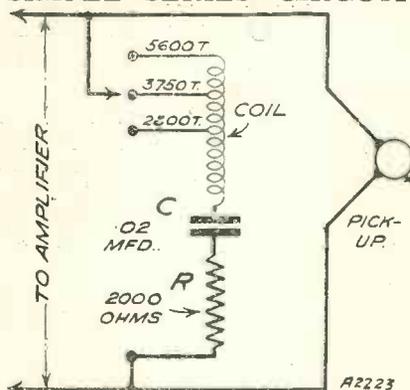
3. Surface noise or "scratch" becomes troublesome. Recent experiment tends to show that surface noise comes in on these peaks, and is not due entirely to a fundamental frequency of its own in higher regions of the musical scale.

Levelling-up Things

We are not concerned with the why and wherefore of these troublesome peaks. We can be sure that they exist generally in our pick-ups, and that if we can reduce these disproportionate notes to their true level our reproduction will be improved immensely. Hence the pick-up corrector.

This device must not be confused with the so-called "scratch filter." It is entirely different in its effect.

SIMPLE SERIES CIRCUIT



The circuit comprises an inductance, a capacity and a resistance in series. The whole is connected across the pick-up. By a careful choice of values the corrector comes into action at exactly those frequencies where practically all pick-ups tend to peak. An incidental result is that the bass has a real chance to show up.

The scratch filter reduces, and in some cases completely wipes out, the top region of the musical scale. In doing so it certainly reduces a little of the scratch, but of what use is that if some of the most important high notes and overtones are cut out as well? Reproduction becomes lifeless, "woofy," and lacking in definition.

The pick-up corrector, on the other hand, does not affect the base or the extreme top end of the scale. It is tuned to be effective over a narrow band of frequencies only, i.e. around the frequency of the peak.

Adjustable Frequencies

This is reduced to its normal level, and the balance of tone restored. In some ways it is analogous to a wave-trap: cutting out unwanted interference and leaving the rest untouched.

The question then arises, "How am I to know the frequency at which my pick-up peaks?" As a matter of fact, this can only be determined by a laboratory test with recording milliammeters, etc. However, the aural method is quite satisfactory.

It can be taken for granted that the majority of pick-ups peak between 1,000-3,000 cycles, and, since the corrector is variable over this range, it is adjusted until the most pleasing results are obtained. This may sound rather unscientific, but the ear is fairly sensitive to small variations of tone.

More Effective Bass

One of the very noticeable effects of a corrector is the apparent increase of the bass response. This is due to a fact already mentioned, that the peak having been reduced the

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general level of volume can be increased. The bass, usually rather elusive, then has a chance to show up.

The circuit of the corrector is shown in the accompanying diagram. It consists of an inductance, a capacity and a resistance in series. The resistance, which may be a variable quantity, merely allows more or less of the peak to be absorbed. The coil and condenser are the factors that determine the frequency at which the absorption is to take place.

The Construction

The constructional details are as follow :

PANEL.—4 in. \times 2½ in., with three terminals on the left-hand side and one on the right.

COIL BOBBIN.—Length, 1½ in.; core, 1 in. diameter; end pieces, 2 in. in diameter. This can be made of cardboard or any other suitable material. The bobbin is wound with a total of 5,600 turns of No. 40 gauge copper wire, single silk covered, about 3 oz. In winding, a tapping is brought out when 2,800 turns have been wound on. Continue winding, and bring out another tapping at 3,750 turns. Finish off when the total turns reach 5,600. This is a tedious job, but it is sometimes possible to find a friend or a local wireless dealer possessing a winder and revolution counter, in which case it will not take longer than a quarter of an hour.

THE RESISTANCE.—This is approximately 2,000 ohms, and if one of roughly that value is not to hand it can be made up by winding 10 yds. of 47 gauge Eureka resistance wire

on to a small bobbin or flat former. An exact value is not essential, but it should be above rather than below 2,000 ohms. The greater the resistance the less the corrector will absorb. If it is found, therefore, that the absorption is too great, a value of 3,000 ohms, or even 4,000 ohms, can be tried.

CONDENSER.—A fixed value of .02.

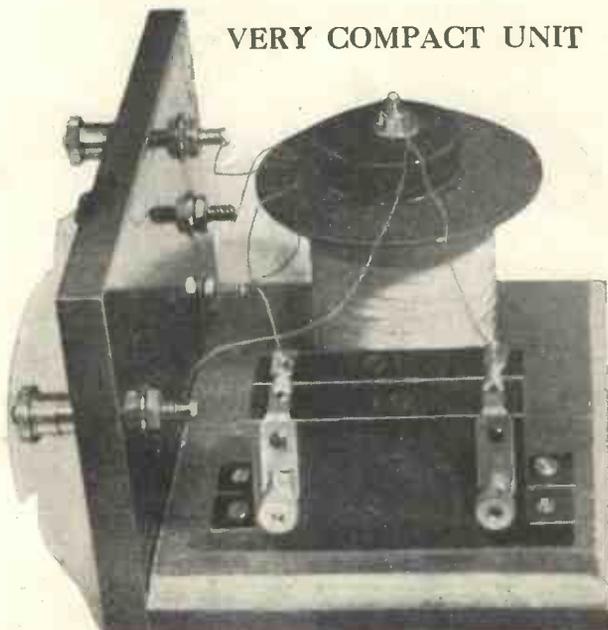
All three components are connected in series, as shown in the accompanying diagram. One end of the resistance goes to the single terminal on the right of the panel, the other end to one side of the .02 condenser. (The original model had two .01-mfd. condensers in parallel.) The remaining connection of the condenser is joined to the beginning of the coil. The first tapping (2,800 turns) goes to

terminal, the other to whichever of the three terminals gives the best results.

As a rough guide, the bottom terminal will absorb a peak occurring at 3,000 cycles; the middle one will deal with 2,000 cycles, and the top one with 1,000 cycles. When the corrector is connected in circuit there will be a slight decrease in the overall volume, and this should be compensated by coming up on the volume control. The resulting reproduction, however, should be greatly improved, being less shrill and with more apparent bass.

Definite Improvement

In conclusion, it would be as well to mention that a corrector is not a panacea for all ills of the pick-up. It will not spur a badly-designed specimen to respond to frequencies hitherto unobtainable. Nor will it reduce record wear, or compensate for bad tracking. But it will definitely improve the reproduction obtainable from the majority of pick-ups, and is vastly superior to any form of scratch filter, which at best is only a compromise.



The little panel measures only 4 in. by 2½ in., and the whole unit can easily be accommodated in some odd corner of a radio-gram cabinet.

the lowest of the three terminals on the left of the panel; the second tapping (3,750 turns) to the middle terminal; the outside end of the coil (5,600 turns) to the top terminal.

The corrector is connected across (in parallel with) the pick-up, one side of which goes to the right-hand

SNAPPY FACTS

Points about high tension, whistling and resistances.

The actual voltage on the plate of a valve is never as high as the voltage implied by the reading at the battery or mains unit.

One of the commonest causes of whistling when using a gramophone pick-up is the use of long, straggling leads between the instrument and the set.

Although over-running a valve by excessive voltage may give improved results for a time, that time is likely to be very short!

Wire-wound resistances have many advantages in the way of reliability over the old compression type.



The new RADIO WONDER

SPECIFICATION	CLARKE'S ATLAS
I Variable Tapping	0/100 V.
I " "	0/120 V.
I " "	150 V.
I Fixed " "	25 m.A.
Output at 150 V.	2, 4 & 6 V.
L.T. Trickle Charger	0.5 A.
Charging Rate	1½, 3, 9, 16 V.
4 Grid Bias Tappings	12 months
Guarantee	£ 6-10-0
Price	10/- down
Yours for	



£6-10

ALL-MAINS UNIT A.C. 290

COMPARE THESE
UNIQUE FEATURES
FOR YOURSELF

You can't beat "Atlas"

4 OTHER NEW "ATLAS" UNITS.



MODELS No.
A.2 and A.K.22

"ATLAS" Model A. 2. H.T. Unit for 1, 2 & 3 Valve Sets. 3 Tappings 60/80 V., 90/100 V., and 120/150 V., respectively. Output 12 m/A. Price 52/6 cash or 10/- deposit and 6 monthly payments of 8/- each. "ATLAS" Model A.K. 22. All-Mains Unit, has similar tappings but incorporates a L.T. Trickle Charger for 2-Volt Accumulators at 3A. Price 77/6 cash or 10/- deposit and 9 monthly payments of 8/6 each.



MODELS No.
A.C.244 and A.K.260

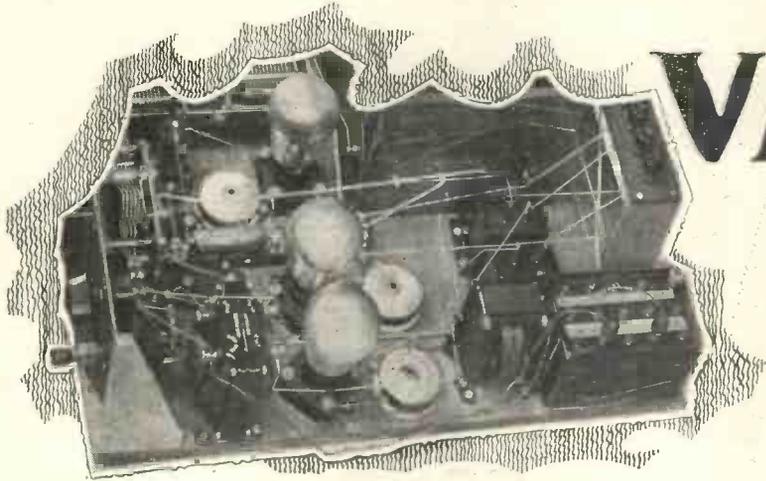
"ATLAS" Model A.C. 244. H.T. Unit. 3 Tappings 60/80 V. (max. & min.), 50/90 V. (max., med. & min.), 120/150 V., respectively. Output 20 m/A at 120 V. Price 59/6 cash or 10/- deposit and 8 monthly payments of 7/- each. "ATLAS" Model A.K. 260. All-Mains Unit, has similar tappings but incorporates a L.T. Trickle Charger for 2, 4 & 6-Volt Accumulators at 3A. Price 90/- cash or 10/- deposit and 9 monthly payments of 10/- each.

Last year the "ATLAS" All-Mains Unit A.C. 188 was voted the finest Mains Unit at Olympia. Since then it has remained unbeaten. Now comes an even finer unit. One that only "ATLAS" ingenuity and experience could produce. "ATLAS" Model A.C. 290 includes 4 Grid-Bias Tappings which are entirely independent of the H.T. Voltage supply, and incorporates the Westinghouse Rectifier. Moreover, an exclusive "ATLAS" L.T. Safety Switching arrangement isolates the receiver when Trickle Charging. The exceptionally easy H.P. Terms of 10/- deposit and 9 monthly payments of 15/- each make this wonderful "ATLAS" Mains Unit the finest value of the year. See it at Olympia, Stand No. 33, or ask your dealer for a demonstration.

"CLARKE'S ATLAS" MAINS UNITS

H. CLARKE & CO. (M/CR) LTD.,
Atlas Works, Old Trafford, Manchester.
LONDON OFFICE: BUSH HOUSE, W.C.2. ☉

USING HIGH-MAG VALVES



By C.P. Allinson, A.M.I.E.E.

An intensely practical article on the operation of S.G. and Pentode valves.

AMONG the new valves that have recently appeared on the market there are some that will appeal very greatly to the listener, whether he be an advanced experimenter or just one who is anxious to get the best out of his set; and some hints on getting the best performance from these new valves will no doubt be of interest.

First of all, there is a new indirectly-heated cathode valve with mag. of 1,500 an A.C. screen-grid valve of very great merit.

Amazing Amplification

It is claimed that the internal residual capacity between grid and anode of this valve is far lower than that hitherto attained (it is stated to be as little as .001 m/mfd.), and, judging from my own work with this valve, I am inclined to view the maker's claims as justified.

The amplification factor is the amazing figure of 1,500, with an impedance of only 430,000 ohms, and it is claimed that an actual stage gain under working conditions of 200 is easily obtained.



This mains S.G. valve has a magnification factor of 1,500—a colossal figure.

I have not yet had time to make any actual measurements on the stage gain obtained with this valve, but I must say that, comparing it with other indirectly-heated valves of this type, it does give an extraordinarily good performance. Indeed, the impression I have gained is that it is the best valve of its class at present obtainable.

One of the most important points with regard to the use of the valve is that the right value of grid bias should be employed. In fact, I have found this to be somewhat critical with this valve, and you will readily appreciate this point if you will bear the following facts in mind.

As you know, screen-grid valves are rather liable to run into grid current even when the grid is slightly negative, and some valves will run into grid current even at three-quarters of a volt negative. It is important, therefore, that sufficient grid bias should be used to prevent grid current, especially when dealing with a strong signal.

Grid-Bias Difficulties

If the valve has not got a large enough grid base to deal with a heavy signal without running into grid current, obviously rectification and consequent flattening of tuning and "cross talk" will result.

On the other hand, if we use too much grid bias, then, of course, we shall run into lower bend rectification, and this, again, will lead to flat tuning and interference being obtained, due to the resulting loss of selectivity.

We, therefore, have to be rather careful and strike a compromise, and since the slope of the valve is

very steep there is probably not a great deal of latitude.

Luckily, in the case of indirectly-heated valves we can adjust our grid bias by a very small fraction of a volt when we obtain this by means of a resistance connected in the cathode return. The value of this resistance will depend, of course, on the total anode and screening-grid current and the actual value of bias we wish to obtain.

Altering the H.T.

If, for instance, a current of 1 milliampere is passing, and we wish to obtain a negative bias of 1 volt, then a resistance of 1,000 ohms will, of course, give us the required value.

The current passed by the plate and screening grid will, of course depend again on the H.T. voltage; though with a valve of the screen-grid type, which has a high impedance, it will not be found that altering the H.T. volts between, say, 120 and 180 volts will have a very great influence on the plate current.

The connection for the automatic bias resistance is shown in Fig. 1.

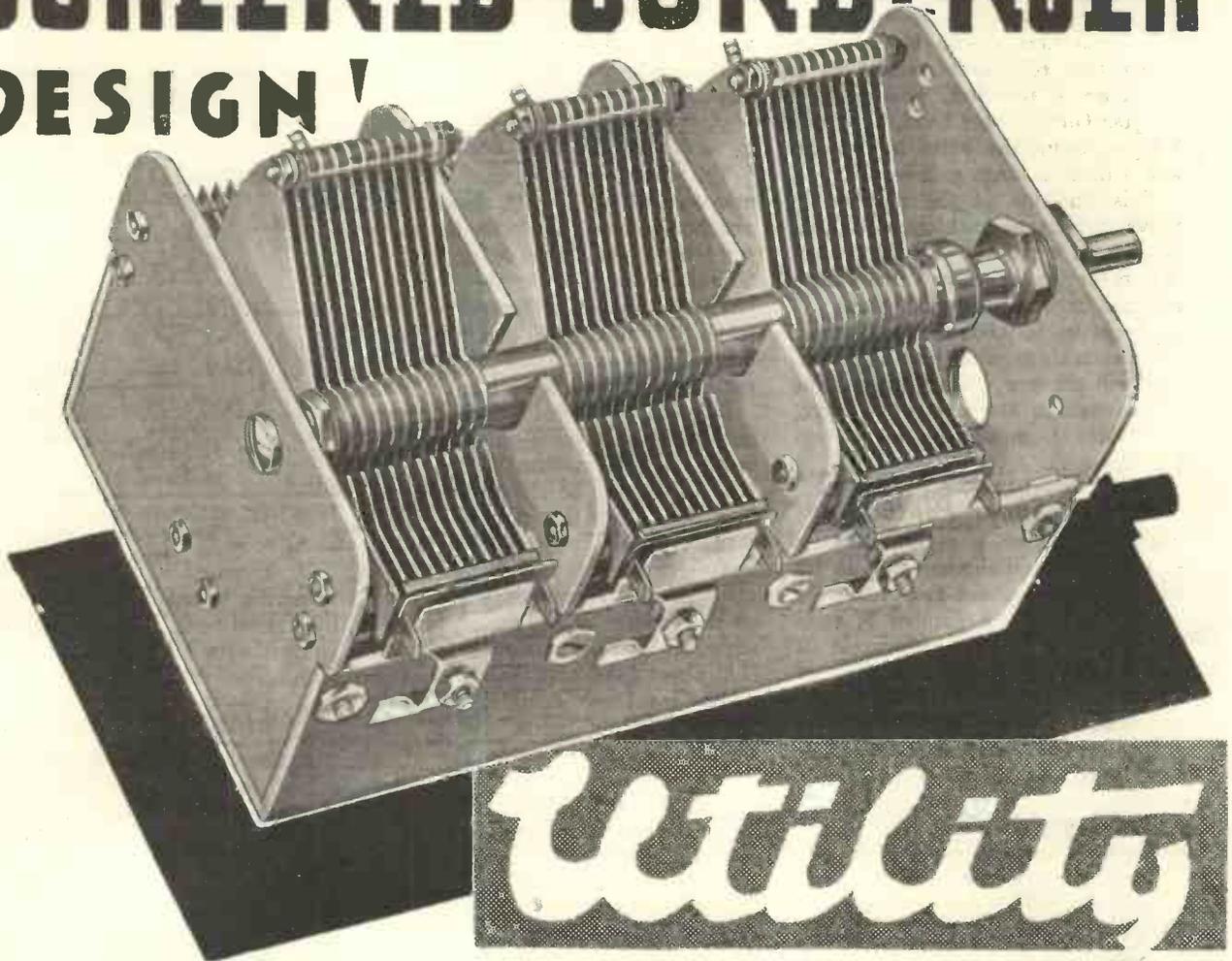
Under actual operating conditions I find that a resistance of 1,000 ohms is needed. If less than this is

A POWERFUL PENTODE



One of the latest super-power pentodes, a five-pin 400-volter.

BIG DEVELOPMENTS IN SCREENED CONDENSER DESIGN!



Realising the increasing importance of screened ganged condensers, "UTILITY" designers have produced this year a range of instruments which for construction and performance surpass all others. All the ingenuity of these experts has gone to the making and perfecting of these condensers. A new, high degree of matching has been achieved, and there are ingenious trimming devices to make any slight adjustment which might be necessary. Unlike most other ganged condensers "UTILITY" are so constructed that torsional stresses are impossible during tuning operations. This means that capacity remains balanced—the most important factor in securing correct tuning. A ball-bearing centre spindle provides an incredibly smooth action and the special trimmers ensure dead accuracy of tuning.

SEMI-SCREENED

TOTALLY SCREENED

Cat. No.		Cat. No.	
W.305/2	Two-gang 17/6	W.306/2	Two-gang .. 22/6
W.305/3	Three-gang (as illustrated) .. 22/6	W.306/3	Three-gang .. 27/6
	Friction Dial 2/6 extra. (Prices of four-gang on application.)		

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AGENTS—London: E. R. Morton, Ltd., 22, Bartlett's Buildings, Holborn Circus, E.C.1; Scottish: E. B. Hammond, 113, Vincent Street, Glasgow; Lancashire and Cheshire: J. R. Lister, 93, Old Road, Blackley, Manchester; Westmorland, Cumberland, Durham, Northumberland, Yorkshires and Derbyshire: H. C. Rawson, Ltd., 100, London Road, Sheffield.

NEW HIGH DEGREE OF MATCHING ... PERFECT SCREENING

WE ARE EXHIBITING AT



STAND NO. 90

Keep Within the Maximum Wattage Recommended

used there is a tendency for a curious kind of instability to develop, the symptoms being too difficult to describe, but rather like a grid-leak howl or "squegg."

A little care should be taken in fixing this resistance value, for if the bias is too low, grid current results. On the other hand, too much bias sends up the valve impedance, and a drop in stage gain results.

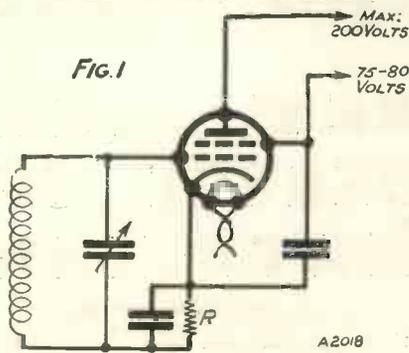
This question of the increase in valve impedance with negative bias is quite an important one. When you remember that a power valve with a nominal impedance of 6,000 ohms will easily go up to 9,000 or 10,000 ohms when suitable negative bias is applied, you will see how, with a steep-slope valve such as the screen-grid type, the working impedance can be extremely high.

New Super Pentode

This, of course, is a point to bear in mind when designing circuits for use with the screen-grid valve. I have carried out a number of tests with this valve and compared it against others in a number of different circuits and mains receivers, and I have found that the S.4.V.A. gives a decided increase in amplification.

Comparisons were made on weak transmissions, low-power stations in daylight in some cases, and it was

THE INPUT STAGE



A satisfactory way of biasing an A.C. S.G. valve.

found that the use of the new valve gave an increase in signal strength varying between 20 and 100 per cent. The next valve I want to refer to is the new super-pentode—the P.M.24B.

This valve, which is of the directly-

heated type, has a 4-volt filament consuming 1 ampere. In the case of this valve it is most important that the filament be run at its rated figures, especially when working anywhere near the maximum rated values of H.T., otherwise the emission will be impaired.

Handles Big Inputs

The maximum plate and auxiliary grid volts are 400 and 300 respectively, and under these conditions the valve will handle a total grid swing of about 80 volts.

The amplification factor (theoretical) of this valve is 50, the impedance being given as 24,000 ohms. The mutual conductance is 2.1 mA/volt.

It is recommended that the anode current of this valve should not be more than 20 milliamps., and when used off mains, as shown in Fig. 2, bias may be obtained in the usual manner with a resistance R in the H.T.—return for the valve. The actual value of this resistance will depend on the amount of H.T. used, but for anywhere near the maximum values of H.T. about 2,000 ohms will be needed.

This resistance should be variable between certain limits, and a convenient way of achieving this is to have a fixed resistance of 1,600 ohms and an ordinary 400-ohm potentiometer connected in series with it to give the necessary control.

When using 300 volts on the plate, and 200 volts on the auxiliary grid, only 20 volts approx. are required for bias and a resistance of 1,000 to 1,250 ohms only is needed.

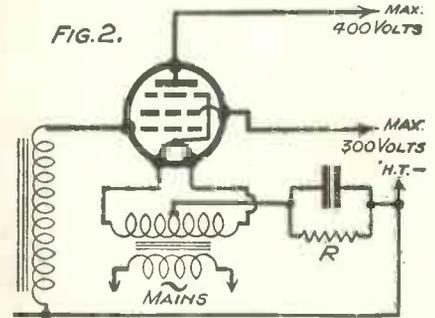
On the Safe Side

Personally, when working with a valve capable of handling a fairly heavy output, I have generally reckoned my anode current to a certain extent on the basis of the power which the valve is actually capable of handling. In the case of the 24B, which should not pass more than 20 milliamps. at 400 volts, this represents a total dissipation of 8 watts.

When working on a lower anode voltage I sometimes find it an advantage to pass a slightly greater anode current, especially when working under conditions where a fair amount

of output power is required, and providing the total dissipation does not rise above the 8 watts specified by the makers, and provided always, of course, that the plate current does not rise to a value which is an appreciable fraction of the filament current, I reckon that I am working on the safe side.

THE OUTPUT END



Supplying automatic bias to the A.C. power pentode.

It is possible that this line of reasoning is not quite correct, on a theoretical basis, but from a practical point of view I have found it quite a satisfactory rule to work on.

Output Arrangements

A filter circuit should be used, of course, to feed the loud speaker, or else an output transformer, as 20 milliamps. is rather high to put through a loud speaker. If a filter is used, a tapped choke such as the Varley Pentachoke will enable an excellent frequency response to be obtained, and the slight low-note loss that is often obtained with pentodes is entirely compensated for.

I may confess that up till now I have not liked pentodes for output valves, but I must say that this new valve not only enables excellent quality to be obtained with suitable output arrangements, but is also capable of handling really big outputs, enough to fill quite a fair-sized hall, in fact.

Naturally, a valve of this description needs an eliminator capable of giving it the full value of H.T., and the actual value is that of the H.T. plus G.B., when automatic G.B. is being used. This means that a total of 440 volts will be needed, and a rectifying valve capable of dealing with this voltage is necessary.



AN ENTIRELY NEW RANGE



MULTI-GRID VALVES

An entirely new range of Tungram Multi-grid Valves—the first of the new Tungram series. Of unique construction, they supersede entirely the pentodes at present on the market; they are so arranged internally that the electron stream is *twice* controlled by the grid.

These new valves can be used in any existing pentode receiver without any circuit alteration whatsoever; in ordinary receivers only one extra connection is necessary. Three types of Multi-grid Valves have been introduced: PP230 (2 volt), PP415, and PP430 (4 volt). PP230 will very materially increase the output of the small receiver, although the anode current consumption will in most cases be below that of the ordinary power valve. PP415 and PP430 will be found extremely efficient for the output stage of A.C. Receivers. All Tungram Multi-grid Valves can be supplied with a 5-pin base, or 4-pin base with side terminal.

For characteristic curves and other technical information write to Dept. ST2. Prices: Multi-grid Valves Type PP230, 16/-; PP415, 16/-; PP430, 19/-. Other types from 5/6 to 19/-. Tungram Barium Valves are manufactured under one or more of the following Patent Nos.: 289,762, 289,763, 311,705, and 313,151.

TUNGSRAM ELECTRIC LAMP WORKS (GT. BRITAIN), LTD.
Radio Department, Commerce House, 72 Oxford Street, London, W.1.
Makers of the famous Tungram Electric Lamps.

Branches in Birmingham, Bristol, Cardiff, Glasgow, Leeds, Manchester, Newcastle, Nottingham, Southampton Lamp, Valve and Glass Factories: Austria, Czecho-Slovakia, Hungary, Italy and Poland. I.F.S. Organisation, Tungram Lamps & Radio, Ltd., 11 Burgh Quay, Dublin. Tungram photo-electric cells: Nava "E" (for scientific measurement), £2 17s. 6d.; Nava "R" Red sensitive cell (for colour matching devices), £3 3s.; Nava "EH" (for talkie work), £3 13s. 6d.

3125

TUNGSRAM

CONCERNING OSCILLATION

A curious radio experience in South America in which the oscillating properties of a radio receiver were turned to good account.

EX-INSPECTOR BLAZER has a peculiar sense of humour. At least, that is what Dare thought when the detective staggered to the quayside with a thirty-pound portable radio set.

"Not going to use it myself for a bit," he panted; "thought you might like to take it along with you."

Last-Minute Luggage

"My dear, dear policeman," protested Dare, "I've already got about a ton of luggage. I'll admit that I was once so foolish as to mention in your hearing that I had had ideas about taking a portable with me, and that my own had been left at my little place at Winkelsea, but I assure you, Blazer, I——"

"Get aboard, you ungrateful devil!" interrupted the detective; "they'll be casting off any moment now."

Dare managed to find just enough room for the cumbersome instrument underneath his bunk. It remained there, untouched, during the whole of the voyage.

San Paulesco, the capital of one of those South American states, lies on the coast and it has a fine natural harbour. When Dare arrived he was relieved to find a British cruiser anchored in the "roads," like a watchful greyhound, for he had heard rumours of an impending revolution, and was a bit uneasy about it.

He had been engaged to supervise the erection of a private radio station of some considerable power for a prominent citizen of San Paulesco. The fee was alluring, and he had been unable to resist it, for it seemed a quite straightforward, above-board job.

Trouble Brewing

Señor Grandioso, his client, welcomed him profusely, and his huge palace-like mansion, with its quiet deferential servants, seemed far removed from lawlessness and revolution.

The señor explained that the radio station to be erected in his spacious grounds was for communicating with the various trading centres in which he was interested.

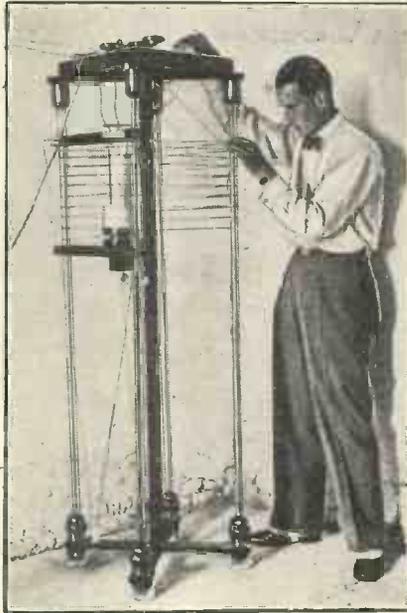
The government concessions that he exhibited seemed to be quite in order, although Dare did make a few inquiries at the Government House, but ample confirmation was available.

After that he ceased troubling himself about anything except the immediate task of getting unskilled local labour to assemble all the apparatus that had arrived in huge packing-cases, and to erect the two 175-ft. masts.

Between times he wandered through the town and motored into the surrounding country—generally alone, for the señor was away much of the time.

A month or so elapsed before the radio expert first began to notice significant changes in the domestic staff. The places of many of the

ANOTHER DEATH-RAY!



Herr Schimkus, a young German engineer, and his "Death-Ray" machine. America is said to have purchased a four-month option on the invention. In preliminary tests Schimkus succeeded in firing off unprepared explosives over a distance of fifty yards.

servants were gradually being taken by rough, coarse-speaking fellows, who swaggered about with knives stuck in their sashes.

Also, people began to gather in little bunches in the streets, and many more soldiers were to be seen.

It was certainly all very ominous. Dare hastened the work and was extremely thankful when it was finally completed. So one day, after making one last inspection of all the component parts and checking the wiring, he decided to have one test "on air" before packing up, collecting his fee, and departing by the steamer scheduled to leave the following morning.

He went into the summer-house that had been converted into a control-room in accordance with Señor Grandioso's wishes, and sat down before the tapping key.

A Sudden Development

A layman would have thrilled to the core as he closed a switch and set the huge generators into motion, but Dare had lost most of his early enthusiasm for such affairs. However, it must be admitted that he felt very pleased with himself as the various complex instruments sprang into life at his command.

He quickly made contact with a large commercial station, and was amused to find that its operator was Spanish and knew no English. This conversation through the ether consisted almost entirely of universal code abbreviations.

But apparently the Spaniard grew excited about this new high-power station, for presently he lapsed into "prose." With one eye on the flickering meters, Dare idly recorded the words on a scrap of paper that happened to be at hand. But he was so sufficiently engrossed not to hear Señor Grandioso enter.

"So, Mistaire Dare," that worthy suddenly exclaimed in his ear, "you tell me you know no Spanish?"

The radio expert started and turned round to face his visitor.

A Poke-ze-Nose Spy!

"Know Spanish? I can't speak or understand a word of it, Señor Grandioso."

"Then 'ow is it that you write the Spanish words from the wireless—yes?" demanded the señor, with unmistakable ferocity.

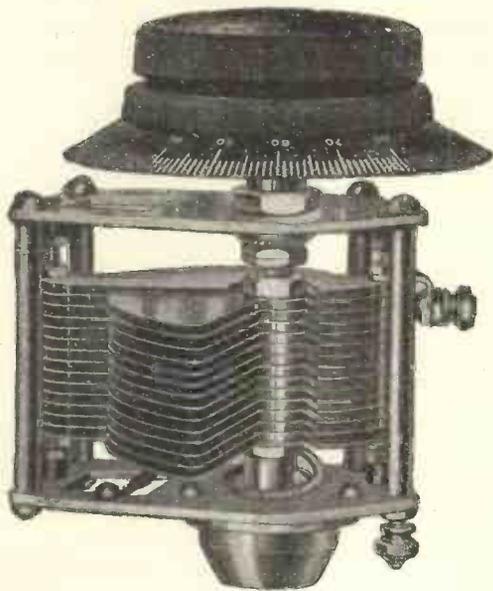
"That's an old one," laughed Dare. "Morse, señor, gives you the letters, and you don't have to know any particular language to write strings of letters down."

"You lie! You are a poke-ze-nose, spy you call him—yes?"

"Spy? My dear señor, why on earth should I be a spy? This isn't a secret station, is it? Anyway, I am British, and a quite well-known

(Continued on page 400.)

HERE IS THE PERFECT CONDENSER

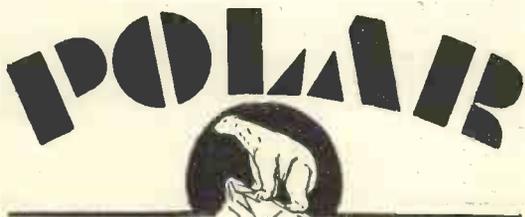


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A product of specialists in the design and construction of variable condensers. The Polar "Ideal" Fast- and Slow-motion gives you precision tuning control. Totally enclosed ball-bearing movement gives smooth and silent action. Design ensures high conductivity. Vanes are well spaced from frame. Made entirely of chemically cleaned brass. Rigid construction. One-hole fixing.

- 0003 10/-
- 00035 10/3
- 0005 10/6

Write for Illustrated Catalogue of complete range of Polar Condensers.

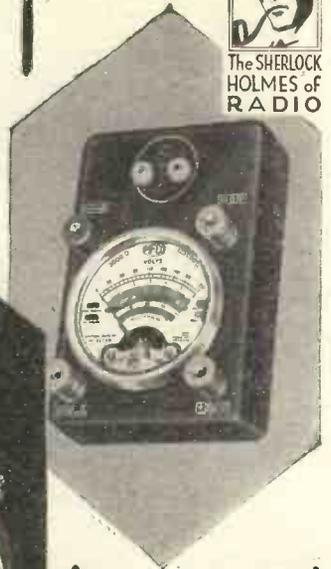


CONDENSERS

STAND No. 60 OLYMPIA

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TEST then Rest



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With the "All-In-one" Radiometer you can instantly check the performance and efficiency of any Valve, Circuit, Battery or Component. This little instrument tests everything—in a few minutes—with absolute certainty. If the "All-In-One" Radiometer says such a thing about any part of a set—then it is so!

Think of the time, trouble and money you could save if you had an "All-In-One" Radiometer of your own. Then look at the amazingly low price—12/6. You'd save that over and over again in a year, by entirely cutting out costly guesswork and also being independent of the need for expensive expert assistance. Ask your Radio Dealer to demonstrate the "All-In-One" Radiometer. See how efficient it is—how speedy—how economical.

**TESTS VALVES
FILAMENT · ·
ANODE & GRID
COMPONENTS
AND CIRCUITS
H.T. AND L.T.
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Everything!**

Patents: Pifco Ltd., High St., Manchester.

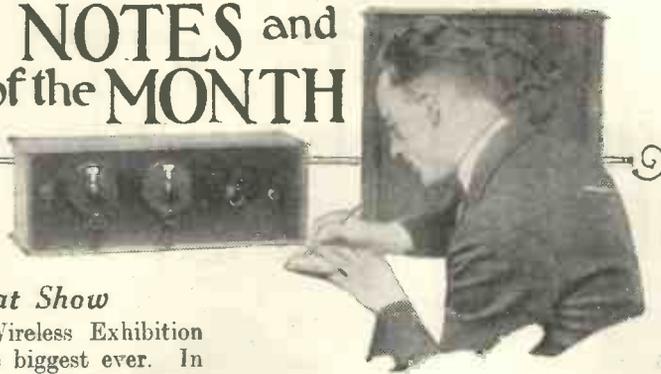
PIFCO ALL IN ONE RADIOMETER



Standard Model shown above on left. For Battery Operated Sets only. Price 12/6.

De-Luxe Model shown above on right. For Battery Operated Sets, Electric Receivers and Mains Units. Price £2 : 2 : 0

RADIO NOTES and NEWS of the MONTH



The Great Show

THIS year's Wireless Exhibition will be the biggest ever. In addition to the National Hall, the organisers have taken three floors of the Empire Hall, Olympia, London, W. The latter will be used for stands for the first time, and there will be greater facilities for demonstration purposes.

See the Sets

I would like to take this opportunity of reminding you that you will be very welcome at our Stand, which is No. 67. MODERN WIRELESS staff men will be on duty to answer your questions and to render any possible service they can to MODERN WIRELESS readers.

Also, you will have a chance of examining some of the more outstanding radio receivers designed in our Technical Department. The

actual models of these sets will be shown on our Stand, and in such a way that you will be able to compare your own efforts with those of the original designers.

Broadcasting House

On going over Broadcasting House one cannot help remembering that the B.B.C. has now found the building not big enough, and that an adjacent site has been acquired. And yet when I looked over the huge Conference Room at Broadcasting House I wondered whether such a huge room was really necessary for conferences, when the space could have been better utilised for housing the various staff departments.

Semi-Circular State!

This Conference Room has walls decorated with Tasmanian oak. The room is in the shape of a half-circle, and is more like a millionaire's vestibule than a Conference Room. Certainly it is far bigger and more impressive than the Cabinet Room at Downing Street.

5XX Goes "Talkie"

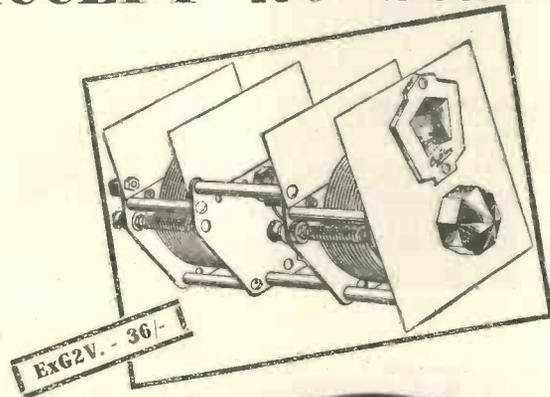
The new arrangement whereby the National programme will deal with all the solid talks and educational features until 8 o'clock each evening, except on Tuesdays, when the evening's entertainment will begin at 7.20 and will be interrupted at 8.30 by a half-hour talk, has caused a good deal of discussion. But, to counteract the effect of the National station "going talkie," the B.B.C. has made arrangements to keep the Regional programmes, Northern, Midland and London as free from talks as possible, and from these stations the period from 6.30 to 10.15 will be definitely available for entertainment.

In Country Districts

No doubt in districts which really can get hold of an alternative programme service this new arrange-

(Continued on page 396.)

ACCEPT NO SUBSTITUTE FOR CYLDON EXTENSER IN THE "SUPER QUAD"



FOR "SUPER QUAD"

CYLDON Double Gang Extenser. Type ExG2V. Fitted with wedge drive, disc type, Slow-motion Control. Hair-line sight. 5 to 1 reduction. Fitted straight-through spindle and high interstage screening. Price 36/-

FOR "SUPER QUAD"

AND FOUR-BAND THREE

CYLDON Slow-motion, Type Ex5V. Fitted with wedge drive, disc type, Slow-motion Control. Hair-line sight. 5 to 1 reduction. Perfectly timed Extenser wavechange switch. Price 16/6

FOR "PENT-ACE."

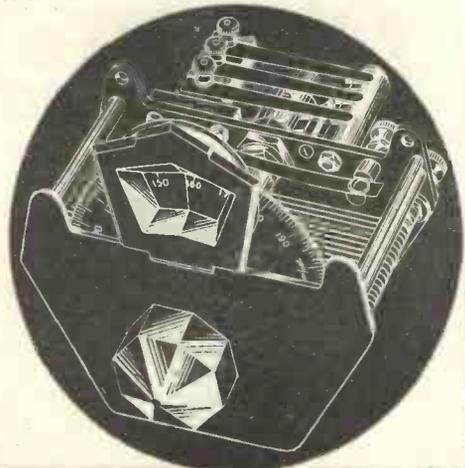
CYLDON Extenser, Type Ex5. The standard unit fitted in all Cyldon Extenser Condensers. Price 12/6

Insist upon CYLDON for Extenser Sets — perfect wavechange switch, noiseless wipe contacts, 4-pilar construction, rigid and fool-proof. Be wise—refuse to accept substitutes for specified CYLDON EXTENSERS in Kits of Parts you buy for the "Super Quad." Don't risk trouble — those who know Extensers build with CYLDON.

S. S. BIRD & SONS LTD. CYLDON WORKS, SARNESFIELD ROAD, ENFIELD
Enfield 2071-2 Grams: Capacity, Enfield

STAND
172
EMPIRE
HALL
1st Floor

SEND FOR
NEW
CATALOGUE



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FIVE YEARS GUARANTEE



NEW R.K.'S

PRICES NOW FROM
3/6

R.K. reproduction is the ambition of every radio enthusiast. Now—that ambition can be realised. The 1931 range of redesigned R.K. moving-coil speakers is released to the public! In this new range, from the "Minor" D.C. Model at 3/6 to the "Senior" A.C. Model at £7.15.0, there is an R.K. to suit your purpose and pocket. Come and see the new R.K.'s at the **RADIO EXHIBITION, STAND NO. 21** or ask your dealer for a demonstration.

B.T.H.



**MOVING-COIL
LOUD SPEAKERS**

EDISWAN RADIO PRODUCTS

Minor Permanent Magnet Model—A moving-coil speaker to work from a small output valve. Capable of handling outputs up to 2 watts. Performance is comparable with the Senior R.K. Price £2 10s.

Minor D.C. Model—Similar to permanent magnet Minor, but suitable for 200 volts mains field excitation. Price £1 11s. 6d.

1931/2 Senior Permanent Magnet—Incorporates the highest grade cobalt steel magnet, and 10 in. corrugated cone. New Reduced Price £5 12s. 6d.

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Minor Permanent Magnet R.K.—In fumed oak cabinet. Price £3 17s. 6d. In special walnut cabinet, Price £4 4s. Dimensions of cabinet 14 in. high, 13 in. wide, 7½ in. deep.



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CASSELL'S Magazine

Now on Sale **1/-**

RADIO NOTES AND NEWS OF THE MONTH
—continued from page 394

ment will be appreciated, for listeners will certainly get more contrasts between the National and Regional programmes.

But what about the areas where alternative programmes are not obtainable? Moorside Edge, for example, is theoretically supposed to serve the North region, but in actual practice many listeners are finding that its range does not by any means cover the entire North of England. A great many listeners, including those in districts like Tyneside and Windermere, have to rely on the National station for definitely good reception.

More National Music

People in these districts will certainly be rather fed up with the amount of talks they will get from the National transmitter, and I shouldn't be surprised if there will be in due course quite a lot of local agitation.

Down on Seven Metres
It is interesting to hear that the B.B.C. will shortly begin experimental local transmission on a wavelength of 7 metres. The Telefunken Company in Germany are also doing the same thing, for it has been realised in both countries that there are many possibilities in ultra-short-wave wireless. The B.B.C.'s effort will be purely experimental for the time being, but possibly as a result of these experiments a good many of the existing problems due to interference will be cleared away.

Sprayed Programmes
In an interview the other day, Mr. Noel Ashbridge, the Chief Engineer of the B.B.C., pointed out that if these experiments proved successful there is a chance that a 7-metre broadcasting system could be used as an auxiliary to the Regional Scheme. "The angle of the ray is limited to a few miles," said Mr. Ashbridge, "and comparatively small power is required, but the transmitter has to be placed at as high a point as possible. The waves are then sprayed over the surrounding district."
He went on to say that the fact that the waves completely disappear and are not reflected back to earth,

as is the case with long waves, makes it possible to use any number of stations without the chance of their interfering with each other

Those Early Days
Our readers have probably noticed that our Radio Consultant-in-Chief, Captain P. P. Eckersley, has made arrangements to publish broadcasting criticisms in a well-known daily newspaper.

Captain Eckersley, apart from his great technical qualifications, is well able to criticise the programmes of the B.B.C., for it will be remembered that in the early days, long before broadcasting began, he ran the Marconi Experimental Station at Writtle, and probably in the whole history of entertainment by wireless there never since have been such cheery little radio evenings.

Capt. Eckersley's Articles
Captain Eckersley, however, still retains his staff appointment as Radio Consultant-in-Chief for MODERN WIRELESS and its associated journals, the "Wireless Constructor" and "Popular Wireless." And only in these three radio papers will you
(Continued on page 398.)

Components of Excellent Quality . . .

MAGNUM VOLUME CONTROL

As specified for the "M.W." "Four-Band" Three. $\frac{1}{2}$ megohm.
A component of entirely new design in a very compact form; $1\frac{1}{2}$ in. diam. and $\frac{7}{8}$ in. deep. Method of contact eliminates noises and wear.

PRICE 5/- EACH



WE SPECIALIZE in the "M.W." "Pent-Ace," "Super-Quad" and "Four-Band" Three Receivers, which can be supplied as constructional kits, ready wired and tested, or parts separately. Particulars of these together with a comprehensive range of lists dealing with Magnum Components and Receiving Sets—free on request.



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As specified for the "M.W." "Pent-Ace," "M.W." "Super-Quad" and "M.W." "Four-Band" Three Receivers, as described in this issue.

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There is no high-grade Permanent Magnet M.C. Speaker on the market at this phenomenal price; nor is there one at any price to equal its remarkable performance.

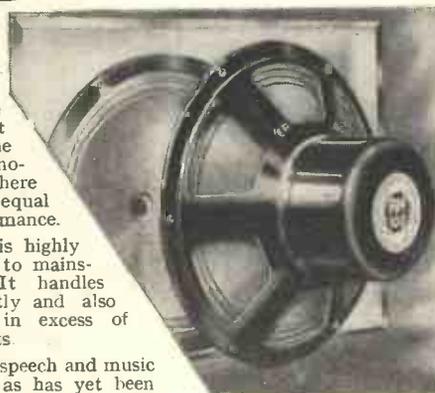
The R. & A. "100" is highly sensitive and equal to main-energised types. It handles small inputs perfectly and also those considerably in excess of domestic requirements.

The reproduction of speech and music is as near perfection as has yet been attained by any type of speaker. The cobalt steel magnet is totally enclosed in a dust-proof cover as also is the apex of diaphragm. Speech coil resistance 8.5 ohms, requiring a suitable output transformer.

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Panel, 16" x 8"	s. d.
Band Filter, Coils and Special Oscillator	7 6
per set of 3	37 6
Potentiometer, wire-wound, 50,000-ohm	4 0
H.F. Chokes, range 10-2,000 metres. Each	6 6
Valve Holders, 4-pin. Each	1 3

"PENT-ACE"

Panel, 21" x 7"	8 9
Wire-wound Potentiometer, 50,000 ohms	4 0
H.F. Chokes, 10-2,000 metres. Each	6 6
Output Chokes, List No. H.T.5	12 6
G.L. Holder	6
Quoit Formers (6d.) wound to specification. Each	2 0
Coils:	
P.J.2	2 0
P.J.3	2 9
4-pin Valve Holder, sprung sockets. Each	1 3
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Panel, 18" x 8"	8 6
Special Ganged 3-pole and 4-pole double-throw Switch, with Bracket and Extension Rod. Complete	9 0
1-megohm Volume Control	4 0
H.F. Choke, range 10-2,000 metres	6 6
Output Chokes, List No. H.T.2. Each	21 0
Coil Mounts, special low-loss. Each	9
P.J.1 Coil	2 9
Coil Quoit Formers (6d.), wound to specification	2 0
Valve Holders, special sprung sockets. Each	1 3

To get best results from above Sets a good Earth is essential, and is only possible by fitting our Patent All-Copper Earth Tube. Price 3/6.

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H.T.8**

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WE ARE EXHIBITING AT



RADIO NOTES AND NEWS OF THE MONTH

—continued from page 396—

find technical articles from Captain Eckersley's pen.

"The Big Three"

Another feature which is entirely exclusive to "Popular Wireless," and which you will find nowhere else, is Captain Eckersley's Query Corner, in which week by week he answers readers' queries. So remind your friends that if they want to read Captain Eckersley's technical articles, and to learn from his wide experience in radio engineering, it is only via the Big Three in radio that they will be able to enjoy his technical articles.

Our Changing World

Several new features are to be introduced into the talks to be broadcast during the winter session. A series planned by the Central Council for Adult Education, under the general heading of "The Changing World: A Broadcast Symposium," will pro-

vide much material for discussion by group-listening centres. Among the subjects and speakers scheduled are: "How Wealth has Increased," by Professor Arnold Plant; "Why does Poverty Continue?" by Mr. D. H. Robertson; "The New Spirit in Literature," by Mr. Harold Nicolson; "What is Science?" by Professor H. Levy; "What is Man?" by Professor Julian Huxley and Dr. John Baker; and "Can Democracy Survive?" by Mr. Leonard Woolf and Lord Eustace Percy

Introduced by H. G. Wells

As a prelude to the Disarmament Conference, which takes place early next year, a series of talks will be broadcast, the general heading being "War or Peace?" The speakers will deal with technical and political aspects of the problems confronting the Conference.

Mr. H. G. Wells is to introduce a series with the title: "What I would do with the World," in which a number of speakers with special knowledge and experience of the affairs of the world, or with some special point of view, will discuss their individual ideas for the conduct of the world's affairs during the next twenty years.

"PRACTICAL RADIO"

New Book Reviewed.

FROM the McGraw-Hill Publishing Co., Ltd., we have received a copy of "Practical Radio," by Meyer and Wostrel. This is a well-bound, handy-sized volume of over 400 pages.

As the title implies, it is really practical, containing a mass of information about all aspects of radio, from the theory of simple wave-motion, etc., to a description of television. A great deal of really helpful information is contained in such chapters as that on the Selection, Operation and Care of Radio Apparatus, and that on Common Troubles and their Remedies.

Good illustrations, clear type, and a crisp lucidity of statement enable an enormous amount of information to be contained in this volume. It is a pity though that the English edition was not Europeanised, as the references to such things as "binding-posts" (terminals), "B batteries" (H.T.), and so forth, will certainly puzzle the uninitiated. The price is 12s. 6d.

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Correct, steady Turntable speed—a pick-up that faithfully interprets all the beauty of tone which modern electrical recording has placed upon your record—correct Volume Control; these are the three first steps towards Perfect Reproduction. These conditions can easily be satisfied—

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Booklet describing both instruments, free and post free. Request at the same time one of our Stroboscopic Speed-Testers (illustrated), printed on stout white card.

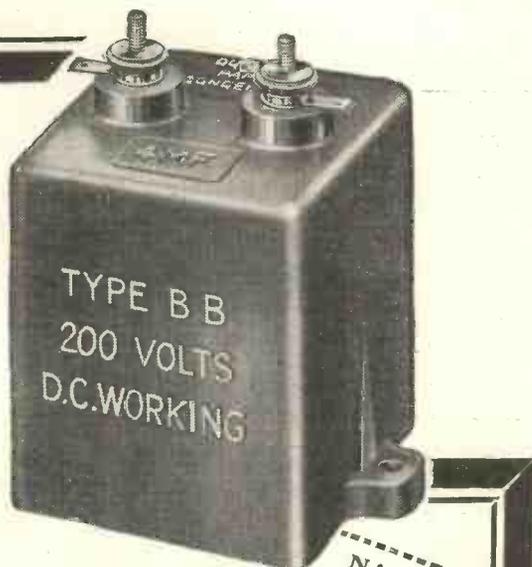


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A 4 mfd. Type BB



With the addition of this new 4 mfd. model the need for paper condensers suitable for wireless receivers can now be met from the range of Type BB Dubilier Condensers.

This range of Condensers has already been used by many thousands of constructors of wireless receivers with entire satisfaction. They are built with all that precision which ensures unflinching reliability in any Condenser bearing the name Dubilier.

PRICES (Type BB):—

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(Working Voltage 200 D.C. Tested at 400 V.D.C.)

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EXHIBITION
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is contributing a weekly review of the latest developments in wireless to *The Daily Mail* every Wednesday. World-famous as one of the pioneers of broadcasting, both in connection with the Marconi Company and the B.B.C., his expert knowledge and unique experience are at your service.

*See
The Daily Mail
every Wednesday!*

**CONCERNING
OSCILLATION**

—continued from page 392

man in my own line, as you should know."

"The revolution, it is started!" exclaimed Grandioso inconsequentially, his eyes lighting up fanatically. "Me, I will be ze president, and I order you to proceed to your private room. Jazzo! Seizo! Enter and escort the very excellent Mistaire Dare to his room, and remain to guard his door. Ze window it is high and sees over the palazio—yes?"

Seized as a Spy

"Just a moment," said Dare, as two of the most insolent of the new servants entered and lined themselves up beside him, "you can't detain a Britisher against his will. That sort of thing doesn't pay revolutionaries or anybody else."

Señor Grandioso twirled his long moustaches and puffed out his chest.

"Ze Mistaire Spy Dare, he is my prisonaire. Maybe it is my pleasure to release him—later. Maybe it is my

pleasure to despatch him and sorrow with his so fine government that he has been keeled by ze accident in ze great revolution."

"Do tell me what you think I have really done to harm you, my dear brigand?" implored Dare. "You know as well as I do that this spy business is all bunk. I've built you a fine radio station, and surely that will help your revolution no end."

Dare Gets a Fright

"Ze government of ze present, they think that I obey their instructions of yesterday to have this station out-of-ordered, they know not that it is me, me who is the so-great new president," admitted Grandioso calmly.

And as Dare perforce retired to his room in the mansion, he could not help smiling to himself at the unreal madness of it all. He even wondered if the revolution extended farther than the immediate domain of Señor Grandioso. At the same time he was worried, if not actually in fear; he had looked into the senor's eyes—they were undoubtedly the eyes of one who was not sane.

Dare's escort provided evidence that there were at least some accomplices who believed in the revolution,

for they guarded him rigidly and blankly refused all his attempts to buy them off.

Late that night Señor Grandioso was rudely disturbed by a violent hammering at the main entrance of his mansion. He himself rushed to the door.

Drawing a revolver from his pocket, he flung it open. The bright moonlight revealed a double file of His Britanic Majesty's Royal Marines. A youthful officer stepped forward.

"I have reason to believe that you are detaining one of our nationals against his will," he announced.

Señor Grandioso smiled toferantly. "In my 'ouse?" But his heart sank within him as he noted the bright gleam of fixed bayonets.

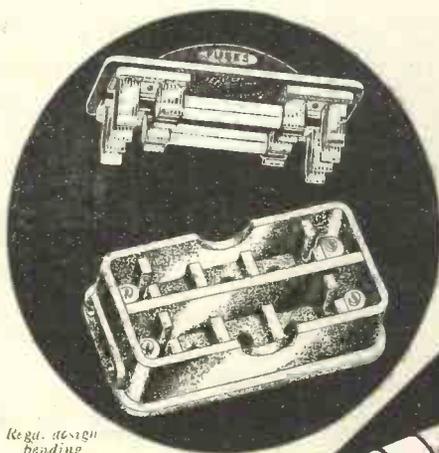
The Rescue

"Our embassy has evacuated; we shall enter by force if you do not release Mister Dare immediately."

Needless to say, the British navy had its way, and Dare was soon en route for the harbour, complete with his baggage and escorted by twenty business-like marines.

"The reason for the delay was because we couldn't understand why

(Continued on page 402.)



Regd. design pending

TWIN BASEBOARD FUSE-HOLDER, with two 1 amp. fuses for mains leads (illustrated above) . . . 3/6

WANDER FUSE. Combined Wander Plug and Fuse, with 60 m/a fuse . . . 1/6

FLEXIBLE LEAD FUSE-HOLDER, short type, with 1/2 amp. fuse . . . 1/-

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BASEBOARD FUSE-HOLDER, with 1/2 amp. fuse. The best method of mounting a fuse inside a set or mains unit . . . 1/3

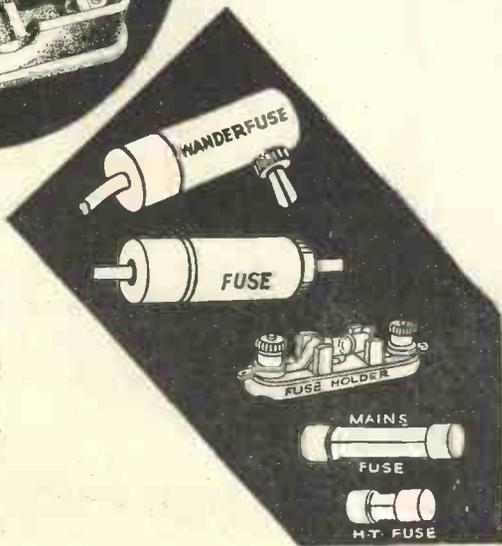
**A COMPLETE RANGE of
FUSES
FOR EVERY
REQUIREMENT**

TECHNICAL REASONS.

A fuse in a mains lead is a totally different proposition from a fuse in a H.T. or G.B. lead. In the mains lead it is unsound to use a lower rating than 1 amp., because the mere switching on and off of current creates a surge which might easily blow a fuse of lower rating. Further, in a mains lead fuses should always be more than 1 in. long to make arcing impossible.

In H.T. and G.B. leads, and rectifier circuits, on the other hand, it is unnecessary for fuses to go beyond 1/2 amp., even with multi-valve sets. Nor need they be longer than 5/8 in., even with a powerful H.T. supply. H.T. fuses should be kept as short as possible, for the fine high-resistance wire used is liable to act as a coupling between the circuits and to set up "motor-boating" if too long. That is why Belling-Lee now make their fuses in two lengths. H.T. ratings 60 m/a., 150 m/a., and 1/2 amp. 5/8 in. long. Mains ratings 1, 2 and 3 amp. 1 1/4 in. long.

Spare fuses of all ratings are sold at 6d. each.



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DIAL READINGS.

0-100 covers 230-530 metres.
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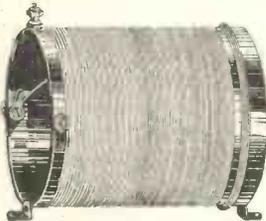
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"POP VOX" COILS.



These coils are accurately made to the correct specification. The windings are carefully made on a strong former fitted with feet for mounting.

Price 3/9
See also pages 405 and 407.

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Factory . CROWN WORKS, SOUTHAMPTON.



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THIS MONTH**

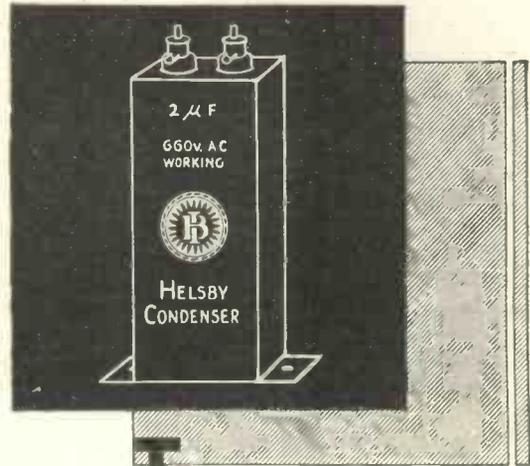
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50,000-ohm Sovereign Volume Control (See blueprint) - 4/6
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50,000-ohm Sovereign Volume Control - 4/6
20,000-ohm Sovereign Spaghetti Resistance - 10d.
2 Sovereign Coil Quits - each 6d.
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50,000-ohm Sovereign Volume Control - 4/6
600-ohm Sovereign Spaghetti Resistance - 4d.
50,000-ohm Sovereign Spaghetti Resistance - 1/1
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	2 mfd. ..	4/9

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**BRITISH INSULATED CABLES LTD
PRESCOT... LANCASHIRE
MAKERS OF B. I. CABLES**



CONCERNING OSCILLATION

—continued from page 400

you were not able to receive our messages," explained the officer, as they tramped along; "and, by the way, how on earth did you get access to the transmitting station? I saw the masts, but I understood you to say you were under close guard."

"My signals were very weak, weren't they?"

"Yes, extremely so, and that again made us suspicious, for our operator thought they were coming from a much greater distance than San Paulesco, and we are lying only a mile or so outside."

How It Was Done

"No wonder it took me a long time to get over," said Dare smilingly. "I was sending for hours. I guessed that it would be necessary. You see, by the greatest of good fortune I happened to have a portable radio receiver in my room. Now you know if you use two much reaction on most ordinary receiving sets you radiate a radio wave that may

interfere with legitimate transmissions? Well, I turned this fact to very good account. I stripped the frame aerial off that portable and hooked it up as an extended indoor aerial. I then altered the wiring of the set until it was an ordinary oscillating receiver. It was quite a simple matter to arrange it so that

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November "Modern Wireless." On sale October 31st. Price 1s.

I could stop and start the oscillations in accordance with the Morse code. Fortunately, I was able to tune to the wave-length I guessed you'd be listening on, and your operator heard me.

Back in London Blazer was working on a murder case.

"It seems," he said to his assistant, "that it all rests on the evidence that

someone heard this suspected person say, 'I'll kill you for that.' Now people often use such expressions without meaning anything at all. Look here, I've just had a telegram, it reads—"Returning to England today. Your portable saved my life. Dare." Saved his life, my eye! I'll be hanged if I know why people use such exaggerations."

"It's a good job you don't know, then," grinned the other.

THOSE CRACKLING NOISES

If your trouble is intermittent crackling noises (by which I mean noises outside the usual run of dry joints, dud grid-bias batteries, and so on), suspect the aerial. Make sure (using an Irishism) first that your earth lead is in order. Then inspect the change-over switch or lead-in plug on the aerial.

Finally see that the twisted bits at each end of the aerial are clean and done up tightly. Then, if you use stranded wire, look along it and make sure that you have not a broken strand, with the two ends occasionally rubbing together.

RADIO-GRAM ENTHUSIASTS!

Here's the way to the best possible reproduction

A well designed amplifier, a good moving coil speaker and—a B.T.H. Pick-up and Tone Arm. These are the ingredients for the finest reproduction of records. The recipe is recognised by leading Radiogram experts.

And there's no need now to forego your B.T.H. Pick-up on the score of cost. The new B.T.H. "Minor" is a product of the same engineering principles that have made the "Senior" Model the standard of excellence where Pick-ups are concerned. Ask your dealer for a demonstration.



PICK-UP and Tone Arms



THE EDISON SWAN ELECTRIC CO. LTD.
155 Charing Cross Road, London, W.C.2



"Minor" B.T.H. Pick-up and Tone Arm. Price complete 27/6

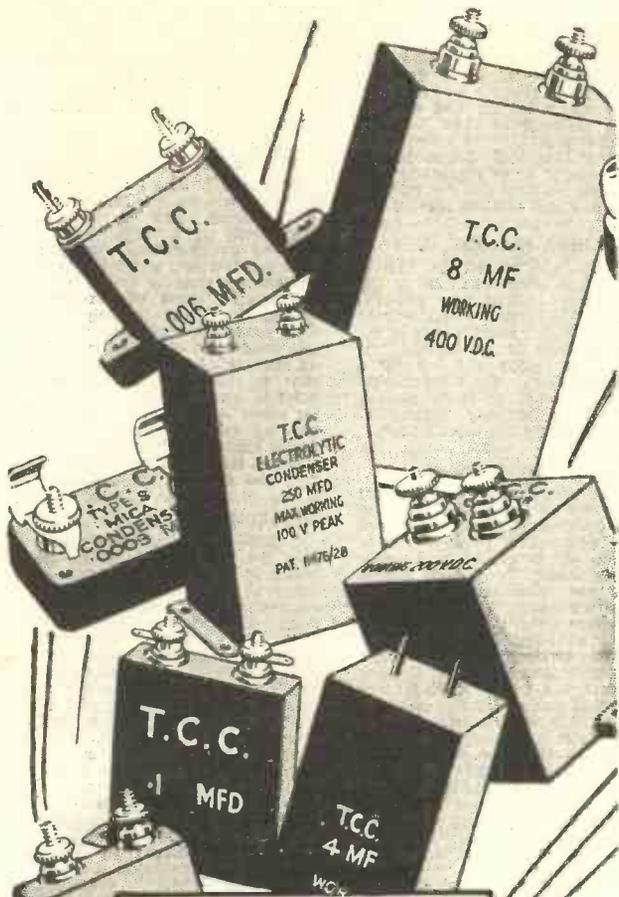


"Senior" B.T.H. Pick-up and Tone Arm. Price 45/-



"Senior" B.T.H. Pick-up only with adaptors. Price 27/6





YOU'LL FIND THEM ALL ON STAND NO 14
and in all the best sets at **OLYMPIA**



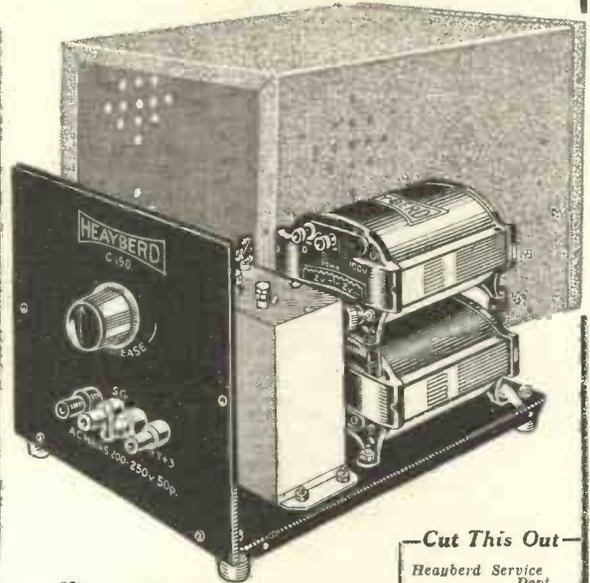
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MODEL C.150.
Output 150 v. at 25 m/a. Three tappings: 60/80 v. S.G., 120 v. and 150 v. Westinghouse rectification. Assembled in Handsome Case. Requires Wiring up only. Simplified Point-to-Point Diagram.

September 18 will not only open Olympia—it will be the commencing date of the most amazing warrant ever given in the Radio industry. Every Heayberd Main Unit and Assembled Kit will be covered against breakdown for Three Years from date of purchase.



76/-

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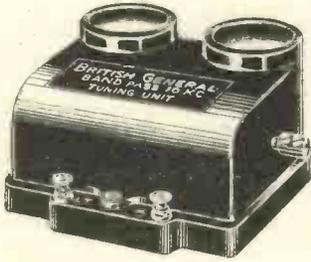
Heayberd Service Dept., 10, Finsbury Street, LONDON, E.C.2.

I enclose 3d. stamps for full lists showing how to build the Main Unit best suited to my Receiver.

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for **INCREDIBLE!**
AMAZING!
selectivity

NEVER BEFORE ACHIEVED without loss of Side-bands



PRICE **14/6** including non-inductive coupling condenser.
BRITISH GENERAL MANUFACTURING CO., LTD., Erockley Works, London, S.E.4.

Here is a new development in Tuning Units which is unique in its scope. It overcomes the difficulty which is experienced in achieving separation of near stations without destroying the effective range of the set. This new Band-Pass Unit gives the separation of 10 Kilocycles as laid down by the International Radio Convention and yet covers the entire wave-band between 230 and 550 and from 800 to 2,000 metres on one dial.

BRITISH GENERAL BAND PASS 10KC. TUNING UNIT

SEE US ON **STAND 30 RADIO EXHIBITION**

OUR STAND TO STAND REVIEW
The concluding section of an article that commences in our special coloured section. This "over-running" was necessitated by the inclusion of a quantity of last-minute information

SIX-SIXTY RADIO CO., LTD.
 Besides valve holders and useful little plug-in adaptors, the Six-Sixty Radio Co. mainly addresses its energy towards the manufacturing of valves and among the Six-Sixty range of valves are to be found some of the most successful on the British market. Ranges of two, four- and six-volt valves are extremely complete, especially in the case of the two-volters, and so rapidly are these ranges growing that very few weeks elapse when we do not hear of something new by the Six-Sixty Radio Co., Ltd. to improve their stock.

The Six-Sixty valves are specimens of the valve industry to be reckoned with, and especially fine are some of the special detector valves which they have brought out during the last few years. The firm's components are very rapidly growing in numbers, and this season many new lines have been added.

Among these some of the most interesting are the Spaghetti resistances, of which a very large range is available, and the bakelite moulded coil quots, which have been brought out specially to meet the demand of our readers and those of our contemporaries, "Popular Wireless" and the "Wireless Constructor." In addition an extremely efficient binocular H.F. choke and a wire-wound potentiometer have made their appearance, while recently the P.V. and P.J. coils have been added to their list of components.

SOVEREIGN PRODUCTS.
 High-class chokes and resistances form a large proportion of this firm's exhibits. The chokes can be obtained in two forms, straight and binocular, while the wire-wound potentiometer and the Spaghetti resistances are worth close attention. In addition, compression-type condensers are in evidence, and also a number of exceedingly neat terminal blocks, moulded in bakelite and forming a very convenient method of mounting terminals.

STANDARD BATTERY CO., LTD.
 The Waters pick-up and the Waters Standard wet H.T. battery are too well known to need any introduction here, and, as expected, they occupy pride of place in this exhibition.

We should like to mention the Waters Star loud-speaker unit, whose chief features are fixed magnets with eight laminated pole-pieces and dual means of control, and, of course, with it the Waters model 31 loud-speaker chassis.

Then we have a rotary converter for D.C. to A.C. It is supplied complete in sound-proof box for £9 10s., or with a smoothing unit for £1 5s. extra, where a 60-watt output is required; 120 watts can be supplied at £11, and £1 5s. for smoothing box as before.

Then, of course, we have the famous three-in-one meter, and also the Polyscope valve tester, which constitutes a complete circuit tester, useful for carrying out wiring, transformer, filament, condensers, etc., tests.

Finally, we must not forget the new synchronous gramophone motor, which employs a distinctive principle and eliminates all driving belts, etc., thus obtaining a total absence of the usual motor noises. The price is £3 3s., or £3 15s. where a heavy-duty motor for talking picture apparatus, etc., is required.

TANNOY PRODUCTS, LTD.

A very interesting programme for 1931 in mains units has been arranged by Tannoy Products, Ltd., while a number of complete sets, and a super-het radio-gramophone, junior and senior models, priced at 45 and 65 guineas respectively, for mains operation, have been produced. These receivers and gramophones combined have high-grade chassis which embodies a pre-detector H.F. multi-band-pass super-het receiver and a corrected L.F. amplifier. All the models incorporate a specially made moving-coil speaker, and can be obtained in battery types at somewhat lower figures than the mains.

There is also a Midget super-het receiver (mains operated) for 23 guineas, and a battery model for 25 guineas, comprising a high-grade chassis with corrected L.F. amplifier, and in an effective figured-walnut dome cabinet for single-dial tuning. It incorporates radio-gram fittings with independent volume control and moving-coil speaker.

TELEGRAPH CONDENSER CO., LTD.

This is a firm whose famous green-coloured condensers need no introduction. They are to be found in practically every home constructor's receiver, and are the products of a firm which has been very many years in the construction of condensers.

As is to be expected, the T.C.C. stand at Olympia this year is to be literally covered with these little green units, and the tiny flat types of condenser of low capacity. Anything from .0001 mfd. up to large blocks with plenty of microfarads are available from this company, while a new model specially brought out is the high-tension type of electrostatic condenser. This can be obtained with a capacity of 20 mfd. for use in mains units, and takes up extremely little space. It is a component that will be welcomed by a large number of set builders.

TELSEN ELECTRIC CO., LTD.

One of the most outstanding happenings in the world of radio during the last year has been the almost meteoric rise to fame and success of Telsen Electric Co., Ltd.

Grid-leak holders at 6d., designed to hold any standard type of grid leak—though Telsen, of course, make their own—right up to output chokes, loud-speaker units, transformers, and big fixed condensers, we can go practically through the whole gamut of the odds and ends required in a wireless set.

A recent line is the Spaghetti flexible resistance, in values from 300 up to 200,000 ohms, the prices ranging from 6d. to 2s.

Fuse holders of various descriptions, three-point switches of the self-cleaning contact types, small fixed condensers supplied complete with patent grid-leak clips, and tested to 500 volts, can be obtained from this enterprising firm at remarkably low prices.

The Telsen valve holder is too well known to need much description. They are sold at the ridiculously low figure of 6d. each.

Coming along to the transformers we have the "Radiogrand" and the "Ace" transformers, and pentode and ordinary output transformers with varying ratios. Then there are differential reaction condensers, output chokes, and power grid chokes, having an inductance of 40 henries and capable of passing 6 milliamps, and Mansbridge condensers which are available in various sizes and at various prices.

These are said to be non-inductive, and the capacities to be within 5 per cent of the nominal rating. Tested at 500 volts, they are priced at 1s. 6d. for the '01 up to 3s. for the 2 mfd., while in the 1,000-volt test they are from 2s. 6d. up to 5s. for the same capacities. An extremely neat new component is the Telsen binocular H.F. choke,

which has an exceptionally high impedance and low capacity.

We have not mentioned all the Telsen things because space does not permit, and those we have mentioned have only been described very briefly, but we think we have said sufficient to show that the Telsen stand is not only worth visiting, but that if you are an enthusiastic home constructor you will feel you must visit it to see what this go-ahead firm are offering.

ULTRA ELECTRIC, LTD.

Loud speakers of the famous Ultra type are to be found on this stand, and constructors and listeners who wish to hear a good quality loud speaker which is not of the cone or moving-coil type should go along and ask for a demonstration. The Ultra speaker is not a newcomer to the market, but it is certainly capable of providing very fine reproduction.

WATMEL WIRELESS CO., LTD.

The main item which will attract attention on the Watmel stand is the wire-wound potentiometer and the wire-wound fixed resistance, which will be pushed most extensively during the coming season. The new potentiometer is a very fine instrument, and the manufacturers claim that the following points will enable it to give long and reliable service. It has a smooth wiping contact, large self-cleaning bak contact, and the resistance wire is wound on a special non-splittable former. It is obtainable in such values as 1,000, 5,000, 10,000, 20,000, 25,000, 40,000 and 50,000 ohms, and costs only 5s. 6d. The wire-wound resistances have been designed for use in circuits requiring a non-inductive winding, such as in screened-grid biasing, potential dividing, voltage regulating, etc.

The prices are remarkably low. Resistances from 100 to 600 ohms, with a current carrying capacity of about 20 milliamps, cost only 1s. 6d., while at the other end of the scale a 100,000 ohms, carrying 6 milliamps, costs the remarkably low figure of 4s. Other gadgets of all descriptions, of course, are turned out by the Watmel Wireless, Ltd., such things as earthing clips, grid-leak clips, fixed condensers, H.F. chokes, etc., being seen in abundance.

WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD.

A very comprehensive range of dry rectifier units is to be found on this stand, and readers will remember that these units in several cases came down considerably in price a month or two back. For instance, the H.T.10 unit, which provides 200 volts at 28 milliamps, is now only 17s. 6d. instead of 21s., while the H.T.5, at 120 volts at 20 milliamps, is 12s. 6d. instead of 15s. Recently also the H.T.8 has been added, an extremely useful unit providing 250 volts smoothed output at 60 milliamps.

In addition to H.T. rectifiers the Westinghouse people market trickle-chargers, and, in fact, a dry rectifier for practically any purpose, including grid-bias battery eliminators.

Special prominence is being given at this stand to the H.T.8 rectifier, which we mentioned just now, and the battery charger type R.C.T.4 will be demonstrated daily. This is a larger type of battery charger than the one we just mentioned, having a large output.

WHITELEY ELECTRICAL RADIO CO., LTD.

One of the most interesting things to see here is the W.B. moving-coil loud speaker, which will be shown in two models, both of the permanent-magnet variety, but of different sizes. The P.M.1, completely assembled on baffle board and chassis, costs 6 guineas, while the P.M.2 costs £4. Special radio transformers having the two ratios can be obtained for either models at

an extra charge of 15s., while the speakers can also be obtained if desired in polished oak, mahogany and walnut cabinets at extra cost. In addition, of course, a number of valve holders, switches and other "smaller fry," but of equal importance are to be seen.

WILKINS & WRIGHT, LTD.

Among a number of extremely useful accessories the one which will probably catch the visitor's eye mostly is a special totally-enclosed double-ganged condenser with ball-bearings, which has been brought out specially to deal with the present vogue of band-pass tuning. It is an extremely neat little condenser, and takes up far less room than many others now on the market, and at the same time is thoroughly efficient and properly screened. It is suitable for either drum or disc drive, and provides extremely simple tuning device inside the metal cover. In addition, this firm is also making a very neat model of the Extenser.

WINGROVE & ROGERS, LTD.

A large number of entirely new lines are being introduced to the public by this firm, the manufacturers of the famous Polar condensers, and here are a few of them. The first is the Polar No. 2 and No. 4 condensers, which are similar in construction to the Ideal No. 3 condensers, but are somewhat smaller, while the vanes are of aluminium. They are supplied in the usual capacities, and their prices are 6s. 6d. and 4s. Then there is a slow-motion condenser which is similar to the No. 3, but is supplied with a scale instead of a dial, which fits behind the panel, the knob fitting in front and the reading being obtained through a moulded escutcheon.

The Compact condenser is a very reliable solid-dielectric condenser supplied complete with knob, and made in the usual capacities, the price being half-a-crown. In addition there is a differential condenser and a slow-motion drive, with solid-dielectric, while the differential condensers can also be supplied in capacities of .0001 and .00015 in air-dielectric.

WRIGHT & WEAIRE, LTD.

It is impossible to give an adequate idea of all the little gadgets which are made by this go-ahead firm, but chief among these must be mentioned their super-heterodyne kit, which was introduced during the summer, and their frame aerial which goes with it—both highly efficient designs. In addition all sorts of rotary switches, some of which will be found in sets being exhibited on our stand, switches, coil holders, valve holders, H.F. chokes, L.F. chokes—in fact, an infinite variety of components is made by this firm.

Among the Wearite coils, which have been famous for a long time, we must now number the P.V. and P.J. coils, and the coil quots introduced and used by ourselves during the last few months.

MULLARD RADIO SERVICE, LTD.

Naturally, valves are the chief points of interest here, and a large and varied collection is to be seen. Many new types have been brought out, including the double-grid two-volter, and the A.C. indirectly-heated Pentode—Pen 4V.

The two-volt list of valves now numbers a dozen or so, and forms a most comprehensive range. Directly-heated D.C. valves have also received attention, and we now have the P.M.13 and the P.M.25, which are specially designed for mains operation. So far, no Mullard indirectly-heated D.C. valves have been released.

Loud speakers, of course, and all sorts of components also occupy a large section of the exhibit, which is extremely attractive and should be closely examined by constructors and listeners alike.

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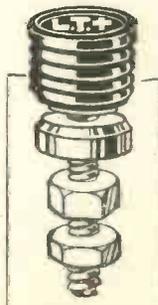


Contents:—2 Spade Terminals engraved L.T., 2 Plugs, and Sockets (A and E); 7 Terminals, L.T., L.S., H.T.; 6 Winder Plugs, H.T. and G.B. Value 3/5. Price **3/-**

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Strongly made with two lock-nuts and soldering hole for contact. Insulated knob. Easily read markings. For use with Clix Hook, Ring or Spade Terminals and all standard fittings. Adds to the efficiency and appearance of any set **3d.**
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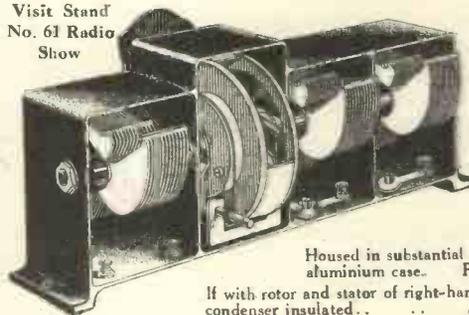
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Two controlling knobs are provided. The right hand for the rotor vanes of all three condensers and the left hand for the stators of the two left-hand condensers.

A unique feature is the hidden pointer which clearly shows the position of the stators by a shadow thrown upon the illuminated drum dial.

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(See also pages 401 and 407..)

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THE "M.W." "PENT-ACE"
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EBONITE PANEL, 21" x 7", drilled - - 6/-
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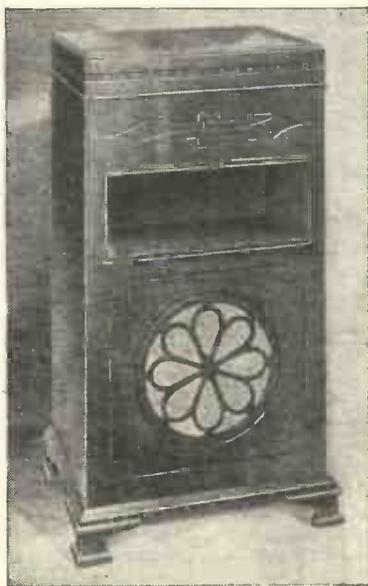
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THE "FOUR-BAND" THREE
—continued from page 322

For instance, for the lowest band of 19 metres upwards you will want a No. 2 coil in the aerial, a No. 4 in the grid circuit, and probably a No. 4 or No. 6 for reaction; in the second band, instead of having, say, a No. 4 in the aerial and perhaps a No. 6 for the grid and a No. 8 in the reaction, we keep the same set and have another No. 2, No. 4 and No. 6.

Coils in Series

This is an important feature and one which is likely to be overlooked unless the constructor thoroughly realises what happens. The Extenser does the wave-changing between the two short-wave bands, and enables the lower band to be tuned in simply by short-circuiting the coils which are used in conjunction with the shorter-band coils on the higher wave-band.

The medium-wave coil (the P.J.1) is a standard coil and can be obtained from makers or can be home-made quite easily. It is wound with No. 30 double-silk-covered wire and consists of the following windings: Former, 2 in. diameter, 3 in. long. All windings in same direction. Aerial winding: 9 turns, tapped at 4 and 6. Beginning "A" (red flex), end "X" (blue flex). Space 3/8 in. between this winding and the next, the grid winding. This consists of 64 turns, beginning marked "G" (white flex), end "Y" (black flex). Another space of 1/4 in. and then the reaction winding of 34 turns. Beginning "Z" (green flex) and end "R" (yellow flex).

Coil Quilts

The long-wave coil is wound on a coil quilt, and consists of a reaction winding of 40 turns, wound with 30 D.S.C. wire, then a layer of empire tape, and then a long-wave winding of 150 turns tapped at 40 from the end of the winding.

The beginning of the reaction coil and the end of the long-wave winding are joined together, and taken to the point marked E in the wiring diagram, while the end marked R goes to the reaction circuit. The Contradyne coil consists of 60 turns of No. 24 gauge wire D.S.C. on another coil quilt. This coil should be wound rather loosely, as tight winding effects the efficiency of the coil.

The operation of the set is simplicity itself. The detector is an S.G. type of valve, not the usual type, thereby greatly increasing the set's sensitivity. This is followed by an L.F. valve in the first L.F. position and a power valve in the output stage. An H.T. voltage of about 80 on the screening grid and 120 on the anode of the detector. The remaining H.T. tapping should be 120 to 150 volts. A 150-volt H.T. battery is advisable, giving 120 for H.T.+2 and 150 to H.T.+3.

The S.G. Valve

The choice of the S.G. valve is important, as some are inclined to be microphonic in use as detectors. We have found the Cossor metallised S.215 or S.220 to give excellent results, though if the constructor has an S.G. valve on hand he would naturally try that before getting any other type.

The receiver seems to be free from any tendency to threshold howl, that bugbear of short-wave enthusiasts, and reaction is ample on all the wave-lengths for which the set was designed.

Tuning is carried out as usual; and by the reading of the Extenser dial, which should be set at 0° when the vanes are all out, we can tell at a glance which band one is on. Between 0° and 99° the lower in either set of bands is covered, dependent on the position of the transformation control, and between 100° and 200° the upper bands. With the control to the left the medium and long waves can be covered, and to the right the short waves.

PROBLEMS OF L.F. INSTABILITY
—continued from page 300

power valve, and C is a condenser of at least 2 mfd., tested at 3 or 4 times the H.T. voltage. The loud-speaker circuit is lower in impedance than the circuit through the choke and H.T., so most of the audio current chooses the loud-speaker path.

Another Safety System

Another system, which confers safety, separates the loud speaker, keeps the audio current out of the H.T., and in addition balances out hum, is "push-pull" (Fig. 4). It is vital, however, to have the two power valves matched, not only as regards current taken by each, but in characteristics. If they are exactly

(Continued on page 408.)

FERRANTI SPEAKERS

THE outstanding quality of Ferranti Speakers is attained by intense research, careful selection of the materials used, great manufacturing facilities, and unrivalled experience in true reproduction. It is these factors which establish Ferranti Speakers in a pre-eminent and predominant position.

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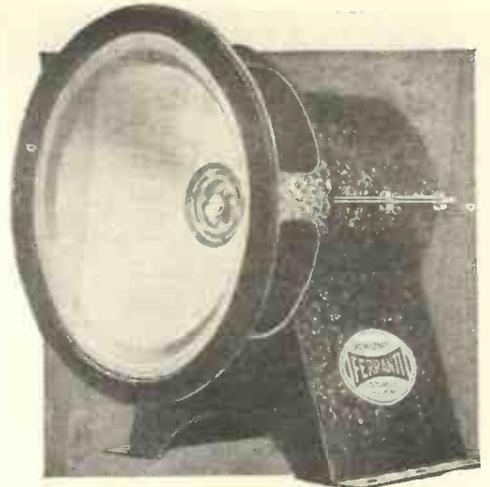
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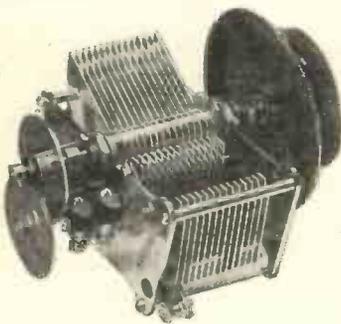
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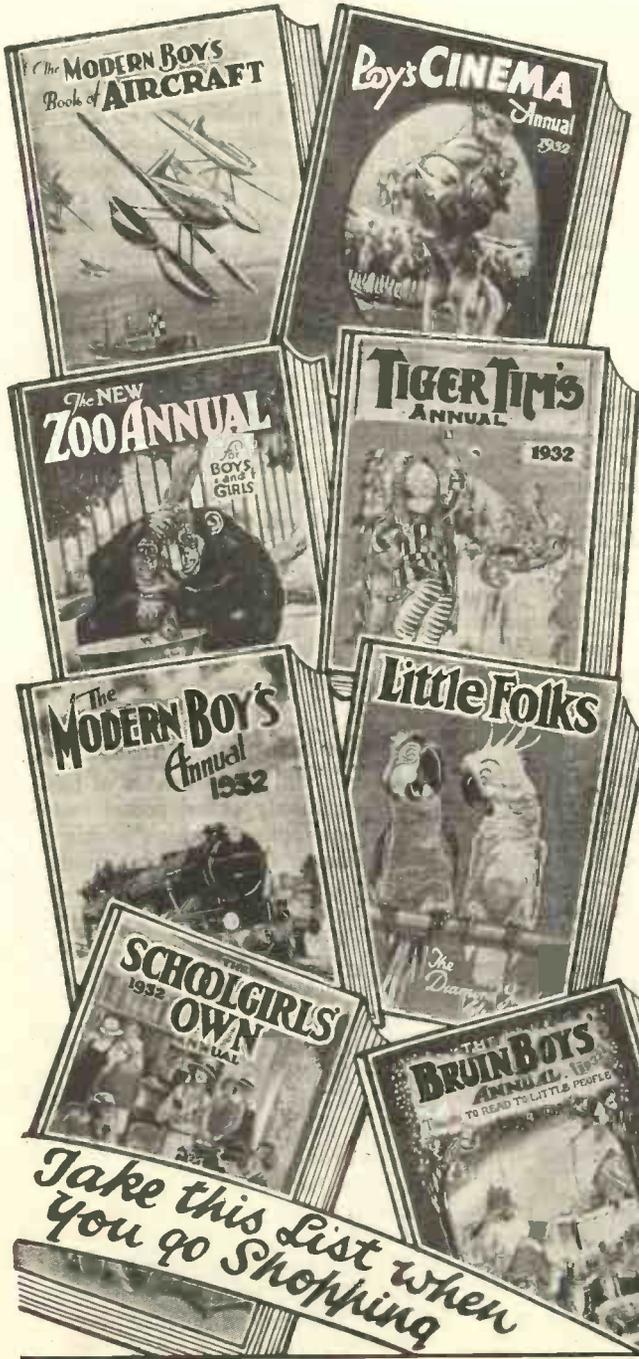
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PROBLEMS OF L.F. INSTABILITY

—continued from page 408

each valve may be provided with an independent filter, or the filters may form a continuous chain, as in Fig. 7 (a) and (b) respectively.

In (a) the de-couplers have to be progressively more effective as one moves away from the loud-speaker end, whereas in (b) the feed to the first valve has already been partly filtered on the way. On the other hand, it is more difficult to calculate the allowable resistances in (b), because a variation in the current taken by one valve affects the drop and consequently the H.T. voltage of others besides itself.

An Important Point

An important point in deciding the choice is that (a) is more effective than (b) at extremely low frequencies, therefore (a) is preferable where there is a tendency to motor-boating, and (b) is the better for hum removing.

Turning back to our circuit, Fig. 6, the power valve audio current is diverted, so the previous valve requires little or no de-coupling; smoothing is essential, however, so we shall choose method (b), as elaborated in Fig. 8. As R_1 is purely for smoothing, and there is the step-up of the transformer tending to increase hum, it may be desirable to use an iron-core choke instead.

If, as shown, R_1 is carrying about 6 milliamps, and there are 60 volts to spare, it should be 10,000 ohms, which as a pure resistance is hardly likely to be enough for smoothing in conjunction with a 2-mfd. or even 4-mfd. condenser. R_2 takes less current, and there is actually in effect a step-down between it and the grid of the L.F. valve, so 10,000 ohms and 2-mfd. should be enough. R_3 , dropping 20 volts, with only 2 m.a., is another 10,000 ohms, which with 1 mfd. will be enough to prevent coupling, for the detector grid condenser cuts off the very low frequencies. R_4 drops the voltage for the screen, and with the figures shown must be 60,000 ohms, and C_4 is required to function only at radio frequencies so may be as low as 0.1 mfd. R_5 completes the chain with 240,000 ohms (a quarter-megohm leak).

A Tuned-Anode Trouble

Many sets do not require so much de-coupling; this H.F. stage, being

"tuned anode," must be de-coupled, for audio voltages fed to the H.F. valve anode are conveyed to the detector grid; but if it is "tuned grid," the low-impedance tuning coil short-circuits the audio impulses straight to earth, and R_3 may be omitted, unless it is required for voltage reduction. C_3 is desirable, to prevent H.F. currents from straying about. With push-pull it is practically essential for R_1 to be a choke if full advantage has been taken of the ability to cut down the main smoothing to the bone.

L.T. Feed-Back

Two transformer-coupled stages with modern valves provide such immense amplification that great care is necessary, especially in portable sets, which require particularly complete de-coupling if their inherent nastiness is not to get out of hand entirely.

L.T. feed-back is rare, and one only need issue a warning to avoid unusual filament circuits. It is best to lay down a common earth connection, to which all filter condensers, batteries, etc., are brought. In a battery-driven receiver this is usually connected to L.T.—, H.T.—, and G.B.+.

But a word must be said about grid-bias circuits. In battery sets it is wisest, on the whole, to stick to grid-battery bias, except sometimes when fractions of a volt are needed that can be borrowed from the L.T. battery by using filament resistors on the negative side. But mains-driven sets have pitfalls, and even professional designers of commercial receivers often confess their incompetence by making the set "all-electric"—*except* the bias battery.

There is some excuse in the case of D.C. mains, where the voltage is limited, but even here the advent of D.C. indirectly-heated pentodes has put a different aspect on the matter.

Don't Do It!

The way *not* to provide bias is to connect a resistor between the negative H.T. and the filaments (or common negative of I.H.C. valves), for this couples all the valves in the most disapproved manner, and even substantial condensers in parallel are not likely to make it quite nice.

In a set using I.H.C. valves it is always safe to connect a resistor between the cathode of each valve which requires bias and the common earth or negative, so far as coupling between one valve and another is concerned, but one must take steps to prevent the current in the anode

circuit which returns via the cathode from applying an audio voltage to the grid, as well as the desired steady bias.

The usual method is illustrated in Fig. 9, where R_1 is a resistor, usually about 500–1,500 ohms, sufficient to drop a suitable bias voltage, and R_2C a little filter. As the grid does not, or should not, take any current, there is no objection to making R_2 quite large, and for the same reason a small resistor of the grid-leak type is suitable.

De-coupling Values

It is well, however, to avoid going to extremes, in case the valve is very slightly "soft"; 100,000 ohms is a good value, and 1 mfd. for C. In special cases another R and C can be used, making a multiple filter.

A condenser, unless it is an electrolytic one of several hundred mfd., is not much good direct across R_1 , which is usually about 1,000 ohms, for to be effective the impedance of the condenser must be much lower than this, and a 2-mfd. condenser is useful only above several hundred cycles when used across such a low impedance. A 0.1 mfd. is quite suitable for an H.F. valve, however.

The important thing is to join all cathodes which require no bias to the common negative, and to provide bias where required in each case by a separate little filter circuit as shown. If the power valve is of the directly-heated type the same method may be adopted, except that R_1 and C instead of being connected to the cathode go to the centre point of the transformer winding which heats the filament.

For Ringing Valves

There is still another form of feed-back, commonly called sound coupling or microphony, which is due to sound issuing from the loud speaker striking the valves and making them vibrate sufficiently to impose a ripple on the current passing through them, which is amplified and increases the sound in the loud speaker and builds up to a loud continuous note.

The detector is usually the troublesome valve, but sometimes the H.F. valves are responsible, and then the effect is rather elusive, for it takes place only when the carrier-wave of a station is tuned. The remedies are well known—wrap the valves round with cotton-wool, use spring valve holders, move the loud speaker farther away, if separate. The main object of referring to the effect here is

(Continued on page 411.)

QUALITY

PROBLEMS OF L.F. INSTABILITY

—continued from page 410

to point out that this also can cause distortion, short of actual oscillation.

A Golden Rule

There is one thing which has not been emphasised, but which must have occurred to anybody who has followed the foregoing carefully. That is, that the whole feed-back and hum difficulty is largely avoided by observing one golden rule. **DO NOT USE MUCH L.F. AMPLIFICATION.** With modern valves the detector may usually be coupled straight to the power valve.

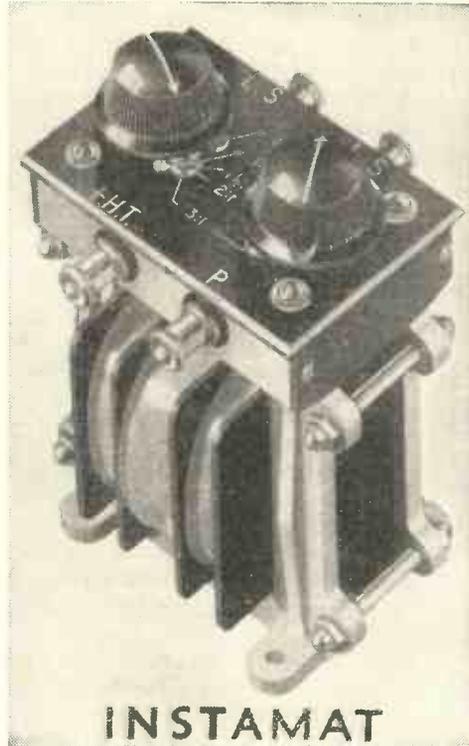
This minimising of amplification brings problems of its own, of course. The detector must be capable of handling more power without distortion. The H.F. amplifier comes into greater prominence. But these are big subjects in themselves.

To summarise the whole matter:

- (1) Keep components and leads between which there is much amplification well apart.
- (2) If you *must* have more than one transformer, see that they have coils at right angles and are not too close.
- (3) Choose your by-pass condensers carefully, making them as large as possible, short of cutting high notes.
- (4) See that all H.T. battery connections are free from high-resistance joints and that there are no dud cells.
- (5) If a mains-driven set, do not pass all the H.T. current through all the chokes, but use separate chokes, or, if adequate, resistors, for the non-power valves.

Some Final Points

- (6) Divert the audio currents by using push-pull or choke coupling for the speaker.
- (7) First see that the resistors or chokes are correct for dropping the allowable amount of voltage, then see that they in conjunction with their condensers are adequate for de-coupling.
- (8) Mark the common earth connection on the circuit diagram in heavy lines and see that all by-pass and de-coupling condensers are brought to it.
- (9) Use, if possible, separate grid bias for each valve requiring it, and, in any case, de-coupling.
- (10) If you keep down the L.F. amplification you need not bother so much about (1)-(9).



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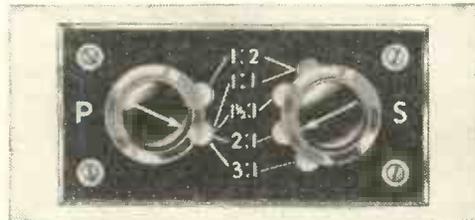
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REGARDING YOUR RECORDS

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

WHEN you electrically reproduce your gramophone records it is a fairly simple matter to introduce controls into the amplifier so as to regulate both the volume and, to some extent, the tone of the reproduction as you wish. But with an ordinary unamplified gramophone, or what is often called "acoustic" reproduction, you have no such means of control.

Has it ever occurred to you that in actual practice, using an ordinary acoustic gramophone, you can get the same sort of control by using different types of needle as you get with electrical reproduction by means of the tone and volume controls of the amplifier.

Different Needles

Of course, different persons have different tastes in this matter, but most people will, for instance, use a soft-tone needle, or perhaps even a fibre needle, for chamber music—although, personally, I detest fibre needles—whilst for talking records often a "medium" steel needle gives the best reproduction.

"Loud" steel needles may be used for special purposes, but they should be employed sparingly, as from the point of view of the power taken from the record they react seriously on the life of the latter; furthermore, the cases that call for the use of loud steel needles are comparatively few and far between.

Now bearing in mind that volume control is obtained in a general way

with an acoustic gramophone by the use of different types of needle—inserted also to different lengths into the needle holder—and that volume control is obtained, in the case of electrical reproduction, by means which are entirely apart from the gramophone itself, we can easily see that with electrical reproduction it is possible to keep to one particular type of needle.

Varying the Volume

This is a point which may not perhaps have occurred to you. If you keep to fairly "soft" steel needles for your records when using electrical reproduction, you can obtain all the various effects you want by controlling the amplifier, and you will find that

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keeping to the one type of needle will greatly minimise wear and tear of your record.

With the non-electric gramophone reproduction you are unfortunately obliged to vary the type of needle from time to time, which is bad for the records, but that is no reason why you should not take advantage of the fact that with electrical reproduction you can keep to a type of needle which treats your records kindly.

The distinction mentioned above is obvious when pointed out, but at the same time I think many people overlook it in practice, and go on using all kinds of different needles for their records when, as a matter of fact, with electrical reproduction it is quite unnecessary.

RADIO AND THE MOON

—continued from page 301

and throw them on to our aerials.

The disadvantage caused by the moon's lack of water, where wireless is concerned, is counter-balanced to a certain extent by its lack of air, for the air on the surface of the moon is believed to be about as dense as our own air at a height of 43 miles above the earth's surface. Thus the extremely thin air near the moon's surface will not damp out wireless waves to the same extent as the denser air near the surface of the earth.

There is also the possibility that the moon may possess some kind of a Heaviside layer of its own. If there were no air or vegetation on the moon at all this would not be possible, but as mentioned before the moon has air of the same density as that of the earth 43 miles up.

The Heaviside Layer

Our own Heaviside layers are calculated to be anything from 60 to 250 miles above the earth, and as our own layers owe their existence to the effect of the sun's rays on the thin gases of our upper atmosphere, it is quite likely that some similar effect may occur in the case of the moon.

Therefore, wireless signals outward bound from the earth, even if they do manage to penetrate our earth layers, may find their progress further impeded by the layers of the moon.

Whatever the result of Professor Taylor's experiment—provided some definite result is obtained—it is almost certain to mark yet another milestone in wireless history.

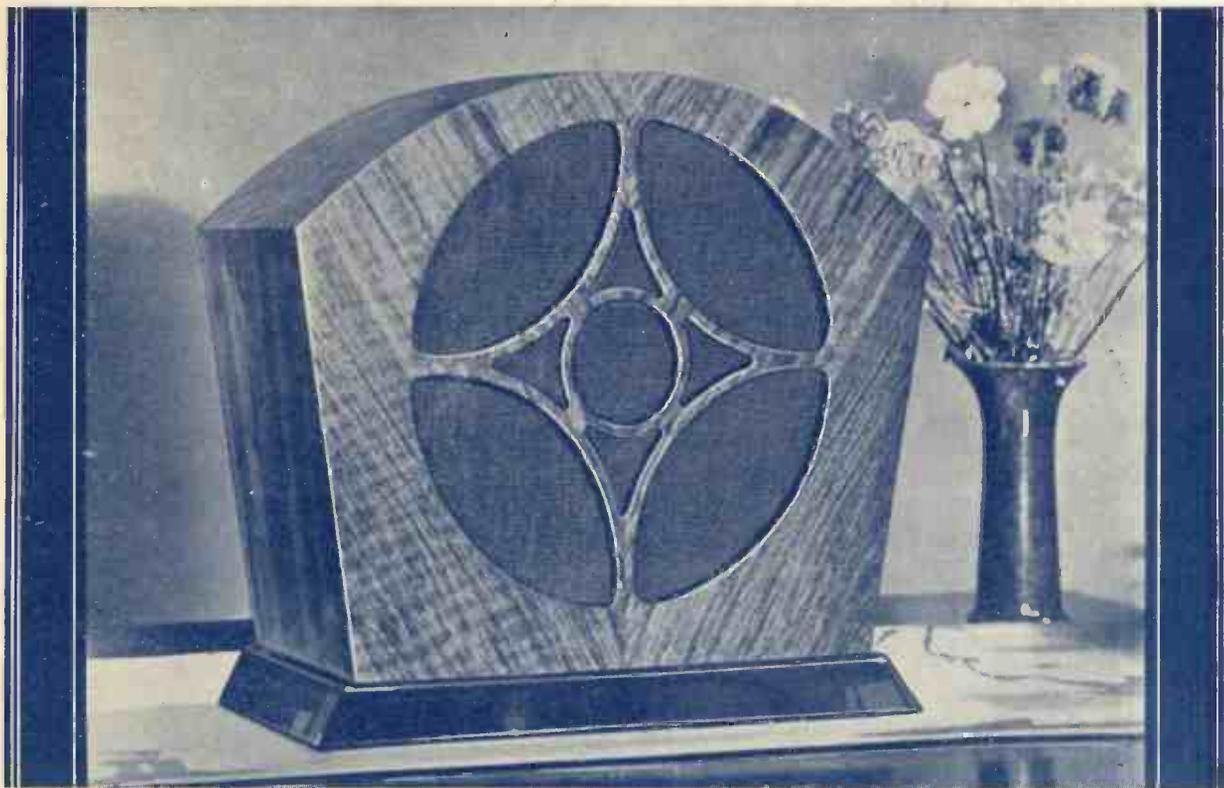
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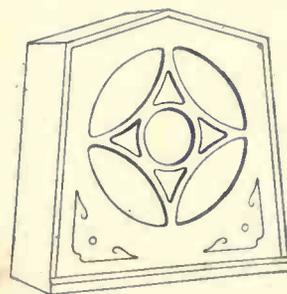
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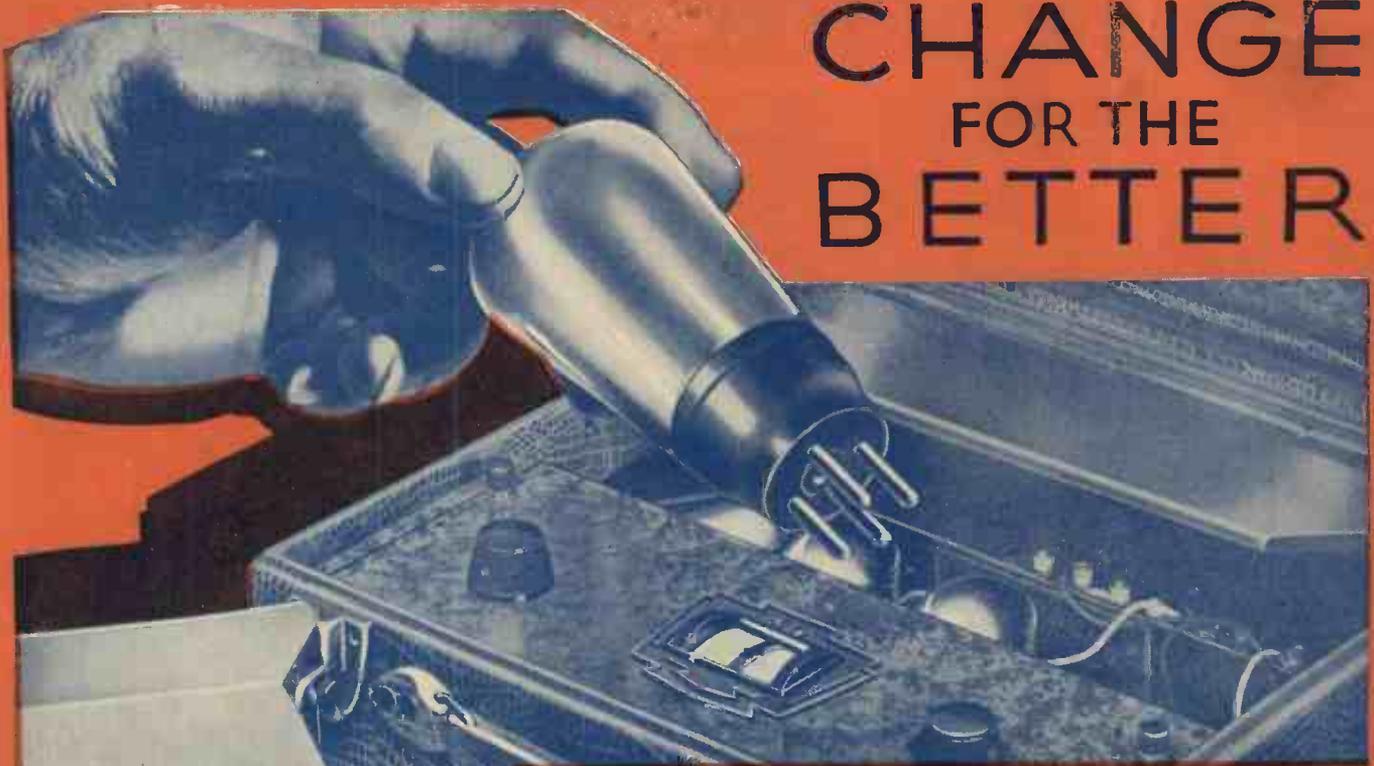
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