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INCORPORATING "WIRELESS"

January 5th, 1929.



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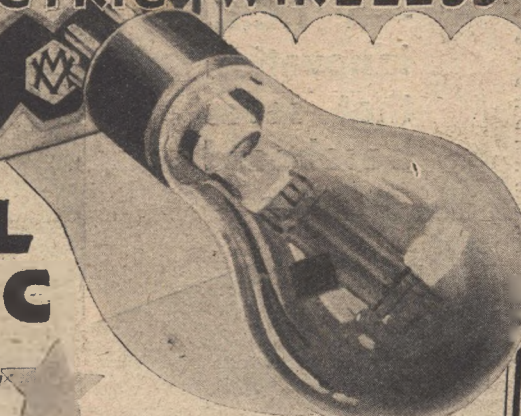
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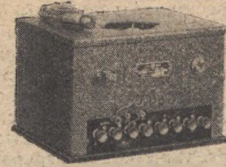
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5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
6. H.F. & CRYSTAL (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. & DETECTOR (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
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14. OUT OF PRINT.
15. OUT OF PRINT.
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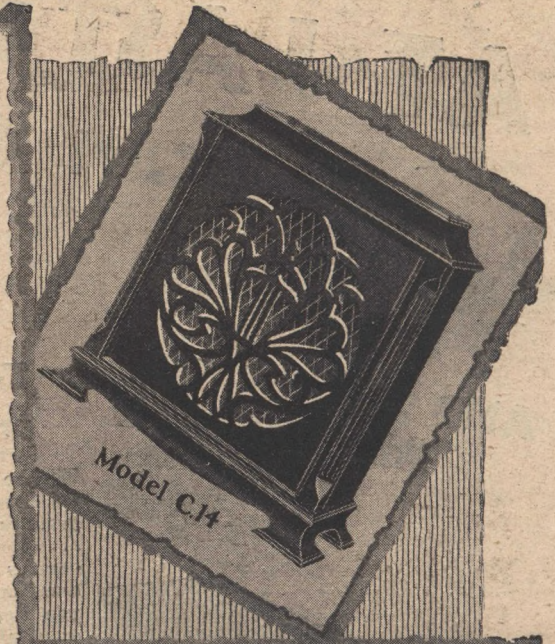
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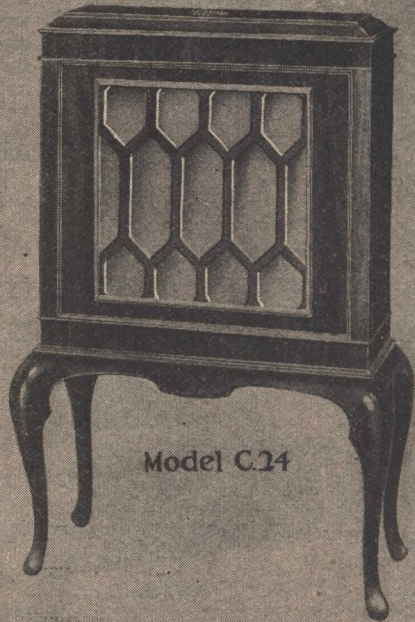
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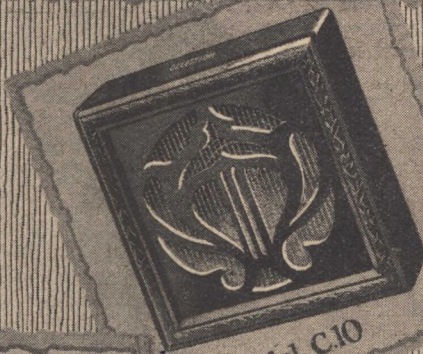
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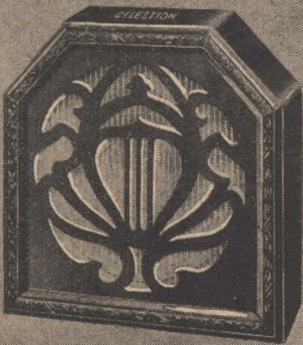
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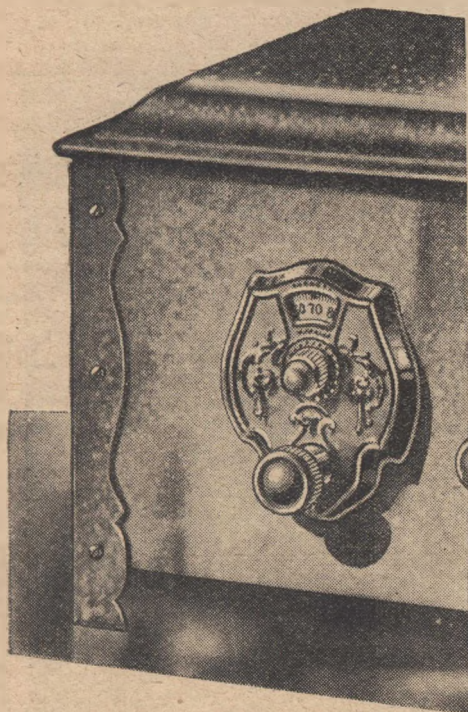
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RADIO NOTES AND NEWS.

Tele-Television—Pictures at Sea—Hark, Hark, the Asparagus!—Thirty-Million Cycles—
 The Ether-Robbers—Our Bartest Bart.—The B.B.C.'s Latest.

"Ariel's" Promotion.

GREAT news! Effective January 1st: I am to be allowed real ink, provided I roll my shirt-cuffs back; and something better than the backs of used envelopes to write on. I can have the reversion of the tea-leaves in the office pot, and the technical chaps say that I can have any burnt-out valves I see lying around. If all this happens in January, perhaps by June I'll be a director.

The Wireless Diary.

I KNOW that it is not a scrap of good talking about diaries, for although they are bought in thousands they are "kept" only in dozens—and that by folk who haven't much else to do. But I know one good use to which the hideous thing can be put; it can be used as a register of your accumulator charges. But I suppose no one uses accumulators nowadays except on cars. You can't run a car from the mains. I asked a man if he was interested in keeping a diary, and he replied: "No, a brewery!"

Tele-Television.

A REPORT from Johannesburg states that an engineer of that city picked up some television transmission from 2 X A F (New York), a distance of nearly 7,000 miles, on a home-made set. Amongst the things he said he saw was a toy monkey. Yes! This television is going to keep us sober, for I can conceive occasions when a televised monkey would make some men ask their companions if they, too, saw it. It reminds me of the story of the man who said he saw rats with top hats on, but whose "steady" friend said: "Hold up, Jock—they've no hats on at all!"

Red Letter Days.

JANUARY 5TH, 2 L O and 5 X X. Running commentary on Rugger match, England v. The Rest, at Twickenham. January 8th, 2 L O and 5 X X. Wish Wynne. January 11th, 13th and 14th. 2 L O and 5 X X. The Wireless Singers. Also from 5 G B on January 18th. By the way, in 1929 the Greenwich Time Signal will be given from 5 X X in place of Big Ben at 1 p.m. The present 4 p.m. time signal will be dropped and a new one introduced at 4.45 p.m. On Sundays, the

time signal at 4 p.m. will be dropped and one will be broadcast at 3.20 p.m. instead of Big Ben.

Pictures at Sea.

FIRST the ocean newspaper and now the ocean *illustrated* newspaper. Pictures have been successfully transmitted by the Fulton process through Rugby to the "Olympic" in mid-Atlantic and printed in the ship's paper. This is undoubtedly a great stride forward, but soon there will be no place on earth where a man can escape from the busy world except the inside of a monastery. I wonder whether radio is permitted in such places.

Hark, Hark, the Asparagus!

THERE is a man in Austria called Professor Richtera, who is said to be able to measure the one ten-millionth of a metre's growth of a plant, and to make the sound of the plant's effort audible. This gentleman aims at broadcasting that sound. As for the measurement, well, if

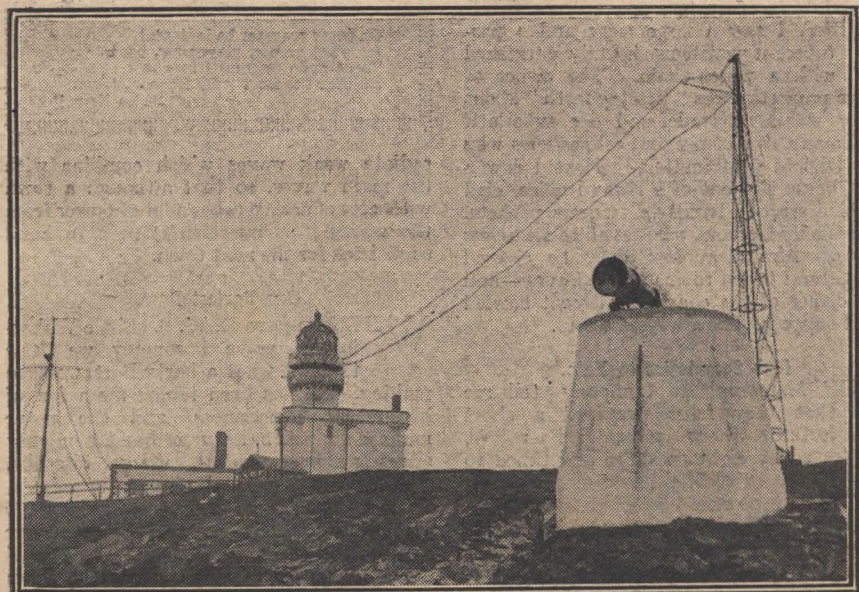
that is scientific gardening, I'd sooner collect stamps. And as for the sound, I don't think a plant has any right to make a noise about a ten-millionth of a mm., unless it can "say it with flowers." I think the professor should start with the song of the mushroom, which cometh up like a rocket.

"And the Next, Please?"

ON reading over my notes so far, I have the feeling that I have been straining your credulity. Here's another. New York says that the radio operator of the "New York Times" failed to get through on the 'phone to a friend in a suburb of that city. Knowing that the friend was listening to the Byrd Antarctic Expedition, 10,000 miles distant, he sent a radio to the operator of the Expedition, who relayed the message back to New York, and so the friend received it. Nothing incredible about this, and I envy "friend" the thrill he undoubtedly got.

(Continued on next page).

"FOR THOSE IN PERIL . . ."



Lighthouses are now being equipped with radio as a safeguard for mariners, and this illustration shows the new aerial installed at Fraserburgh, Scotland. Note also the foghorn on the tower in the foreground.

NOTES AND NEWS.

(Continued from previous page.)

Talking Back.

NEWS from America! The Bell Telephone laboratory has evolved a means of inverting speech, with the object of ensuring secrecy in telephony. The speaker pours out a stream of gibberish which at the other end of the line is, somehow, converted into real words. I don't know how it is actually done, but on thinking it over I should say it would not be difficult and that the method will have much to recommend it.

Brain Wave.

A HINT to the Post Office. Why not issue an "All In" Licence, covering dog, radio set and chauffeur and/or gardener, and (by arrangement with the L.C.C.) the car? All the best insurance companies have omnibus policies, so why not omnibus licences? Think of the work it would save! That's the snag, I fear.

Thirty Million Cycles.

GOODNESS! What a frequency! Ten metres. What a wave-length! We are getting on and no mistake! Our famous amateur, who must be quite a clever engineer, Mr. E. J. Simmonds, has been working from G 20 D a regular two-way communication with I A Q D (Maine, U.S.A.) on 10 metres. He uses an Osram T-250 valve, with quartz crystal control, and for doubling the control frequency he uses Osram L.S. 5 B. valves. His receiving valves are the D.E.Q. and the S.625 screen-grid type, also Osram's.

Television Tests.

COLONEL MALONE recently asked a question of the Postmaster-General, in the House of Commons, about the Baird Television, whether his department carried out any examination and with what results. This question was answered by Lord Wolmer, Assistant P.M.G., who said: "Demonstrations of a limited character have taken place before Post Office officials; the results were inconclusive but sufficient to warrant further experiment."

Seen in a Day.

FIRST, I saw a large cigar and a tuberculant waistcoat heavily garnished with a watch-chain. The owner of those properties was "holding forth" about "der wahless terrade, und der suberlatif vorkmanschipp of my lout shepkeerss wiss our falls in gombination." Next I saw a slim figure slip out of a Strand office, clad in blue serge; hands in trousers pockets. It was only Marconi, who set all this wireless going. Almost apologetically he crossed the Strand to his rooms at the Savoy—and the owner of the convex waistcoat bawled on, I suppose. It's a wicked world.

Club Secretaries to Note.

THE Marconiphone Company tell me that they have prepared a short lecture about screen-grid valves, illustrated by eighteen slides and timed to last from forty to fifty minutes. They will lend the lecture and a set of slides to secretaries of radio clubs. Shortly they will have also a lecture on "Drawing Power from A.C. Mains," with about twenty slides. (These lectures ought to help the Queen's Park Society out of their fix.)

The Ether-Robbers.

MESSRS. R. H. BARFIELD and G. H. Munro, in a paper read before the Wireless Section of the Institution of Electrical Engineers, described their investigation of the effects of buildings, tuned aeriels and transmitting aeriels masts in robbing the waves emitted by 2 L O. A complete survey of S.E. England was made with a receiver on a motor-van, and two distinct minima were observed in W.S.W. and E.N.E. directions, due to the "shadows" of the transmitting masts.

Take and Give.

THE absorption of the wave energy was found to be strongly marked over the denser parts of a town on the short waves. A large number of aeriels in tune with the transmitter have a critical effect on the attenuation of the waves, due to their acting as absorbers of energy. When these aeriels oscillate, however, they actually

SHORT WAVES.

A military expert predicts that the next war will be fought by wireless. From what we heard the other night we had the impression that it had started.—"Punch."

First Comedian: "Didn't it make you nervous, to be telling your jokes the first time to a radio audience!"

Second Comedian: "Nervous? Man, I never felt safer in my life!"—"Radio News."

A correspondent writes to ask us whether he is correct in assuming that the filament terminal of an audio-frequency transformer should be connected to L.T. positive. The answer is, of course, in the negative.

UP-TO-DATE.

It was the schooner Hesperus
That sailed the wintry sea;
But the Skipper had a wireless set
To keep him company.
So what cared he for the wintry sea?

A member of the radio trade expressed his opinion that far more valve receiving sets would have been bought as Christmas presents if the public would get the idea out of their heads that a set employing valves was too complicated for the uninitiated to operate. Everyone round our way is making a howling success of them, anyway.

BY REQUEST.

A thousand talents has this chap
To whom I humbly doff my cap.
A world-renowned composer, he
Whose name is flung 'cross land and sea.

On every program he is starred
As gifted author, playwright, bard.
Those radio features I love best
All bear the label "By Request."
"Radio News."

radiate weak waves which combine with the main waves, so that although a town with a lot of aeriels takes a lot of power from the waves it is unselfish enough to hand some back for the next town.

Our Bartest Bart.

WHEN we gave R. W. S. (Little Wakering) a valve baronetcy we little thought what a barty Bart. we were making. He has been telling me a few of his recent experiences, and the naive manner in which he describes his mighty spans is almost comical. We get bits like, "At present the Americans are unreliable, in fact, Bandoeng, Java, has the whole lot beat." "I have been having some splendid evenings with 7 L O (Nairobi)." "One slight move of the condenser (from 7 L O.—Ed.) and 3 L O (Melbourne) was on." Isn't he rich?

Nairobi Relays.

R. W. S. likes Nairobi so much that he stayed there, so to speak, for eleven consecutive nights, on two of which 7 L O relayed 5 S W and the voice of Big Ben was heard in Essex, rebroadcast from Africa. What would Gladstone have said in '29? Our Bart. vouches for the variability of P.C.J., and states his opinion that K D K A has "gone off" since last year, though he has ascertained that the output has not altered. He dares anybody to tell him to look to his set for the answer, nevertheless. Guess he's right, too.

Sabbath Humour.

WHENEVER I feel downcast I turn to my clippings from the wireless columns of the Sunday newspapers; generally they rival "Punch." I have just read in one of them the astounding news that a wireless operator can tell that a friend is on duty aboard another ship by the "rhythm of the Morse he taps out on the wireless key." Well, I ask you to recall or look at the Morse code and then to consider how much *rhythm* can be "tapped out." Might as well talk about a Yeoman of Signals doing his flag-wagging as gracefully as Maud Allen!

A Minute Off.

"PUNCH" says: "Discussing work for the B.B.C., a novelist says it is time authors looked round. This advice has been anticipated by Mr. G. K. Chesterton." Jolly good! But authors ought also to "sit up," advice which has been anticipated by the Sitwell family. (Sit down and dry up!—Ed. "P.W.")

Jugo-Slavia Gets the "Bird."

BERLIN reports the completion of the new Jugo-Slavian broadcasting station at Laibach, 35 miles from Trieste. The station will radiate on a wave-length of 566 metres. But the great joke is that during intervals it will broadcast the call of the cuckoo. This is an indication that the B.B.C.'s advertisement of the nightingale had not universal appeal. It is to be hoped that the idea will not be generally adopted, lest the ether be filled with the cries of animals and birds. Such competition with chamber music would be deplorable.

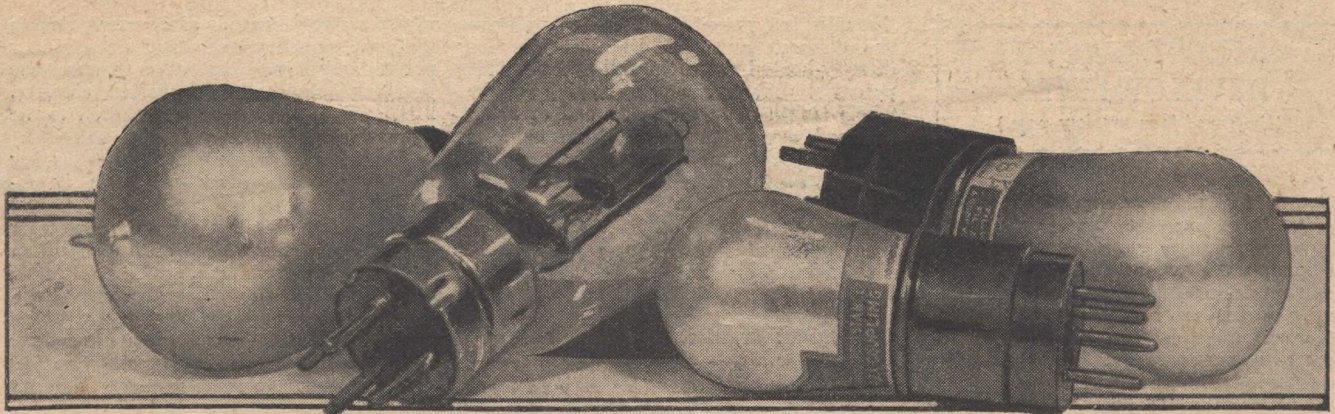
The B.B.C.'s Latest.

SO not content with brochures, libretti, syllabuses, "annuals," and the "Radio Times," the B.B.C. plans to found a twopenny "literary" weekly—an unwarranted invasion of the rights of "T.P.," "G. K. C.," and John o' London, etc. Won't the minor poets grow fat? Well, if this is a true report, all I can say is that the B.B.C. is running wild with the bit in its teeth. Much more cheering is Sir J. Reith's alleged statement that an orchestra a hundred strong is to be formed for London.

The Busy B's.

THIS is to give a friendly shove to the fortunes of the Bec Radio Society, Bec School, Beechcroft Road, Balham, S.W.17. (Hon. Sec., Mr. A. L. Odell, 171, Tramere Road, S.W.18.) They sent me a notice of a very fresh-looking little "do" called a Radio-Gramophone Dance, organised by themselves, but unfortunately far too late for me to use. However, they are evidently one of Balham's hot spots, and I hope that some of you may be tempted to join them.

ARIEL.



RECENT VALVE DEVELOPMENTS

THE Tetrode, or four-electrode valve, is now safely past what may be called the experimental stage. In the form commonly known as the screened-grid valve, it has set a new standard in radio-frequency amplification. On the low-frequency side of reception we have another remarkable new-comer—the Pentode—which is, in effect, a Tetrode with an additional grid.

Looking ahead and venturing to make an intelligent anticipation as to where these innovations are leading, one might be tempted to say that they foreshadow the "passing of the three-electrode valve."

The Screened Grid.

It is, perhaps, the natural line of evolution. The two-electrode tube had its brief day and gave place to De Forest's valve with a grid. The introduction of a second grid has taken longer to develop, but it is now standardised, and has quickly been followed by a third grid, making five electrodes in all.

Originally the second grid was introduced as a means of dissipating the so-called "space" charge, or accumulation of stagnant electrons trapped between the control-grid and the filament. The insertion of a space-charge grid permitted a

The advent of the Pentode valve has already marked a tendency towards a departure from the ordinary design in the manufacture of valves. The valve of the future is discussed in this article.

By **SEXTON O'CONNOR.**

more efficient control of the electron stream passing from the filament to plate. To some extent the same idea still holds good, but it has been specialised.

In the screened-grid valve as used for high-frequency amplification, the additional grid serves to screen the control grid from the electrostatic charge located on the plate. By breaking-up the field of force which normally links the plate with the grid, it prevents "back-coupling," or the transfer of energy in the wrong direction through the valve.

Previously the same result had been secured by neutrodyning or using a special balancing coil and condenser in the external circuits. The screened-grid valve provides a more convenient method of preventing capacity coupling, and one which is equally efficient for all wave-lengths.

Another consequence of the insertion of an extra grid is that it gives the valve an exceedingly high internal resistance, of the order of 200,000 ohms, together with a very favourable amplification factor, in the neighbourhood of 200. Both these features are extremely desirable in a high-frequency amplifier, because they tend to increase selectivity as well as range.

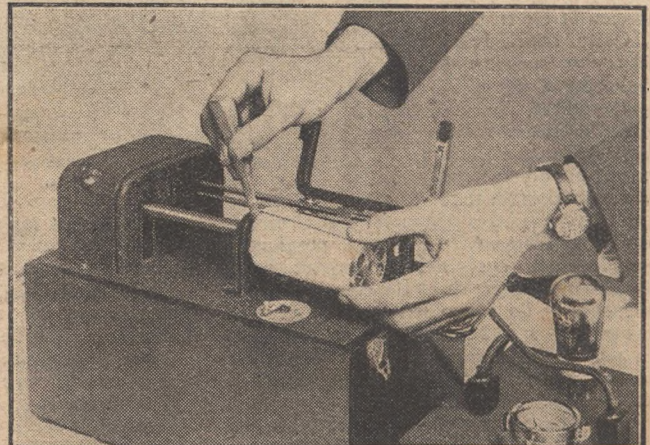
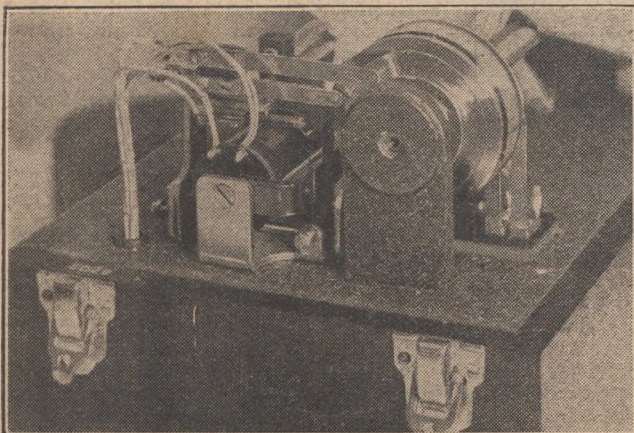
On the other hand, so high a resistance is a fatal defect where low-frequency amplification is concerned. Ample current flow is necessary when it is a question of operating a loud speaker, and this is not possible with a valve having a resistance of nearly a quarter of a million ohms.

Still Another Electrode.

Accordingly, in the Pentode, still another grid is employed, which is "earthed" by being connected (inside the valve) to the filament. It is located between the "screening grid" and the plate, and increases the total flow of current through the valve by preventing the formation of the reverse electron current, which tends to occur under certain circumstances in the ordinary screened-grid valve.

As is well known the screening grid carries a high potential, nearly as high, in

(Continued on next page.)



Two views of the Fultograph. (Left) The driving and synchronising mechanism and (right) placing the "doped" paper in position.

RECENT VALVE DEVELOPMENTS.

(Continued from previous page.)

fact, as the plate. One effect of this voltage is to increase the speed of the electron stream to such an extent that "secondary" electrons are liberated when it strikes against the plate. These secondary electrons are then attracted back on to the screening grid, so that sometimes the plate may lose more electrons in this way than it receives from the filament.

The third or "carthed" grid of the Pentode blocks the backward passage of the secondary electrons, and in effect reduces the internal resistance of the valve to something in the neighbourhood of 30,000 or 40,000 ohms.

The "False" Filament.

At the same time the amplification factor is kept high, and, what is of more importance, the change in plate current for a given change of input voltage is maintained at an extremely favourable figure. The latter characteristic is usually called the "conductance" factor and, other things being equal, reaches a higher value in a Pentode than in any other type of valve.

Curiously enough there is another tendency in valve design which also affects the three-electrode standard. For instance, the indirectly-heated valve is an attempt to eliminate the battery problem by using alternating current drawn direct from the electric-supply mains. The method employed necessitates the use of a fourth electrode in the shape of a "false" filament or heating-element mounted inside the valve.

The current-supply from the electric-light mains flows through the false filament, the heat from which is then radiated on to a sensitive filament, causing the latter to liberate a stream of electrons.

Quite apart from its convenience in not requiring a filament accumulator, the indirectly-heated valve possesses another peculiar advantage. Owing to the fact that

no current passes through the electron-emitting filament, which, as previously explained, is energised by radiant heat, this filament remains at the same potential throughout its entire length. By way of contrast, it is to be noted that a steady fall in potential takes place from the positive to the negative end of a filament heated in the ordinary manner.

Now the control of the electron stream passing through the valve depends upon

the effective potential difference between the filament and the grid. In the indirectly-heated valve the full effect of this potential difference is exercised over the whole length of filament, instead of being confined merely to the positive half, as in the three-electrode type. This in turn leads to an increased efficiency or over-all performance. For instance, the new Cosmos AC/S valve of this type has a magnification factor of no less than 1,200, an internal impedance of 800,000, and a high conductance value.

The Housing Question.

In consequence, the indirectly-heated valve is likely to exercise a permanent influence on the future design of valves in general. Already, in fact, the principle of the uni-potential filament has been combined with screened-grid amplifiers for radio-frequency working and to Pentodes for low-frequency amplification.

The Loewe multiple-stage valve is still another instance of valve elaboration. Here two or three separate sets of electrodes, together with the necessary coupling resistances and condensers, are all housed together inside the same glass bulb. In certain cases a unitary stage of four electrodes is used, including a space-charge grid.

Taking the case where a four-electrode high-frequency amplifier, a three-electrode rectifier, and a three-electrode low-frequency amplifier, are housed inside the same bulb, we get one valve containing no less than ten electrodes, to say nothing of the intervalve coupling elements. In fact

whilst a single Pentode gives nearly double the low-frequency output of an ordinary power amplifier. In other words the previous standard five-valve receiver, 2 H.F., Det., 2 L.F., has now shrunk to the dimensions of a three-valver.

To push the comparison a stage further the original five-valver will soon be replaceable by two of Dr. Loewe's valves, and in all probability the day is not far distant when these two multi-unit valves will be combined in one.

Glancing backwards one recalls the time, not so long ago, when from eight to ten valves were built into a super-heterodyne circuit to form the most powerful receiving set then known to radio science. Now we depend upon Tetrodes and Pentodes to do the same work, with less than half the number of valves in circuit, whilst Dr. Loewe appears dimly upon the horizon with the whole bag of tricks housed inside a single bulb.

The Set of the Future.

Simultaneously with the tendency to complicate further the inside of the valve, the number of outside accessories of a wireless set is steadily diminishing. The loud speaker is now commonly incorporated in the receiver "cabinet." The high- and low-tension batteries were first transformed into separate "eliminator units" drawing the necessary "juice" direct from the electric-lighting mains. Now, in the latest models, eliminators and smoothing circuits are both neatly housed inside the common cabinet.

Finally, with the increased range and power of the modern valve, and its emancipation from heavy batteries, the outside garden aerial is beginning to lose its former importance. Compact portable sets are now available which are quite capable of touring Europe on a 15-in. loop aerial.

Fitted with an "eliminator" unit supplied from the mains, and mounted on a turntable so as to take full advantage of the directional properties of its frame aerial, the compact self-contained set of the so-called portable type appears to foreshadow the lines along which the ideal home receiver of the future will be modelled.



Sir Harry Lauder (above) is one of the many thousand portable-set enthusiasts.

one can almost say that the complete wireless receiver, apart from the batteries and loud speaker, is centred in the valve.

This emphasises another striking tendency in modern receiver design. As the complexity of the valve increases, the number of separate valves necessary for a given "reach" in reception is decreasing.

The screened-grid high-frequency valve is roughly worth two stages of "unbalanced" high-frequency amplification,

HINTS AND REMINDERS.

ANTI-SULPHURIC paste, which is obtainable quite cheaply, is an excellent preservative of a wooden accumulator carrying case, and is very useful for floors and cabinets, etc., where the accumulator stands.

* * *

If your accumulator carrying case has a leather handle, be absolutely certain not to get any acid upon this, or the result will be to eat it away, possibly with disastrous results to the carpet.

* * *

Although, theoretically, the anode bend method of detection is capable of giving better quality than the grid leak method of detection, the latter is very much more sensitive.

* * *

If threaded brass rod has to be gripped in a vice remember that it should be placed between two pieces of soft, rounded wood or the thread may be damaged.



How to Make Loudspeakers

No. 6. ASSEMBLING AND USING MOVING COIL TYPES

You can save pounds by assembling a moving-coil loud speaker yourself instead of buying a complete instrument. But a certain amount of care must be exercised in the constructional work as well as in choosing the necessary parts. Here are some valuable hints on the subject.

By A MEMBER OF THE P.W. TECHNICAL STAFF.

ONE of the most fascinating sights in radio is to watch a keen wireless enthusiast listening for the first time to a good moving-coil loud-speaker demonstration. Up to this time probably he has been quite content with his existing instrument—possibly he has modified the circuit slightly to get the best from it, and quite likely he is running two different loud speakers, say a cone and a horn, together, to get the effect he desires. But once he has heard a good moving-coil instrument outfit, he realises the shortcomings of his present outfit, and how much he has deceived himself in imagining that the reproduction was really true to life.

How Can I Get One ?

Naturally, the first question that jumps to his lips is "How can I get one of those?" There are, of course, two ways—by buying a ready-made outfit, or by home construction, either throughout, or from a kit of parts. The B.T.H. Rice-Kellogg, the Magnavox, the Marconiphone, the S. G. Brown—these are a few of the completely finished moving-coil loud speakers available at prices to suit different purses.

Alternatively a large number of excellent kits of parts are available which not only add considerably to the pleasure of the reader in enabling him to do a good deal of the work himself, but also bring the first cost down to a low figure. It is quite possible by choosing a suitable kit of parts to build for oneself a good moving-coil loud speaker at a cost much lower than is generally realised.

Before we go any further it should be pointed out once more that a moving-coil loud speaker, wonderful as is its reproduction, cannot improve on the quality fed into it, and thus, in order to get the best from these remarkable instruments, we must make sure that the receiver itself gives not only first-class quality, but that such quality is at adequate strength for operating a moving-coil speaker.

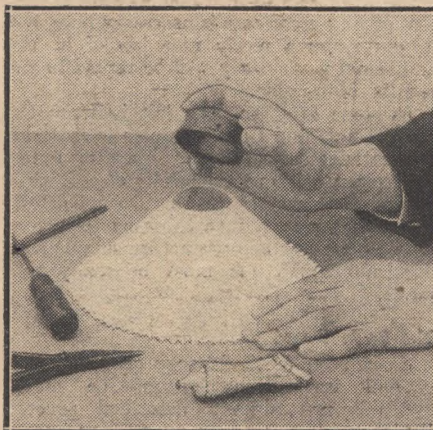
Real M-C. Quality.

With one or two exceptions, the sensitivity of the average moving-coil loud speaker is considerably below that of the average cone or horn, and for really high-quality reproduction either a large modern super-power valve, of a high voltage type, with 200 or 300 volts on the plate; two in parallel at a somewhat lower voltage; or two in push-pull at, say, 120 to 150 volts, are really necessary.

When the maker of a kit or a finished moving-coil loud speaker tells you that it will work perfectly satisfactorily from an ordinary three-valve set, you must not take this to mean that it will give what the more expert user calls "real moving-coil quality"!

A moving-coil speaker working off an ordinary three-valve set will give results of a pleasing order, providing the speaker is reasonably sensitive, but you will not get that fine, rich, undistorted tone which is so characteristic of the properly driven moving-coil instrument.

The choice of a kit is governed by several considerations. Moving-coil loud speakers are of different types, one requiring a supply of direct current to energise the field magnet and the other providing the necessary strong magnetic field by a permanent magnet. The advantage of the former type is that they are more sensitive, while the



The fixing of the moving coil to the cone and the latter to the suspending material are tasks that must be carried out very carefully.

advantage of the latter type is that one can dispense with rather a heavy drain on one's current supply.

The former type can be sub-divided once more into high and low voltage instruments, the low voltage generally working at six to twelve volts with a current up to one ampere (thus making the accumulator a practical form of "drive") while the high voltage can be run direct from D.C. mains or from high-tension mains units (A.C. or D.C.), provided they will supply adequate current.

As we are concerned in the field magnet with ampere turns we can obtain our magnetic effect with a small number of turns and a large current, as in the accumulator-driven model, or with a small current and a much larger number of turns, as in the "mains" models.

Self-Smoothing.

When alternating-current mains are available one plan is to fix up a simple voltage reducing and rectifying unit so as to provide adequate current for the low-voltage type. Personally, to drive my low-voltage moving-coil loud speaker, I use a step-down transformer from 220 down to 9 volts, and a Westinghouse R4-2-2 metal rectifier, with its output terminals connected directly to the field magnet terminals of the loud speaker.

The very large inductance of the field winding provides adequate smoothing, and there is no hum heard when we come to an interval between items. This form of drive is perfectly satisfactory, takes very little current from the mains, and does away with the trouble of constantly recharging the rather large accumulator necessary to drive the accumulator-driven model of the moving-coil loud speaker. Another method which can often be used is to run the field winding from an ordinary trickle-charger, provided that the current required is not too large.

Correct Number of Turns.

Another point you must consider before purchasing your kit, or before beginning the construction of the instrument, is whether you will use a high or low resistance winding for the moving coil itself. Opinions are divided on this point, which means in practice there is not a great deal to choose between the two methods, but there is no question that the low-resistance winding, by using a thicker wire, is the easier to wind.

The correct number of turns is very important, and the makers' instructions should be followed very carefully. Alternatively, you can buy the moving coil ready wound—not a bad plan, as the task is by no means so simple as many people think.

An output transformer is essential with the low-resistance winding (generally a 25 to 1 ratio is used), and a suitable transformer or choke output is highly advisable with the high-resistance winding.

(Continued on next page.)

HOW TO MAKE LOUD SPEAKERS.

(Continued from previous page.)

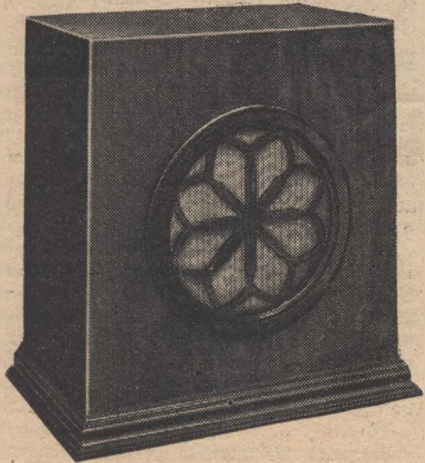
The parts of a moving-coil speaker consist of the field magnet, the moving coil, the cone, the flexible material for supporting the front edge of the cone, and the supporting frame, which enables the cone with the moving coil attached to it to be accurately centred so that the moving coil itself is free to move back and forth in the annular space between the inner and outer poles of the field magnet without at any time touching the poles. A number of highly ingenious fittings have been devised for this purpose, one in particular by Mr. G. P. Kendall, B.Sc., of the "P.W." Research Department, as regular readers will no doubt remember.

The field magnet consists of a casting called a "pot"—a kind of iron jar—a central pole firmly secured in the middle of the bottom of the pot, and an iron plate—a kind of lid for the pot—with a round hole in the centre of such a size that the central pole comes neatly in the middle with a ring aperture of just sufficient size to enable the moving coil to swing freely back and forth.

The Current Consumption.

Before the "lid" is secured in place a bobbin of wire with a very large number of turns is connected to external terminals, and when a current flows through this winding the whole pot and pole pieces are magnetised. The pot and the central rod or pole piece forms one part of the magnet and the lid the other, the magnetic field being concentrated with great intensity in the annular space between the central pole and the lid.

It is as well to find out the exact current consumption of the field magnet in the moving-coil loud speaker kit as the current drain on an accumulator may be very considerable, and I have known some field



A moderately large cabinet can be used instead of a baffle board, but remember that the back of the cabinet must be left open.

magnets which take nearly two amperes. From half to one ampere, however, is the usual figure, and one should reckon on an ampere when choosing an accumulator.

If you are using an accumulator you will naturally not desire to have it charged more frequently than once a week, and if

you run for three hours a day during weekdays and longer on Saturdays and Sundays you will find that a thirty ampere-hour (actual) accumulator is the very smallest that will give satisfactory service, and a sixty ampere is much more suitable. If you are running off the mains you will not have to worry on this score.

The task which the purchaser usually has to perform for himself in building a moving-coil loud speaker from a kit is the cutting out of the cone, its formation, attaching the moving coil, and fixing the cone to the soft material such as leather, which is used for the suspension. *Do not attempt to rush any of these tasks.*

Some Practical Points.

So far as cutting and making the cone is concerned, I strongly advise you to make one first of all from ordinary fairly stiff paper, using the design furnished by the manufacturers before you cut the special material used for the actual cone itself. By making up a "dummy" first of all you will become accustomed to handling the paper and you will find several little tricks about it which you would not discover perhaps if you started straight off on the final cone.

In particular be very careful in the use of the adhesive material such as seccotine. Too little will make an unsatisfactory joint and too much will make the drying period prolonged, while causing at the same time an infernal mess. I find it a good plan, when handling sticky material such as seccotine, to keep handy on the table a well-soaked cloth and a dry cloth, then if one should get any seccotine on the fingers it can be quickly washed off with the wet cloth and the fingers dried on the other cloth. Remember that your cone will show prominently in the finished instrument and you will want to keep it neat and tidy.

Spend all the time you can afford on making a nice job of the moving coil itself, if you wind your own. You may not at first realise why great care is necessary here, but if you make a really nice job of it, the additional work really will be repaid in the results obtainable.

In some kits the gaps left between the central pole and the outer pole is so small that satisfactory results are impossible unless the moving coil is very carefully placed, while others allow a great space. Do not delude yourself, however, into thinking that your moving coil will be satisfactory so long as it does not touch. It must be really well made.

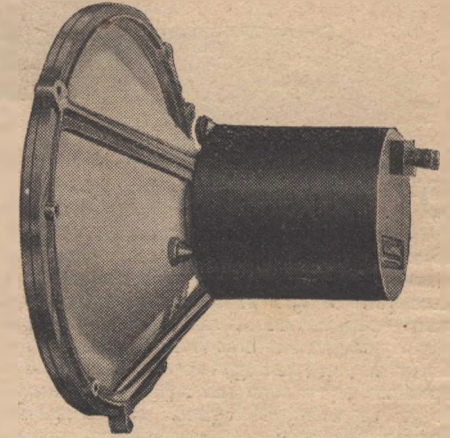
The Baffle Board.

Suspension methods vary so much that general instructions cannot be given. "P.W." has already described several. Whichever is chosen, remember that accuracy in final adjustment must always be possible or failure will inevitably result.

Once you have completed the task of assembling your moving-coil speaker you can of course try it, but if you do this before it is suitably mounted the tone will be poor, thin and unsatisfying. The use of either a large, flat and fairly thick baffle board, or a suitable cabinet so designed that the shortest air path from the front of the cone to the back is at least 30 inches, is essential if proper note reproduction is to be obtained. Fortunately, the moving-coil user is now very well catered for in this direction, and baffles and cabinets may be obtained

in what may be truly termed a baffling variety, either as plain or polished boards, fire screens, decorative cabinets, or tables and pedestals. One or two enthusiasts have even mounted their speakers in the middle of a door!

If you do not get thoroughly satisfactory results at first, do not be in too much of a hurry to blame your kit. Remember the better the speaker the more it will show up defects and distortion in your set! Blasting noises will almost invariably be due to set distortion or valve overloading, as a moving-coil loud speaker can handle enormous volume without any sign of distress.



A complete unit all ready for fitting to a baffle board or into a cabinet.

DON'T FORGET THAT—

The earth connection is quite as important as the aerial, if not more so.

For a sensitive long-distance set it is often an advantage to use a variable condenser as a grid condenser, provided that this does not necessitate long wiring.

Good containers for 2, 4, or 6 B.A. nuts, small screws, etc., can be made from the lids of old valve-boxes.

Before stowing drills away give them a rub over with petroleum jelly or a little oil on a rag, as a rusty drill loses its cutting edge quickly.

Ordinary lighting flex, obtainable from any electrician's, makes quite a good indoor aerial.

The fact that a valve filament is intact does not necessarily mean that it is in good order, for it may have lost its emission.

The necessary current to energise the mains-driven type of moving-coil loud speaker can practically always be taken direct from D.C. mains, as it does not have to be filtered or smoothed like that of H.T. mains units.

When flash-lamp bulbs are recommended for use as fuses in radio sets, the kind meant are the low consumption type of bulb.

January 1st, 1929, was the date selected for the introduction of the new Q sign abbreviations for wireless.

By dividing the total filament consumption into the actual ampere-hour capacity of your accumulator, you can tell about how many hours the latter should last without recharging.

MAKING YOUR OWN COILS



LOOKING at the title of this page you may fear that you are in for an exhaustive (and exhausting!) talk on coils of every possible type, so let me start by assuring you that I have no intention of inflicting any such thing upon you. On the contrary, we shall be dealing with just one simple type of coil, and that from an entirely practical point of view.

I am rather an enthusiast about winding coils myself, for the simple reason that so far as most ordinary types are concerned you can wind at home ones which are quite as efficient as the average commercial equivalent at a considerable saving in cost. Consequently, it seems to me that if only people would get over their idea that the job is a difficult one (quite a mistake, really) they would get a good deal more pleasure out of constructional work. Also, they would be able to try out all sorts of special schemes calling for coils which they do not feel justified in buying just for an experiment.

Really Quite Simple.

In this article I am only going to try and show you how easy it is to wind for yourself a set of plug-in coils of standard sizes. This is really the easiest job of all, and strongly to be urged upon all who have not already got such a set.

The only reasons why more people do not do it seem to be (a) a suspicion that it is difficult and tedious, and (b) lack of information as to the correct turn numbers.

By adopting some simple schemes the first reason vanishes, while as for the second, I will give you the necessary data later on to wind a set of useful coils which will match those of a standard series. You will thus be able to use them wherever standard sizes are recommended.

For The First Attempt.

Here is the job I am suggesting to you as a first venture in coil winding; get a set of those simple black fibre basket-coil formers, some basket-coil mounts and a little wire, and proceed to wind the first four coils of a standard series. It won't take you long, you will need no tools beyond a screw-driver and a pair of pliers, and it is the simplest little job you ever tried. The resulting coils are quite good from the efficiency point of view, and will cover practically all normal purposes on the ordinary broadcast wave-lengths (we will discuss long waves later).

How to make a simple but efficient set of plug-in coils of the basket type. Correct turn numbers are given to make them match up with the usual standard commercial types. By THE "P.W." TECHNICAL STAFF.

If I can once persuade you to take this first step I believe I shall have achieved my object, for you will discover what a lot of benefits follow from a very little work, and will be pretty sure to go on and tackle bigger jobs of coil winding.

Well, I have probably said enough to convince you that a set of home-made plug-in coils of standard sizes would be a useful thing to have, but so far as the difficulty or otherwise of the job is concerned I expect all that you will have gathered is that I personally think it a very easy one. To satisfy yourself on the

going alternately over and under the spokes all the way round, a basket formation coil grows under your hands with surprising ease and quickness.

All that you need do to ensure a good coil is to keep a fair amount of tension on the wire as you go, so that it shall fit down snugly turn by turn.

A few moments of trying will show you how easy it is to wind a coil like this, and then you can see about winding the whole series. A suitable gauge of wire for the job is No. 24 D.C.C., and I suggest you get a 1/2-lb. reel.

The usual set of fibre formers will be found to have an inner diameter of about an inch and a quarter, by which I mean that the first turn put on will be of that diameter, and the turn numbers which I shall give presently are based on that size.

The Right Turn Numbers.

Start with your largest former and put on 66 turns, and label this No. 60, for that is the standard coil to which it will be equivalent. At the beginning and end leave three or four inches of wire projecting, then take one of your coil mounts, attach the coil former thereto by means of a small brass screw and nut through the holes provided (see photo again).

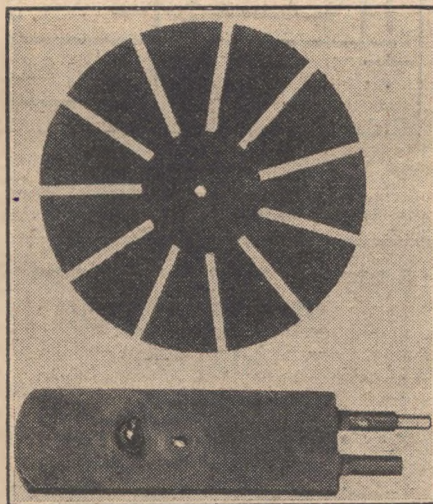
Next scrape a bare place on each end of the wire and secure to the plug and pin respectively of the mount by means of the nuts or screws provided, and the coil is finished. Just one point here: be careful to connect all your coils up the same way, and attach them to their mounts the same way round.

Turn numbers for the others in the series are these: 56 (equivalent to a standard No. 50), 44 (equal to a No. 35), and 32 (No. 25), and these smaller sizes will be quickly wound and mounted up. There, that wasn't a very difficult business, was it?

Don't Forget This.

The only points to watch are these: to make sure you get the right equivalent sizes use the gauge and kind of wire I have specified, and also the size of former. To ensure correct reaction don't forget the question of uniform connections.

Finally, as to long-wave coils: these, I admit, are a little tedious to wind, and the basket system is no longer very suitable, because one has to use very fine wire to get all the turns into so small a space. Perhaps I shall be able to make some suggestions about these coils in the future.



The foundation for each coil is a black fibre former and a simple type of plug mounting which can be purchased very cheaply.

point I think all you will have to do is to read the practical instructions which follow.

First of all, just how is a basket coil wound? Well, if you take one of the fibre formers I have mentioned (one is shown in a photo on this page) you will find that if you pass the wire round it,

SHORT-WAVE EXPERIENCES.

The Editor, POPULAR WIRELESS.

Dear Sir.—It will, no doubt, be of interest to you to know of my experiences with a two-valve short-wave receiver designed by a friend of mine. The best station I have so far received is P C L L, Kootwijk, which is good loud-speaker strength in daylight. I have a card from the Dutch State Telegraphs stating that their wave-length is 38.8m, and their power 32 kw. (I do not know if this is kilowatts in the aerial.)

P C J J, Hilversum, used to be very good strength, but lately it is only possible to receive him weakly on the 'phones.

2 X G, Rocky Point, comes over at excellent 'phone strength, and without any fading when he is operating on 35 m. But when he works on about 20 m. he is much weaker, and fades badly.

2 X A F on 31.4 m. is always a good 'phone signal and does not fade very often.

2 X A D on 21.96 m. is slightly weaker and more subject to fading.

8 X K, Pittsburg, is about equal to 2 X A F in strength and quality.

K D K A on 62.5 m. is very weak and difficult to time. His quality is poor.

During last August 2 X A G and 2 X E, New York, were received after midnight on 26.92 m. and 22.1 m. respectively. Their strength was only weak 'phone strength and both faded badly.

A F K, Döberitz, near Berlin, is a good 'phone signal here. The wave-length used varies considerably. He comes in best, however, on 37.65 m. (7.968 kc.). I am sure W. L. S. is in error when he says this station transmits for days on end without ever giving a call sign. At the beginning of every speech test he calls "A F K, Anna Franca Kaspar." With reference to Mr. Birchenall's query, the power used is 5 kw.

3 L O, Melbourne, was heard for the first time on Sunday, December 2nd, from 7.8 p.m. at fair 'phone strength. "The 'Lost Chord" and a Scottish song came over very clearly. The rest of the items were weaker and fading was troublesome.

7 L O, Nairobi, on 33.5 m. has been coming in regularly at fair 'phone strength during the last fortnight. He is badly jammed at intervals by a C.W. station.

From 3.30 p.m. onwards an unknown station has been transmitting a musical programme on about 32 m., during the last week. The language is guttural and similar in sound to German. I should be interested to hear if any other reader has received this transmission.

Also, did anyone hear the tests from a Swedish station on 51 m. at the end of September. I believe these came from Motala, but I am not certain.

I will close now, thanking you for your valuable assistance in wireless matters, and wishing "P.W." every success.

I am,
Yours faithfully,
R. C. WHEARE.

Nr. Bristol.

AN AUSTRALIAN SHORT-WAVER.

The Editor, POPULAR WIRELESS.

Dear Sir.—I was interested to read in a recent issue of "Popular Wireless," of an Edinburgh reader hearing the S. W. station at Perth (Western Australia), 6 A G.

I also received the station on Armistice Day at about 7.30 p.m.

Although this station is advertised at 32.9 metres it came in slightly below 3 L O, Melbourne.

The items I heard were some popular dance tunes of about two years ago, one, I think, was called "Whispering," and also a woman singing opera.

Signals were rather weak, however, being overshadowed by 3 L O, which is a very strong signal here.

Best wishes to "P.W."

Yours truly
ALBERT S. COCKS.

Surry.

I HAVE been asked to pass on the word to readers that a new Egyptian station is now operating with the call-sign I C A G in Suez. The operator is a three-years' subscriber to "P.W.," and his address is Box 2, Suez. He will be delighted to receive reports from other readers on his 32.5 metre transmissions.

For the first time for over a year I heard a signal from the Philippines on 40 metres or so a few days before Christmas. The honour falls to I A F, at first P I A F, then O P I A F, and now K I A F. His C Q calls at 6 p.m. G.M.T. are always received now at a good R6, although he never seems to receive any of the numerous Europeans who reply to them.

Speaking of the new call-signs, in such a case as this it is essential that the call be written as K I A F, since the "K" is an

CORRESPONDENCE.

SHORT-WAVE EXPERIENCES.

AN AUSTRALIAN SHORT-WAVER.— 5 S W IN ARGENTINE.

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

5 S W IN ARGENTINE.

The Editor, POPULAR WIRELESS.

Dear Sir.—I thought a few notes from someone in the Argentine would prove interesting to your readers.

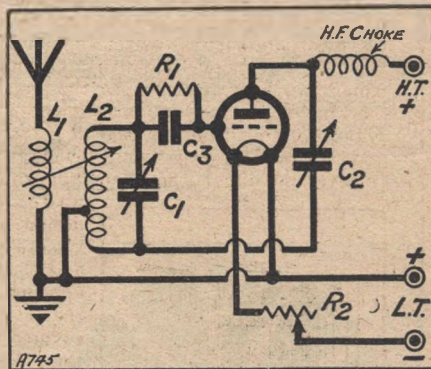
I listen regularly to 5 S W and the American short-wave stations. I have tried many and varied circuits for the detection of short-wave signals, and the best one I have yet used is as shown.

The values are: $R_1 = 6$ meg.; $C_3 = .000175$ mfd.; $R_2 = 20$ ohms.

This circuit consists of leaky-grid detection with 22½ volts on the plate using a Radiotron 201A general-purpose valve. With a DEL 610 I find 45 volts at least are necessary. For waves up to 30 metres these low-plate voltages are ample, but for higher wave-lengths an increase in voltage is necessary, so as to avoid excessive use of reaction.

Coil L_1 consists of five turns, ¼ in. diameter, of bare No. 18 wire, variably coupled with L_2 , which has nine turns of 2-in. diameter, also of No. 18 bare wire, and tapped for 3 turns of reaction. The condensers are neutralising condensers, C_2 having a maximum capacity nearly double that of C_1 . The actual condensers used were 7 and 13 plate neutralising condensers as made by the Pilot company.

The condenser C_1 is connected across the whole of L_2 , thus reducing the total number of turns for a given wave-length to a minimum. The set is com-



pletely free from hand-capacity effects. In fact, unless the coil is actually touched the only effect putting the hand over the coil is damping. To avoid this damping the condensers are mounted on 20 cms

extension rods with the coil well away from the panel.

The set is very easy to tune, and with a two-stage L.F. transformer-coupled amplifier, gives enough strength to work 5 S W on a loud speaker, loud enough to hear well at 12 yards on average days.

On some days the volume obtainable is almost incredible. It has been heard in a shop on the other side of the road. The roads in this particular place are 40 metres wide, but of course, all is more or less quiet, in camp town like M. Caseros.

The strength of 5 S W varies considerably, and for that matter so do the American stations. 2 X A D is on the whole stronger than 5 S W, but K D K A is weaker than either.

The time difference of 4 hours is all in our favour for listening-in, the gramophone concerts ending at 10 p.m. The value of 5 S W to Englishmen out in the Camp in this country can only be appreciated by those who have experienced it.

For example, one Englishman had an American six-valve Mono-control Atwaterkit for waves from 200-600 metres. This was a 3 H.F., detector, and 2 L.F. transformer-coupled set, on which with favourable conditions at about 11.30 p.m. he could hear 500 metre-wave American stations. Apart from this he could listen only to Buenos Aires stations.

I built for him a detector unit on the principal outlined above for short-wave listening. This unit was plugged into the broadcast receiver by taking out the detector valve, which was used in the short-waver, thus giving a three-valve short-wave set, using the foot of an old valve for plugging in purposes.

A filament switch for cutting off L.T. current to the H.F. valves was provided, so accomplishing the change from one set to the other with the minimum of movement of valves, connections, etc. This set works Chelmsford, Pittsburg, and the General Electric stations at comfortable loud-speaker strength.

In conclusion, I would like to say how much the Chelmsford station is appreciated out here, and I am quite willing to pay a voluntary licence-fee in support of the station if the Postmaster-General should wish to collect same, the fee being the same as for listeners at home.

Yours very sincerely,
A. S. WORBOYS.

Argentine.

TELEPHONE TIPS.

It is easy to damage telephones by dropping them from—apart from the effect upon the magnetism—their sensitivity depends upon the exact shape and position of the diaphragm.

If a telephone diaphragm is discovered to be rusty, it can after careful removal be cleaned and slightly smeared with petroleum jelly before being replaced, in order to keep it in good condition.

If, for any reason, the telephone diaphragm is taken from off the earpiece be very careful not to bend or damage it in any way.

When replacing a diaphragm over a telephone earpiece, do not place the diaphragm straight down over the earpiece, so that the magnet exerts a pull upon it, but slide the diaphragm sideways over the rim of the earpiece so that it will not be bent or pulled.

SHORT-WAVE NOTES.

By W. L. S.

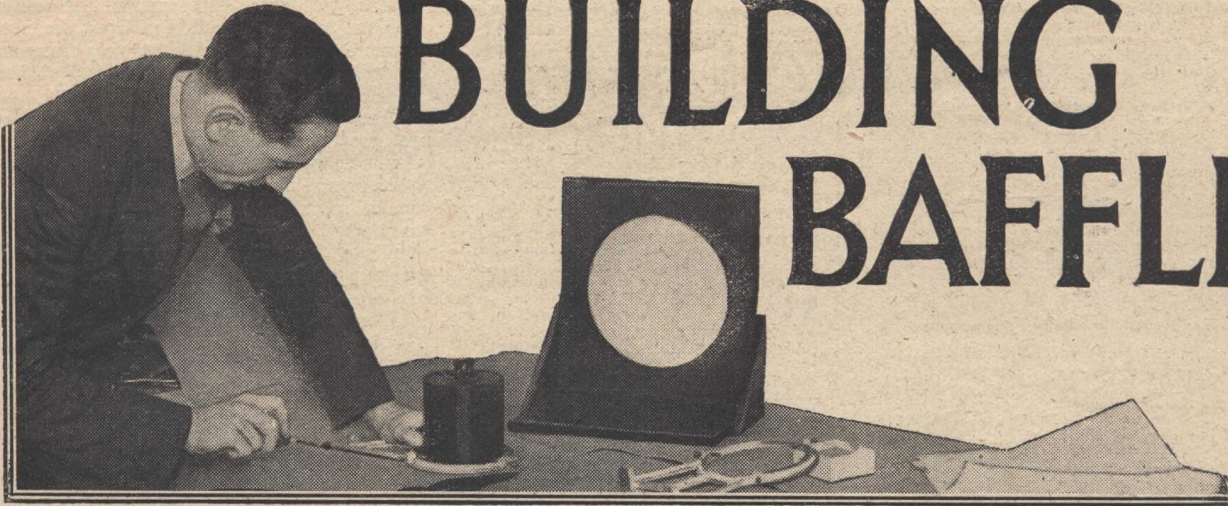
integral part of the call-sign. "K-1 A F" or "k 1 A F" will now be incorrect, since the "K" is in no sense a prefix or "intermediate." As various countries will apparently be retaining their old prefixes well into the new year I propose to use a hyphen when referring to them, and to drop it when speaking of the new call-signs. Incidentally, British amateurs, even when using telephony, should now include the "G" on every occasion.

Whether the United States broadcasting stations will include the "W" (or our own, for that matter!) is a moot point. It seems rather unlikely that we shall ever hear "Hullo, folks, this is W 2 X A D!"

P C J J is dropping one of his J's in the new year, and I believe all the Dutch stations with similar call-signs are being treated in the same way. At all events, we are certain of hearing P C J and P C L on 31 and 38.8 metres respectively.

A F K, about which a correspondent had a "friendly tilt" with me recently, is certainly announcing his call-sign much more frequently. A G K and A G L, both at Nauen, are also frequently heard nowadays, and A G J, at present working with a vile L.C.W. note which wipes out half the amateur wave-band on 42 metres, is, I understand, shortly changing over to telephony.

BUILDING BAFFLES



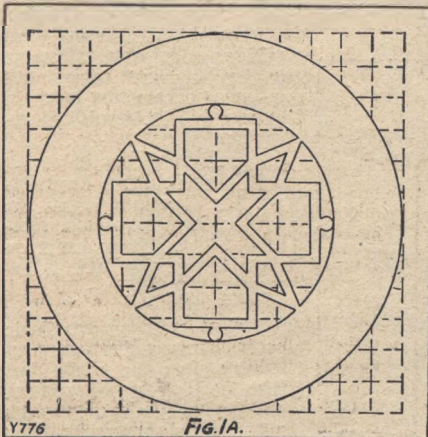
Simple, inexpensive, but artistic, baffles for cone and moving-coil speakers are described.
From A CORRESPONDENT.

A BAFFLE-BOARD at first sight presents a little difficulty to the constructor, but there is really no reason why he should not be the proud possessor of one he has made for himself. There is little work which any home

speaker, he can add a fretted front as an overlay to the board, making it to his own design and style. If he purchases a plain plywood board—and five-ply is certainly preferable, he can cut out the central hole with a keyhole saw, holding the wood upright in a bench vice whilst cutting. As, too, the circle edge will be covered by the fretted portion he need not be particular if he runs a little off the cutting line, or makes a jagged edge.

be held by a strengthening block glued inside, and to the back of the board. One is clearly seen in the picture.

Small moulding should be used for the edges and glued flush with the outer edge of the board (Fig. 3).

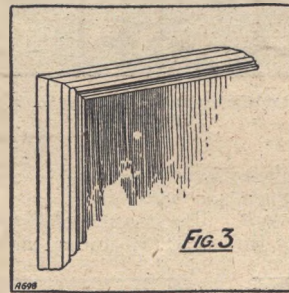
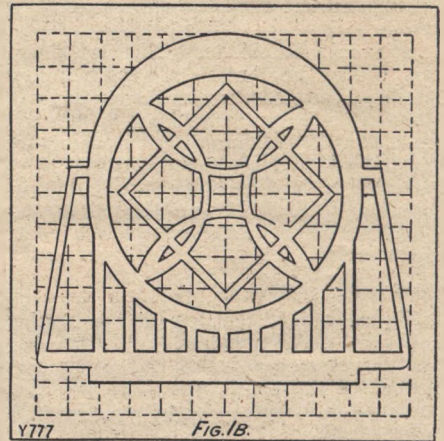


Suitable Front Designs.

The fretted panel can be designed according to one's ingenuity, and can even be made to incorporate the owner's monogram. We illustrate herewith two simple designs which can be transferred to the wood by marking off the inch squares shown.

Both are cut from a board 12 in. square, and the rim of the design at 1A is wide enough to cover any circular hole from 8 in. to 10 in

wide. The design at B is more open, and the 8-in. aperture of the board is covered by the circular rim seen. Of course, if a greater circle is required, the squares can



amateur cannot undertake for baffles are usually quite plain, straightforward affairs of plywood.

Very Small Cost.

To this plain board he can add his own handiwork, to his own style, and in his own time until he has completed a board equal to any he can purchase. Moreover, the cost is quite small, and entirely in inverse ratio to the result obtained.

Instead of the ordinary open circle of the

be marked off proportionately larger.

These fretted panels are cut from faced plywood, or ordinary fretwood $\frac{1}{4}$ in. or $\frac{3}{8}$ in. thick. Any young friend will cut out the work if the worker cannot himself handle a fretsaw. The outer edges can be left square, but will look better if rounded down with sandpaper. The completed panel is glued to the larger board, or screwed on from behind.

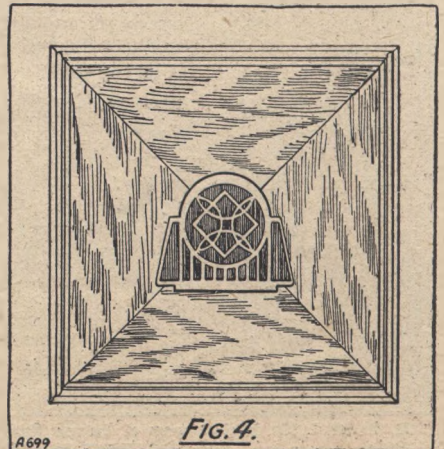
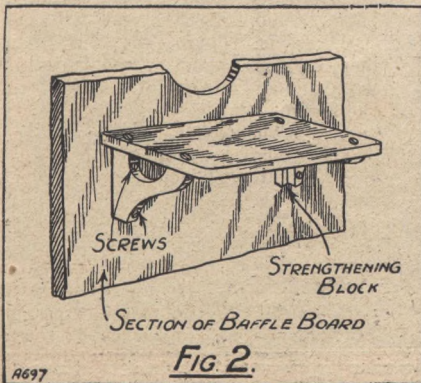
Supporting the Speaker Unit.

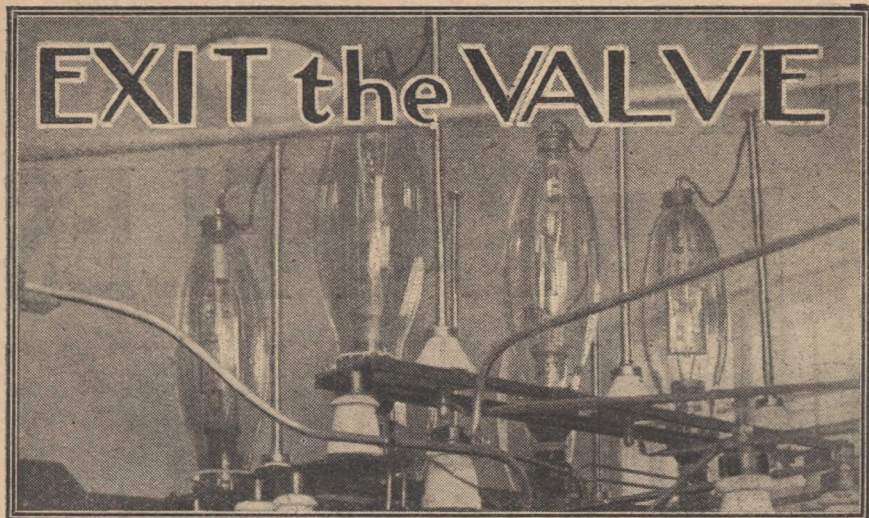
The use of a fretsaw handframe is also necessary if we are to build on behind the baffle-board a support bracket for the moving-coil unit. The illustration at Fig. 2 shows one simply constructed from three pieces of board.

To give greater strength $\frac{1}{2}$ in. or $\frac{3}{4}$ in. wood should be used and, in addition to the two screws shown, each bracket should

The whole board can be polished or varnished, but if polishing is done it should be undertaken before the fretted panel is glued on.

Another method is to purchase four large sheets of veneer paper, and glue these to the board with a decorative scheme, such as shown at Fig. 4.





New H.F. generators have been developed in Germany capable of producing outputs suitable for even short-wave transmissions. These wonderful machines enable broadcasting to be carried out without using valves.
From A SPECIAL CORRESPONDENT.

VALVES are expensive, difficult to manage and sometimes fragile. I do not think that I go far wrong in stating that nearly all of the very few transmitter breakdowns are due to the burning out of a valve.

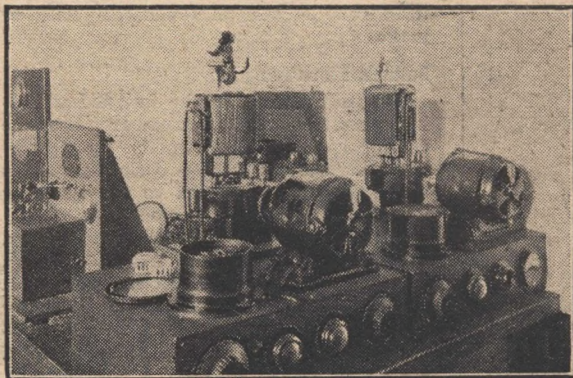
It is quite an old story, of course, that I am dishing up, but it has quite a new ending. Long-wave transmitters with waves from one mile and a half long to ten and more miles long, at present use machines for generating their high-frequency power. But with these machines one would require anything from 10,000 to 100,000 revolutions per minute to generate waves under 1,000 metres.

New System at Munich.

So valves hold their own for generating what is really nothing but alternating current of rather a high frequency. At home, on the mains, you have anything from 15 to 100 alternations per second. A wave-length of 300 metres requires one million alternations per second.

A German firm (Lorenz & Co.), with their technical manager, Hahnemann, and their engineers, Herzog and Seidlbach, and using fundamental patents of numbers of eminent research workers, have now developed a transmitter solely employing generators

instead of the expensive valves for broadcast wave-lengths right down to 250 metres; and work is going ahead, I am told, to adapt the new type of transmitter for the short-wave band down to 15 metres.



The voltage and revolution regulator belonging to the high-frequency generator.

The first of these transmitters has been installed in Munich and will shortly take over full time work. The transmitter has had rather a bad time of it, and during one

period the Munich listeners had the rather dubious honour of suffering from the new transmitter in its crudest experimental stages. This was as early as 1925 at the All German Traffic Exhibition.

Since then it has been completely redesigned and rebuilt and is now even better than the existing type of valve transmitter quite apart from being much cheaper in operation, as there are no expensive valves to renew.

I hear that a further transmitter of the same type will be erected in Leipzig during the coming year.

When I viewed the new transmitter in Munich, the original inventors of all the more important improvements and alterations were there and I got first-hand technical details, which I could not attempt to put down on paper—they were far too formidable.

* * * * *
WORKSHOP WRINKLES.
* * * * *

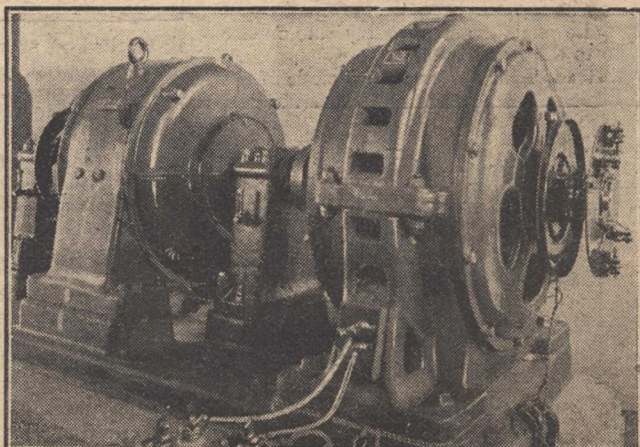
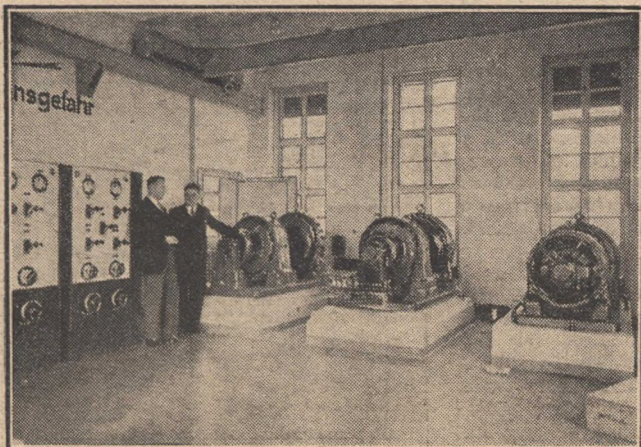
The presence of lumps of sediment in the bottom of the electrolyte of an accumulator is an indication that the cell has been misused and that it needs careful handling or overhauling.

The objection to using killed spirit as a flux when wiring up is that the heat causes this to splutter, and the acid will eventually give trouble in reception.

It should be an invariable practice directly a joint has been soldered to wipe it carefully with a clean duster so that all surplus flux is removed.

Violent and uncontrollable oscillation on a short-wave set is very often due to the fact that the high-frequency choke and the reaction condenser are setting up an unwanted tuning effect (the easiest cure is another H.F. choke).

When wooden separators are grooved only on one side, the grooves should be placed against the positive plates, so as to provide free access of the electrolyte to the active material of the plates.



On the left is the machine-room of the new Munich transmitter; Engineer Herzog and Dr. Pohousch are seen inspecting the generators. On the right is one of the high-frequency generators that are now being used instead of valves. (Photos, copyright by L. J. Kleintjes, 1928.)



silence

stant

The hush that comes before the downward sweep of the conductor's baton is all-important; it gives time to gather the instruments together for the burst of melody and it adds contrast to the intensity of the succeeding sound. These pauses are used to fine effect by great musicians and the silent background which you get when you use Lissen Transformers gives you amplification which is inimitably fine. Notice how the notes of music and the words of song and speech stand out in sharp stereoscopic relief when you use Lissen Transformers. In every circuit you can employ them—no matter what else is specified. They have brought a vast improvement to radio reproduction.

LISSEN
TRANSFORMERS

The LISSEN SUPER TRANSFORMER

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high-impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price **19/-** is the same for both ratios

The famous 8/6 LISSEN TRANSFORMER is still supreme in price and will never break down—

The famous 8/6 LISSEN Transformer is suitable for all ordinary purposes, and its huge sale proves it still supreme value. It continues to earn high praise as "the transformer that never breaks down." **8/6** Turns ratio 3 to 1. Resistance ratio 4 to 1

LISSEN LIMITED,
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(Managing Director: Thos. N. Cole.)

FROM THE TECHNICAL EDITORS NOTE BOOK



A LOEWE RECEIVER.

Undoubtedly the Loewe valve forms one of the most striking developments of radio. Here you can have a valve not much larger than any ordinary type and not quite so large as some of the power varieties, which contains in itself all the necessary items for a three-valve amplifier. And the interesting feature is that the Loewe Radio Company Ltd. have gone into production with these remarkable valves, and the sets with which to use them, in this country. No doubt their recent patent action will still be fresh in the minds of readers.

Quite recently we were sent a Loewe radio receiver type O.E.333. Actually, of course, the receiver part is mostly within the valve itself, for this is three separate valves and their coupling elements all in one.

The other part of the set consists of a neat base into which the valve plugs and on

the set are so arranged that it cannot be inserted the wrong way round.

When one has connected up this Loewe set one gets something of a shock, for the set itself is rather smaller than some of its accessories, such as the H.T. battery and an ordinary size of accumulator, and much smaller than a small loud speaker. The price of the set without coils is £4, the royalty in addition being 10s. (not 37s. 6d. you will notice!), and it is quite a good little set. On the local station, 5 G B, and 5 X X the reproduction is very good, and some of the powerful Continentals can be tuned in.

SCREENED WIRE.

Messrs. Ward & Goldstone recently sent us a length of their new back-of-panel brass-screened wire. This, they state, they have found particularly useful where either low- or high-tension mains units are

amount of bitumen which binds each cell together. In actual practice the result is tantamount to almost complete air spacing of cells.

A BOOK RECEIVED.

Messrs. Partridge & Co. recently sent me a copy of "Wireless—The Modern Magic Carpet," by Ralph Stranger (3s. 6d. net). The book is brightly written and endeavours to cover a lot of ground.

FERRANTI SAFETY BOX.

Messrs. Ferranti Ltd. have produced a fireproof box made of steel for the containing of mains units. A double-pole switch and a fuse are arranged so that when the lid of the box is lifted the whole of the apparatus secured inside is completely disconnected from the mains. A three-cord flexible cable is fitted, the one cord being provided for earthing purposes in order to comply with regulations. (This is where an earthing pin is fitted to the power plug.) If this plug is not available, then you do not use this lead.



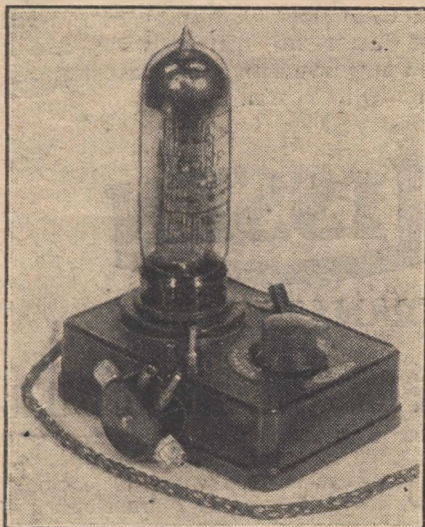
Dr. Loewe, inventor of the Loewe valve.

As readers will probably remember it was mentioned recently in this page that the Ferranti people had prepared charts of a number of mains units, and any one of these units can

be fitted into their safety box. The price of this very useful arrangement is 13s. 6d., although it has the appearance of something of a much higher price. It certainly enables complete safety to be achieved.

FORTHCOMING REPORTS.

Among the various components and accessories recently received for test are: Geophone Mains Units, H.T. Batteries, Plaque Loud Speaker, Amplifier Unit and Condenser Bank, R.I. and Varley A.C., H.T. Eliminator, Philips' Pick-up, Lewcos Fixed Potentiometer and Loading Coil.



The Loewe receiver described in this column. On the left will be seen the coil holder which accommodates the aerial tuning and reaction coils. The knob in front of the valve operates the tuning condenser.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

installed, also for receiving sets where there is an alternating-current supply or where K.L.I. type valves are in use.

They also state that they have supplied for some time a similar screened wire with aluminium armouring, but, owing to the difficulty of soldering it, it has been found preferable to use the brass screened conductors.

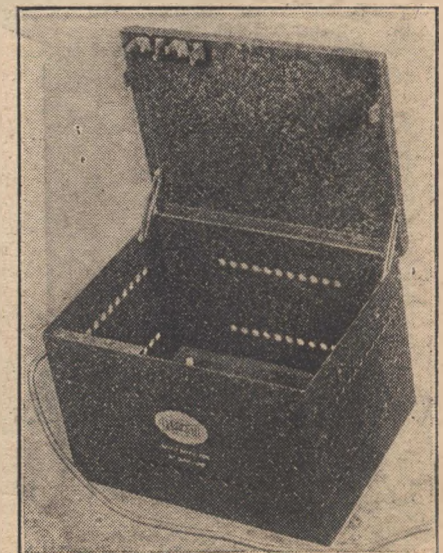
The insulation can easily be stripped off and the brass armouring unwound. It certainly seems to be a useful material, and constructors should bear it in mind for they might find it very useful for certain jobs.

OLDHAM H.T. ACCUMULATOR.

There is a further development in design in connection with the Oldham H.T. accumulator of a very interesting character. In future, all Oldham H.T. accumulators are being fitted in 10-volt units utilising the method of "Isola" cell construction. The purpose of this system is to provide a minimum leakage path between cells. The cells are filled with bitumen providing an unbroken surface from end to end. The only contact between cells is by a connecting bridge at the top of the cell and the small

which is a tuning dial and the coil holders. A "multi-flex" cord is provided for battery connections. The triple valve takes .34 amps. at 4-volts L.T., and the set as a whole operates satisfactorily with an H.T. voltage of 90.

The valve itself, as can be imagined, is a remarkable assembly. Readers will remember an article in "P.W." some weeks ago in which the valve was fully described, and looking at all its intricate internal assembly one trembles at the thought of dropping it. The valve has six pins at the base, but this and its corresponding socket



This is the Ferranti Safety Box. The fuses and switch can be seen in the left-hand corner.

HEAR REVELRY ON SUNDAYS!



from CONTINENTAL CABARETS

YOU will enjoy the kind of programme they broadcast on the Continent on Sundays—gay hours from the famous cabaret shows, music from the dance halls, and all the happy freedom of the Continental Sunday are brought to your home by the Lissen S.G.3 Receiver. Because, with this latest development of radio, distant stations come in all around the dials at full loudspeaker strength; the Lissen S.G.3 Receiver gives you a degree of selectivity, volume and purity of reproduction of Continental programmes such as you can get from no other receiver you have ever tried. The cost is moderate; you can easily build the S.G.3 Receiver yourself, or you can buy it completely assembled. If you build it yourself you save pounds.

HOW TO START BUILDING IT!

There are only 6 steps in the building of the Lissen S.G.3 Receiver. Lissen have published a free STEP-BY-STEP Chart and Wiring Diagrams, which make every step absolutely simple. Lissen also provide a ready-drilled panel, baseboard with component layout marked, aluminium screens all ready to erect, and all the wires, terminals and sundries you require in an envelope, price 10s.

Go to your wireless dealer and ask for the Lissen S.G.3 Chart; on the back of it is a list of all the parts you require. Your wireless dealer will help you to choose these parts from his stock. Lissen do not tie you down to any particular make of valve, nor to any special cabinet; you choose these yourself, although Lissen advise a cabinet of polished wood so as to make the finished set a handsome piece of furniture.

10,000 RADIO DEALERS

sell the parts for the Lissen S.G.3 Receiver, and any one of them will help and advise you. Get the free chart to-day, or send coupon below direct to factory for it.

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If you prefer it, you can buy the S.G.3 Receiver completely assembled in finely finished wood cabinet large enough to hold batteries and accumulator, price **£8**

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EVERYTHING **The S.E.C.** your guarantee



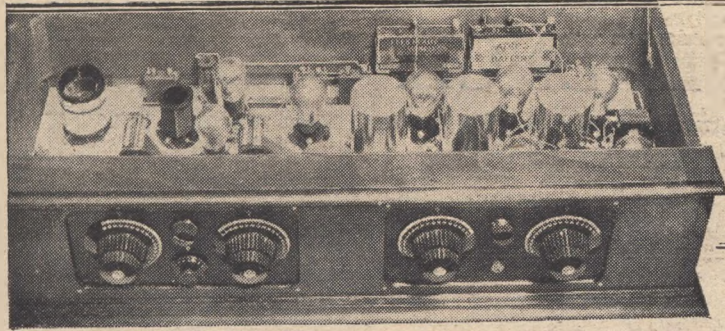
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1929

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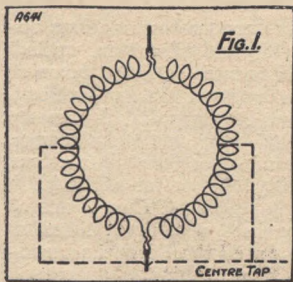
MADE IN ENGLAND.
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TORUSOLENOID TRANSFORMERS

By B. H. J. KYNASTON.

RECEIVING sets employing several stages of transformer-coupled high-frequency amplification are often troublesome things to construct to one's own design, especially if the set is intended for use on the very short wave-lengths. The amateur often finds, unless he works to a good modern design, that although great care has been taken and all leads have been kept



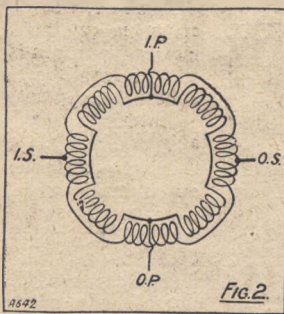
well apart, and as short as possible, the results are not what they should be.

The usual trouble is that the set has a nasty habit of bursting in to oscillation for no apparent reason.

Often a receiver using several stages of transformer-coupled H.F. will be found to work more or less satisfactorily even when one of the high-frequency valves has been removed from its socket.

Such troubles as those mentioned above will in almost every case be found to be due to small energy exchanges taking place between tuning coils, H.F. transformers, etc.

Some time ago a type of coil was described in this paper which has certain special advantages over the ordinary types of coils in



general use, and is very interesting to the man who designs his own sets. The coil referred to is the Torusolenoid, which was invented by Ross Gunn, of Yale University Laboratory. The chief advantage of the coil was that it had no external field, and a very low distributed capacity.

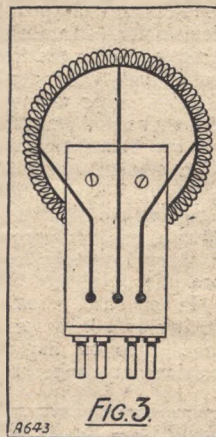
Fig. 1 shows the arrangement used for the fieldless coil. It will be observed that the coil is wound in two sections, and that the sections are wound in opposite directions.

A very similar arrangement can be used for constructing fieldless H.F. transformers. The transformer consists of two Torusolenoid coils wound in sections. The diagram, Fig. 2, shows the method of winding much better than it is possible to describe it in words.

It will be seen that each section of these transformers and coils is in parallel with a similar winding. This secures a uniform magnetic field inside the coil, which does not have any tendency to stray outside the coil and interfere with any other component in the set. The two windings also being in parallel decrease the high-frequency resistance of the winding.

Number of Turns.

Figs. 3 and 4 show an easy method of constructing and mounting these transformers. It will be seen from these diagrams that the coils have a fairly small diameter and will therefore need a large number of turns. The high value of inductance of each half of the coil will allow a



large number of turns of fairly small wire to be used.

For a 200-500-metre band a coil can be wound with a total of 480 turns (240 in each section). No. 30 D.S.C. wire being used.

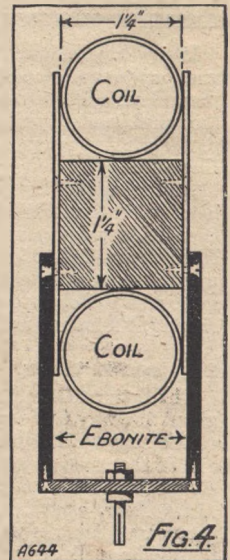
For a transformer for the same band the primary can have 120 turns and the secondary 140 turns.

On the Short Waves.

The number of turns for a tuned transformer for long waves of 1,600 metres should be 440 turns in the primary and 500 in the secondary.

A Torusolenoid for short waves can either be made as shown in Fig. 1, but if the Hartley or similar circuit is to be employed

a centre tapping can be used. The centre tapping must, of course, be taken from the centre of each section, as shown by the dotted lines in the diagram. Using the same size formers, as shown in Figs. 3 and 4 twenty turns in each section (a total of 80 turns) will tune from about 35 to 60 metres with a .0003-mfd. condenser. If a similar coil is used with a centre tapping and the same size tuning condenser is connected between the grid and filament ends of the coil, it will be found to cover about 20 to 40 metres. Such coils are likely to be helpful when an attempt is made to use H.F. amplification on these waves.



If your reception is interrupted intermittently according to the position of your head or the position of the telephones, it is a sign that one of the leads is faulty and needs replacing.

An excellent test for sensitivity is to place the telephones over the ears in the ordinary way, put one of the tags between the lips and rub the other tag with a key, nail, or other piece of metal; if a rubbing noise is heard corresponding with the movement of the key you can be sure that the 'phones in question are sensitive.

To calculate the total amount of low-tension current required by a set add together the figures given by the makers for each valve under the heading "Filament Amps."

TELEPHONE TIPS.

As telephones are among the most sensitive instruments known to science that are in common use, we should always treat them carefully.

When telephones are not left connected permanently to the set, but are stowed away in a cupboard, make sure that they are kept in a dry place, as dampness will in time affect them.

If you are using a crystal set it does not matter which way round the telephone leads are connected to the terminals.

If you are using a valve set be very careful that the 'phone leads are connected in circuit the right way round. Practically all telephone leads are marked with a red cord or a positive sign to denote which side of the telephones should be connected to that telephone terminal which goes to H.T. positive.

If the telephones are incorrectly connected to the 'phone terminals in a valve set, it is only a question of time before they become demagnetised, owing to the plate current flowing through them in the wrong direction.

INTERFERENCE.

The problem of jamming and heterodyning between two or more transmitting stations is not an easy one to solve.

By THE EDITOR.

AS we go to press with this issue, there is still no definite clue to the origin of the unknown broadcaster who has been interfering with 2 L.O. A few days ago, many listeners complained of an amateur station working on 2 L.O.'s wave-length, and which was not only causing interference with the programmes but which was broadcasting matter which has been described as blasphemous and obscene.

DON'T FORGET

your copy of the

JANUARY

MODERN WIRELESS

Full of articles of exceptional interest including full descriptions of

Four Fine Receivers

Now On Sale

Price 1/-

It is thought that these vulgar transmissions have emanated from a station somewhere in the centre of London, although it is also a theory that it is a high-power station operating in the North of England.

According to the "Daily Express," a listener in North London said that one evening he was listening-in to the Children's Hour from 2 L.O when he thought he would switch over to a German station and, as he was switching over, he heard someone singing, "Linden Lee."

Objectionable "Items."

The listener thought there was something about the way this song was being rendered which suggested it was not being done by one of the usual broadcasting stations. The singer soon broke off, then there was a talk about Beer, and then some laughter, and then some remarks which the listener hopes no children listening in will again hear. According to the listener, this sort of thing went on from about 5 o'clock to 5.30, when he turned off his set and communicated with the authorities.

The B.B.C. has investigated the matter, and so has the Post Office, and it is anticipated that should this had-mannered radio pirate start interfering again he will soon be located by the direction-finding sets and brought to book.

There have also been cases reported in the papers lately of rather mysterious broadcasts from an unknown foreign broadcasting station, and the B.B.C. have received many letters of complaint during the last few weeks from listeners who say they cannot pick up 2 L.O because of interference caused by this mysterious station transmitting during programme hours.

If by the time this issue of POPULAR WIRELESS is in the hands of our readers there is no news of the culprit being caught,

we hope any readers who pick up this station will take every care to note full details, and that they will forward them to us and to the B.B.C.

Shifting Wave-lengths.

In the case of the foreign broadcasting station, it may be that, like Langenberg the other day, the station is off its wave-length and is not deliberately interfering with the B.B.C. It is most important that every station should keep to its allotted frequency. There is no excuse these days for foreign stations not keeping to their right wave-lengths, for the practice of keeping transmitters at a constant frequency is now widely known, and ignorance cannot be put forward as an excuse.

Furthermore, the increasing use and development of quartz crystals and other devices for maintaining the correct carrier frequency of a station is well known, but unfortunately a good many Continental stations either do not use these devices or else they use them casually or wrongly.

Very often these days we have to complain of a station transmitting a frequency as much as 5,000 cycles from its normal one. Luckily, the International Radiophone Bureau and various watching stations keep a sharp look-out for these offenders, who are quickly brought to book.

In one case, a station may operate at a frequency a little removed from its normal one, while on the other hand a foreign station may sometimes be heard having a

varying frequency; sometimes being above and sometimes below its normal one. British stations seldom, if ever, err in this matter, for the B.B.C. maintains a very strict supervision on the frequency of its various broadcasting stations.

Of course, any broadcasting station usually has to have a frequency range of 10,000 cycles, whereas a C.W. Morse transmitting station usually requires only about 400 cycles. Consequently, a telephony broadcasting station usually takes up more frequency channels than an ordinary Morse transmitting station.

Minimising Interference.

If we consider broadcasting stations operating between 200 and 600 metres, we find the wave-lengths covered include a range of a million cycles between the two extreme frequencies, and consequently it can be worked out that there are only enough broadcasting channels for about 100 stations broadcasting telephony, or for about 2,500 high-speed Morse stations. That is one of the reasons why there is so much difficulty in finding room for all the European broadcasting stations now working.

On the very long wave-length range there is available for broadcasting a wave-length band of 1,000 to 2,000 metres, or in cycles 150,000. But even then, only fifteen or sixteen stations having a frequency range of 10,000 cycles each can be accommodated. This country only has one wave-length in that range, and that is 5 X X Daventry.

However, when the change-over of the relay stations to one common wave-length is accomplished, and, better still, when the Regional Scheme is in operation, this trouble of interference will be considerably minimised.

In the meantime, it behoves every amateur to keep a very close watch as far as he is able, and to report at once in full detail any stations he hears interfering either deliberately or unintentionally with the legitimate broadcast transmissions.



Members of one of the leading radio societies carrying out D.F. tests during a search for a "pirate" transmitting station.

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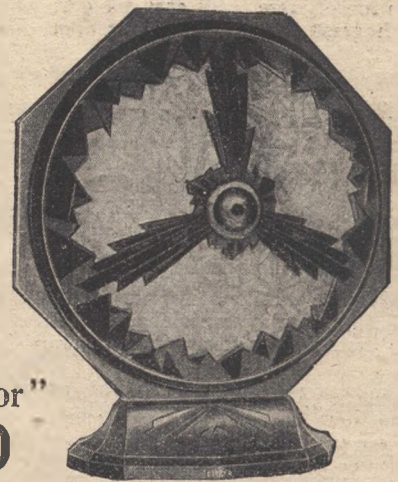
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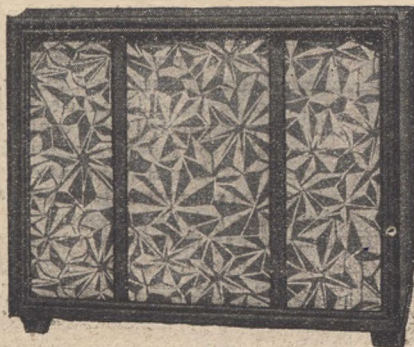
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"It can't be done!" said the Editor of "P.W.," laying down his pen with great deliberation and swivelling round in my direction.

"Why not?" I replied, settling back very comfortably into the visitor's easy chair and preparing for an argument.

"Do you mean to tell me," went on *He Who Guides "P.W."*, "that you can show our readers how to make a three-valve set with variable condenser tuning, condenser-controlled Reinartz reaction, antiphonic valve holders—in fact, everything but the batteries, valves and speaker, for under half-a-guinea?"

"Yes," I replied, with what the novelists called "studied nonchalance." (After all, I had spent many weeks thinking it out, and I was feeling that this was rather *my* day.) "Let's call it 7s. 6d., and I will see that you get aerial and earth terminals, and nice red and black insulated spade terminals for the accumulator and loud speaker leads."

YOU CAN MAKE IT!

"Far be it from me," remarked the Guiding Spirit of "P.W.," picking up his pen once more and examining its nib with great care, "far be it from me to suggest that the eminent editor of the 'Wireless Constructor' is capable of adding three stages of amplification to the truth, but I should very much like to see and hear this set you are talking about."

And so, a few weeks later, the Editor and I stood by the testing bench in the "P.W." Research Department. In front of us stood the weird but efficient receiver depicted on the cover of this issue. Out of the loud speaker near by poured music—loud, clear, and free from distortion. A touch of the dial and it faded away to nothing, and in a moment another programme poured in from 5 G B.

"Good heavens, you've *done* it!" exclaimed the Editor, "and far better than I would ever have believed possible."

Any reader of "P.W." can make up this novel three-valve receiver for a maximum expenditure of 7s. 6d., and actually the cost, in ninety-nine cases out of a hundred, will be appreciably less, for I have charged up a number of items which readers will have by them, and have assumed that everything has to be bought beyond a few oddments that

are obtainable in any household without cost. The circuit is shown on the next page. It is a tried and tested arrangement following standard practice in its theoretical essentials, with the aerial inductively coupled to the grid circuit, and Reinartz reaction provided.

There are two stages of low frequency coupled by the resistance-capacity method; while tuning and reaction are condenser controlled by special variable condensers I have invented for the purpose. Everything is home made, with the solitary exception of the antiphonic valve holders. It would have been fairly easy to show readers how to make the valve holders at negligible cost, but as the object was to give readers a *good* working

A THREE VALVE SET FOR 7/6^d

by PERCY W. HARRIS



All the parts needed for the 7s. 6d. three-valver!

Note the very low total cost!

	s. d.
Baseboard, 15 in. x 8 in.	— —
Double flex, 4 yds.	0 8
3 antiphonic valve holders (Cason)	3 0
5 Clix wander plugs	0 10
4 Clix Spades	0 8
1 tin Enameline, 3d.	0 3
2 terminals for aerial and earth	0 2
Bare tinned wire, stiff, 1 yd.	0 2
3 doz. roundheaded brass wood screws, 3/8-in.	0 6
1 1/2 doz. tin soldering lugs	0 3
Tinfoil, wax paper from 7 packets	
20 Players' cigarettes	— —
Stick of sealing wax	0 3
Twenty yards No. 24 D.C.C. wire (2 oz.)	0 9
Piece of "P.W." paper, and odd pieces of firewood	— —
	7 6

threepenny tin of Enameline stove polish (of which only a tiny spot is used, the rest being available for the household), a few yards of electric lighting flex, some cardboard, wood screws, soldering tags, stiff wire, sealing wax, tinfoil, wax paper, and three antiphonic valve holders.

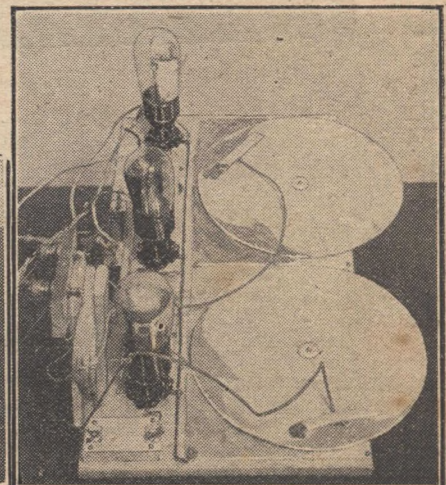
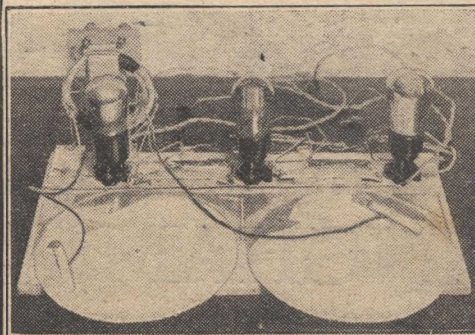
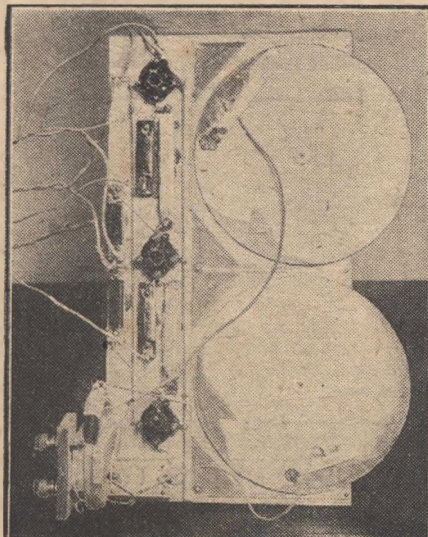
As a touch of luxury I have added two terminals for aerial and earth, five Clix wander plugs, and four Clix spades. These can, if desired, be dispensed with, reducing the cost by 1s. 6d. or so, but they add to the comfort and still enable the set to be made for 7s. 6d. In the list of components I have not included any charge for the cardboard, tinfoil, or wax paper, as any old pieces of flat stiff cardboard will do, such as the lids of boxes, while in the case of the tinfoil and wax paper, I have confined myself exclusively to the wrappings found in packets of 20 Players' cigarettes!

The fixed condensers, for example, consist of nothing but the wrappings of Players' cigarettes, at the rate of one set of wrap-

receiver, and as the agreed figure of 7s. 6d. allowed the holders to be bought, the manufactured articles were included. They are quite efficient but inexpensive, costing only a shilling each.

"Players', Please"!

The materials required are—any old piece of board for the base, a few tiny pieces of firewood for supporting the anode resistances, grid leaks, and condensers, a couple of ounces of No. 24 D.C.C. wire, a



Three views of Mr. Harris's unique set clearly showing its construction. You will notice that the home-made coupling resistances and condensers are mounted between the valves, while the large circular objects are the home-made variable condensers. The assembly is an extraordinarily compact one notwithstanding its simple all-home-made nature.



pings per condenser. Tinfoil from cakes of chocolate will be equally satisfactory, as will the wax paper used for wrapping many food products, such as breakfast foods. There is more than enough wax paper round one packet of "Force," for example, to provide all that is necessary for this receiver. May I take this opportunity of offering, in advance, apologies to many readers who smoke and who have found they are unable to obtain their cigarettes with the usual facility? No doubt the makers will immediately erect a large number of new factories to meet the demand!

Continentials on the L.S.!

Seriously, this receiver has taken many weeks to work out, particularly with the view to making it as easy as possible to duplicate. The work has been made particularly simple, but it is necessary to follow out all instructions carefully, even when some of the instructions may appear to you a little unnecessary or trivial. No skilled work of any kind is required, there are no electrical measurements to be done (this has all been

worked out in my laboratory), and if built as described you will be able to receive on the average outdoor aerial, not only the local station and 5 G B but, after dark, several of the continentals on the loud speaker, with a little practice.

Probably the most interesting part of the receiver is the special type of variable condenser used. If you examine the circuit diagram you will see that one set of plates of each variable condenser is at earth potential. For this reason two strips of tinfoil measuring, when placed end to end, some 14½ in. long by 3 in. wide are placed along the baseboard, being gummed to a strip of card fastened down to the wood. The card is used here to obtain smoothness.

Next, two discs of card are cut, 7 in. diameter, from as thick cardboard as you have available, and over half of one side of each of these discs a sheet of tinfoil is attached with gum. The ends of the tinfoil are folded over to the other side of the disc, where they are out of sight, and gummed

This is undoubtedly one of the most striking receiver designs ever published. For "three half-crowns" one can build a Detector 2 L.F. three-valve set capable of surprising punch and purity. The L.F. stages are resistance-capacity coupled, and capacity reaction control figures in the efficient and up-to-date circuit. You can work a loud speaker with this set, and the results will compare with those given by an expensive commercial production. Home-made variable condensers, home-made resistances and fixed condensers, and home-made coils, are features of this real home-constructor design. Literally this is a set you MAKE, as opposed to the usual assembly of manufactured components. And the parts are easily made out of ready-to-hand materials. The 7s. 6d. Three-Valver is a triumph of ingenious improvisation, and the description of its construction makes fascinating reading.

firmly in position. Tell all your friends who smoke Players' cigarettes to let you have the wax paper and the foil from their

packets, and you will find that the baseboard mounted foil can be made from exactly two sheets of foil, while one sheet of foil will serve for each card disc.

How Coils are Made.

Wax paper from 'outside the packets is gummed to the foil on the baseboard, thus serving as the necessary dielectric. In the photograph the wax paper is shown cut away somewhat to reveal the foil, but so long as the wax paper is so arranged that the foil on the underside of each disc cannot touch the foil on the baseboard, all will be well. In order that electrical connection may be made to the foil on the discs, two strips of cardboard are fastened with sealing wax as shown, and the bared ends of flexible wires tucked underneath the cardboard so as to make contact with the foil. Each disc is held in position by means of a wood screw passing through it into the baseboard.

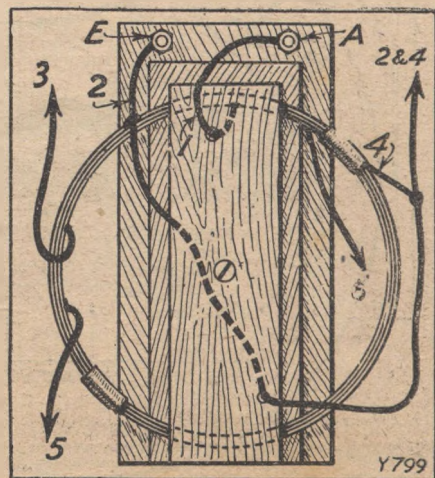
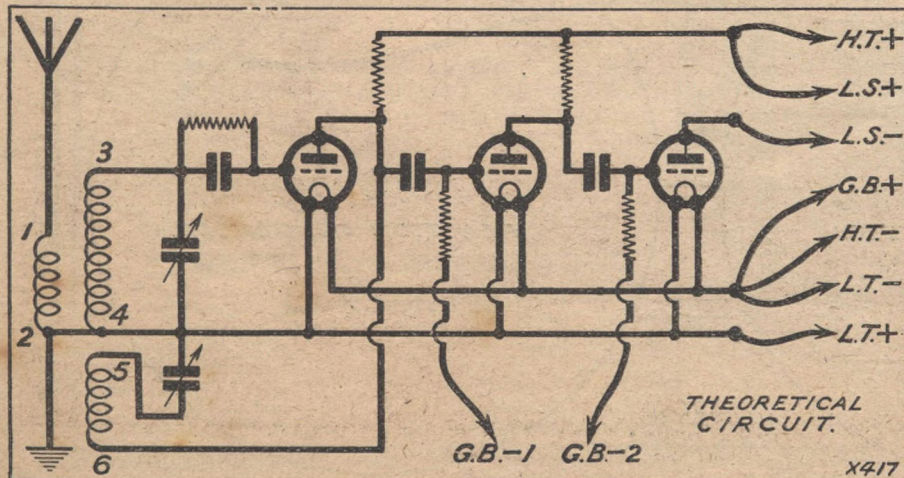
The valve holders are simply screwed into the wooden baseboard in the positions shown, with the plate terminals on the right and the grid on the left. The coil, which really consists of three separate windings, is hank wound, and to make this all you have to do is to take some round object 3 in. in diameter (a tumbler or cocoa tin will do if it is this diameter) and then wind on to it the three coils as follows.

Coil No. 1. This consists of 10 turns of the No. 24 D.C.C. wire. Allow 2 or 3 in. at each end of this coil, carefully pull it off the former, and tie it in two or three places with cotton so as to make a tight hank. Lay this aside, and then make another coil with 40 turns of the same wire, leaving 2 or 3 in. at each end as before, and binding it again; and then wind a third coil of 20 turns of the same wire and put this aside also.

Watch the Winding.

You will now have three coils. Place these on top of one another, being careful to keep them so that the direction of winding is the same in each case, and tie them all together lightly but firmly with cotton; or, if you like, bind them round in one or two places with electricians' tape. Bare the ends of all three coils and, for convenience at the moment, stick paper labels on at the ends, numbering them 1 and 2 for the beginning and end of the first or aerial coil, 3 and 4 for the beginning and end of the second or grid coil, and 5 and 6 for the beginning and end of the third or reaction

(Continued on next page).



A THREE VALVE SET FOR 7/6.

(Continued from previous page.)

coil. Now cut a piece of wood measuring approximately $\frac{3}{8}$ in. or $\frac{1}{2}$ in. by $5\frac{1}{2}$ in. high and $1\frac{1}{2}$ in. wide, and screw this against the back edge of the baseboard in a vertical position.

Next cut a similar piece of wood measuring 1 in. wide by 4 in. long, and screw this on to the back piece in such a way that it clamps the composite coil between it and the back upright, as shown. This will hold the coil firmly in place. An additional small strip of wood of any convenient size should be screwed as shown to the top of the upright at the back to carry the aerial and earth terminals. None of these sizes are critical, and if you follow the general connections shown in the drawings for these pieces of wood the results will be quite satisfactory.

Certain other portions must be cut accurately, and these will be explained later.

What the Coil Covers.

This coil, by the way, will be found to cover a very wide range of wave-lengths running well above 5 G B—indeed, up to 600 metres or so—and well down below the lowest British broadcast wave-length, so that you will be able to get a number of the Germans in favourable conditions

on the lower band. This week we will confine ourselves to details, to the manufacture of the coil and the variable condensers; and next week I will give you full details for the manufacture of the grid leak and condenser, the coupling condensers, the anode resistances, and the grid leaks. For this I have had a series of special, very clear explanatory photographs prepared, and these will accompany the next article.

“Foiled at Last!”

The following points should be borne in mind when making the variable condensers: You may wonder how it is that a single moving plate condenser can give you the necessary capacity for tuning in this receiver, as the variable condensers usually incorporated have a number of fixed and moving plates. The reason is that the separation between the fixed and moving plates in this receiver is extremely small, being only that due to the thickness of the waxed paper.

For this reason, it is necessary that the foil should be applied to very smooth surfaces (provided, in this case, by the sheet of cardboard on the baseboard and the cardboard disc), that the foil itself shall be very smooth, and that the wax paper shall be smoothly applied. Remember that it is the smoothness of the cardboard which is important, and it does not matter a jot whether anything is printed on it or not. This is how I proceeded in my own work.

First of all, I took a sheet of smooth millboard measuring 5 in. by $14\frac{1}{2}$ in.

(you can obtain quite a large sheet of new Bristol board from a stationers for 4d.) and fastened it to the baseboard (which was made of a piece of an old packing-case) by means of four small round-headed wood screws, one at each corner. I then took a lead pencil and ruled a line along this cardboard at a distance of 3 in. from the back.

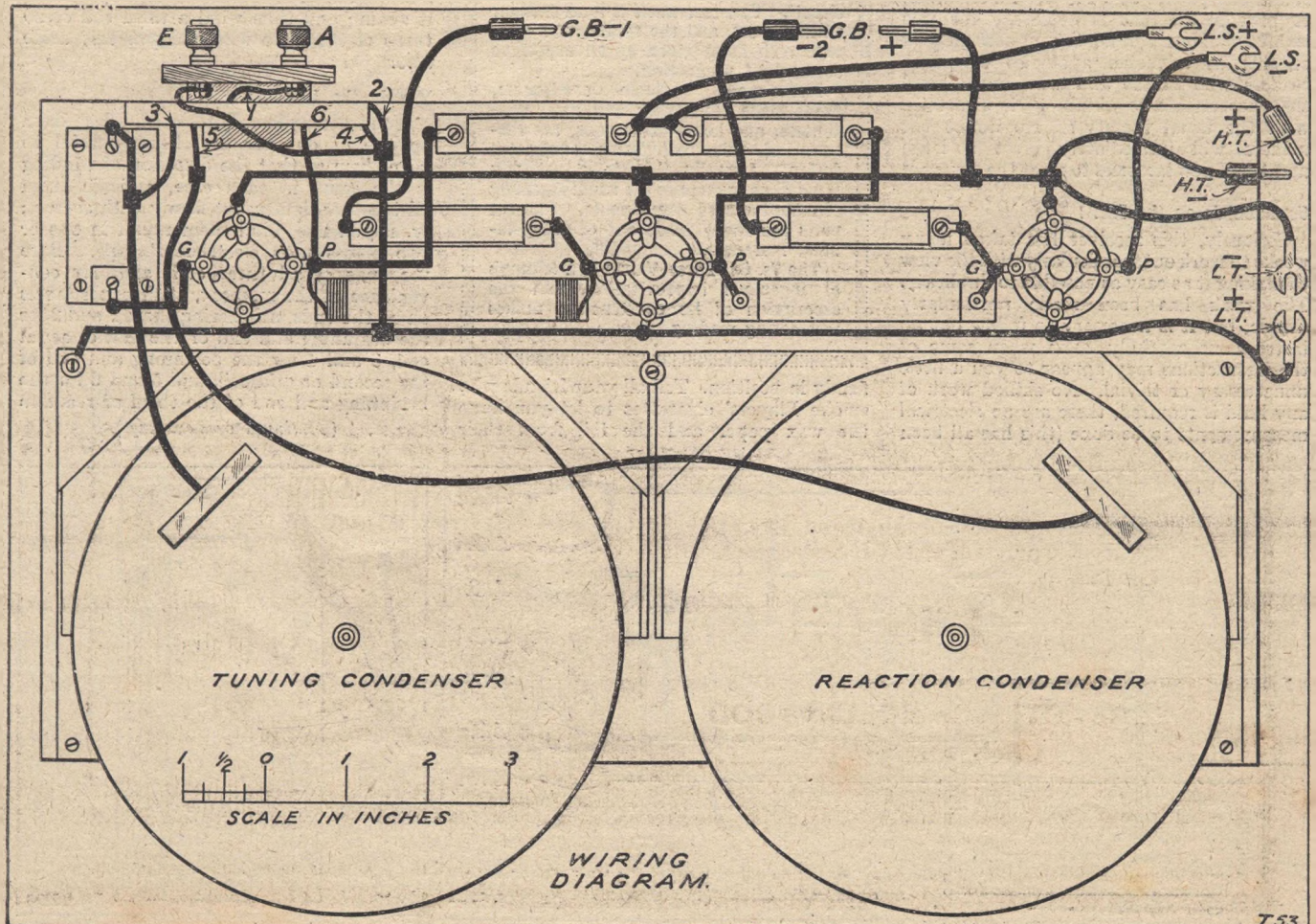
The next step was to take some gum and spread it thinly and smoothly all over the cardboard behind this central line; that is to say, between this pencil line and the edge of the cardboard nearest the valve holders. This was then allowed to get nearly dry, and two sheets of tinfoil out of packets of 20 cigarettes were carefully laid on and rubbed smoothly in place with a handkerchief rolled up into a pad. In rubbing down this foil, you should work from the centre outwards, so as to drive out air bubbles.

Do not rub too hard, otherwise you will tear the foil. The task is quite easy, and a few fine creases here and there will not matter much.

The Condenser Connection.

The two foils are not in contact in the middle of the board, but sound electrical contact is assured by passing a wood screw through the centre space with a piece of any thin metal, such as a brass or tin washer interposed between the screw-head and the tinfoil. When the screw is driven home this will make good contact between the two foils, and assure continuity from one end of the tinfoil to the other.

(Continued on page 938.)



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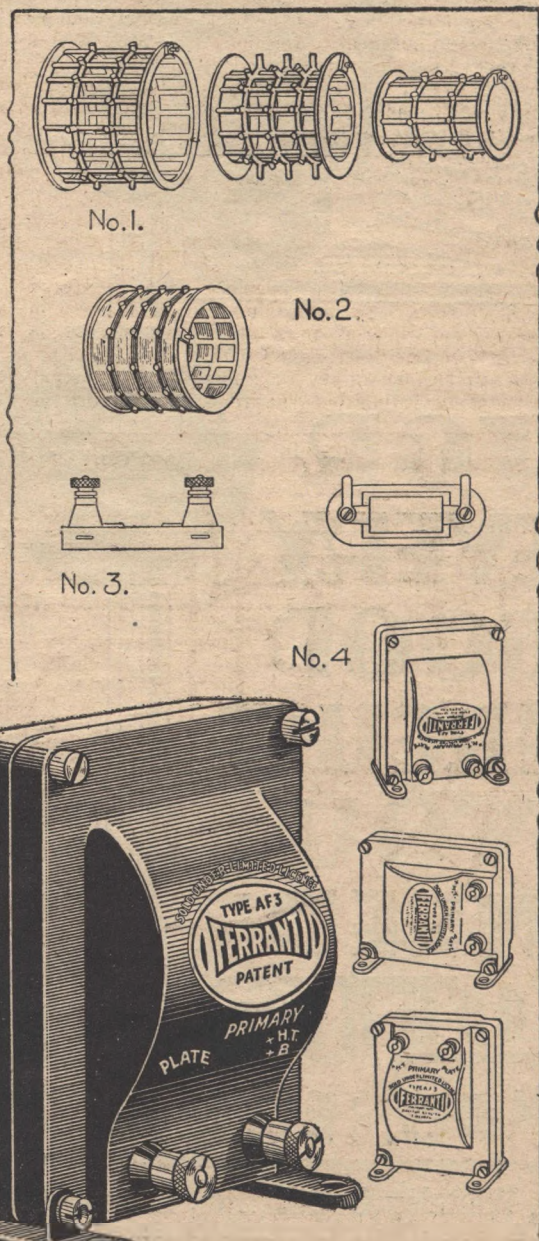
The AF 3 is the almost perfect transformer; made up to a standard that only the house of Ferranti could set.

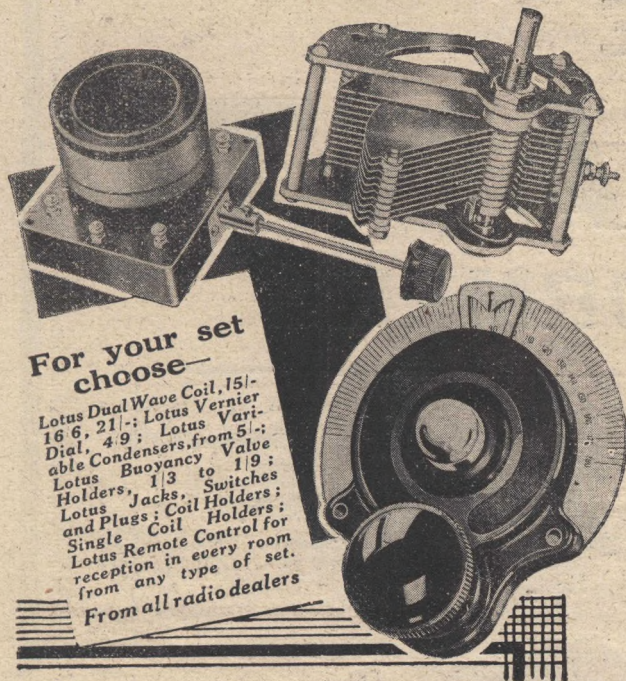
As some evidence of skilled design and craftsmanship, glance at the accompanying sketches. No. 1 shows the special skeleton coil formers which ensure robust strength along with low self-capacity. Fig. 2 shows the secondary coil, and gives an idea of the unique sub-division of the windings. No. 3 shows the '0003 condenser which is built into every AF 3 across the primary winding. No. 4 gives an indication of the general adaptability of the transformer, which can be mounted in either of the three positions depicted — thanks to the movable feet.

For a component of anything like its quality the price of the AF 3 is remarkably low at

25/-

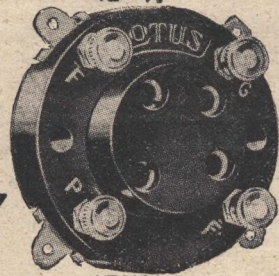
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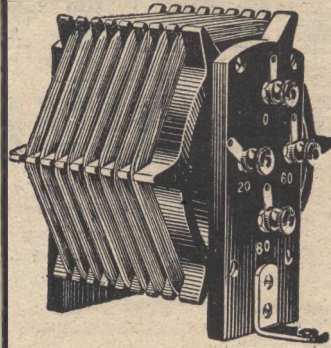


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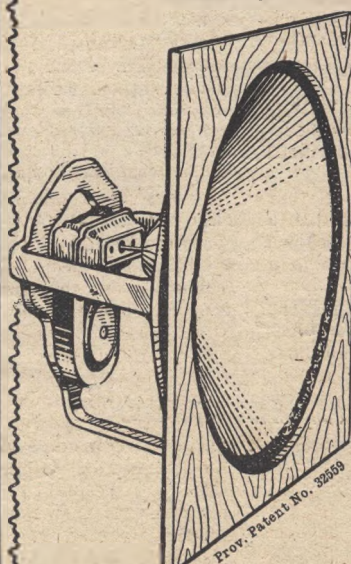
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 Designed to give easy access to adjusting nuts on reed of unit.

CONE KIT, comprising **11 1/2** in. Kraft Diaphragm (forming **9 1/2** in. Cone) 4 Suedlin Segments, 1 Card Ring, all cut to size ready for **2/6** mounting

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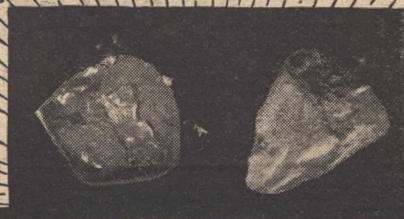
A Plywood Clamping Washer included with complete set. Postage **9d.** extra (inland).

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Framework is as used in Loud Speaker described in this issue.

GLOWING CRYSTALS



AS most of our readers know, a quartz crystal, in common with certain other piezo-electric substances, will vibrate with enormous rapidity under the influence of a high-frequency current. Each crystal has a certain fundamental frequency at which the "mechanical" action is most pronounced. This frequency is determined by the particular dimensions of the crystal and the manner in which it has been cut out from the mother quartz.

For instance, by cutting along certain directions related to the optical and electrical axes of the original quartz, a size can be selected such that the finished crystal can be depended upon to vibrate, say, at the

The valve, marvellous as it is, cannot claim to be any more mysterious than the crystal. For certain crystals will not only "vibrate" and glow when connected to a suitable circuit, but they can thus act as a relay, as told below.

By **SEXTON O'CONNOR.**

in the wave-length allotted to a given broadcasting station. Such an indicator forms a valuable means of avoiding the heterodyne trouble that occurs when a station "wavers" above or below its allotted wave-length, and so overlaps the carrier of another station.

Quite recently the glowing crystal has found another ingenious application in the hands of the Metropolitan Vickers Company, in connection with the distant control of apparatus by wireless, or by high-frequency currents fed through wires.

The idea of controlling the flight of an aeroplane or the course of a submarine from a distance by means of wireless waves has been known in principle for several years. The method broadly consists in installing several relays, each sensitive to one particular frequency, and each controlling a definite part of the steering apparatus.

In practice, however, it has been found difficult to design a relay sufficiently selective, as regards frequency, to give a reliable response. Obviously, if the "star-board" relay is tuned to a certain frequency, it must respond promptly to this frequency, but must remain inactive when "port" signals are received, and vice-versa.

The Fundamental Frequency.

It has been previously stated that a piezo crystal only glows when it is energized at its fundamental frequency.

It has also been pointed out that the "glow" is due to ionization of the rarefied gas surrounding the crystal oscillator. Now when a gas is ionized it becomes a conductor, whereas before it is ionized it is an insulator. This fact is utilised in the selective relay illustrated in the diagram.

A quartz crystal (Q) is mounted on one electrode (A) inside a glass bulb containing Neon, Argon, or Helium gas under reduced pressure. A second electrode (B) is brought to a point very close to the crystal, but not actually touching it.

A third electrode (C) is bent around the electrode B, as shown, so as partly to encircle but not to make contact with it.

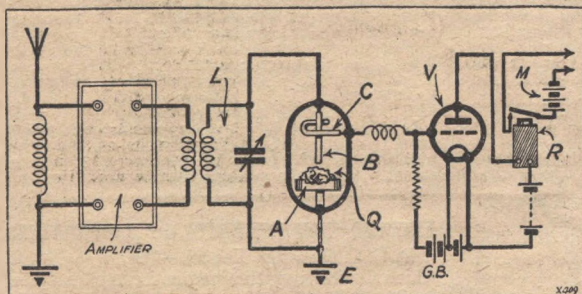
Released by the Glow.

Under normal circumstances the electrode B is insulated by the Neon gas from the electrode C. If, however, the circuit L is energised, say, from a valve receiver at the particular or fundamental frequency of the crystal Q, then the peculiar "glow" sets in, the gas in the bulb is ionized, and the electrode B becomes in effect electrically connected to the electrode C. In other words, the insulation previously existing between the electrodes B and C is broken down by the "glow" of the crystal.

On the right-hand side of the figure it will be seen that the electrode C is connected to the grid of an amplifying valve, V. Normally, a heavy negative bias is imposed upon the grid from a battery GB, so much so that the valve is "paralysed," i.e. practically no current flows in the output circuit.

As soon as the crystal "glow" breaks down the gas insulation between the two electrodes C and B, the voltage from the bias battery GB promptly finds a path of escape from C across the ionized gas to the electrode B and then to earth at E.

This, of course, immediately reduces the paralysing voltage on the grid of the amplifier, so that a considerable plate current begins to flow through the electro-magnetic relay R. The armature of the latter is thereupon closed and a local circuit containing a battery, M, comes into operation either to swing the rudder to one side or other, or to do whatever other work it may have been designed for.



Here is the circuit which enables the glowing crystal to be used as a sensitive relay.

rate of one million per second. Such crystal oscillators may be used to control or stabilise the output of a valve oscillator, so that the carrier-wave, say, of a broadcasting station can be maintained absolutely steady.

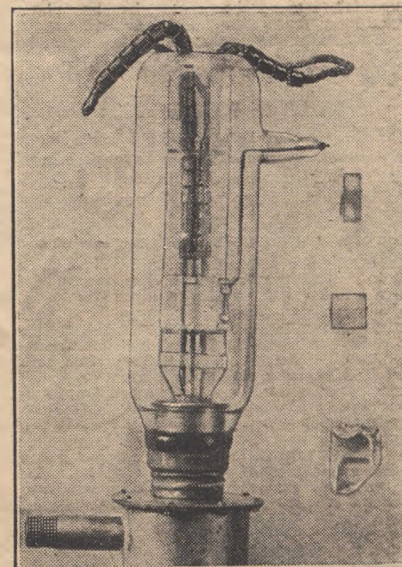
Control at a Distance.

Some time ago two German scientists, Messrs. Giebe and Scheibe, made a further curious discovery. They found that when a piezo crystal is mounted in a bulb containing rarefied Argon or Neon gas, and then energized at its fundamental frequency, it gives out a distinct glow or luminous effect.

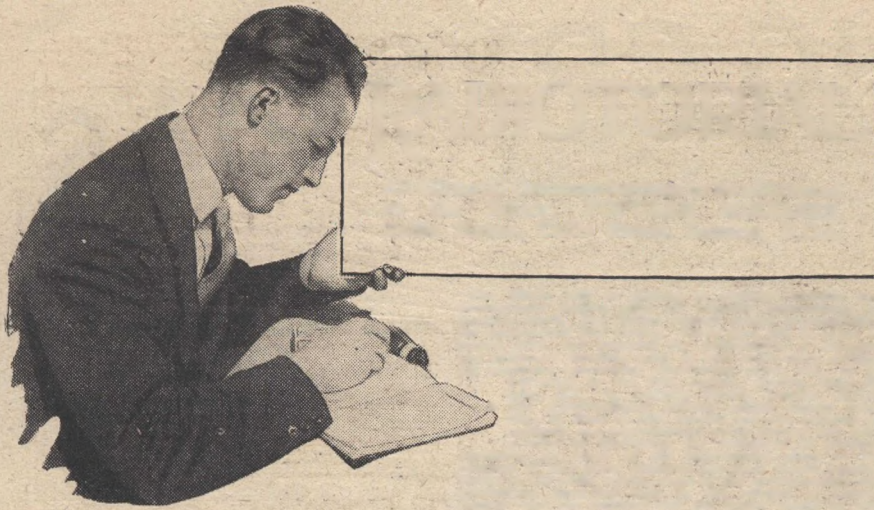
The glow is something similar to that observed when a Neon tube is placed in a high-frequency field, as in the well-known method of testing for aerial current in a wireless transmitter.

In the case of the quartz crystal the luminous effect is due to the piezo voltages which accompany the bodily or molecular movements of the crystal. These actually ionize the adjacent molecules of Neon or Argon gas, and so render the gas conductive, whereupon a glow discharge occurs similar in principle to that seen either in a Neon tube or in an ordinary Osclim lamp, but naturally of less intensity.

Messrs. Giebe and Scheibe have utilised this piezo glow, both to give a visible indication of the frequency of a particular carrier-wave and also to indicate any fluctuation



This picture shows a powerful transmitting valve contrasted with the piezo-electric crystal used to hold a transmitting station upon its assigned wave-length.



QUESTIONS AND ANSWERS.

THE VALVE TO USE.

W. B. M. (Birmingham).—"I am a little puzzled about the valve to use for my set. I have a power valve which is O.K. for the output, but the first valve is a neutralised H.F. employing the split-primary method. After this comes a grid leak detector valve with a high resistance in its plate circuit. What type of valve would you suggest for each of these sockets?"

For both the H.F. and detector valves you will need one having an impedance of about 20,000 ohms and an amplification factor of 20 or so. If desired, they can both be fed from the same H.T. positive terminal.

A POINT TO WATCH.

E. B. W. (Leigh-on-Sea).—"I was going to try and repair the accumulator myself, but a friend of mine who works at an electrical engineer's in London strongly advised me not to, on the ground that there is a good deal of poison in an accumulator, and I might damage my hands which are frequently cut, or knocked a little owing to my work. Is it a fact that accumulators might be poisonous in this way?"

Accumulators, as you know, consist of lead plates immersed in sulphuric acid. Both the lead and the acid are poisonous, and neither of them should be allowed to come into contact with broken skin. We certainly recommend you to take your friend's advice.

SKILL IN SOLDERING.

G. S. W. (Leamington).—"Soldering is to me the greatest difficulty. I have not been taking 'P.W.' for long, so probably I have missed articles dealing with this subject, and I shall be glad if you can tell me the proper method of setting about this soldering business."

Soldering is really quite simple, the main idea being merely to heat the surfaces which have to be joined together sufficiently for solder to adhere to them. When they are thus warmed, solder can be "run" across from one surface to another, and on this cooling it will set as one mass, thereby joining the two surfaces together. The great art is to keep clean both the iron itself and the working surfaces.

First of all, the iron must be "tinned," which is done by heating it in a clear flame (a gas jet is ideal), till it commences to burn with a green flame. When this occurs it can be removed and filed till it is bright, and whilst still very hot it should be dipped into a little flux and a blob of solder, in a tin lid. The melted solder will then run over the clean surface of the iron and coat it with a bright covering of solder, and then the iron is warmed up again ready for business.

Whilst it is reheating the two surfaces can be thoroughly cleaned with a file or emery cloth, till the bright metal shows, touched with a little flux, and then brought into contact of the hot iron until a thin coating of solder appears on them also. (In other words, until they are "tinned" also.) When

both the surfaces have been tinned, they are held together, the iron is heated again, and then it is placed over the two surfaces so that it can *simultaneously and equally heat them.*

When hot enough the blob of solder adhering to the iron will readily run over the two surfaces, and these should be held perfectly steady until it solidifies, which it does a moment after the iron has been removed. At this stage, and before the joint has had time to get cool, wipe it over with a clean cloth so as to remove any traces of superfluous flux.

The heat will have liquified this, and it can be removed easily and quickly, but if it is left for a little while it will get cool and become greasy, and then be exceedingly difficult to remove. If, however, the above hints are borne in mind soldering will become a very easy and pleasurable occupation.

COILS "FOR THE CHITOS."

T. S. C. (Stafford).—"What are the proper coils for the 'Chitos' Two-Valver, which was described last spring in 'P.W.,' and can this

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receiver be used for 5 X X band as well as for the ordinary broadcasting?"

You should provide a No. 52, 60, 75, and 100 for work on the shorter band for the "Chitos." In the aerial socket you usually require either the 75 or 100 coil according to the range you are working on (that is to say, whether on the band of waves below 400 metres, or the band above 400 metres). For reaction the No. 50, 60, or 75 coil should be tried, and you will soon find the one to give the best control over the whole tuning scale.

A little experimenting here will soon show you the best size to obtain really good reaction, not forgetting, of course, that different values of high tension should at the same time be tried on the detector valve.

For the long waves you will require a fairly large size in the aerial socket, and you may meet with a little difficulty in getting the best values. As in all series-tuned circuits one coil does not give a very wide tuning range, and therefore you must try more than one size to get the best results. Usually a No. 200 coil will be correct, but you may have to try even a higher value than this.

A No. 150 will usually be correct for the reaction, although you may find it advisable to increase the value of high tension on the detector valve a little when experimenting on the long waves. In the earlier models of the Chitos receiver there were certain difficulties about getting the long-wave stations, but the set you refer to employed a special supplementary reaction control which practically eliminated this difficulty.

CALCULATING THE FILAMENT RESISTANCE REQUIRED.

B. N. F. (No address).—"I have a 6-volt accumulator and a 6-volt power valve, but would like to use 2-volt valves for the H.F. and detector positions. What is the correct value of filament resistance to use with these?"

When 2-volt valves are being run from a 4-volt or 6-volt accumulator the value of the resistance required can easily be calculated by a slight modification of the ordinary Ohms' law.

Ohms' law says that if the volts are divided by the current in amps, the answer will be resistance in ohms. In other words $R = \frac{V}{C}$. For our purpose we can modify the meaning of these letters a little.

If we call the correct consumption of the 2-volt valve C, and if we subtract the voltage at which the 2-volt valve should operate from the voltage of the accumulator, and call this figure V, then the required resistance in ohms will be equivalent to V divided by C. For instance, suppose that we are going to use a 6-volt accumulator with a valve which is rated to take .25 ampere filament current at 1.8 volts. we can use the above formula as follows.

To determine the value of V we take 1.8 volts from 6 volts, and the answer is 4.2 volts. This gives us V, and C is the rated consumption of the valve, i.e. .25 amps. To find R we must divide C into V, and in this case the answer is 16.8.

In other words, if a 6-volt accumulator is to be employed for a valve needing 1.8 volts, an additional resistance of 16.8 ohms will be necessary in the circuit. Any other resistance can be worked out in the same manner.

FINDING THE POLARITY OF THE MAINS.

D. V. C. (Preston, Lancs).—"How can I tell which is the negative mains and which the positive?"

An easy method of finding the polarity of direct-current mains is to bring flexible leads from a lamp holder to a glass of water to which has been added a pinch of salt. One lead should be immersed at one edge of the glass and one at the opposite edge, the two being arranged so as to be well separated and secure.

When the current is switched on, bubbles will rise to the surface from the wires, and the wire from which most of the bubbles rise is the negative.

[NOTE.—Do not forget that in all cases where the house wiring is interfered with in this way, the utmost care is necessary in order to avoid the danger of shocks, etc.]

THE CHOICE OF VALVES.

"HORATIO" (No address).—"Which are the best valves for the 'All-Programme' Two, the 2-volt or the 6-volt type?"

The valves for the All-Programme Two may be either 2-volt or 6-volt, the former for extreme economy and the latter if super results are the main object.

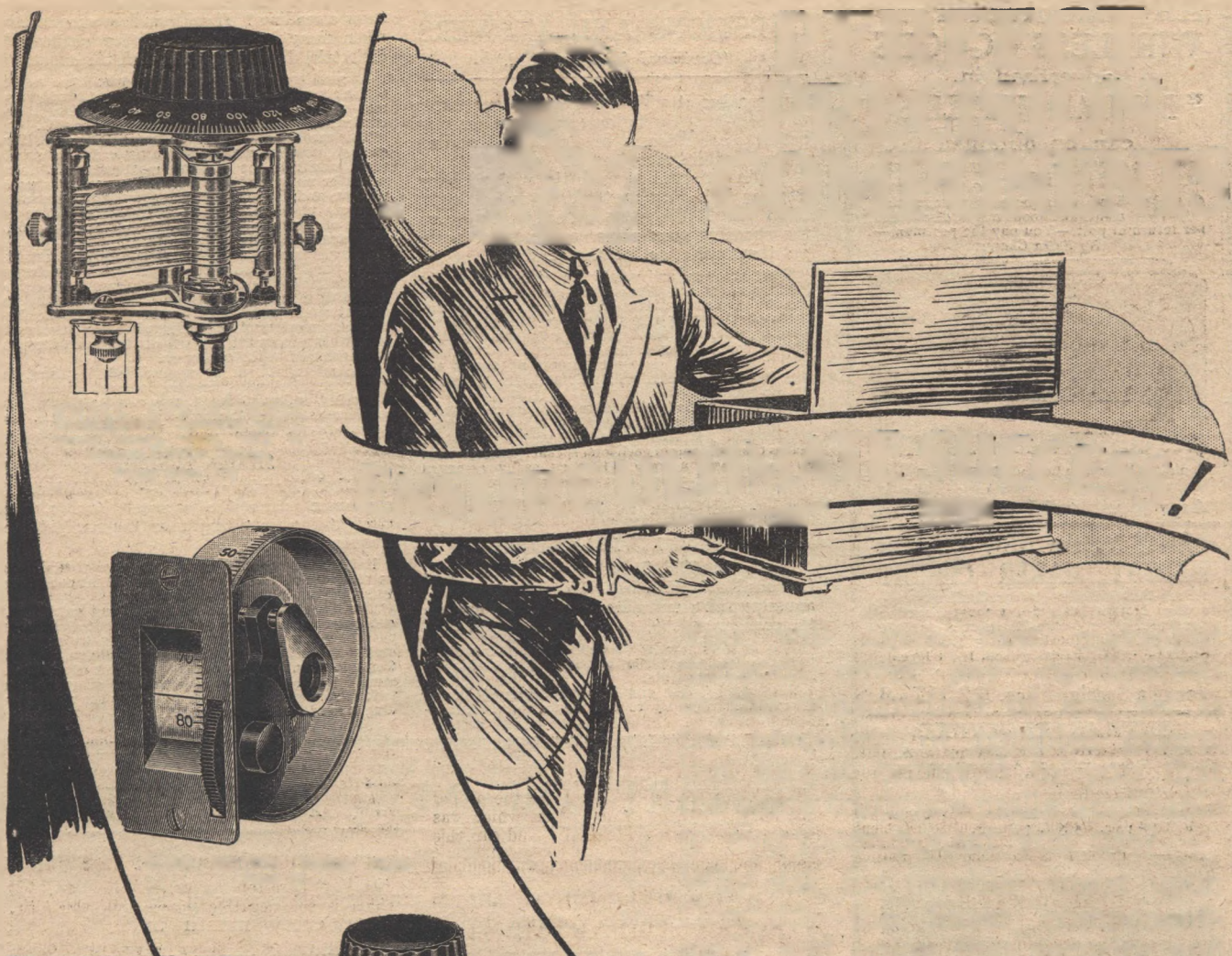
The first valve should be of the H.F. type with some 45 to 60 volts H.T., while in the second valve socket you should use a power valve with all the H.T. you can muster up to 120 volts, if you want real quality on the loud speaker. Certainly you should not use less than 100 volts if the signals are fairly strong, but if you are so situated that you have a small aerial and can only get medium strength, a somewhat lower high tension—say, 72 volts—will serve quite well.

Whatever you use, of course, be careful to use the correct grid bias specified by the valve makers. This is an important point if you wish to secure the best results and have a long life from your H.T. battery.

LOUD-SPEAKER EXTENSIONS.

P. F. (Norwich).—"When the workmen were in the house I got them to lay wires so that we had three different loud speakers in use, one in the dining-room, one in the drawing-room, and another in the kitchen. These all work excellently, but I should like some stunt whereby I could switch out any

(Continued on page 934.)



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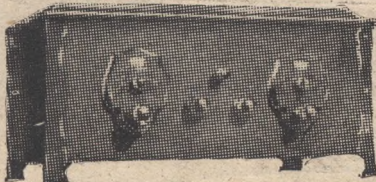
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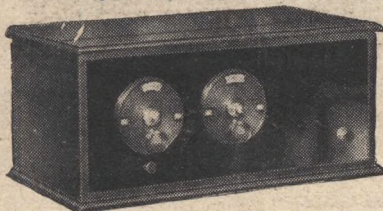
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 932.)

loud speaker at will, as very often one wants to listen-in only in one room and not in both the other rooms, or perhaps in two and not in the third room.

"I do not want to undo the wiring in any way, as it is very neatly done out of sight, but I should like some means, preferably on the speakers themselves, by which I could put them out of action when desired."

Your speakers are wired "in series," so if the loud speakers are fitted with plugs that can be removed from the wiring, all you need do is to purchase another plug like the one on the end of the loud speaker, and short its two terminals together. Then when any loud speaker is removed because it is not required, simply replace it by one of the shorting plugs, which will automatically reconnect up the circuit.

If, however, the loud-speaker plugs are not removable in the wiring system, but are permanently attached, all you need do is to arrange a wire to short across the terminals of each loud speaker or telephones. In most cases a switch is very easily arranged (ordinary on-off type), or alternatively, you should not have any difficulty in arranging an inexpensive cut-out from pieces of stiff wire.

ADDING NEUTRALISATION.

B. N. T. (Old Trafford).—"Can an old-fashioned set (H.F.-Det.-L.F.) of the tuned-anode type be neutralised, and if so what are the connections?"

This type of set can be neutralised satisfactorily providing there is plenty of room upon it for the additional components.

The holder for the plug-in neutralising coil should be mounted close up to the holder for the tuned-

impressed across the circuit would the meter show a reading? If so, how does current flow when there is an insulator (the condenser's dielectric) directly in series with the circuit?"

A sensitive meter of the hot-wire type would register a current flowing in such a case, but the current registered would not be flowing through the condenser, it would merely flow in and out of it.

This can be explained as follows: When no difference of potential was applied to the ends of a circuit there would be no electron movement (i.e. there would be no current). But when one end was made positive and the other negative, a rearrangement of electrons would take place, and there would be an excess of electrons on the negative plate and a deficit of electrons on the positive plate.

This electron movement would constitute a current, which would be shown by the meter, and every change of potential on the condenser plates would be accompanied by a rearrangement of electrons so that "a current would be flowing" continually. But the electron movement would be taking place via the external circuit connecting the two sets of plates, not through the insulation of the condenser.

The meter, it will be remembered, is placed in that external circuit connecting one set of plates to the other, so, providing it was a suitable type, it would register the electron movement there, i.e. the current-flow in that circuit.

SHARP TUNING.

T. S. I. (Hamilton, N.B.).—"Which kind of condenser gives the sharpest tuning, the straight-line wave-length or the straight-line frequency?"

Neither type can do this. Sharpness of tuning is an attribute of the set itself, and not of the condenser which is used in the tuning position.

The difference between an S.L.F. and an S.L.W. condenser is one of the distribution of stations over the condenser scale, but sharp tuning depends on certain other things about the circuit design, such as the coil sizes, type of coupling, amount of reaction, size of aerial, etc. And although this sharpness, or lack of sharpness, will be shown up by the condenser dial, it is not due to the condenser.

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anode coil, so that when the coils are plugged in they are coupled closely together. A neutralising condenser should then be mounted near to the neutralising coil, and then a terminal on each of these two should be joined together by a short wire.

The only remaining connections are a lead from the free side of the neutralising condenser to the earth side of the filament lead, and another lead from the remaining coil-holder terminal to the grid of the tuned-anode H.F. valve. Neutralising is carried out in the ordinary way, but it may be necessary to reverse the leads to the neutralising coil (or if more convenient the anode coil), as these two must be arranged in correct relation to each other.

BACK NUMBERS.

D. C. W. (Grantham).—"I have only had the set about a couple of months and since then I have become extremely keen on wireless and anxious to do a bit of experimenting myself. For this purpose I frequently want one of the back numbers which I see referred to and which I am unable to get locally. Is there any way of getting it from the publishers?"

Back numbers of "P.W." (or of "Modern Wireless" or "The Wireless Constructor") can be obtained direct from the publishers, The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4.

CAN CONDENSERS PASS CURRENT?

B. M. (Lechlade, Gloucestershire).—"If a sensitive meter is placed in series with a large condenser and an alternating potential is

If you take, for example, two stations very close to one another in wave-length, but sufficiently far apart to enable a very sharp tuning receiver, such as a super-heterodyne, to separate them; when using a straight line wave-length condenser at some portion of the scale these two stations will be separated by, say, two degrees. If a straight-line frequency condenser is used, they would be separated by perhaps three degrees. The set would do the separating, and the condenser dials would show it (in one case by three degrees, in the other by two degrees).

If, on the other hand, the receiver is such that it cannot separate these stations, it will make no difference to its sharpness of tuning whether they use a straight-line frequency or a straight-line wave-length condenser. For, if when tuned to one station you hear signals from the other, you will get precisely the same amount of interference with a straight-line-frequency condenser as with a straight-line wave-length condenser.

WHAT IS A CONDENSER?

I. A. T. (Richmond, Surrey).—"Are fixed condensers the same in essentials as the other type, and if so, what is it that decides the capacity?"

A fixed condenser, like the ordinary variable condenser, consists of two sets of metal plates placed close together but not touching one another. These plates, or sets of plates, are separated by means of air or some substance such as mica, which will not conduct electricity.

The size of the plates, the distance separating them, and the substance separating them, decides the capacity of the condenser. The larger the plates and the closer they are together the greater its capacity—its capacity to hold electricity like a tank holds water.

(Continued on page 936.)

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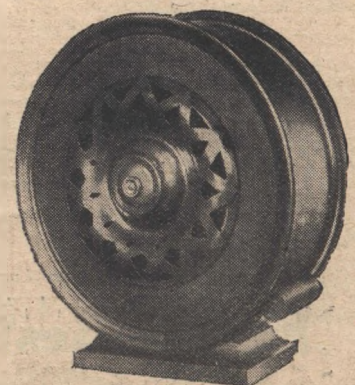
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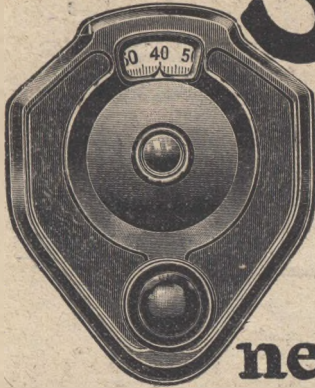
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**RADIOTORIAL
QUESTIONS AND ANSWERS**

(Continued from page 934.)

The capacity of an ordinary variable condenser is varied by altering the overlap of the two sets of plates, and this is the same as varying the size of the plates or the distance between them, which ever way you like to look at it. A fixed condenser is simply one which is not provided with any means of adjustment, so its capacity will always be that value marked upon it, i.e. '0005 mfd., '0001 mfd., etc., etc.

A GOOD LONG-DISTANCE SET.

M. F. W. (Edgware).—"I want a good DX set, preferably of the H.F.-Det.-L.F. type, as I have two H.F. valves on hand and one of the small power kind. Could you recommend me to a good set, preferably one using a couple of '0005-mfd. variable condensers, slow-motion type, and if possible transformer coupling for the last stage, as I have on hand a good low-frequency transformer of fairly low ratio."

For your purpose we recommend the "Long Range" Three, described in the "P.W." Blue Print circuit, No. 51. This is a sensitive and selective set for long-distance work, and it incorporates one high-frequency valve, a detector, and one low-frequency, as desired, with switching for changing over from ordinary broadcast waves to the long waves. The components you mention can all be employed, and as we have had very enthusiastic reports from readers about this set we feel sure you will be completely satisfied with it. It is not a difficult set to build.

HOW TO OPERATE THE "SYDNEY" TWO.

K. R. G. (Burton-on-Trent).—"I have built the original 'Sydney' Two (like the 'P.W.' Blue print No. 39), and although it is going extremely well, I fancy I could get more out of it if I knew how to operate it properly. Can you give me some particulars?"

The first point to consider is the type of detector valve to use (the second valve can be any L.F. or small power type). What is wanted is a valve of a

freely oscillating type which is also a good detector, and the modern special H.F. valves will be found to satisfy these requirements very well for the most part. Here are a few examples: P.M.5X., G.P.607, H.L.610, Cossor 610H.F., S.S.6075H.F., etc.

H.T. Adjustment.

The H.T. voltage on the detector must be adjusted by trial, and will be found in most cases to be rather higher than one is used to on the broadcast band. This is because there are usually several patches on the tuning range of a short-waver where it is a little difficult to get enough reaction, and a fair amount of H.T. is needed to overcome the trouble.

Further, of course, the H.T. and L.T. must be adjusted to give smooth reaction effects, and in this you will find the potentiometer on the baseboard very useful. This is a special feature of the "Sydney" Two, and is a great help in getting rid of the annoying trouble called "threshold howl" which afflicts so many short-wave sets. "Threshold howl" usually takes the form of a nasty little squawk just as the set goes into oscillation, and makes it a very difficult and ear-aching business to get the receiver adjusted to the proper point on the verge of oscillation (for telephony reception, of course).

Searching.

Once the detector valve is functioning properly there is little to do except to revolve the tuning dial very carefully and slowly, keeping the set just oscillating with the reaction condenser, until you pick up a carrier-wave. Then bring back the reaction until oscillation just dies out, very carefully and delicately readjusting the tuning all the while.

A little practice will be needed in handling these controls, and in learning to allow for the slight hand-capacity effects which are almost inevitable on the shorter waves. By the way, if you find body-capacity really very troublesome (this may occur with some pairs of 'phones) connect up a fixed condenser of '001 mfd. across the 'phone terminals.

The only other operating point concerns the aerial tap, and this again must be adjusted by trial on each station picked up. As a general guide it may be stated that for stations coming on the upper half of the condenser dial the tap will be somewhere near the middle of the coil, while for those near the lower end of the scale it should be only about two or three turns from the right-hand end.

With these adjustments and the particular type of tuning condenser and vernier dial mentioned in the list of components, K D K A should then be found between 60 and 70 degrees on the dial, and Sydney between 10 and 20 degrees, assuming an aerial of medium size. For K D K A the "grid" clip will be on the left-hand end of the coil, and for Sydney on the fifth turn from the right.

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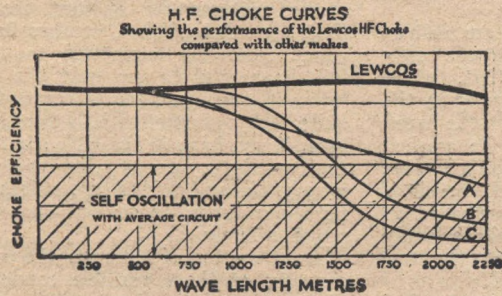
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The above diagram shows the percentage Choking effect of the LEWCOS H.F. Choke on all wavelengths from 20 to 2,250 metres, as compared with three other popular makes.

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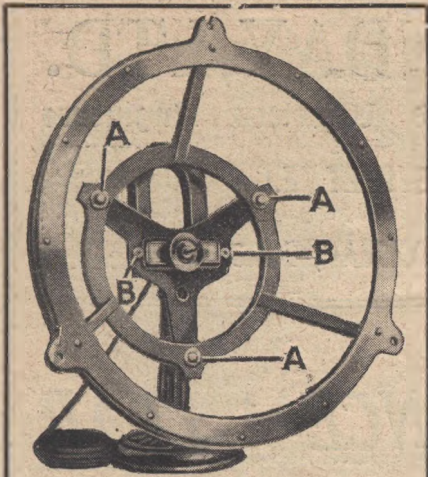
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P.W.

A THREE-VALVER FOR 7/6.

(Continued from page 928.)



GET MOVING COIL RESULTS FROM YOUR "BLUE SPOT" UNIT BY USING THE "WHITE SPOT" FRAME.

The whole made of solid castings, and front ring highly polished. THE UNIT can be attached by two screws B, which are provided, in one minute, and centred by means of the three screws A.

Frame, complete with diaphragm assembled and suspended as in moving coil practice, price 16/-. This can be fitted to either a cabinet or baffle by means of the three lugs provided.

Frame only, complete with front ring and all screws, 12/6.

Stand extra to either of above, 2/6. All post free.

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On the extreme left-hand end the wood screw used for securing the cardboard in position was removed, and a soldering lug placed underneath it, whereupon it was driven in again. Later a wire soldered to this made connection to the tinfoil sheet, which is all at earth potential.

The procedure in fixing the foil to the half of each disc is the same, but in this case a little gum is placed on the upper surface of the disc, so that the foil can be folded over and pressed in contact with it. Obviously, the foil will be somewhat creased and crinkled where it is brought over at the top, but this does not matter so long as you do not tear the foil.

Fixing the Flex.

The two pieces of card, which are sealing-waxed in position as shown, are only attached at each end, so that, when necessary, they may be sprung up in the middle with a penknife to enable the bared end of the flexible wire to be pushed underneath, so as to make contact with the foil. You will understand that it is not possible to pierce the cardboard in any way here, as it would make a bump on the other side and prevent the two foils coming as close as we need.

The wax paper can be similarly attached to the tinfoil, by means of gum, avoiding air bubbles as much as possible. Actually the paper used to wrap the cigarettes is not strictly speaking "waxed," although it is impervious to moisture; but if you are using waxed paper as used for wrapping

some of the breakfast foods, you will find that on holding it in front of the fire the wax will soften.

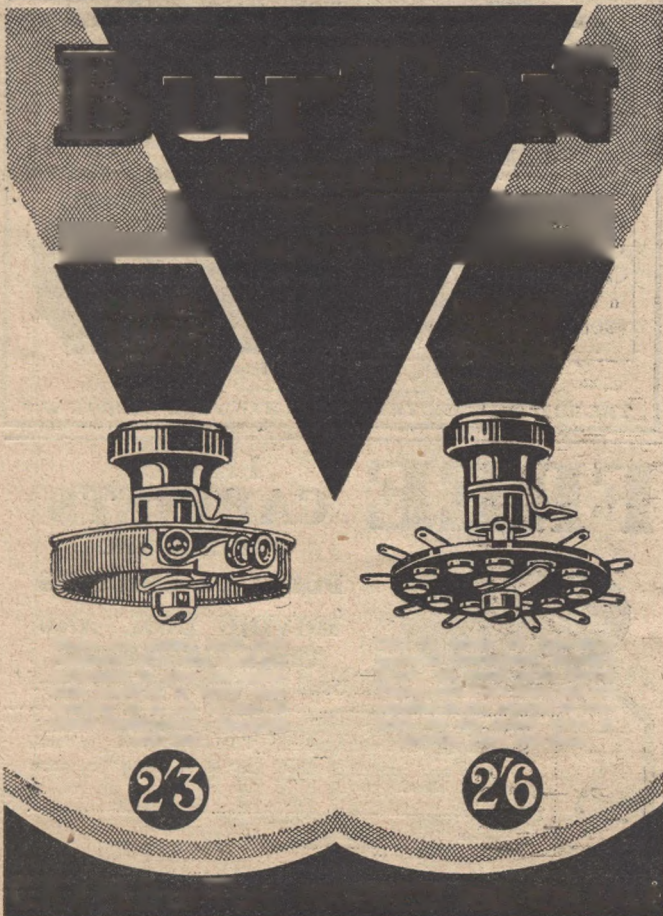
If this kind of paper is being used, it should be cut to the necessary size to cover all the foil, and can then be secured in position by using a hot iron, a piece of cloth being interposed between the iron and the wax paper, and the hot iron passed quickly but firmly over the whole.

By Gum!

Some readers may care to take a strip of ordinary thin paper and soak it in melted paraffin wax, draining off the surplus wax and, after it is set, applying it with a hot iron as just explained. There are many variations of the method of applying the wax paper to the foil, and so long as the paper is reasonably thin, and is smoothly applied without air bubbles, that is all that is needed. When you are fixing the paper from the cigarettes to the tinfoil, be careful to use only the thinnest layer of gum, and let it stand till it is quite tacky. Seccotine is better than gum here, if you have it available; but be sure that, whatever form of adhesive is used, it is very thin and easy to dry, as it is difficult for the moisture to get out once the wax paper is in place.

As a matter of interest, the measured capacity of these variable condensers at the maximum is about .0003 mfd., the figure being raised when a weight, such as a paste-pot, is placed on top of each disc.

Making the grid leaks, anode resistances, and fixed condensers is a most fascinating task, and a description of this I will reserve until next week.



CLARKE'S "ATLAS" BATTERY ELIMINATOR

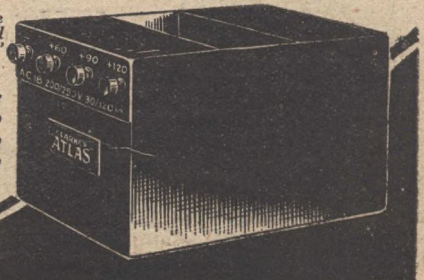
makes noisy, expensive H.T. Batteries a thing of the past. The model illustrated (A.C.18, for Alternating Current) is especially suitable for "Cossor Melody Maker" and "Mullard Master Three" Sets, and is priced at £4 17s. 6d. with half-wave rectifying valve and Royalty. Full-wave rectifying valve 7s. 6d. extra. There are also Direct Current models at prices ranging from £1 17s. 6d.

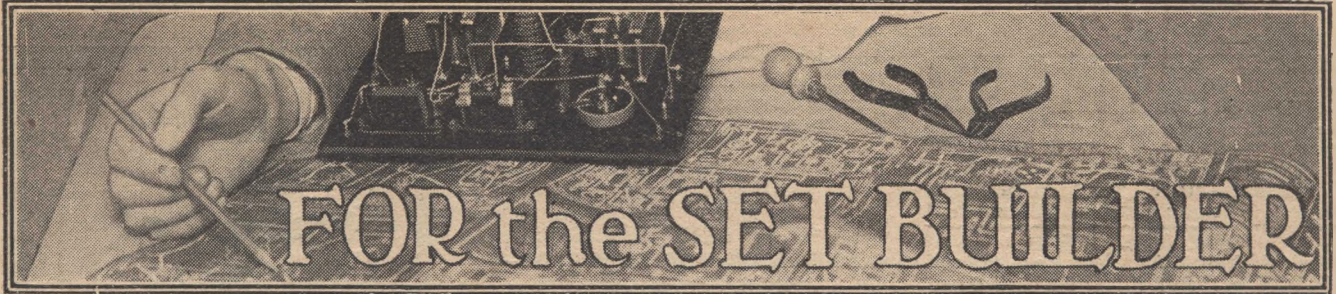
Each model is covered by the "ATLAS" guarantee of safety and efficiency, and provides perfect, reliable high tension current, practically without cost.

"ATLAS" Eliminators are recommended for use with Pitman's "All Europe Three."

Write for Brochure No. 32, giving full details of all "Atlas" Eliminators.

H. CLARKE & Co.
(Manchester), Ltd.,
"ATLAS" WORKS,
OLD TRAFFORD,
MANCHESTER.





SAFEGUARDING YOUR VALVES.

NO, this is *not* a political note: it is nothing to do with protecting British valves from foreign competition, but deals with a question of more direct practical importance to every user, namely, how to prevent one's valves from contracting that deadly disease, "blueflashitis," in the event of a short in the H.T. circuit.

Now, it is all very well to say that such things should not happen, that one should always pull out the plugs from the H.T. battery before doing anything inside the set, and so on, but if anyone imagines that such preachings will stop a man in a hurry from taking risks, well, he has still something to learn about human nature!

Practise What You Preach!

As a matter of fact, it is often the people who talk most virtuously about precautions who are the first to plunge their hands into the interior of the set while it is working. Who has never been shown a new set by its proud owner, with a discourse on his beautiful safety-switching schemes to cut off the H.T. altogether, immediately after which he dives inside to find out why a crackling noise has started?

The sudden transition from a lecture on safety switching to muffled curses as he gets his fingers across the H.T., having forgotten to operate the aforesaid switches, is certainly amusing, but it also points a moral which we should all do well to take to heart. We may as well be honest and confess that we all do these things at times, and then see whether anything can be done about it. The fact is that although switches and what-not are all very well as a protection, unless we have some sort of absolutely automatic safety device on the job we are prone to forget, and then we are no better off than when we started.

The mere risk of shocks to intruding fingers is, after all, rather a minor matter, and merely acts as a reminder to switch off or disconnect next time.

One Fuse Not Enough.

The serious affair is the risk to expensive valves, for if one goes fishing about inside a set with a screwdriver or other tool, there is always a chance of something really disastrous happening, as a result of the shorting together of two points with the H.T. across them. Although we only do things like this in our more reckless moments, still it does sometimes happen, and there are various other ways for the same thing to occur, which need not be enumerated.

What can be done about it? Well, for a sum of round about a shilling you can get an H.T. fuse of the flashlamp bulb variety, and until you have experienced it you can have no idea what a comforting feeling it gives you to see one of these

A selection of short articles covering many subjects of especial interest to the home-constructor of radio receivers, contributed by various of "P.W.'s" well-known technicians.

flash up and go out again instantaneously when a short occurs which might otherwise have cost the lives of a set of valves.

Now, most of us understand the normal placing of such a fuse in the lead between H.T. negative and L.T. negative, and just a single fuse here will certainly do a great deal to insure safety in the event of a short. There is still, however, the possibility of another type of short-circuit in a set with more than one H.T. positive terminal, namely, between a high and a low voltage tapping, which is not covered by a "single fuse" insurance policy.

One for Each Lead.

To protect properly a set like this a fuse is needed in the intermediate H.T. positive leads where they leave the terminals inside the set, and the small expenditure required to put them there is surely a good investment. Although a single fuse in the negative lead is usually the only provision shown on publication designs, it is to be understood that if the fullest degree of protection is desired one or two others might be added as has been explained. The main risk is covered by the negative fuse, but the others are probably worth while in all large sets.



A greatly enlarged photo of a terminal shank, showing the packing in the hole.

TIGHTENING TERMINALS.

Occasionally, owing to an error of judgment, or to some other cause, a hole is bored in a panel which provides too loose a fit for the terminal; and the result is that, no matter how tightly the under-nut of the terminal may be fastened, the terminal itself sooner or later comes loose, and develops a most annoying degree of play.

Fortunately, however, such cases can be remedied by the exercise of a little trouble. If the hole in the panel is only very slightly larger than the outer diameter of the terminal shaft, make up a paste of fine ebonite powder and thick gum. Roll the terminal shaft in this, and then insert it immediately into its hole, allowing it to stand for several hours before it is again touched. By this method, the ebonite powder will effectively bind the terminal.

If the panel hole is considerably larger than the diameter of the terminal shaft, another means will have to be employed in order to provide an effective fit for the terminal.

This is the method of terminal "packing"—the terminal being packed in its hole by means of some substance which can be poured in the hole in a molten stage, and then allowed to solidify.

The Best Substances.

The two best substances available for this purpose are sulphur and Wood's metal. Either of these may be melted, and then carefully poured from a small spoon around the terminal in its hole. They will quickly solidify, and will provide a very fast binding for the terminal.

On the whole, Wood's metal is the better material to use for this purpose, it being rather more indifferent to mechanical shocks than sulphur.

If the hole in the panel is not excessively greater than the diameter of the terminal shaft, the presence of the packing will not show on the upper side of the panel, for it will be hidden away from sight by the base of the terminal pillar.

As for the underside of the panel, if the packing material overflows the hole when it is poured in, and flows over the ebonite surface, it can readily be removed after it has solidified by the aid of a knife and a little sand-paper.

SOLDERING.

To many constructors, soldering is the most unsatisfactory part of their work.

All too often one sees a poorly-soldered joint surrounded with a mass of flux. The main stumbling-block is the absence of a well-tinned "bit."

So many "solderers" never tin their bits at all, but simply run a blob of solder on and wonder why the thing won't work! To tin a "bit," heat the soldering iron to

(Continued on page 941.)

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| 1 " 20,000 " (with holders) | 4 0 | graved Terminals, |
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Total £5. 7. 3. Above Lot 3/6 extra.
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14" x 7" Panel, '0005 Slow Motion Condenser, 2-wire Coil Holder (long handle), On-and-Off Switch, Spring Valve Holder, 2 B.B. Coil Sockets, '0003 and '001 Fixed, 2-meg. Leak and Holder, Strip, 8 marked Terminals, Wire, Screws, Flex.

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Total £5 : 12 : 6 Carriage Paid up to 150 miles

Please add 3/6 to above price (total £5/16/0) and I will include: 2 Handsome S.M. Dials, Set of Connecting Links, 8 Plugs, 2 Spades, 4 Engraved Terminals, 2 Ebonite Strips, Twin Flex, Splendid Aluminium Panel, 16 x 7, drilled ready for use, 9-volt Grid Bias, Base board. Carr. Paid under 150 miles.

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FINSTON always in stock. Made under Mr. Finston's licence. 250 to 2,000 metres. 3W one coil, Q.A. 15/-. Q.S.P. 21/-. Q.A.R. 21/-. Q.A.M. 21/-. Master 3 Star, 17/6. (Leaflets Free.)

BLUE SPOT 66K (101) BALANCED 25/- ARMATURE

Squire Cradle Frame, 12/6 for Blue Spot. Cone Kit, 2/6. Free plywood damping washer with 15/- kit.

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ONLY ONE COUPON ON ANY ONE ORDER
If you spend 25/- or more you can buy for 3d. extra any one (only) of the following:
S.M. Dial, 100 ft. 7/22 Copper Aerial, 12 yds. Lead-in, Fuse and Holder, 12 Nickel Terminals, 50X Coil, H.F. Choke, Permanent Detector, Battery Switch, '0003 and 2-meg. Leak, 9-volt Grid Bias, Panel Brackets, 6-pin Coil Base, 100 ft. Insulated Aerial, Loud Speaker Silk Cord, 30 ft. Covered Connecting Wire, Ebonite panel, 9 x 6, 12 yds. Twin Flex, 100 ft. Insulated Aerial.
OR 1 New Gramophone 10" Record (Broadcast, Dominion, or Edison Bell) FREE. (State title required. (Must be recent issue.)

TECHNICAL NOTES.

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

SELECTIVITY

"P.W." LEADS THE WAY.
ELIMINATING THE DIAPHRAGM—
A GOOD EARTH—ETC., ETC.

THE advantages of a counterpoise instead of an earth are well known, especially in cases where there is much interference from artificial causes, such as electrical machinery. A well-known radio engineer has recently described his experiences in this direction, in which he found that a suitable counterpoise gave him practically a perfect solution of his problem. His account runs as follows:

"A counterpoise was decided upon as being the best of a bad bargain. There was simply nothing else we could do. A piece of No. 14 rubber enamelled wire was run out of the window and strung horizontally around two sides of the building.

"It was attached to several window ledges on the same floor. We hooked up the set to the aerial, which was located on the roof, and to our new counterpoise as an earth instead of using a common earth connection of the building; the counterpoise was not connected in any way with the earth, in fact, the set was not earthed at all in the ordinary sense.

Good Results.

"The result was little short of a miracle. All traces of the artificial static and motor noises absolutely disappeared. Furthermore, the strength of reception was increased about 50 per cent, and there was a marked increase in selectivity.

"The motor noise was coming through the set in the original arrangement through the common earth connection and not by direct radiation and pick-up from the aerial. By disconnecting the set from the earth this source of interference was entirely eliminated. As soon as the counterpoise was employed the signals increased and the tuning became sharper because the aerial and counterpoise were much lower in resistance than the aerial and the long earth connection previously used."

I give his account in case it may help other readers.

"P.W." Leads the Way.

An excellent short-wave adaptor (similar to the "P.W." Antipodes Adaptor), has been introduced on the U.S. market for use with broadcast receivers. It was designed by E. T. Flewelling, the well-known radio engineer.

The adaptor is designed to be plugged into the detector socket of a standard broadcast receiver, whereupon the L.F. amplifier and the loud speaker of the regular receiver may be employed for reproducing the short-wave signals. An adaptor of this type may be used with any broadcast receiver which employs L.F. amplification.

Eliminating the Diaphragm.

A recent German invention relates to the production of atmospheric vibrations
(Continued on page 942.)

The only Universally Standardised Component in Radio



Some components are frequently mentioned for use in new circuits—others less frequently—Belling-Lee inevitably. This constant recommendation of Belling-Lee terminals is no mere accident. It is a tribute to the ingenuity of design and unswervingly high standard of workmanship always associated with these excellent little products.

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DARIO Super H.F. means Super Radio

See page 935.

PLEASE MENTION "POPULAR WIRELESS" WHEN MENTIONING TO ADVERTISEMENTS

FOR THE SET BUILDER.

(Continued from page 939.)

nearly red heat, then rub it vigorously with an old file and plunge into a tin lid in which there is a smear of flux and blob of solder.

Each "face" of the "bit" should be so treated.

But all this will be useless if (a) the joint, (b) the flux, and (c) the "bit" are not all kept scrupulously clean.

HOME-MADE DX COILS.

Without a certain amount of geometrical knowledge a simple spiral is very difficult to put down in black and white. The construction of spiral short-wave coils, however, is a real pleasure, and it would be difficult to imagine anything more simple. This fact will be revealed by a glance at the accompanying photographs, which are almost self-explanatory.

The former (Fig. 3) is made from a piece of board $4\frac{1}{2}$ in. square by $\frac{1}{2}$ in. in thickness, and four slotted spacing ribs as detailed in Fig. 2, the latter being arranged as shown in Fig. 1 and attached firmly by means of small screws or nails which are driven in from the under side of the square base.

The distance between the slots in the upper edges of the ribs (i.e. the marking-off distance) is $\frac{1}{8}$ in., the width of same depending upon the size of the (bare) wire used for the winding. They should all be of an accurately equal depth—about $\frac{1}{4}$ in.

The wire should be an easy push-in fit into the slots, so that any "jump-out" tendency is avoided. Such a former will serve for the winding of coils up to eleven turns, and it will be obvious that for larger coils the ribs should be extended.

The wire is wound on in the manner shown in Fig. 3, the beginning and the end being sharply bent so that the spiral is

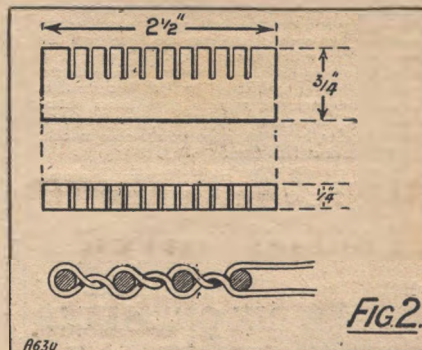
For an 8-turn coil each piece of twine should be about 15 in. long; this leaves a sufficient amount for tying the knots on the outer (last) turn of the spiral. The four "twistings" should then be given two or three coats of shellac varnish, and when this is thoroughly dry (it should be left over night) the complete coil may be carefully eased out of the slots.

The problem of mounting the coil presents no greater difficulty than its construction. A very convenient method is shown in Fig. 1, where the coil, being sufficiently rigid, is self-supporting, the two ends being formed into loops and clamped under the nuts of an ordinary coil-plug. Other methods should suggest themselves.

The great advantage with such coils is that they occupy very little space, in fact rather less space than ordinary plug-in coils, and considering that they are as efficient as other types, and that their cost is practically negligible, any DX enthusiast will do well to give them a trial.

but give rise to the possibility of leakage and scraping noises.

If a loud speaker is connected to the input terminals of an amplifier, speech from this can be reproduced by the main loud speaker.



If the flux from a newly-soldered joint is wiped whilst it is hot it comes away cleanly, but if left until cool it becomes sticky, and it is impossible to remove it from the underside of wires, etc.

One of the greatest disadvantages of soldering flux left behind on a joint is that dust will settle upon this in time, and so make a conductive path which may destroy the advantages of correct insulation.

Galvanised wire as sold for clothes lines makes good stays for high masts.

When a water-pipe earth is used, and a clip is placed round this to carry the contact, it will often be found that a few sharp blows on a nail so as to form projecting points, will cut through any small film that may have formed, and so ensure better contact.

GETTING SMOOTH REACTION.

Although with modern valves rheostats are not generally necessary, it is as well to remember that a filament adjustment of the detector valve on a short-wave set is often an invaluable aid to smooth reaction.

A neglected soldering iron which has become "scaly" can easily be cleaned by heating the iron until it is red hot and then plunging it into cold water.

When soldering at a gas stove, do not forget that the best way of holding the iron in the gas flame is to arrange a duster on the stove, upon which the handle of the iron can be rested in any position.

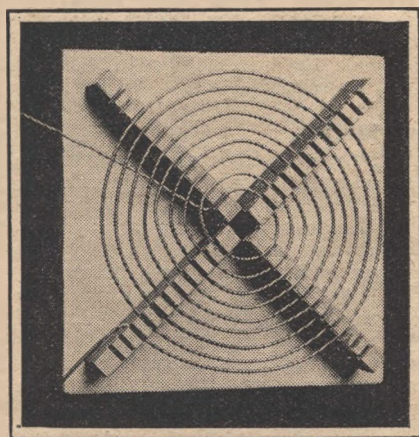


Fig. 3. On a cross former it is easy to wind a low-loss coil.

OSCILLATION ON SHORT WAVES.

If your set employs a standard H.F. choke and you are experiencing difficulty in the matter of oscillation, a cure can often be effected by replacing it with a number 60 or 75 coil of the ordinary plug-in type.

In a short-waver the use of a fairly high impedance detector such as an H.F. valve, is strongly to be recommended. As a general rule, however, a valve of this type will not oscillate so readily as one with a lower impedance.

The use of a higher H.T. voltage will often help in this respect, and only if the H.F. valve cannot be made to oscillate should a lower impedance valve be tried.

Finally, do not ignore the possibility of a reversed reaction coil. This error may seem somewhat obvious, but we are all liable to mistakes and it is of little use to expect satisfactory results if the reaction coil is connected round the wrong way.

FOR YOUR NOTE-BOOK.

Accidental shorting of an H.T. accumulator is more serious than a similar mishap in the case of a low-tension accumulator, owing to the smaller capacity.

Frayed flexible leads in which a single wire stands out from the others are not only a source of irritation when screwing down terminals,

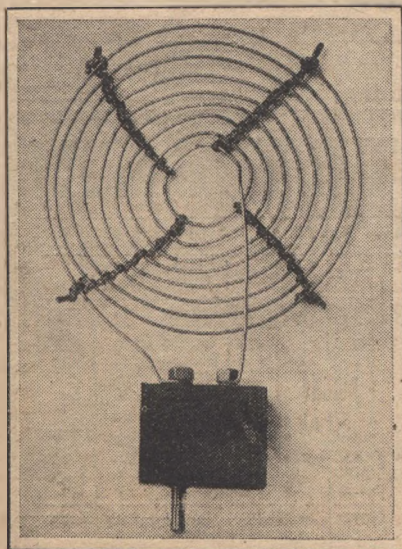


Fig. 1. A self-supporting coil of bare wire.

firmly held in position. While still on the former the spiral is permanently locked by means of twine bindings, or perhaps it would be more correct to say "twistings," as shown in Fig. 4 and also in the lower part of Fig. 2.

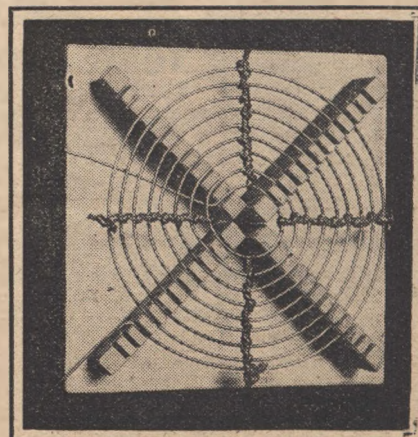


Fig. 4. Shows the method of fixing the turns.

In a properly-charged accumulator the negative plates should be light grey in colour, and the positive plates chocolate colour.


**THE
'ARTILLERY' ELECTRIC TORCH**

2 in. wide by 5 in. high, just a convenient size for carrying in the pocket. Switch cannot be accidentally left on and thus run down the battery. Specially manufactured to Government specification for use in the Army and the very best materials and workmanship. The ends of the case are brass and the body is zinc which cannot rust. Fitted with a powerful Bullseye Lens, white un tarnishable reflector and bulb. New "Ever-Ready" two-cell batteries (No. 1626) of full strength, capable of 6 hours' intermittent light for months with ordinary care and use. These Torches being Surplus, we are able to offer a limited stock at Half Cost.

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Packing and postage in the U.K. 6d. extra.
Refills, 1/- each. Spare bulbs, 25 volt, 6d. each.
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DIX-ONEMETER**



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COMPLETE RADIO OUTFIT
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AN IDEAL NEW YEAR GIFT.

Radio & Electrical Testing Booklet with each.

**ELECTRADIX RADIOS,
218, Upper Thames St., E.C.**
Blackfriars Stn., Met. Rly. City 0191.

OAK CABINETS.—Mystery 660, 17/6; Master 3 15/-; Melody Maker 15/-; baseboards included. New Corsor, including polished panel and 5-ply baseboard, Oak, 15/-; Oak, Walnut, or Mahogany finish, 10/6. Hand-made and French polished. Rubber feet. Crated and carriage paid. Send for list.

GILBERT, Cabinet Maker, SWINDON.

HEADPHONES REPAIRED 4/-

Transformers 5/-. Loudspeakers 4/-. All repairs remagnetised free. Tested, guaranteed and ready for delivery in 24 hours.

Discount for Trade. Clerkenwell 1795.
MASON & CO., 44, East Rd., City Rd., N.1.

DARIO

This week's best bargain

See page 935.

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

TECHNICAL NOTES.

(Continued from page 940.)

(sound-waves) without the intermediary of a material diaphragm. Whenever a diaphragm is employed for the purpose of transforming electrical vibrations into sound-waves it is clear that the diaphragm must exert its own influence upon the nature of the sound-waves produced and consequently the material diaphragm is bound to introduce a certain amount of distortion. In some cases this may be quite considerable, and usually takes the form of extra amplification of one frequency—sometimes several frequencies—these frequencies which are abnormally amplified being called the "resonance points" of the diaphragm system.

Small Mass.

It is obvious that if a method can be found whereby the sound-waves are produced by a non-material agency, or at any rate by something which is of exceedingly small mass, the disadvantages just referred to may be avoided.

Brush Discharge.

According to this German invention, an electrical brush discharge is obtained from a pointed electrode, whilst the output from a low-frequency transformer is superimposed upon the high voltage which produces and maintains the brush discharge.

The effect is that the brush discharge takes on the character of the superimposed electrical variations from the low-frequency transformer, and it sets the air into corresponding vibration. As might be expected, this arrangement gives remarkable purity of tone, but I have no information as to the volume obtainable; I should imagine that this would be rather limited.

A Good Earth.

In making an earth connection by means of an earth plate or earth tube it is very important to ensure that the plate or tube maintains good electrical contact with the surrounding soil or earth throughout all periods of the year.

In the winter-time, when rain is abundant, there will be little or no difficulty arising in this direction, but in the summer-time, if the plate is not too deeply buried and in intimate contact with the soil, there is a danger of the "earth" becoming very inefficient and giving rise to a good deal of trouble, the exact nature of which may not at first be suspected.

Low Conductivity.

In the first place the earth plate should always be in contact with soil or clay and not with gravel or sand, as the latter allows the moisture to drain away and has little or no conductivity of itself in the absence of moisture. Soil or clay, on the other hand, tends to retain a certain amount of moisture much longer, and so to be more reliable from this point of view.

Zero Potential.

It is a good plan, especially if any trouble is experienced owing to the soil around the earth plate becoming dry, to pour two or three buckets of water into the surrounding soil, say, every week or two.

The simple theory underlying the efficient operation of an earth plate is that it should maintain good electrical connection with the surrounding earth, so as to maintain itself reliably at zero potential to dissipate instantly any electrical charges which may be fed into it.

Ingenious.

A curious example of ingenuity is sent to me by a reader who describes an arrangement by which the radio receiver is automatically switched off when the house telephone is in operation. You will have already thought of the arrangement before I go any further.

It consists in a little "gadget," attached to the vertical pillar of the telephone instrument, whereby the filament circuit of the radio set is interrupted when the telephone receiver is removed from its hook.

Easily Made.

To make the little device, all you have to do is to carry a pair of twin leads from the

(Continued on page 944.)



P.R. VALVES. TRY ONE!

YOUR JUDGMENT IS FINAL

If it doesn't beat your "Favourite" WE'LL GLADLY TAKE IT BACK

P.R. VALVES ARE STOCKED BY

- 4. NEWINGTON CAUSEWAY, S.E.1—Magneto Service Co.
- ROMFORD RD., MANOR PARK, E.15—Felix Radio, 945; Emco Radio, 923; Park Radio, 676.
- 12. BLACKHORSE LANE, WALTHAMSTOW, E.17—R. Wilkin.
- 241. EAST INDIA DOCK RD., POPLAR, E.14—Bottoms & Co.
- 103. HOLLOWAY RD., N.7—John Burns & Sons.
- 249. HIGH RD., KILBURN, N.W.6—Deskphone Co.
- 24. KNIGHTS HILL, W. NORWOOD, S.E.27—Frederic Chidsey.
- 100/101. HOUNDSDITCH, E.1—E. Simons.
- ROMAN RD., BOW, E.3—Bishops Stores, 309; Harrison, 119; Louis Saverina, 19.
- LEA BRIDGE RD., E.10—W Flower & Sons, 623; Jarrett, 412.
- HIGH RD., LETCHWORTH, E.10—Stander Motor Works, 721; Trumbles, 424; S. Saunders, 359.
- 69. PLASHET GROVE, UPTON PARK, E.—G. E. Pryor.
- 179. HIGH ST., WANDSWORTH, S.W.—J. & M. Stone.
- 342. BATTERSEA PARK RD., S.W.11—F. C. Allen.
- 8. CHATSWORTH RD., CLAPTON PARK, E.5—J. S. Humphreys & Son.
- PUNNEY BRIDGE RD., S.W.15—Job-Co., 24a; Florian Rd.
- PECKHAM—C. & W. Thew; 5, Station Parade, Queen's Rd.
- GRAVESEND—Fairlamb, 8, Stone Sq.
- LEYTONSTONE RD., E.15—Jarrett, 131; Martin's Mart, 159.
- 194. PLAISTOW RD., E.15—Syd Bull.
- 47. GOLDHAWK RD., W.12—W. T. Canning & Co., Ltd.
- 79. UPTON LANE, FOREST GATE, E.7—T. F. Trudgen.
- 159. NEW KENT RD., S.E.1—S. A. Smith.
- 141. FULHAM PALACE RD., HAMMERSMITH, S.W.—D. S. Aluss.
- 372. CLAPHAM RD., S.W.9—W. E. Harvey.
- 584. BARKING RD., GREEN GATE, PLAISTOW, E.15—P. A. Downes.
- CAMBERWELL RD., GOODMAYES, ESSEX—Rydin's Electrical Co.
- 172. WALWORTH RD., S.E.17—S. Becker.
- 291. ILFORD LANE, ILFORD—A. J. & Co.

LIST OF DULL EMITTERS

	Type	Fil. Volts	Amp.	Imp. Ohms.	Amp. Fac.	
3/6 Post 4d.	PR 1	2	.095	30,000	14	H.F.
	PR 2	2	.095	28,000	13	Det.
	PR 3	2	.095	15,000	8	L.F.
	PR 4	2	.095	120,000	32	R.C.
	PR 8	3.5-4	.063	23,000	15	H.F.
	PR 9	3.5-4	.063	18,000	14	Det.
	PR10	3.5-4	.063	10,000	8-7	L.F.
	PR11	3.5-4	.063	88,000	40	R.C.
	PR16	5.6	1	19,000	13	H.F.
	PR17	5.6	1	18,000	17	Det.
PR18	5.6	1	9,500	9	L.F.	
PR19	5.6	1	80,000	40	R.C.	
POWER 7/6 Each Post 4d.	PR20	2	.15	7,000	6	Power
	PR40	4	.15	7,000	6	"
	PR60	6	.1	5,000	6	"

365. SEVEN SISTERS RD., HOLLOWAY, N.4—D. Wensall.

14a. CLAPHAM PK. RD., S.W.4—The Electric Shop.

680. HIGH RD., TOTTENHAM, N.17—Ruskin's Accumulator Service.

18. BLACKHEATH RD., S.E.10—Radio Box.

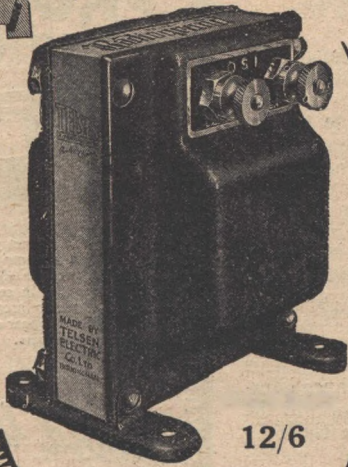
80. HIGH ST., COLLERS WOOD—Kinetic Wireless Supply.

14. HARROW MANORWAY, ABBEY WOOD, S.E.2—Abbey Wood Radio Depot.

P.R. VALVES, 17-38, Paternoster Sq., London, E.C.4
(Opposite G.P.O. Tube.)

TELSEN

TRANSFORMERS



12/6

TO HOME CONSTRUCTORS!

Build the Peerless "Resonic 2"

Anyone can build this set in 60 minutes. No drilling. No soldering. All Wires cut and bent, **JUST ASSEMBLE** and then immediately enjoy the radio entertainment which is of splendid tone and comes in at good loudspeaker volume. Circuit allows use of standard valves (1 H.F. & 1 Power). Blue Print and easily followed Diagram of Connections included with every set. Cabinet and full Kit supplied in Carton.



Regd. No. 456002

£3.15.0

Obtainable from all dealers or

THE BEDFORD ELECTRICAL & RADIO CO., LTD., 22, Campbell Rd., BEDFORD.

DX Short-wave COILS

For short wave work specify the famous DX Coils. Experts use them wherever Radio is known.

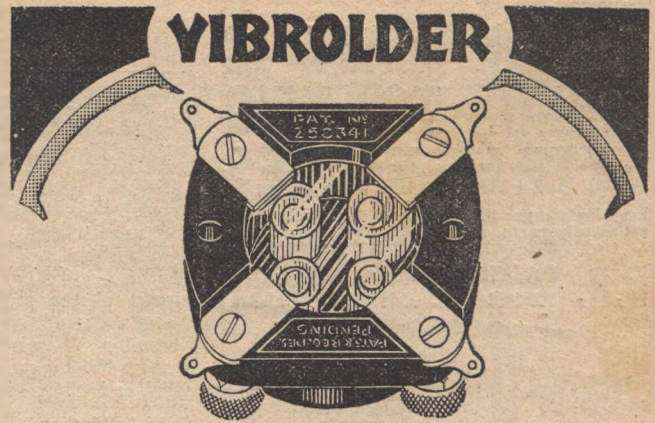
Wound 3 in. diameter; fit standard coil holders. Tinned copper, 16 gauge; open core; can be tapped any where by alligator clips.

DX COILS, LTD., LONDON, E.8.



7/6

The Set of four



EXCELLENCE of DESIGN

Look at the base of the Vibrolder; study its design from behind the scenes. Note the one-piece springs whose coils form the sockets for the valve legs—the self-aligning contacts; the transparent "window" which excludes all dirt and dust; the ready tinned soldering tags.

PRICE

Next time say "Vibrolder" **1/6** and be sure of the best.

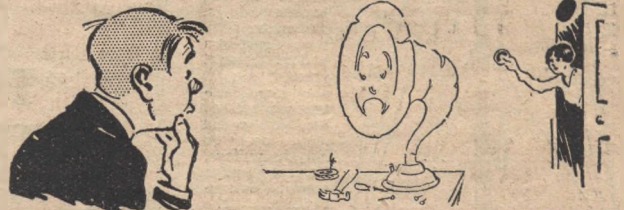
1,500,000 Benjamin valve holders are already in use

BENJAMIN

ELECTRIC LIMITED

Brantwood Works, Tottenham, London, N.17.

NEVER SAY DIE!



UP MAN AND TRY



FLUXITE

IT SIMPLIFIES ALL SOLDERING

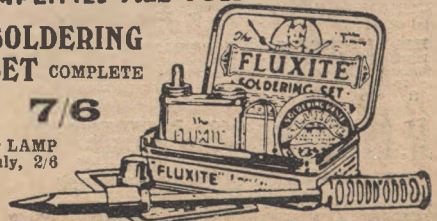
FLUXITE is sold in tins, price 8d., 1/4 and 2/8.

Another use for Fluxite: Hardening Tools and Case Hardening. Ask for leaflet on improved methods. **FLUXITE LTD.** (Dept. 324), Rotherhithe, S.E.16.

SOLDERING SET COMPLETE

7/6

or LAMP only, 2/8

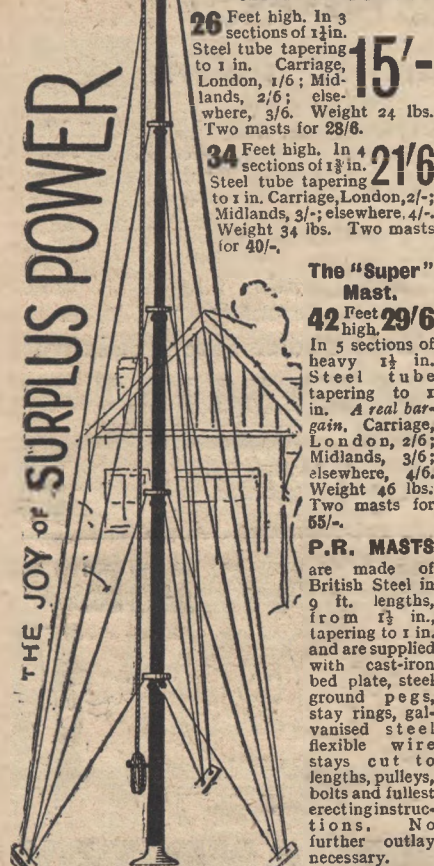


A HIGH MAST IS EQUAL TO TWO EXTRA VALVES

Everybody knows that to have a high aerial is to get extra powerful signals. The difficulty of fixing up a high aerial is banished if you fit a

P.R. PATENT STEEL MAST

**DAMP PROOF!
ROT PROOF!!
CALE PROOF!!!**



26 Feet high. In 3 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 1/6; Midlands, 2/6; elsewhere, 3/6. Weight 24 lbs. Two masts for 28/6.

34 Feet high. In 4 sections of 1 1/8 in. Steel tube tapering to 1 in. Carriage, London, 2/-; Midlands, 3/-; elsewhere, 4/-.

The "Super" Mast.

42 Feet high. In 5 sections of heavy 1 1/2 in. Steel tube tapering to 1 in. A real bargain. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 46 lbs. Two masts for 55/-.

P.R. MASTS are made of British Steel in 9 ft. lengths, from 1 1/2 in., tapering to 1 in. and are supplied with cast-iron bed plate, steel ground pegs, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts and fullest erecting instructions. No further outlay necessary.

NO HOLES TO DIG. ONE MAN'S JOB.

Any intelligent man can assemble and erect a P.R. Mast in a couple of hours. Our patent Mast being tapered, it is easy for anyone to raise it from the ground into position. Ordinary tubular Masts require several hands and difficult rigging to do this. To help you the wire rope is sent out to size—a saving of endless worry. Imagine sorting out 500 ft. of rope in your back garden!

Minimum Radius 3 ft. 6 in. **GUARANTEE** Money refunded without question if not satisfied. **The easiest Mast to erect.**

PAINTING. Any protective coating applied before dispatch gets damaged by the Carriers that it is essential to paint the Mast before erection. All P.R. Masts are sent out oxide-finished ready for painting. One coat of P.R. Colloid covering applied—a 10 minutes' job—to all parts of the Mast when ready to erect sets dead hard in an hour and protects it against all weathers.

PRICE OF ACCESSORIES. P.R. Colloid Covering sufficient for a Mast—with brush, 2/6. Halyard Log Line—Ryland's patent rot-proof; For 26-ft. Mast, 1/6; 34-ft., 2/-; 42-ft., 2/6. For 100 ft., 3/-. Note.—Double length supplied to make lowering of Aerial easy.

A HIGHLY EFFICIENT AERIAL. P.R. Aerial is made of 14-26 High Conductivity Pure Copper Enamelled Wire—each strand insulated from its neighbour to give the highest signal strength obtainable. 100 ft., 4/3; 50 ft., 2/3.

P.R. MASTS 17-40, PATERNOSTER SQUARE, LONDON, E.C.4. Opposite G.P.O. Tube.

IF YOU USE VALVES it will pay you to write to us for particulars of the famous 3/6 range of P.R. valves. Each valve has a written guarantee of life and performance.

TECHNICAL NOTES.

(Continued from page 942.)

filament circuit and pass these through a pair of contacts arranged one upon the telephone hook and the other upon the main pillar of the telephone instrument: of course, both these attachments must be carefully insulated from the telephone instrument itself.

When the telephone receiver is picked up, the hook rises and breaks the filament circuit of the radio set, which therefore "shuts down," while the telephone conversation is going on, immediately re-summing the programme when the telephone receiver is replaced upon its hook.

Official Objection!

I am not sure that I can recommend this device, since for one thing it would certainly be objected to by the Post Office engineer the next time he called round to inspect the telephone, but as an example of simple ingenuity, not without a certain amount of convenience, it is interesting.

G.B. from Mains.

In many cases where a resistance is employed for the purpose of obtaining grid bias from the H.T. mains-supply unit, no by-pass condenser is employed. This is an item which ought not to be overlooked, since L.F. currents must pass through this part of the circuit with the resistance offering serious opposition to their flow: in the case of a wire-wound resistance there is, in addition, a certain amount of "choke-coil effect" as well. In fact, in many cases there is an appreciable loss of volume and tone-quality in the absence of a by-pass condenser.

The "TITAN" THREE ?

Better Tone.

You will generally find that there will be an improvement both in volume and tone when a by-pass condenser is shunted across any grid-bias resistance. This condenser may conveniently have a capacity of 1 or 2 mfd. and may be of the comparatively low-voltage type, with an operating rating of say 200 volts.

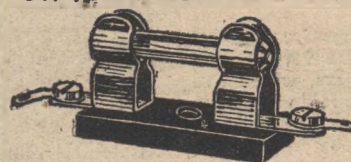
Gradual Decay.

Talking about grid-bias there is an important reason why the grid-bias battery should be occasionally inspected and tested, and that is because no dry battery will last indefinitely, even if it is disconnected from the set altogether.

A dry battery gradually loses its efficiency even whilst in stock on the dealer's shelf, owing to the deterioration of the chemical ingredients, the drying up of the small amount of moisture which is contained in the cells, and which is essential for their operation, and also to various forms of "local action" and electrical leakage

The New SIFAM

RADIO FUSE completely PROTECTS RADIO CIRCUITS



Now you can protect your radio circuit just as an ordinary electrical house circuit, with the ingenious SIFAM Radio Fuse which, when connected in series, ensures complete valve and meter protection from overload. Banishes the bugbear of burnt-out valves and costly meter repairs. A boon to all. Don't be without it.

Avoid burnt out valves and costly meter repairs
Fit this ingenious invention **2/6**

Price: 50-500 M.A. 2/6; 1-5 to 4-6 Amp. 2/- Complete with clip. THE SIFAM ELECTRICAL INSTRUMENT CO., LTD. (Dept. P.W.), Bush House, Aldwych, W.C.2

Obtain from your dealer or direct

SIFAM Radio Meters have been specified for the



Sir Isaac Pitman "All Distances Three."

NOW CONTROLS AND PROTECTS RADIO METER RADIO FUSE



Protect Your Set with the

AERMONIC

Safety Earthing Switch

Scientifically designed to adequately protect your set in all conditions. Has a fuse between the aerial and the set, thus giving security from lightning even if the set is left connected. Soudly made with Bakelite cover to keep it waterproof. Price 4/6.

AERMONIC List Free. post free on money-back guarantee. JAMES CHRISTIE & SONS, Ltd., 246, West St., SHEFFIELD. or London Agents: A.F. Balgoin & Co., 10, Curator St., E.C.4

The Picture Paper with the MOST News —SUNDAY GRAPHIC—

TECHNICAL NOTES.

(Continued from previous page).

Economy.

Therefore it is a good plan to test your grid-bias battery at least every three or six months, and if you find that it is not up to standard, it will pay you to replace it with a fresh G.B. battery, since the actual cost is quite small, whilst, on the other hand, the influence of the correct grid-bias voltage upon the operation of the receiver as a whole can scarcely be exaggerated.

LATEST BROADCASTING NEWS.

TELEVISION DEVELOPMENTS

FULTOGRAPH EXPERIMENTS EXTENDED—NEW WAVELENGTHS—UNDERGRADUATE ELOQUENCE.

ALL the various moves between the B.B.C., Wireless Pictures, and Television have been accurately and exclusively forecast in POPULAR WIRELESS, "Modern Wireless," or the "Wireless Constructor." The curious calm which fell upon the television front recently was duly noted. Then there was a short, sharp period of activity, but a minimum of investive.

And now the calm has fallen again. Round at Long Acre, there are rumoured improvements, and it is a fact that a lot of eminent people have been very much impressed with recent demonstrations there. Leading M.P.'s, including Mr. Lloyd George, are reported as having witnessed demonstrations, arranged by Lord Angus Kennedy, and Sir Edward Manville.

THE FERRANTI CHART

Every copy of this week's issue of P.W. should contain a chart fully describing the construction of the Ferranti "Simple Three-Valve Set." If your copy does not do so, please advise the Publishers at Fleetway House, Farringdon Street, E.C.4. and matters will be put right immediately.

What is all this leading to? Intelligent deduction is not difficult. There are to be trials from B.B.C. stations, presumably conducted with guarantees of secrecy. It is believed that these will take place in February. One wonders what Captain Eekersley will have to say about what can only be interpreted as a political move against him personally. Whatever happens, there will be some terrific rows, and a lot of fur flying!

Fultograph Experimenting Extended.

The decision of the B.B.C. to continue the Fultograph experiments until October 30th next year is of very great importance. It can only mean that the B.B.C. are favourably impressed with result to date. It is now a practical certainty that still picture transmissions will find their way into the programmes next year. This has already happened in Germany.

(Continued on next page).

**OUR NEW YEARS GIFT —
REDUCED PRICES
OF THE
STANDARD
SAC LECLANCHE
Permanent H.T. Batteries —
The battery that lasts for years
and the introduction of a new model**

CELL	ZINC		SAC		Complete Cell		Capacity	Milliamp-Hours.
	Old Price	New Price	Old Price	New Price	Old Price	New Price		
No. 1.	11d.	10d.	1/2	1/2	4 1/2d.	4 1/2d.	2,500	milliamp-hours.
No. 2.	1/-	11d.	2/2	1/9	6d.	5 1/2d.	5,000	" "
No. 3.	1/7	1/3	4/-	3/-	9d.	7 1/2d.	10,000	" "
No. 4.	..	1/6	..	4/6	..	10d.	20,000	" "

THE BENEFIT OF AN AMAZING GROWTH IN POPULARITY. The tremendous and steadily maintained growth in the popularity of this wonderful permanent battery has led to what will be greeted as a splendid New Year gift to listeners throughout the Radio World. The prices of the standard Battery are **Now Reduced**—this includes all models of the battery, and all spare parts. This wonderful benefit to listeners means that although the battery has already

NOTE:— ANY VOLTAGE SUPPLIED. Listeners are asked particularly to note that any size of the battery is supplied from 1 1/2 volts upwards. The larger cells and especially the new model No. 4 are proving the most economical in the long run.

sold to the extent of **Hundreds of Thousands**, even greater numbers will use this super efficient and money saving source of permanent H.T. supply. The Standard Battery lasts for years because it is positively self-regenerative and **Recharges Itself Overnight**. All that is necessary to maintain the voltage is replenishment of the elements at long intervals, beyond which little or no attention is needed. This wonderful battery greatly improves the quality of reception.

Write for Booklet now, sent free on receipt of card. The new booklet is entirely revised and contains valuable data that assists in the selection of a suitable battery, cost of upkeep, spare parts, lists and new prices.

NOW 7/6 DOWN on exactly the same terms.

The benefit is passed on to you—order NOW!

CLAROSTAT
VARIABLE RESISTANCES FOR VOLUME, TONE, DISTANT CONTROL, ELIMINATORS ETC.,

As frequently specified by "The Experts."
• HIGH QUALITY • LOW PRICE •
New 20 Page Brochure free on request.
Many unique circuits.

CLAUDE LYONS LTD.
76, OLDHALL ST., LIVERPOOL.

Write for the New
DARIO
Folder
See page 935

WET H.T. BATTERIES
Solve all H.T. Troubles.
SELF-CHARGING, SILENT, ECONOMICAL.
JARS (waxed) 2 1/2" x 1 1/2" sq. 1/3 doz.
ZINCS, new type 1 1/2 doz. SACS 1/2 doz.
Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d.
Sample unit, 6d. Illus. booklet free.
Bargain list free.

AMPLIFIERS 30/-, 2-VALVE SET 2s.
P. TAYLOR, 57, Studley Road, STOCKWELL, LONDON

Make
The DAILY SKETCH
YOUR Picture Paper

ALL APPLICATIONS FOR ADVERTISING SPACE in "POPULAR WIRELESS" must be made to the Sole Advertising Agents, **JOHN H. LILE, LTD.**, 4, LUDGATE CIRCUS, LONDON, E.C.4.

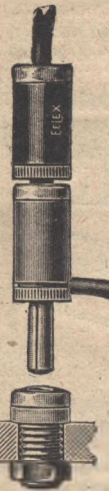


SPADES, PINS AND EYES

are a few of the accessories that comprise the Eelex Standardisation System. Every one is a standardised fitting and all parts are interchangeable. By adopting this system the possibility of a wrong or accidental connection is minimised.



They are specially designed to suit every requirement of the wireless enthusiast. They have coloured sleeves, red, black, green, blue, yellow and white, and cost 2d. each.



E E L E X T14 PLUGS AND SOCKETS

are also components of the Eelex Standardisation System, and are so designed that numerous connections can be made to a terminal or socket. 6 different coloured sleeves are available. T14 Plugs, 3d. each; Sockets, 1d. each; Name tabs (40 varieties) 1d. each.



T 14 CONNECTOR

TYPE C.



This is a very useful accessory to possess, as it connects easily T14 Plugs or wander plugs. Ideal for joining extension leads to loud speakers and earphones, saving wall fittings. Price 3d. each.

Write for the new EEXX Booklet T. 70, which gives full details.



J. J. EASTICK & SONS
Eelex House, 118, Bunhill Row, Chiswell Street, London, E.C.1.
Phone: Clerkenwell 9282-3-4.

LATEST BROADCASTING NEWS.

(Continued from previous page.)

New Wave-lengths.

The application on Sunday, January 13th, of the Plan de Bruxelles, will affect B.B.C. wave-lengths as follows:

PRESENT.		
Kilohertz.	Metres.	Station.
192	1,562.5	Daventry 5 X X
610	491.8	" 5 G B
740	405.4	Glasgow.
780	384.6	Manchester.
830	361.4	London.
850	353	Cardiff.
920	326.1	Bournemouth.
960	312.5	Newcastle.
980	306.1	Belfast.
1,040	288.5	Edinburgh.

NEW.

Kilohertz.	Metres.	Station.
192	1,562.5	Daventry 5 X X
622	482.3	" 5 G B
748	401.1	Glasgow.
793	378.3	Manchester.
838	358	London.
928	323.2	Cardiff.
964	311.2	Aberdeen.
991	302.7	Belfast.
1,040	288.5	Relays and Bournemouth.
1,230	243.9	Newcastle.

N.B.—These changes come into operation on Sunday, January 13th.

Undergraduate Eloquence.

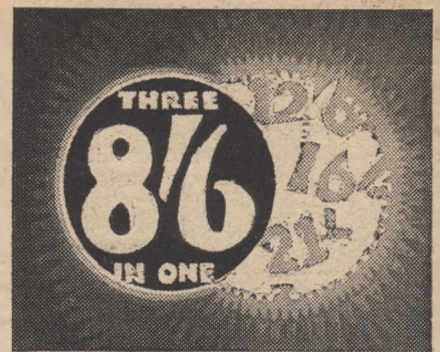
It cannot be helped, though it is none the less regrettable; that only those who can listen in the afternoon will be able to hear the Inter-University debate of the Manchester University Union on Friday, January 18th, which is to be broadcast from all stations of the Northern grouping. The subject promises to be one of the most amusing ever discussed before the microphone, namely, that this House regrets the past, deprecates the present and has no hope for the future. No doubt the various participants will themselves go all out on such an intriguing topic, but the broadcast will be limited to the first four speeches representing, it is hoped, Leeds, Liverpool, Aberystwyth, and Sheffield. The debate begins at 4.30 p.m.



A BOOK YOU MUST NOT MISS!
"ENGINEERING OPPORTUNITIES" is the most complete hand-book on Engineering Exams, and Courses ever produced. It describes over 60 Exam. and home study courses in all branches of Mechanical, Electrical, Motor and Civil Engineering, including WIRELESS. **We ALONE Guarantee—"NO PASS—NO FEE"**
This book should be in your hands—it is a mine of valuable information and advice. We offer it FREE. Write for your copy now stating branch or Exam. which is of interest.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY,
101, Shakespeare House, Leicester Sq., London, W.C.2.

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ECLIPSES EVERY METER VALUE WATES "three in one" VOLT-AMP RADIO TEST METER

THREE READINGS ON ONE DIAL

This wonderful feature incorporated in the Wates Meter has caused a stir throughout the Radio World. Every preconceived notion of meter value has been swept away. This amazing Meter tells you all you want to know—NOW a variety of single-purpose testing instruments are a totally unnecessary waste and expense. The Wates Meter gives three dead-beat readings from one clearly engraved dial. It is in every sense a precision job. Exceptionally handsome appearance. Fully guaranteed. Dead-beat readings. From your dealer or direct with explanatory free leaflet.

Stocked by Halfords' Stores, Currys' Stores and All Radio Dealers.

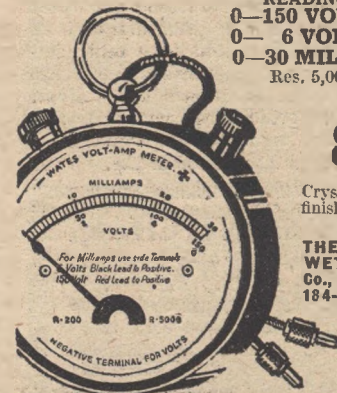
READINGS
0—150 VOLTS.
0—6 VOLTS.
0—30 MILLIAMPS.
Res. 5,000 ohms.

PRICE

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Crystallised black finish. Fully guaranteed.

THE STANDARD WET BATTERY Co., Dept. P.W., 184-188, Shaftesbury Avenue, LONDON, W.C.2.



Three in One
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"BROADCAST" PLUG-IN COILS

We have been making Plug-in Coils for five years. So know your requirements.

NOTE THE LOW PRICES.

25	1/-	50	1/2	125	1/6	250	2/3
30	1/-	60	1/3	150	1/6	300	2/6
35	1/-	75	1/3	175	1/9	400	3/-
40	1/2	100	1/6	200	2/-	500	3/6

CENTRE TAPPED, 6d. EXTRA.
"X" COILS 1/- EXTRA.
Post paid on two or more coils.

CARLTON MANUFACTURING CO.,
1a, Gospel Oak Grove, London, N.W.5.
TRADE SUPPLIED. Phone Hampstead 4290.

Keep on Saying DARIO for Radio

See page 935

THIS week's four-valver has been designed to show how efficient screening can be accomplished in a particularly simple manner. The system of screening is the same as that used in White Print No. 3 (and many other successful designs). Its particular feature is the use of a single vertical sheet of copper or aluminium and the placing of the coils so that their stray fields are cut off by the screen.

In this way it is particularly easy to ensure really good separation of the input and output circuits of the H.F. valve. The result, naturally, is greatly improved constancy of neutralising adjustment over the tuning range, and also better selectivity. This last is an important point which is not so widely understood as it should be.

Simplified Screening.

In a previous example (White Print No. 3) we showed how to achieve the desired effect by using a pair of ordinary 6-pin coils, one for the aerial circuit and the other as an H.F. transformer. These two units were mounted horizontally, their bases being secured with two blocks of wood to the screen, one on either side. This is good electrically, but involves a little more mounting work than some constructors care for.

Accordingly, we are showing in the present design how to get the desired effect by using only one 6-pin coil (a split primary H.F. transformer) mounted on the screen as before. On the other side are a pair of plug-in coils which form the aerial primary and secondary inductances. Since the axis of the magnetic field of a plug-in coil is normally horizontal, all that we need do is to place the sockets carefully, and the stray field will be duly cut off by the screen and prevented from reaching the other coil.

The actual circuit is of a very standard type, with the usual "aperiodic" aerial and

THE "P.W." "WHITE PRINTS."

A NEW SERVICE FOR OUR READERS.

White Print No. 5. :: :: A Powerful Loud-Speaker Set.

This week we publish the fifth of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the White Print filed. In due course you will thus have available an encyclopaedic collection of the best circuits used in modern radio practice. A "White Print" will be published on the last page every week in "P.W." until further notice.—THE EDITOR.

COMPONENTS AND MATERIALS REQUIRED.

- 1 Panel, 21 in. × 7 in. × 1/4 in.
- 1 Cabinet to fit, with baseboard 9 in. deep. (The other standard depth of 10 in. will also serve.)
- 2 .0005 mfd. variable condensers.
- NOTE.—A good slow-motion type is desirable, since tuning is sharp. A pair of good vernier dials on plain condensers would also be satisfactory.
- 1 .0001 or .00015 mfd. reaction condenser.
- 1 L.T. switch.
- 1 Pair panel brackets.
- 4 Sprung valve holders.
- 1 Baseboard-mounting neutrodyne condenser.
- 2 Baseboard-mounting single-coil sockets.
- 1 Standard "P.W." screen, 6 in. × 9 in.
- 1 Six-pin coil socket, unscreened type.
- 1 Piece of wood, about 3 in. × 3 in. × 3/8 in., for mounting the 6-pin base to the side of the screen in the position indicated.
- 1 H.F. choke.
- 1 250,000-ohms anode resistance and base.
- 2 2-meg. grid leaks with holders.
- 1 .25-meg. ditto.
- 1 Fixed condenser of .0003 mfd., one .001, and one .01.
- 1 L.F. transformer.
- 1 H.T. fuse.
- 1 Terminal strip, 19 in. × 2 in. × 1/4 in., and 10 terminals.
- Flex, wire, screws, G.B. plugs, etc.

tuned grid circuit for the H.F. valve, split primary H.F. transformer with the usual neutralising arrangement, condenser controlled reaction on the detector valve, one stage of resistance-capacity and one transformer-coupled stage of L.F. No output filter is provided, and it is to be understood that if you use a super-power

valve in the last stage such a filter is desirable as a separate unit. (It could also be got inside if the L.F. layout is rearranged slightly.)

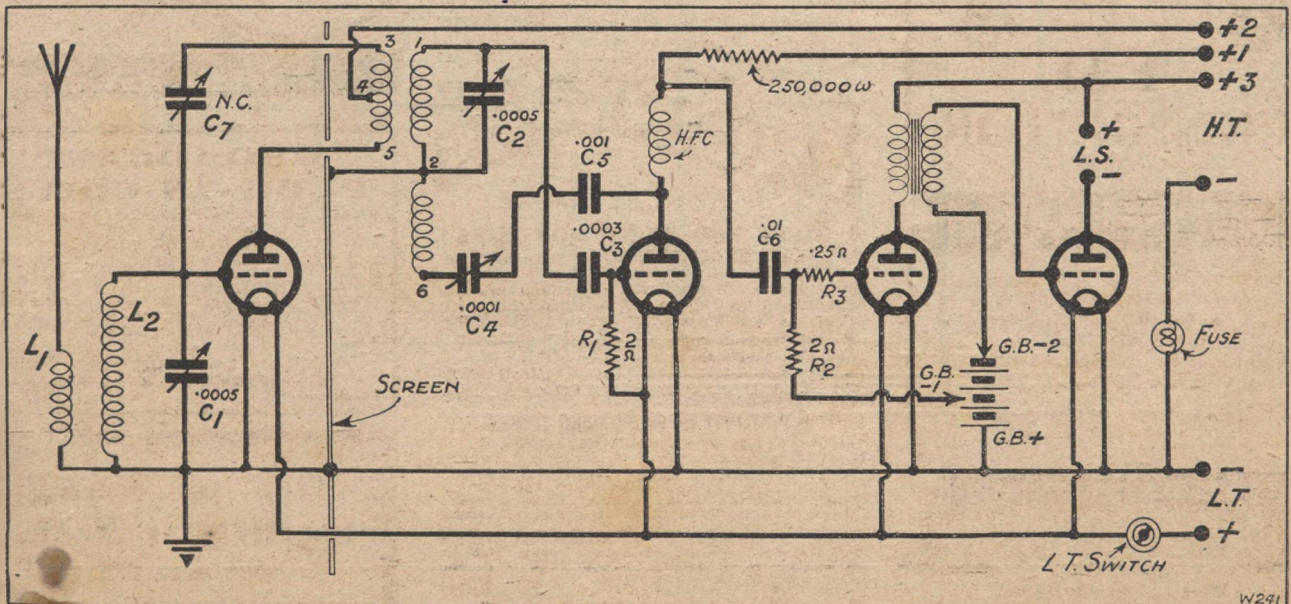
Constructional work need not detain us long. Remember to use insulated wire for all the leads which pass through the perforations in the screen (the standard one has a row of holes right across the lower edge), and note carefully where connections are made to the screen itself. Note also that it was not possible to show clearly every lead to the 6-pin base, so they were numbered to indicate to which terminal thereon they go.

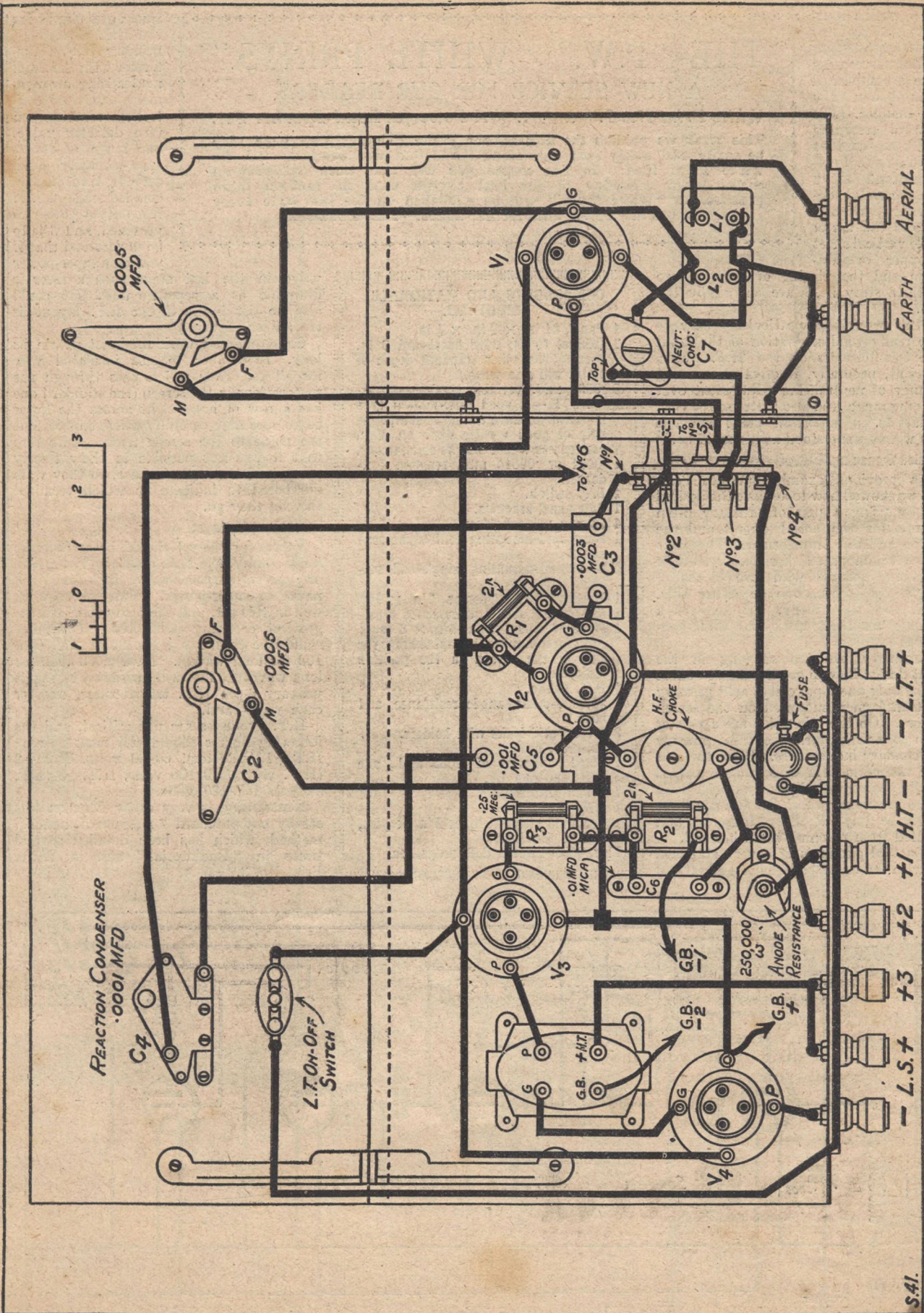
Valves and Voltages.

Valves for the set should be as follows: for V₁ and V₂ the H.F. type, for V₃ an L.F. or general-purpose valve, and for V₄ a power or super-power. Two-volters work well in this set, and are advised where the greatest economy is desired. Coil sizes should be these: L₁, No. 25 or 35 (75 or 100 for long waves). L₂, No. 60 (250 for long waves). You will also need two split primary 6-pin H.F. transformers, one for each wave-band.

H.T. voltages are not critical, and the following figures should suit most valves: H.T.+1 (detector), 60-80 volts, H.T.+2 (H.F. valve), 90-100 volts, H.T.+3 (L.F. stages), 100-120 volts.

Neutralising is very easily done on this set by our standard "reaction demands" method, which has been detailed several times in "Radiatorial," also in White Print No. 3.





S.41.

CUT ALONG DOTTED LINE.



Faint, illegible text, possibly bleed-through from the reverse side of the page.

a ; all

THE · MASTER · VALVE

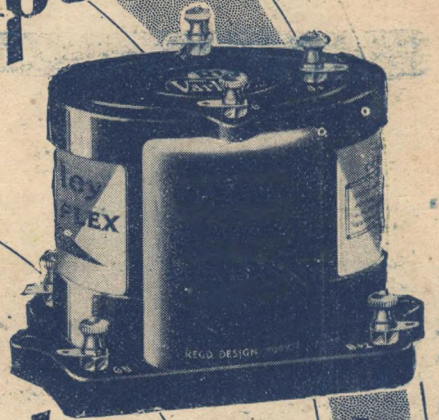
ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., MULLARD HOUSE, DENMARK STREET, LONDON. W.C.2

Arks

No Aerial
No Earth
No Batteries



This up
component



fills
a
great
need in Radio today

Europe. Its clever design in-

earth can be used, if desired.

have used it in their Sets.

Z
Y
X



OF



Kingsway House, 103, Kingsway, London, W.C.2.

MORE ABOUT THE 7/6 THREE-VALVER (See Page 970)

Popular Wireless

Every Thursday
PRICE
3d.

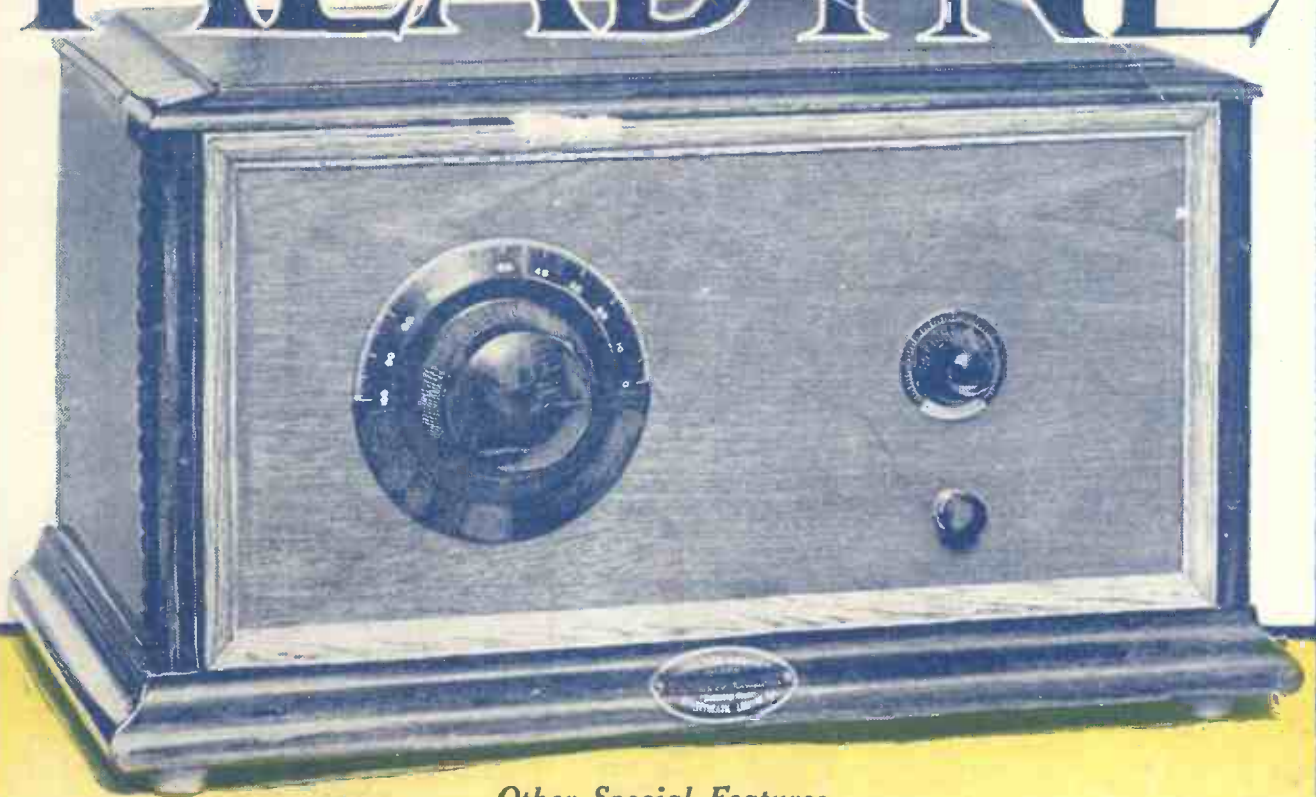
No. 345. Vol. XIV.

INCORPORATING "WIRELESS"

January 12th, 1929.

The 1929 "FILADYNE"

FULL DETAILS
INSIDE



Other Special Features

**Air and Ether. The A.B.C. of The L.T.B.
Testing Dry Batteries. The New Wave-lengths.
WHITE PRINT No. 6.**



DUBILIER CONDENSERS

ALWAYS STAR PERFORMERS

ARE USED IN THE COSSOR "MELODY MAKER"

by A. C. COSSOR, LTD.

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FERRANTI SCREEN GRID SETS

'The New Empire' — 'Shortradyne' — 'Furzehill IV.' — 'Fanfare V.' — and in innumerable other circuits published by the Technical Press.

They are also used by the majority of Set Makers

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PRACTICALLY EVERY BROADCASTING STATION IN THE WORLD.

DUBILIER

RADIO PRODUCTS

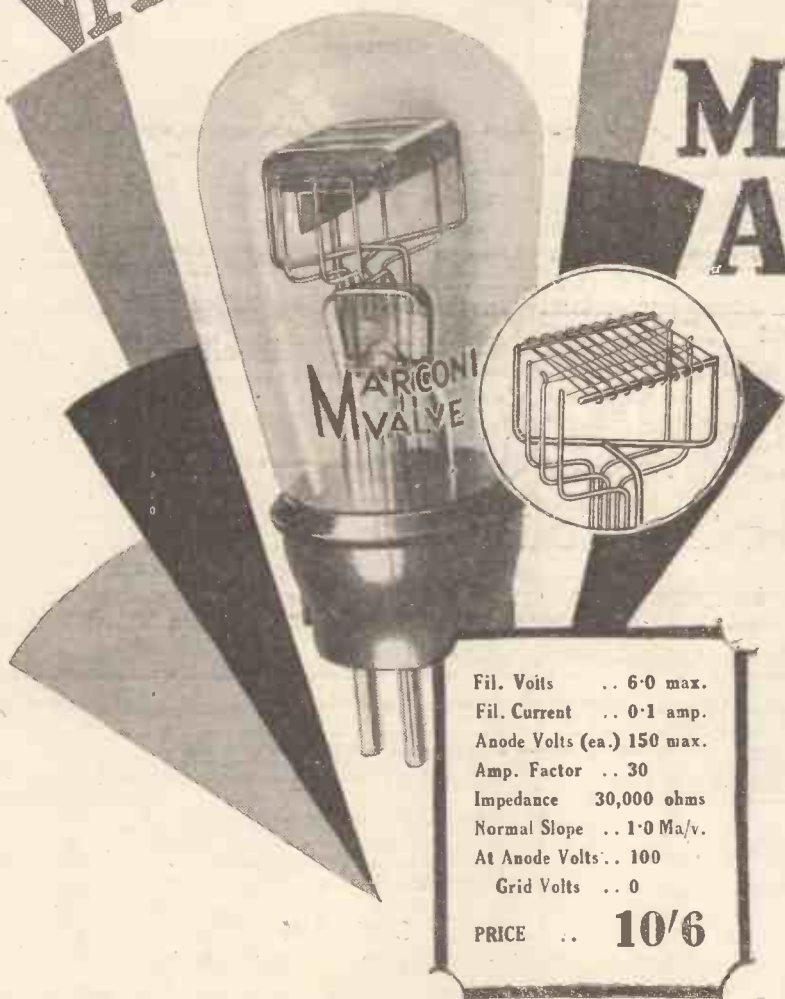
"TOREADOR SCREEN-GRID FOUR"
This set incorporates the latest developments in Receiver design—full constructional details free on request.



If unobtainable from your dealer, write direct to us, mentioning your dealer's name and address.

VALVE IMPROVEMENTS

MARCONI ADVANCES



The New 6 Volt General Purpose Valve Type H.L.610

AN excellent example of a Marconi High Frequency Valve Type H.L.610 has a high magnification with a medium impedance which renders it suitable for high frequency stages, as a detector, or for use in the first low frequency stage.

Marconi Type H.L.610 may be followed by resistance-capacity coupling or a high impedance transformer such as the Marconi "Ideal" (Ratio 2.7 to 1) with which a very high amplification is obtained.

For the output stage Marconi H.L.610 should be followed by a Power Valve such as Marconi D.E.P.610 D.E.5A, P.625, or P.625A.

If you prefer a 2-volt accumulator Marconi Type H.L.210 is equally dependable for similar circuits, this may be followed by a Marconi D.E.P.215 or D.E.P.240 in the output stage.

★ The latest developments in filament construction incorporated in Marconi Valves ensure a copious emission at a very low current consumption, thus giving the long life and absolute reliability.

Write for full particulars of New Marconi Valves mentioning "Popular Wireless."

MARCONI VALVES

The Marconiphone Company Limited, 210-212, Tottenham Court Road, London, W.1

The Secret of successful reception

LEWCOS Centre-tapped Coils are Litz-wound in scientifically spaced sections which ensures minimum self-capacity. H.F. Resistance is extraordinarily low, thus selectivity is certain. In these features lies the secret of that successful reception which has established the popularity of LEWCOS Coils with every experienced radio enthusiast. Instal them in your set and get better reception.



LEWCOS REGD. Centre-Tapped Coils



(Pat. No. 271,384)

LEWCOS
INDUCTANCE COILS
SPECIFIED IN
"LOEWE" RADIO
RECEIVER.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10. Trade, Counter and Cable Sales: 7, Playhouse Yard, Golden Lane, E.C.1.

STILL FURTHER! TESTIMONY! to the wonderful WEILO TRANSFORMER.

This unsolicited testimonial from one of the many satisfied WEILO users indicates the remarkable results achieved with this ultra-value Transformer. Experts and listeners alike join in acclaiming WEILO as the new standard of transformer value—the equivalent of many of the highest priced instruments on the market.

Read Mr. Fleet's letter:—

Oldham, Dec. 18th, 1928.
Gentlemen,—I am delighted with the "Weilo Transformer." I was using two transformers of a well-known make; one broke down in working and I replaced it with a "Weilo." I noticed improvement in the tone, and I then decided to replace the remaining transformer with a "Weilo," and the improvement was remarkable. The volume was increased, and the tone was rounder and crisper. I can honestly recommend them.
(Signed) H. Fleet.

POWER type Model 10 Price 11/6
Heavy type Model 3 Price 8/6
GUARANTEED TWO YEARS.

Weilo Transformers have been specified for the Pitman "All Europe 3" and the Manchester Eeg. Chronicle "Distance 2." Sent for fully illustrated catalogue describing the quality Weilo and N.S.P. components, free and post free on request. Stocked by Harrods Stores and most good-class Radio dealers.

S. W. LEWIS & Co., Ltd.

(Dept. P.W.)
39, Victoria Street, London, S.W.1.



Indian Agents: Bombay Radio Co., Bombay and Calcutta

New Wavelengths

If you are affected by the change in B.B.C. wavelengths to the extent of building fresh coils or altering your present ones, we strongly recommend the

CLIX COIL PIN

This is an ideal fitment for all types of home-made coils. The resilient principle on which the plug is constructed guarantees perfect contact with all standard 1/4 in. sockets. The 1/2 in. shank, which is provided with two nuts, allows connections to be made with ease.

PRICE 2d. EACH.

WOOD SCREW SOCKETS

As their name implies, these are excellent for extension work, wherever plug-in contact is used and for mounting on baseboards as coil bases, etc. A variety of uses can be found for these extremely useful sockets. Complete with Red or Black Insulators and Ring Tag for connections.

PRICE 2d. EACH.

TERMINAL BRACKETS

Here is a means of immediately converting screw Terminal connections to the simpler and quicker Plug and Socket system. The advantages of this bracket are easily seen. All possibility of bad contact is eliminated, and for speed in making and breaking contact there is no finer method.

PRICE 1d. EACH.

LOOK FOR THE "CLIX" SHOWCASE ON DEALERS' COUNTERS.

In addition to the above, many other lines are described and illustrated in the new "CLIX" Catalogue. Ask your dealer for a copy or write to—

LECTRO LINX, LTD.,
254, Vauxhall Bridge Road, London, S.W.1.





**REALISM
COSTS
ONLY
90
SHILLINGS**

FROM THIS MASCOT LOUD SPEAKER

IT would be quite natural if, when you heard this "Brown" Mascot Loud Speaker, you thought such realism would cost many, many pounds. Its faithful reproduction—so uncannily true-to-life that it creates the illusion that the artiste is in the very room—is quite the equal of the performance of very expensive instruments. You will realise, then, that only the resources of the great "Brown" organisation could produce such a masterpiece for 90/-. Other models from 30/- to 15 guineas.

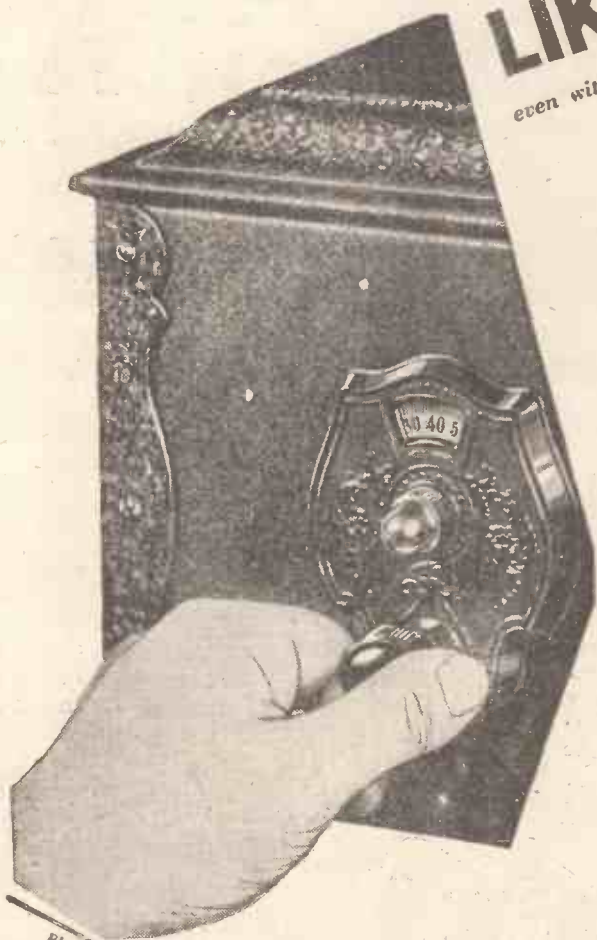
**MADE
BY**

Brown
**BRITAIN'S PIONEER LOUD
SPEAKER MAKERS**

Advt. S. G. Brown, Ltd., Western Ave., N. Acton, London, W.3.

**THE
COSSOR MELODY MAKER**
the most remarkable Receiver ever produced

**CUTS OUT
LOCAL STATION
LIKE MAGIC**
even within a mile or so of the transmitting aerial



**GETS TWENTY
PROGRAMMES
ANY EVENING**

You can take your pick of the programmes with the wonderful Cossor Melody Maker. The Cossor Melody Maker puts all Europe at your finger tips. At the mere turn of a dial you can bring in station after station—Rome, Paris, Berlin—even a novice can get at least 20 programmes—all at full loud speaker strength and free from interference by your local station—the Cossor Melody Maker cuts out its overpowering transmission like magic. *Anyone can build this amazingly successful Receiver . . . no soldering, no drilling, no sawing, and no wireless knowledge is necessary it's as simple as Meccano.* Get full details from your Wireless Dealer or fill in the coupon below.

**COSSOR
Melody Maker**

£7-15s.

Price includes the three Cossor Valves, the handsome cabinet and even the simple tools—everything necessary to assemble this wonderful Receiver. Long Wave Coils 8/6 each extra if required.

Please send me free of charge one of your Constructor Envelopes which tells me how I can build the Cossor Melody Maker in 90 minutes.

Name.....

Address.....

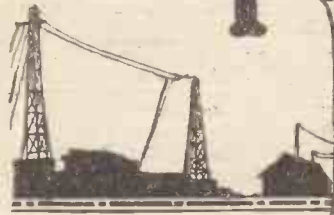
P.W. 12/1/29.

A. C. Cossor, Ltd., Melody Department, Highbury Grove, London, N.3.

Fill in this Coupon NOW!

6943 

Popular Wireless



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RADIO NOTES AND NEWS.

Society Note—B.B.C. Wavelength Changes—The Latest from Mars—Radio from the Mains—More Nature Study—DX Hounds Leap—Radio as Fire Fighter.

S. O. S.

WILL the gentleman, apparently of Greenock, who so kindly sent me the curious implement as a New Year's gift, be good enough to telegraph, at his own expense, stating the purpose for which it is intended, thus saving the technical gang from a nervous breakdown? The voting at present is, 1st, Haggis-cutter; 2nd: Automatic-machine opener; 3rd: Parritch tester.

Idea for Song-Writers.

WHEN one considers how certain nonsensical songs seize the public's fancy and run like wildfire through the Empire, one wonders when a popular radio song will make a hit. Think of "A Bicycle Made for Two," "Oh, Mister Porter," "After the Ball Was Over," and the recent "Why is the Bacon So Tough?" And then imagine: "Give Me My Little Fat Valve," or "Where is 2 L O To-night?" Gentlemen of Boosey's, I look to you.

Wireless Telephony Spreads.

A PUBLIC wireless telephone service has been opened between Holland and the Dutch East Indies. Calls may be made between The Hague, Amsterdam, Rotterdam and Utrecht, to the four leading towns of the East Indies. The fee is £2 10s. per minute, and two days' notice of the call are required. This is the third long-distance radio-telephone service to be opened in two years.

Society Note.

THE Croydon Wireless and Physical Society is the first to open the ball in these Notes this year. Its officers have been elected, and its Hon. Sec., Mr. H. T. P. Gee, of Staple House, 51-52, Chancery Lane, W.C.2, will be pleased to hear from those desirous of joining the society. It is a serious and successful body, and we wish it another good year.

B.B.C. Wave-length Changes.

AS from January 13th the B.B.C. stations' wave-lengths will be: 5 X X, 1562.5; 5 G B, 482.3; Glasgow, 401.1; Manchester, 378.3; London, 353; Cardiff, 323.2; Aberdeen, 311.2; Belfast, 302.7; relays and Bournemouth, 288.5; Newcastle, 243.0.

By the way, the B.B.C. calls "kilocycles" "kilohertz." This is a new piece of B.B.C. City. What's the great idea? We know what a cycle is; why call it a hertz? It hurts! And if a cycle is a Hertz, why not call a metre a Marconi?

Important New Invention.

E. R. R., writing in "The Field," brings before the public notice what is apparently a new product of the inventor's brain; if it is not that, it is the fruit of E. R. R.'s imagination. He introduces "radio meters." Students of philology, and others, will know that this means "measurers of radio," but these radio meters are exceptional, for, says "E. R. R.," "They will measure, that is to say, low tension current up to about 150 volts." (My italics.) Well, clever radiometers which

can measure current in volts ought to be able to act as petrol-gauges!

Odds and Ends.

BERLIN has relayed a Wagner concert from Java. A bit of its "own" back, slightly "faded."

Marconi House is for sale. Senatore Marconi is not included as a "fixture." Men I know say they hope the building will regain its former glory as the Gaiety Bar and Restaurant.

£1 10s. 6d. was collected by the sale of wireless pictures in a Glasgow club. Thirty shillings was paid by the guest of honour, an Englishman, for a photo of Sir Harry Lauder. The odd sixpence was given by an Aberdonian who thought it was the price of the dinner, including wine, cigars, wine and cigars and wine—(and cigars)!

G.B.S. AND B.B.C.



This picture shows Mr. Bernard Shaw broadcasting in happy vein upon Dramatic Art. Note the type of microphone recently used to link up the lecturer to B.B.C. listeners.

Latest from Mars.

DR. MANSFIELD ROBINSON still makes love to Mars. It is now reported that he has hopes of getting through to that planet from Brazil, on 22,000 metres. I am pretty well acquainted with the business capabilities of the chief of the Rio de Janeiro station, and should not be surprised to hear that he has fixed up a contract with Dr. Robinson, providing for one call per week per annum, and, for an extra fee, a guaranteed reply, with the Mars postmark on it. After all, the doctor's money is as good as anybody else's!

Thoughts on Infinity.

HORRID solemn, isn't it? But the principle back of Dr. Robinson's experiments is not so fantastic as might at first be thought. I have doubts about Mars, but why should we confine speculation and experiment to the insignificant scattering of dust which we call our

(Continued on next page).

NOTES AND NEWS.

(Continued from previous page.)

solar system? If the astronomers are to be believed, there are millions more suns, each with its system of satellites. Is it so incredible that in an infinite universe peopled by countless millions of worlds, there should be only one world on which intelligent life exists? I think not! But I am not at all sure that 22,000 metres is the right wave-length to get at it.

Radio from the Mains.

THE idea of distributing radio broadcasting by means of domestic light and power wires has "caught on" in the U.S.A. as a sound proposition. So much so that already one company for its exploitation has been formed, the "Wired Radio Incorporated." This corporation has been granted by the Kolster Radio Corporation exclusive licences for putting radio "on the mains." There can be no doubt that the present generation will see the day when broadcast programmes are "laid on" just as gas, water and electric light are nowadays.

Secrets of the "Beam."

MARCONI'S have sent me numbers 1 and 2 of their new advertising venture, "The Marconi Review." It is very high-brow, commercial and mathematical, but withal of great interest. I suppose that commercial radio engineering is about as far removed from the amateur's gadgets as is the "Flying Scotsman" or the "Golden Arrow" from the toy trains we buy at Christmas. Yet the "Marconi Review" so far has given a most interesting account of the development of the Beam System, showing what an important part was therein played by the famous yacht "Eletra."

The Wireless League.

THIS League deserves to be better known. First, its address is 19, Berkeley Street, W.1, where its secretary sits in his lair waiting to give inquirers full particulars. Membership includes the insurance of wireless sets and accessories, free technical help, and legal advice on all wireless matters. Members are invited to express their opinions of broadcast programmes, which after consideration may be the subject of recommendations to the B.B.C. The League also does useful work in presenting hospitals with free sets, helping the blind, etc. It also has a scheme for the registration of approved wireless traders.

More Nature Study.

THE pup that panicked when the military band was tuned in is no more one of the family; he had to be swapped because his habits were more suited to a prairie than to a house. His successor is a rough-haired terrier, with the sweetest whiskers and beard; only six months old, but the image of an ancient Wesleyan padre I knew years ago. This chap will take anything from the radio except the flute, and if a flautist flaunts his flute during the tyke's waking moments the little blighter barks himself into a fury, and has to bite the sofa cushions to save himself from apoplexy.

Altogether, Boys!

IT is reported from Russia that a man cursed with the name Zlotnikov has been granted a patent for a master wireless clock, by means of which, 'tis claimed, any number of clocks or watches, which are adapted for the purpose, can be kept going and synchronised. It was Charles the Second's grief that he couldn't make two watches keep similar time, and he used to tell people how foolish it was, therefore, to expect all men to think alike. If he could only have had this radio clock—he would have lost his head.

Radio As Fire Fighter.

SOMEWHERE about 1919 I was present at a demonstration given by the Marconi Company to the London Fire Brigade, in order to show how an engine "on the job" could keep in touch with headquarters. The demonstration was successful, and telephonic communication was established in a few minutes. I shall never forget the astonishment of a good lady who, from the window of a little house in a by-street, saw a burly fireman shinning up a lamp-post with the aerial. Nine years have elapsed and now Rochdale has equipped all its fire-engines with radio. Slow but sure! But what of London?

SHORT WAVES.

One old lady writes to say that she can hear much better by using a loud speaker than by headphones, but she simply can't make it balance on her head.

She evidently hadn't seen our issue of December 29th, wherein we published an article entitled: "How to make the 'P.W.' Better Balance Cone"!

NO OLD STOCK.

Mrs. Fan (who is doing a bit of shopping for hubby): "I want to buy a radio battery."

Clerk: "Storage?"

Mrs. Fan (indignantly): "No, of course not! I want a good fresh one."

"Radio News."

A tramp, walking into a pawnbrokers' the other day, enquired how much he would get for a wireless set. When he laid it on the counter the pawnbroker said he would think he'd get quite six months—he'd sold that set to a customer the day before.

Jack: "Was your wedding reception a big success?"

Jill: "You bet! Why, we got Hollywood on the loud speaker."

"Finnish, thank goodness!"—as the DX fan said at the end of the National programme broadcast.

The B.B.C. announce that they would like to find a silent kind of paper which could be used by lecturers, etc., when they read their speeches.

A silent kind of lecturer might be a good idea!

Answer to Correspondent. If your loud speaker continues to croak, remove the horn—you may find a frog has fallen down there.

A TRAGEDY OF 1929?

First Office Boy: "How'd you lose your job, Jimmy?"

Second Office Boy: "Aw, I told the boss I wanted the afternoon off to go to my grandmother's funeral, and he saw me at the football game over the television."

This Power Unit we have here

I must confess, is very dear.

It's guaranteed to give no noise

To spoil the radio listener's joys.

And now it's hooked up all around.

But, darn it all! there's not a sound!

Somehow it's just a little bit

TOO NOISELESS now, I must admit.

"Radio News."

God Save the King.

ALL "P.W."-ites must surely be following the progress of His Majesty's illness with anxiety mixed with admiration for the fight he is "putting up." As a man who has consistently carried out his duty in what must be a most exacting job, he has won the esteem of his people and radio men will recall with a throb of fellow-feeling how he expressed his delight in sitting down to his set for a little ether-combing. One touch of radio—and our King becomes one of us, just as he is one of the philatelists.

The DX Hounds Leap.

MY query about the reception of 6 AG (W. Australia) has proved that the DX hounds, if they were sleeping, had each one eye open. Our champion, R. W. S. (Little Waking), galloped up at the whistle, with a confirmation card from 6 AG in his teeth, and got a lump of sugar. A. G. M. (Stoke-on-Trent) and others also claim 6 AG as their home. J. E. B. (Luton) got him, but modestly described it as "the usual roar of atmospherics, bursts of music, intermittent fading and half-heard announcements that we call Australia!" His query about Nairobi is answered by R. W. S.

Text-Book Wanted.

IN "P.W." for December 22nd, page 836, a gentleman who pleads for good English yet signs his letter in Latin, deploras the lack of lucid text-books about wireless. Dr. J. A. Fleming is a worthy successor of those Victorian giants Huxley, Tyndall and Faraday, and his book entitled "Waves and Ripples in Water, Air and Aether" is a fascinating and simple exposition which will prepare the student's mind for details of radio methods. Then, if our correspondent will let me have his name and address, I will send him a book on elementary physics for wireless amateurs.

Physics the Master Key.

THE difficulty of writing about wireless for non-scientific people lies in the fact that wireless is an art of the electrician, and a proper understanding of it presupposes an understanding of an enormous number of physical constants and conceptions, electrical, magnetic, electromagnetic, acoustic, chemical and mathematical. If one mentions an ampere one involves the volt and the ohm, which, in turn, involve other physical quantities, and so on, well-nigh *ad infinitum*. There are, however, a number of admirable books for beginners—Mr. P. W. Harris has one or two to his credit—which should be found at any large bookshop.

An Idea for 1929.

I DON'T know why the island of Tristan da Cunha suddenly occurred to my mind, but it was no doubt telepathy—"I don't think." However, what a boon it would be to the inhabitants of that island, where a steamer calls but once or twice a year, if they could only have a small short-wave telephone transmitter and receiver, and get into touch with civilisation through the world's amateurs. I wonder whether the amateurs could and would "put it over." It would be a noble gesture.

ARIEL.

THE 1929 "FILADYNE"



One of the most popular circuits ever placed before "P.W." readers is the Filadyne, a circuit originated by the Technical Editor. It is of an entirely novel character and can give astonishing results. Here is an entirely new two-valve version. Designed and described by J. ENGLISH.

THAT unique circuit, the Filadyne, is of particular interest to listeners who want big results for a small outlay. Within reasonable distance of the local station this detector scheme gives quite a fair loud-speaker output with no L.F. amplification at all. Another pleasing

powerful to give excellent loud-speaker reproduction from the local station, results being well above the average for a normal two-valve set. The Filadyne is certainly a detector of great purity, and the quality of the output of this two-valve combination is most pleasing, particularly if it is reproduced on a good loud speaker. Moreover, the set can put up a very good DX performance for its size, in fact, such is its response to the controls that it gives you the impression you are almost handling a three-valve receiver.

quality without much expense. Hence this receiver can be reproduced for some fifty shillings and a little common-sense construction.

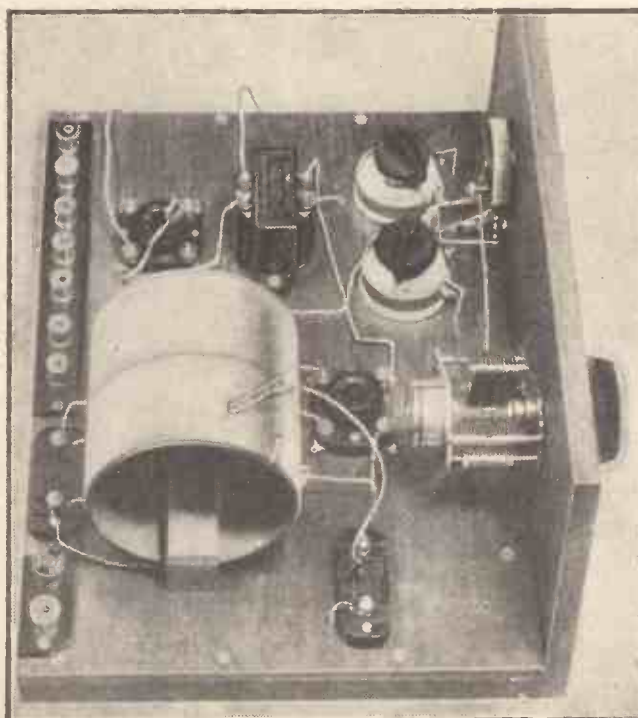
Interested experimenters will certainly want to know how the circuit functions and to have some description of the new features mentioned above, so let us begin with the theoretical diagram of Fig. 1. We have the usual tuned double-filament coil L_1 , L_2 , and potentiometer reaction-control, but you will notice at once that the reaction coil L_3 is not in its usual position. By shifting it to the anode circuit we obtain certain definite advantages, such as a smoother control of reaction and an easier elimination of H.F. energy from the L.F. output grid circuit. You will find further details of the anode reaction scheme in a recent article of mine in POPULAR WIRELESS. When tuning in a strong station I have noticed a perceptible increase in volume when the reaction coil is in the anode circuit as compared with it in the grid circuit. This would appear to be due to the fact that a stronger regenerative effect can be obtained with the valve biased nearer to the upper bend on the grid current-anode volts curve, which naturally ensures a bigger L.F. output for a given H.F. input on the filament.

The New Circuit.

A two-valve receiver does not eat into a lot of money either for building or for up-keep, and when designing this set I have had in mind the man who wants reasonable selectivity and good volume and

COMPONENTS AND MATERIALS.

- 2 Sprung valve holders (Benjamin, W.B., Igranic, Lotus, Pye, Ashley, B.T.H., Bowyer-Lowe, Marconiphone, Redfern, Burndept, Formo, Burne-Jones, Wearite, etc.).
 - 1 L.F. transformer, ratio about 6 to 1 (Igranic type J in set. Any good make in which the correct ratio is available).
 - 2 Baseboard rheostats, 30 ohms (Igranic, Lissen, etc.).
 - 1 .0001 mfd. fixed condenser, one .001 mfd., and one .005 mfd. (Lissen, T.C.C., Dubilier, Igranic, Mullard, Clarke, Goltone, Magaun, etc.).
 - 1 .0005 mfd. variable condenser (Dubilier, Lotus, Lissen, Cyldon, Burton, J.B., Igranic, Ormond, Colvern, Bowyer-Lowe, Pye, G.E.C., Peto-Scott, Raymond, Formo, etc.).
 - 1 Panel-mounting potentiometer, 400 ohms (Lissen, Igranic, etc.).
 - 1 On-off switch (Lotus, Benjamin, Lissen, Burne-Jones, Igranic, etc.).
 - 9 Terminals (Ealex, Belling & Lee, Igranic, etc.).
 - 1 Tapping clip.
- Materials for coils, wood for panel (see text), cabinet if desired, wire, screws, etc.



Mr. English invented the tuned Filadyne-choke system and this is incorporated in his latest set. As you will see, the set is quite a simple, inexpensive affair.

Selectivity.

The remainder of the detector section is quite normal, the aerial lead being tapped on to one of the filament coils, the degree of selectivity increasing and the volume decreasing as this aerial tap is lowered towards the battery end of the coil. There

aspect is that high voltage batteries are not required, and in every way the Filadyne valve makes the utmost of the power supplied to it.

Results Above the Average.

Recent developments led me to design the two-valve receiver illustrated on this page. This little set incorporates several new features and comprises the latest version of the Filadyne detector followed by a simple L.F. stage. I have purposely limited the design to two valves because this particular combination is sufficiently

(Continued on next page).

THE 1929 "FILADYNE."

(Continued from previous page.)

is a small fixed condenser C, in series with the aerial lead, as this improves selectivity when the set is used on a normal aerial. If you change over to a small aerial, it is easy enough to short this condenser with a piece of wire, thus saving the cost of a second aerial terminal. Reaction is controlled by means of the potentiometer, which is shunted across the filament supply,

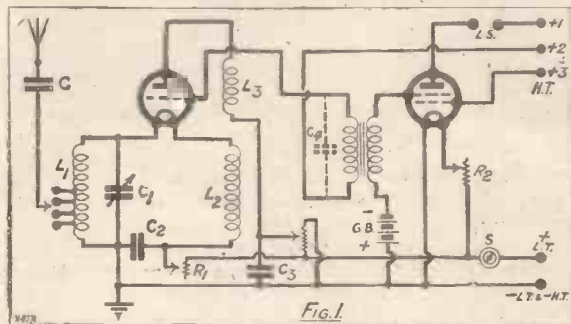
You will notice that a tetrode valve is shown in the L.F. position. While ordinary valves may be used with every success without any alteration in the design, I have made provision for the tetrode in the interests of economy. The Filadyne detector rarely requires an H.T. voltage more than 40, while the tetrode power valve will comfortably handle

the full output of the detector on 40 to 50 volts only. So there is no need for an H.T. supply of umpteen volts: a modest battery of 60 volts will do excellently, while the necessary valves are not expensive.

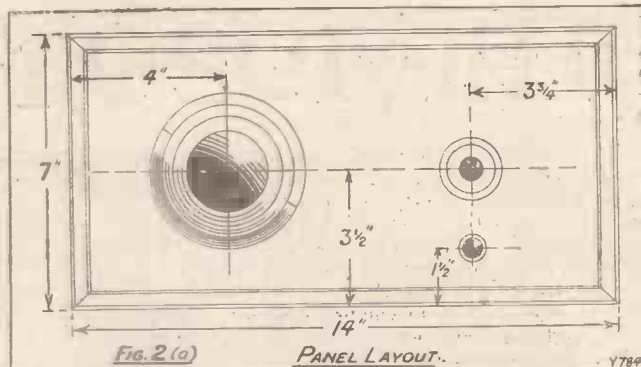
Fixed Condensers.

After an inspection of the theoretical circuit you may think that I have put in too many fixed condensers. With the exception of C₂ they are

all necessary, but the capacities are not critical. The set will work almost as well without C₂ and any fixed condensers from .001 mfd. to 2 mfd. capacity will do for C₂ and C₃. Some types of transformer have the shunt condenser C₁ sealed up



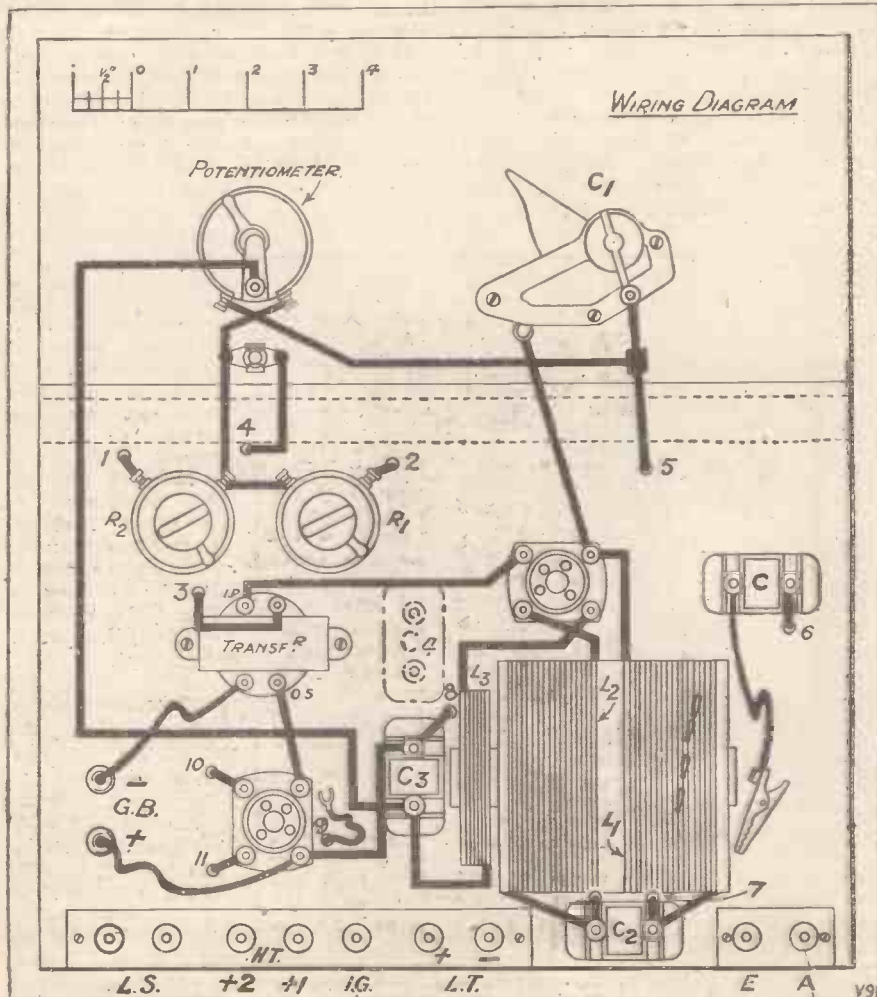
the condenser C₃ being necessary to bypass the H.F. component in the anode circuit. The great advantage of this form of reaction control is that it has no effect on tuning, which is then much easier, especially on weak signals.



inside them, so that this condenser is not necessary if you use one of these transformers. The transformer used in the original set has such a built-in condenser, and in spite of its small size it works quite as well as a more expensive model of larger dimensions. The low A.C. resistance of the Filadyne valve makes it possible to couple it to the L.F. valve with a high-ratio transformer such as the 6:1 component used here without loss of quality. There is no reason, however, why you should not use a lower ratio component if you have one.

The Valves To Use.

There is just one other point in connection with components which I must deal with before getting down to practical details, and that is filament current control. To make the set really adaptable you should be able to use two valves of different filament rating. There are valves specially good as Filadyne detectors in the 2-, 4- and 6-volt ranges, so that you can use any one of these with the 4-volt tetrode or a 4-volt Filadyne valve with a 2-volt L.F. valve, and so on. This is easily arranged by providing a 30-ohm rheostat in series with



VALVE DETAILS.

VALVE.	Filament Volts.	RHEOSTAT SETTING.		H.T. Volts.
		2v. Accu.	4v. Accu.	
Dario Super H.F. Bi-volt.	7	5	1 to 3	24/30
do. 4 volt.	1.6	1/2	Just on	18/24
D.E.2 L.F.	1.4	nearly full	1/2	30/30
D.E. 3	2.5	—	1/2	30/40

each valve filament. These rheostats are of the baseboard-mounting type, and when once adjusted to suit the valves you are using they require no further alteration. A filament rheostat is essential for the first valve, because adjustment of the filament current of the Filadyne detector has to be made rather carefully for the best results. However, once you have chosen your Filadyne valve and set the rheostat, it can be left at that adjustment for good.

The Reaction Control.

When choosing the potentiometer the features to look for are a smooth movement of the contact arm and a wire-wound resistance of not more than 400 ohms. An easy running contact arm is essential for a silent and smooth control of reaction.

(Continued on next page.)

THE 1929 "FILADYNE."

(Continued from previous page.)

The construction of the receiver is quite simple and straightforward, but there are one or two features calling for special mention. This is not a set where construction consists merely of assembling a collection of components and then wiring them up. The keen constructor likes something more exciting than this, and here he will find just that extra constructional work which is neither tedious nor superfluous.

Novel Construction.

The unorthodox Filadyne scheme surely deserves something new in the way of constructional ideas. Accordingly I have

prefer it, and it looks quite well if "picture framed" like the wooden panel. The moulding is secured to the wooden panel with small panel pins, and the help of a little glue or Seccotine. After a good sand-papering, it can be stained and polished.

The wood panel is attached in a simple manner to the baseboard after drilling, as shown in Fig. 2b, the baseboard being another of 1/4-in. thick wood supported at each end on battens. This allows for under-baseboard wiring which is convenient in any type of set. The panel

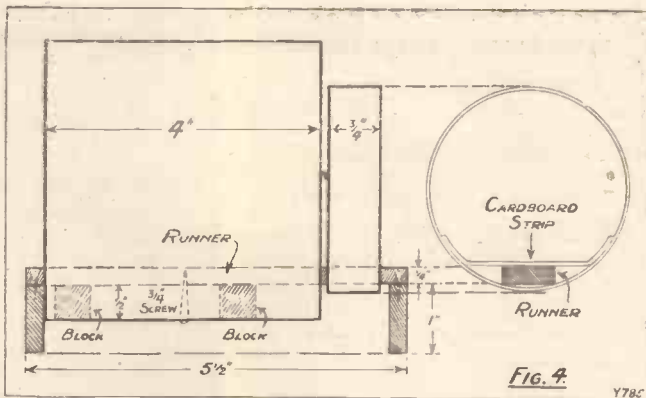


FIG. 4.

Y78C

drilling points are shown in Fig. 2a. The ebonite terminal strips are screwed down to the baseboard after cutting out pieces of wood slightly smaller than the strips. You will not require much advice on mounting components and wiring up the set, but I would recommend you to leave out the coils until everything else has been done, so the necessary details of winding, etc., will be left for the moment.

If you follow closely the under-baseboard wiring diagram of Fig. 3, you can use bare wire, as none of the leads crosses another. The wires are brought up through 1/8-in. diameter holes drilled through the baseboard, which can be done either before or after mounting components.

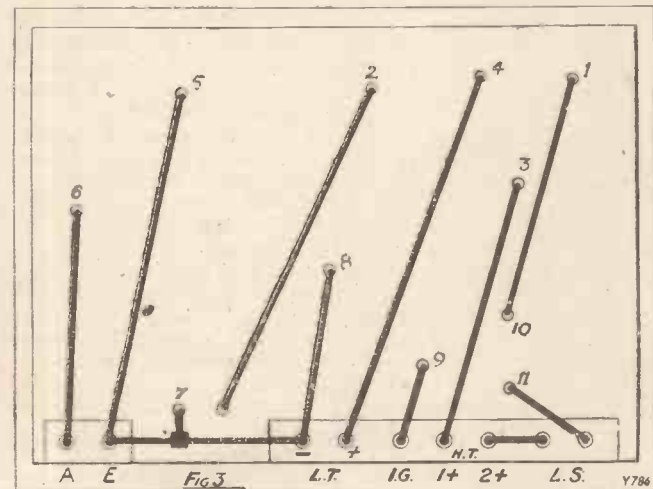
In the wiring diagram I have shown in dotted lines the position of the shunt condenser C₃, should you use a different transformer where this condenser is not sealed up inside it.

The final step in construction comprises the making and mounting of the coils which, from the photographs, may appear to be complicated. Actually this part of the work is quite simple and straightforward.

First of all we have a 4 in. by 4 in. former of Paxolin, Pirtoid, etc., on which you will wind two sections, each of 50 turns of No. 24 D.C.C., both sections being wound in opposite directions with a space of 1/2 in. between them. One of these sections, the one wound in

Mounting the Reaction.

We have now to mount the reaction coil so that its coupling with the filament coil can be varied. The necessary constructional details are shown in the diagram of Fig. 4. A 3/4-in. screw secures the 4-in. former to a 5 1/2-in. length of 1/4-in. wood 1-in. wide, which forms a runner for the moving reaction coil. A piece of thin cardboard is glued inside the reaction coil former. When placing the reaction coil on the runner the direction of winding must be opposite to that of the nearest filament coil and in the same direction as the tapped filament coil L₁. Operating details of the set will be given next week.



Y78B

avoided conventional construction wherever possible.

First of all we have the panel-baseboard assembly. Instead of the stereotyped ebonite panel screwed to a wooden baseboard, I have made up a panel of 1/4-in. thick wood and framed it in a narrow moulding in the same way that glass is set in a picture frame. The photographs you see here cannot do justice to the novel and pleasing appearance of this type of panel, which is so easy and cheap to construct. It

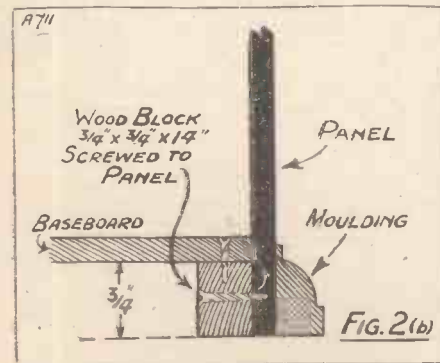
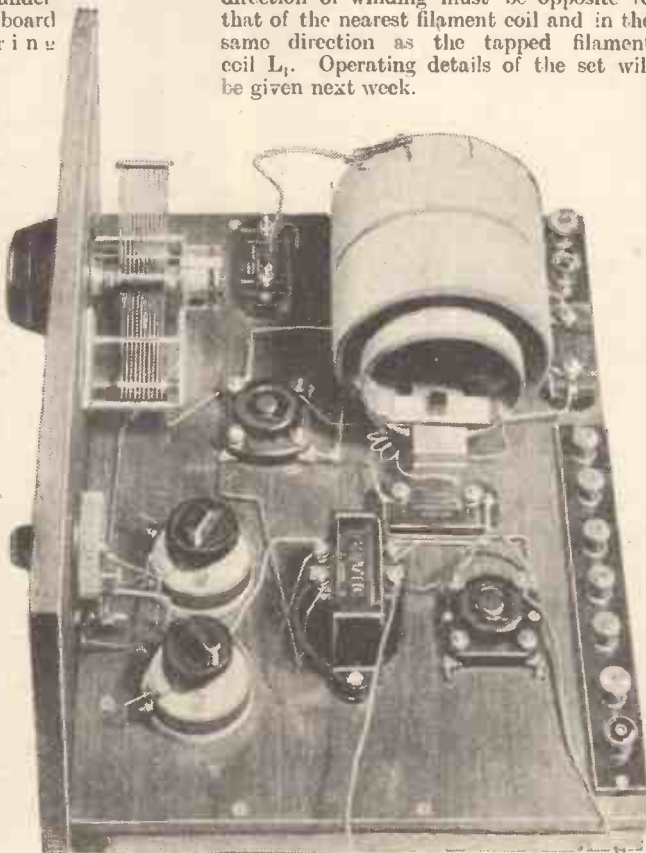


FIG. 2(b)

looks particularly well in a cabinet as the moulding avoids the monotony of the perfectly flat ebonite panel. You need not fear loss of efficiency because the panel is a wooden one. All the components mounted on it are at earth potential, so that there can be no H.F. losses or leakage. Of course, a standard ebonite panel can be used, if you



Note the novel choke-tuner, with its simple and efficient reaction coupling adjustment. The reaction control is by a potentiometer and is unusually smooth.

LATEST BROADCASTING NEWS.

SAVOY HILL
MOBILISES

GALE WARNINGS IN 1929—
ANSERMET AGAIN—JIMMY
WILDE AND BENNY'S BAND
—SCOTTISH STUDENTS'
BROADCAST—A WORTHY
APPEAL.

Savoy Hill Mobilises.

THE passing of the old year witnessed a great revival of activity at Savoy Hill. This came as a considerable surprise in those circles which had encouraged the view that the B.B.C. had lost its accustomed resiliency in defence which pulled it through so many critical times up to twelve months ago.

As the rumours of attack developed into probabilities, circumspection increased, and the holidays saw no dulling of the edge of alertness. A storm is likely to burst; but it will do more good than harm to the B.B.C. Therefore, if it does good to the newspapers concerned, it will belong to that necessarily limited category which benefit the victors as well as the vanquished.

Gale Warnings in 1929.

By arrangement with the Admiralty the broadcasting of Gale Warnings in 1929 will take place at fixed hours, namely, 1 p.m., 4.45 and 6.15 p.m. on weekdays, and 3.30 p.m. on Sundays. The object is that mariners shall tune in at these hours which it is considered are most convenient for the purpose.

The arrangement has necessitated an adjustment in the broadcasting of the Greenwich Time Signal, which in future will be given at 1 p.m. from 5 X X (in place of Big Ben at that hour) and a new one at 4.45 p.m. which will precede the present 4 p.m. Time Signal. On Sundays the Time Signal will be broadcast at 3.30 instead of Big Ben being given as hitherto at 4 p.m.

Ansermet Again.

Ernest Ansermet, the distinguished Swiss conductor whose work is already known to British listeners, is to direct the first of the second half of this season's Symphony Concerts at Queen's Hall on Friday, January 18th.

The programme will include items by Linda Seymour, Kate Winter, Theresa Ambrose, Rispah Goodacre, and a section of the National Chorus. On the previous evening the Royal Philharmonic Society's Concert, conducted by Barbirolli, will be broadcast from the Queen's Hall.

Jimmy Wilde and Benny's Band.

Jimmy Wilde, who since his retirement from the ring has taken an interest in many other forms of entertainment—his name has been associated with three cinemas in South Wales—has recently taken over the Cardiff Palais de Danse at the Celtic Rooms.

Jimmy knows from experience something of the value of publicity, and when he installed Benny's Band as his musicians he

realised that their reputation as one of the finest dance bands in the Principality could be calculated to attract the business. Cardiff Station is relaying its programme between 10.20 and 11 p.m. on Friday, January 18th, with an interval at 10.30 for items by the Welsh Miners' Quartet.

Scottish Students' Broadcast.

For an hour and a half on Monday evening, January 21st, Scottish stations will be under the (what some people might be inclined to consider) risky control of University students. There seems to be no special reason why the B.B.C. should hand over their studios to young men whose reputation, when let loose, is certainly on

the lively side, but no doubt adequate assurances were forthcoming which eliminates any fear of overstepping the mark.

That being so, listeners can look forward with pleasure, rather than with trepidation, to a good entertainment, because it is fairly certain that the students of Glasgow, who are to have the first turn, will put up a show that will take a lot of coaching.

Edinburgh and Aberdeen students follow, and their spasms are not likely to fail in effort to put the first fellows in the shade. However, it will be for listeners to judge which of the three entertainments they like the best, and the three programmes will be broadcast from all stations in the Scottish group.

A CHAT ABOUT CUPS?



Sir Thomas Lipton, the famous sportsman and tea merchant, broadcasting from W J J D, the Chicago Station, during his recent visit to the States.

A Worthy Appeal.

It is difficult to recall among all the many hundreds of appeals for funds on behalf of charity which listeners have been asked to support during the last four years, one that possesses a story so brimful of British pluck and self-sacrifice as those will hear who listen to the Newcastle Station to-morrow (Sunday), January 13th.

It is another of those stirring stories of the gallant deeds of Bob Smith, coxswain of the lifeboat "Harry Vernon." "Bob" died last year with a record that must be outstanding, even in the annals of that distinguished but reticent class to which he belonged.

No doubt East Coast listeners will show their appreciation of the services of one of the most intrepid lifeboatmen who ever lived.

TECHNICAL NOTES.

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

RECORD SPEED

REVOLUTIONS PER MINUTE—EARLY EXPERIMENTS—LENGTH OF RECORD, ETC., ETC.

Record Speed.

I AM often asked by readers why it is that a gramophone record runs at a speed of about 75 to 80 revolutions per minute, and why this particular speed was chosen.

You will realise that once any arbitrary speed has been standardised by record manufacturers, it becomes a very difficult matter to get away from that practice, since a gramophone must be made to play any type of record. Therefore, there is little likelihood of the speed at present adopted being seriously departed from.

Early Experiments.

As to the reasons why this speed was adopted, it would take a long time to discuss the various considerations which enter into the question; indeed, it has been asserted by some experts that there is really no particular reason at all for a speed

of about 80 revolutions per minute and that the speed was arrived at more or less by accident.

I can tell you that this speed was *not* arrived at by accident, but was the result of many experiments undertaken in the early days of the gramophone, although that is not to say that, with new conditions and with the many improvements which have been made in the recording and duplication of gramophone records, some different speed might not give just as good, if not better, results.

Length of Record.

That the actual linear speed (that is, the speed with which the record moves under the needle point) may be varied within wide limits is shown by the fact that the actual linear speed at the edge of the record is roughly two to three times as great

(Continued on page 986.)



THE A.B.C. OF THE L.T.B.



THE first accumulator or storage battery was produced by a Frenchman named Plante about seventy years ago. Like the modern accumulator, it consisted of sheets of lead, separated from one another but submerged in acid.

Plante used sulphuric acid, and he found that if the cell were connected to a source of electrical pressure and charged, certain chemical changes took place inside it. Plante found also that when disconnected and stood aside, the cell's new chemical composition was retained for days, or even weeks, yet when the cell was connected to a suitable circuit the chemical changes began to reverse again, and go back to the normal state, and in doing so gave rise to an electric current like the one that was required in the first place to create those changes.

Input and Output

Plante's cell, therefore, was the means by which electricity could be "accumulated" and stood aside conveniently until wanted. It was a practical and reasonably cheap method of storing electricity, and although the accumulator has been improved greatly during the seventy years of its existence, it remains in essentials very much the same.



A smear of "Vaseline" or other petroleum jelly will protect the terminals.

* * * * *

Every listener knows that it is advisable to keep on good terms with the accumulator—for if you "upset" it the carpet suffers. This article tells of the many little practical points that it pays to watch if you desire to get maximum service from your Low-Tension Battery.

By P. R. BIRD.

* * * * *

One of the great advantages of an L.T. accumulator is that it is a reasonably low-loss component. That is to say, the amount of electricity which it will give off after having been stood aside is nearly equal to the amount which was put into it. The convenience of being able to store electricity by means of an accumulator is so great that even if it gave back only a half or three-quarters of the energy put into it, it would be an extremely useful piece of apparatus. As a matter of fact a good accumulator will do far more than this, and generally about ninety per cent of the input is returnable as output.

When an accumulator has been newly charged, tests with a voltmeter will show that the electrical pressure (or difference of potential, or voltage) between its negative and positive plates appears to be about 2.5. After a time the electrolyte tends to settle down, and the voltage of the cell becomes about 2.1.

As the accumulator is discharged, the voltage across any pair of plates slowly falls, and the lower limit is reached when the voltmeter shows only a difference of only 1.8 volts across each cell. Fortunately, no matter what the size of a battery is, whether it be a large 80-actual-ampere-hour, used for starting a motor-car, or a small 20-actual-ampere-hour cell for running a wireless set, the voltage for any given pair of plates behaves in the way stated above.

Voltage Variations.

Thus a 2-volt battery (one pair of positive and negative groups) will usually show a voltage between 2.1 and 1.8, according to whether it wants charging or not. A 4-volt battery (two groups of plates) will show double these figures (newly-charged 4.2, and 3.6 when run down), whilst a 6-volt battery, consisting of three groups of positive and of negative plates,

will show treble these figures, i.e. a voltage of 6.3 down to about 5.4.

The voltage or difference of pressure between the plates is not the only method of knowing the condition of a battery. Equally good is the indication to be obtained from the liquid in the cell.

Cases are sometimes met with in which an obviously dud battery, quite useless for wireless work, will show a reasonably good voltage after discharge. At service stations and other places where the condition of the accumulator is a matter of the utmost importance, the voltmeter readings are always supported by hydrometer readings. (Hydrometers can be obtained quite cheaply from any electrical shop and every amateur who aims at keeping his L.T. battery in good condition should procure one.)

A Useful Check.

Instructions are given with the instrument, which will be found to consist of a kind of fountain-pen filler, which can be dipped into the liquid of each cell in turn, and which will draw up some of this liquid into a glass tube. Arranged in the tube are floats, generally of different colours, and the position of these indicates the condition of the battery.

There are generally three of these floats
(Continued on next page).



This illustration shows how the electrolyte is drawn up into the tube of the hydrometer, in which are floats that show the condition of the cell.

THE A.B.C. OF THE L.T.B.

(Continued from previous page.)

in the tube, one heavy, one medium, and one light. When the accumulator has been properly charged and is in good condition all three of these will float to the top of the liquid. About half-way through the discharge of the accumulator it will be



Testing the voltage of a battery by means of a voltmeter connected across its terminals. The most accurate reading is obtained after the set has been in use for an hour or so, and whilst the battery is still supplying current to the set.

found that the heavy float has sunk to the bottom of the liquid and the medium-weighted float is preparing to do so.

When the battery is run down even the light float will refuse to keep to the top of the liquid sucked up into the tube, thus showing that the battery is in need of recharging. The hydrometer test is not an electrical one at all, but is a test of the "specific gravity" of the liquid. In other words, the hydrometer checks the chemical changes which are going on inside the cell.

The Two-fold Test.

The actual specific gravity of your accumulator will be found to vary a little with different makes, but as a rule a fully-charged battery will have a specific gravity of about 1.275. Such a battery is fully discharged when the gravity is about 1.150. An important point to notice about the specific gravity is that it is conveniently proportional to the condition of the battery

"ALL PRESENT AND CORRECT!"



Here are shown the various parts of an accumulator — containing case, 14, positive plates, negative plates, separators, lugs, etc. (Note that there are 5 negative (right) and 4 positive plates so that when assembled both sides of each positive faces a negative plate.)

so that when the battery is half charged the specific gravity will be half-way between the two figures mentioned above. (i.e. 1.210).

By using both the voltmeter and the hydrometer to check the condition of your accumulator you can be quite certain of keeping it in good condition. An old battery in which the active material has become very poor is quite capable of giving a misleading *voltmeter* reading, and an accumulator from which acid has been withdrawn or spilt is quite capable of giving a misleading *hydrometer* reading. But there is no accumulator fault which can mislead both the voltmeter and the hydrometer when they are used in conjunction, so that the use of both instruments (and they are both perfectly easy and simple to use) is a complete safeguard for the accumulator owner.

The maker's instructions regarding the charging and discharging of an accumulator should always be adhered to, for although a robust instrument, an accumulator will repay its owner for all the care that is taken with it. Remember that cleanliness is essential and the battery should not be allowed to become dirty or splashed, but should frequently be wiped over with a clean cloth.

Acid and Accidents.

The acid is harmful to all clothes, sore hands, etc., and nowadays everyone knows that it must be treated with the utmost circumspection and under no circumstances must it be allowed to come into contact with clothing, carpets, or anything of the kind, which it will quickly attack and in time destroy.

To prevent it attacking the terminals of the accumulator, these should be cleaned thoroughly with sandpaper or wiped over with a cloth dipped in strong soda water, and then they should be coated with petroleum jelly, a smear of which will afford complete and continual protection.

As an accumulator is sometimes handled by quite inexperienced people it should be noted that there is a right and a wrong way to unfasten its leads. You should *never undo the L.T. leads at the ends joined to the set.*

The proper, and indeed the only safe way to disconnect them is first to take them off the L.T. battery itself.

Disconnected L.T. leads which are joined at one end to the set are comparatively harmless. But leads disconnected from the set at one end and joined to the L.T. battery at the other end, are a source of danger. If the ends of such wires touch the wires will heat up, and there is danger of fire.

The vent plugs in an accumulator are an important part of its construction, and care should be taken not to lose these.

The holes in the vent plugs should be kept open, and as gas escapes from these when the accumulator is being charged and when it is in use, it is dangerous to place a naked light near to them. The greatest enemy of the accumulator is sulphation, which is a form of chemical action that attacks the plates if they are not properly looked after.

Sulphation is sure to be troublesome if the accumulator is allowed to run down and then stand aside without being recharged. Consequently, always make a habit of returning the accumulator promptly to the charging station as soon as the voltmeter or hydrometer tells you that re-charge is necessary.

Don't Shake It!

Remember, also, that an accumulator should not be shaken about more than is necessary. Constant charging and discharging is apt to loosen some of the active material on the positive plates of the cell, and if the cell is shaken this may come in contact with some of the negative plates. If so, it immediately sets up a little "battery" on its own and a form of local action commences which may in time completely ruin the accumulator.

Local action is one of the causes of over-sulphation, and in addition to the accumulator standing idle, which is another common cause, other sources of sulphation are under-charging, "running the cells



In time the acid level falls, owing to evaporation, gassing, etc. Fresh acid must not be added, but the loss should be made good by adding a little distilled water.

down too far," an internal short-circuit such as is caused by metallic impurities finding their way through the vent-plug holes, underfilling of the accumulator, or filling it with acid of the wrong specific gravity.

Level and Loss.

Finally, remember that the level of the acid in an accumulator should never be allowed to fall below the top of the plates, in fact, it always should be slightly above this, say half an inch or so. In time a certain amount of the electrolyte will be lost owing to evaporation, etc., and it will be necessary to add *distilled* water occasionally to make up for the loss. (The sulphuric acid does not evaporate, so, on no account should more acid be put into the cell, only distilled water, or otherwise the specific gravity will rise owing to the fresh acid added.)



The problem of communication between aircraft and aerodromes and other stations is being investigated very carefully. This article describes some of the steps that have already been taken to make air transport safe.

By EDWARD B. CRAFT.

THE present development of air transport is bringing out its need for adequate communication in much the same manner as the earlier development of railway operations disclosed for that industry the necessity of special communication services if speed and density of traffic were to be attained with safety. The electric telegraph, by a most fortunate coincidence, was available just at the time the railways required it; and as the demand for speed became pressing the telephone was perfected.

By another fortunate coincidence, radio appears to be available just at the time it is needed for communication with aircraft in flight. During the war, radio equipment of relatively crude design was installed in aircraft and proved of great utility. Since the war radio telegraphy for aircraft has been further developed by the naval and military services of most countries, but radio telephony has received less attention, probably because of the inherent difficulties and lack of a pressing demand.

Increasing Safety.

When surprises due to bad weather can be eliminated, the safety of air transport should compare favourably with that of other forms of transportation. By means of a suitable communication system weather reports from observers located along and near an airway can be collected; and it should be possible, therefore, to reduce materially the weather hazard of air transport.

On some airways communication between terminal landing fields or airports is now made by means of radio telegraph and on others by trunk telephone calls. Neither system is ideal for the purpose. An ideal system which is instantaneous and reliable repeats messages at all airports, is free from interference, takes up no radio routes, and furnishes a permanent record of all messages at all airports, is the telephony-typewriter service.

This makes possible the instantaneous transmission of communications between distant offices, and simultaneously provides each office and any desired intermediate

stations with typewritten copies. This service has been used for a good many years by the principal Press associations in America and is now being extended rapidly to serve the needs of larger business organisations.

When an aviator leaves an airport he should be given information of the weather along the route ahead of him, and a forecast of the nature of probable changes during the time of his flight. If general weather conditions are settled, or if his flight is a short one, a forecast is entirely adequate. However, for long flights and at times of uncertain and threatening weather, it is important that the pilot be continuously

airway. Provision of radio transmitters at airports and receiving sets in the planes will make possible a simple one-way system of communication, and permit any number of planes in the air to be advised without confusion.

Experiments in America.

The perfection of facilities for communicating weather and landing information to planes in flight, which will enable them to operate with safety under relatively unfavourable meteorological conditions, will greatly stimulate the demand for improved aids to navigation. It seems to be established that under conditions of poor visibility, when landmarks are totally obscured and beacon lights are useless, flying requires some form of radio goniometry if the pilot is to find his way through.

A number of systems have been proposed for this purpose; evolution of the system which is most satisfactory will be a matter of time and will require close co-operation on the part of all factors in the industry.

In America the Bell Telephone Laboratories, at their radio station at Whippany, New Jersey have erected an experimental two-way radio-telephone system and radio



A special aeroplane equipped with radio-telephonic and other types of wireless apparatus. It is a veritable wireless laboratory.

advised by radio of the weather conditions he may encounter during his flight.

In particular, storm warnings and reports of the visibility and landing conditions at the airport where he expects to land should be sent him. Weather and landing advice can be broadcast from each airport along the

beacon. In connection with this apparatus it utilises a Fairchild Cabin Monoplane with Pratt and Whitney "Wasp" engine. The plane has been carefully bonded and shielded and is equipped with radio field-measuring apparatus of the laboratories' design.

(Continued on next page.)

TESTING DRY BATTERIES.

What happens when an H.T. battery "runs down"? Some interesting and important facts are given in this article.

From A CORRESPONDENT.

THE factor which causes the voltage of a dry battery to fall, though this is not perhaps generally known, is rising internal resistance. In a new battery of good design and construction the internal resistance of the cells is very low indeed, being but a small fraction of an ohm apiece. As soon, however, as the battery is put into service two causes of deterioration set in.

In the first place polarisation to a greater or less extent occurs, owing to the formation of hydrogen bubbles about the positive carbon rod. These are dealt with by the depolariser of manganese dioxide, which gives up part of its oxygen to combine with hydrogen and form water.

A Second Cause.

This process brings us to the second cause of deterioration. The manganese dioxide within the sac or "dolly" which surrounds the carbon rod becomes gradually used up, and as it does so the resistance of the sac itself increases. There is no longer a perfectly free path through the cell, and the voltage falls in consequence.

It has been drilled into us for years now that the only proper instrument for taking H.T. voltages is a high-resistance moving-coil voltmeter. This advice is all very well up to a point. The higher the resistance of the meter, the truer will be the reading obtained of the E.M.F. of the battery, taking no account of its internal resistance.

But as the internal resistance rises, this type of voltmeter may give a rather false indication of the battery's condition so far as doing work is concerned. Remember that voltage merely corresponds with pressure in a steam boiler. A pressure of, say, forty pounds to the square inch can be generated in a tiny boiler, but the amount of steam that the boiler can deliver is too small to do any useful work. The battery has to deliver current, and if the internal resistance is high, it may be unable to give as much as we require from it.

Finding True Condition.

It is sound practice always to test a high-tension battery when it is under load, for then we obtain a reading which shows what we may call the true working E.M.F. Better still, if you have a high-resistance instrument, take a voltage reading first of all on open circuit, and then upon closed circuit. Should the resistance of the battery be high, there will be a big difference between the two.

A very convenient way of obtaining a rough idea of the battery's resistance is to arrange across the terminals of the voltmeter a resistance with a value of about 3,000 ohms capable of carrying a current up to 50 milliamperes, and so disposed that there is a switch enabling it to be thrown into circuit (that is, in parallel with the voltmeter's coil) or out of circuit.

Take the reading first of all with the

switch open, so that the resistance is out of circuit. Then close the switch and take the readings again, but do not leave the switch closed for more than just enough time to note the reading. The greater the difference between the two readings, the higher the internal resistance of the battery under test.

A good-quality battery in new condition should show a drop of not more than 2 to 3 per cent when the switch is closed; with a bad one, even when new, the drop may be quite considerable.

When the battery has been in use for some time the difference between the two readings will naturally increase. When it reaches from 10 to 15 per cent the battery may be regarded as having reached the limit of its useful life.



"Air and Ether."—Inspecting the radio transmitter and receiver installed in the aeroplane.

Another way of obtaining an approximate idea of the internal resistance of high-tension batteries is to make use not of a voltmeter, but of an ammeter.

The negative terminal of the ammeter is connected to the negative contact of the battery, and a lead with a bared end is fixed to the positive terminal of the instrument. One touches this bared end for an instant on the extreme positive contact of the battery, watching the meter pointer while. The lower the resistance of the battery, the greater the number of amperes which will pass.

Extreme Care Required.

Generally speaking, a high-tension battery has developed too high an internal resistance by the time that it fails to pass about 5 ampere. In the hands of an expert, the flash test is an exceedingly useful one, but it is not recommended to the beginner.

AIR AND ETHER.

(Continued from previous page.)

With this plane exact measurements can be made at various altitudes, under different weather conditions, of the efficiency of radio transmission from the Whippany transmitter. In addition, the plane carries radio transmitting and receiving sets of experimental design. It is, in fact, a flying radio laboratory in which the engineers may experiment under actual flying conditions.

The Jamming Problem.

A radio-telephone system with a sufficiently powerful transmitter and sufficiently sensitive receiver to give reliable communication for 100 miles will give fair communication for perhaps 200 miles, and its carrier-wave will interfere with reception for a much greater distance. To avoid interference due to the beating of carrier frequencies, airports within a few hundred miles of one another may be assigned to different frequency channels, but serious difficulty is at once apparent from a glance at the map of the National Airways.

Within 800 miles of Chicago, for example, there are over fifty terminal fields or airports. It would seem obviously impractical to assign the available telephone channels, of which the international agreement allows six, to cover the eastern and central United States without serious interference. By restricting power as much as possible and by other means yet to be devised, it may be found possible to assign the same wave-length to airports relatively nearer together. For the distribution of weather information only, however, the airways may well find insufficient the frequencies in the exclusive band, 315-350 kilocycles.

On certain main routes, air transport companies will eventually require two-way telephone despatching systems of their own to control plane movements. These systems will consist of radio stations situated at the various airports along the route and interconnected by suitable wire lines.

Short-Wave Tests.

The frequency channels required for such services cannot be found in the 315-350 kilocycles band which, as just indicated, is apparently inadequate for the public services of weather broadcasting from airports. Further channels in the short-wave region appear to be necessary.

In the short-wave region the Bell Telephone Laboratories have initiated an additional development project. In co-operation with the Boeing Air Transport Company, they have undertaken to make a survey of the airway between San Francisco and Chicago, and to develop a system of two-way telephony between planes in flight and terminal landing fields on this route.

The planes and landing fields will be equipped with experimental radio apparatus and a co-operative experiment will be conducted during the coming winter. From this work it is hoped to determine for an air transport company the requirements for a two-way radio-telephone service. The investigation should furnish invaluable data both for radio operation and aviation, and thus make available to commercial aviation the best possible communication service.

The FICTITIOUS FARAD



The Farad has long been regarded as a unit far too large for practical use. This article gives some startling facts concerning it which will be of interest to all amateurs.

By R. GOODE.

WHETHER it be true or otherwise that, according to a tale which has long gone the rounds, a certain radio tyro entered a wireless dealer's shop and calmly demanded a 2-farad condenser is, perhaps, beyond the present point. But it is certainly true that most of us have become so used to hearing the term "farad" that few individuals indeed take the trouble to realise exactly what a farad means.

The farad is, of course, the standard unit of electrical capacity. Its name originated as an expression of honour and appreciation of the mighty work done by Michael Faraday (1791-1867) in the development of electrical science, and especially the practical side of electro-technics. The term, in fact, serves to perpetuate the memory of the man more effectively than any material monument could do.



A .001 mfd. variable condenser, of the old type, possessing 73 plates.

However, in many ways, the farad is quite a fictitious unit. It was originally defined as the capacity of a condenser which would hold a charge of one coulomb of electricity, and give rise to a difference of potential of one volt between the condenser terminals.

But, one rather thinks, the idea of the farad was developed at a period at which electrical science was still in its earliest infancy, and during which time many theoretical considerations were imperfectly realised.

Consequently it is that the farad can now be shown to be a unit which is almost infinitely too big for all practical usage, no matter whether such usage be in radio technics, or in the older branches of electrical science.

Impossibly Large Apparatus.

Experimental considerations can be made to show that a 1-farad condenser would be an impossibly large piece of apparatus. Consequently, for practical usage, the farad has been divided up into millionths of a farad, each millionth being termed a *microfarad*. Thus, for instance, a condenser possessing a capacity of .0005 microfarads has, in actual fact, a capacity of 1/2,000th of a microfarad.

Within more recent times still, however,

it has been found that even the microfarad is apt to prove rather a large and unwieldy unit for fine electrical work. On this account, therefore, the *micro-microfarad* has come into use, one micro-microfarad being, of course, one millionth of a microfarad, or one million-millionth of a farad. However, for ordinary radio use, the microfarad alone seems to have retained its hold, the majority of such condensers being rated in decimals of a microfarad.

But now let us deal with the farad itself in order that we may endeavour to obtain a true appreciation of its enormous magnitude as a unit of capacity.

Size is Relative.

Naturally, the size of anything depends to a great extent upon the way you regard it. So is it, if you really think of it, regarding the actual magnitude of the unit of capacity—the farad. If we think merely in microfarads, or in micro-microfarads, then naturally, the farad itself appears of an enormous size. On the other hand, if we got ourselves used to dealing in farads only, then the microfarad and micro-microfarad would appear almost indescribably small.

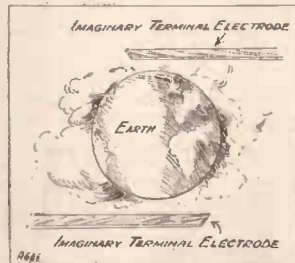
Return, however, for a moment to the .0005 microfarad condenser which we talked about a moment or two ago. This, as we saw, has a capacity of 1/2,000th of a microfarad. Therefore, it would take no less than 2,000 of these condensers to provide one microfarad of capacity. Still further, the astounding number of 2,000,000,000 of these .0005 mfd. condensers would have to be combined to make up 1 farad of capacity.

Capacity of the Earth.

Every sphere or spheroid which can hold an electric charge possesses its own capacity. The capacity of even large spheres is only very small. But, taking the whole earth itself as a sphere of perfectly conducting material, it has been worked out that its capacity would be about 72/100,000ths of a farad, or approximately 720 microfarads; that is to say, the total capacity of about 360 commercial 2 mfd. condensers! Strange, but true enough, so enormously great is the farad itself.

Suppose, again, that some enthusiastic experimenter set out to build himself a 1 farad variable condenser, and that he was able to obtain the plates of an area approximately equal to the ground space of St. Paul's Cathedral. In such an instance, about 117,000 of these plates would be required, and if they were of ordinary condenser-plate thickness and were spaced about 1/25th of an inch apart, the total height of the condenser would work out at approximately 790 feet—without, of course, taking into consideration the enormously thick and strong end-plates, and the various other fittings which would be required for the erection of such an instrument.

Now, the top of St. Paul's Cathedral is given as being 356 feet above the ground, so that the 1-farad condenser of our millionaire radio enthusiast would tower into the air more than double the height of St. Paul's! Such a condenser would hold a charge of 1 coulomb of electricity (1 coulomb being the quantity of electricity conveyed by a current of 1 ampere in 1 second), and it would possess a terminal difference of potential of 1 volt.



The earth floating in space, and acting as a spherical condenser of 720 mfd. capacity between two imaginary terminal electrodes.



Michael Faraday, the founder of present-day electrical science, in whose honour the unit of capacity has been named.



Contrasting the sizes of a 1-farad condenser and St. Paul's. The height of the condenser would be 790 feet.

THE NEW WAVE-LENGTHS.

A review of the re-shuffle of stations which the B.B.C. is bringing into operation on Sunday, January 13th.

By THE EDITOR.

THE B.B.C.'s decision to alter the wave-lengths of their stations comes at an opportune moment, for undoubtedly interference, instead of improving, has been growing worse. The B.B.C. have, as they point out, a definite policy for combating the interference problem, and that may be shortly enumerated as follows:

1. To discover by every possible means a general agreement as to the allocation of wave-lengths between all broadcasting authorities responsible for working stations in Europe.

2. To organise the British broadcasting system in a way which will give satisfaction to the greatest number of listeners.

3. To make the maximum use of the present facilities available.

Work Badly Hampered.

As is well known, the work of the *Unione Internazionale de Radiophonie* has been considerably hampered by the fact that certain careless radio authorities on the Continent have not adhered to the wave-length agreement worked out by the *Unione*, and although much has been done in clearing up the recalcitrant stations—some of the Spanish ones being the worst offenders—much still remains to be done in order to bring all the European stations into line, and to enforce a strict observance of wave-length regulations.

Until this is really accomplished, it will be impossible to guarantee the safe and sound working of the *Unione's* wave-length plan. It will be remembered that in March, 1926, a plan was submitted to the Council of the *Unione*, called the *Plan de Genève*. This plan was agreed to by over eighty per cent of the stations in Europe.

Although the *Plan* exists to-day, it must be remembered that a good many new stations have cropped up since 1926, and consequently the plan is not working as well as it might. In fact, it is a little out of date.

Consequently, a new plan, based on the old, has become necessary, especially when the Governments' Wireless Conference at Washington reduced the total number of wave-lengths for broadcasting, despite the fact that new stations were growing up, and that new broadcasting authorities demanded better service as regards wave-lengths than they had been given in the original *Plan de Genève*.

The New Scheme.

This new plan has at last been evolved, and has been given the title of the *Plan de Bruxelles*. This plan has been worked out as a means of obtaining an amicable adjustment of station wave-lengths for the benefit of all, but owing to the new stations existing to-day, the limitation of wave-lengths necessarily imply a sacrifice from all those broadcasting authorities which were unduly favoured in the old *Plan de Genève*.

This country, among others, has had to give up some wave-lengths. The B.B.C.'s sacrifice, in order to make the plan workable, has been to exchange a wave-length of 353 metres for one of 243.9. The full details have been already given in the "Radio Times," and it is unnecessary to recapitulate them here, except to point out that the new plan will be put into execution on January 13th, 1929.

Required Immediately.

The B.B.C. point out that longer notice of the change in wave-lengths could not be given, as the situation is so serious that it is imperative to get the alterations made as soon as possible. Captain Eckersley rightly states that the B.B.C., realising the possibilities of the international broadcasting

MILLIONS OF VOLTS!



This American engineer has succeeded in taking a record of a lightning flash in detail which can be analysed at leisure. It shows prodigious pressures!

situation, prepared proposals over three years ago to meet such difficulties in the future.

These proposals became known as the *Regional Scheme*, but delay and delay and delay was encountered, so much so, in fact, that interference got the upper hand and, as Captain Eckersley points out, is an evil now very aggravated. Had a start on the *Regional Scheme* been made earlier, and had there been less red tape and dilly-dallying at the Post Office, probably the seriousness of the situation to-day would not have been so accentuated.

Captain Eckersley also points out in his article that Germany is in a much better position than we, and thus gains the reward of foresight because of ability to act upon a situation much quicker than we do. In short, the *Regional Scheme* for this country is two years late.

However, we hope this *Plan de Bruxelles* will help clear up a situation which has

become of late almost impossible, and we sincerely hope that the B.B.C.'s difficulties in connection with the *Regional Scheme* will quickly be swept away and that the whole plan will go forward to a triumphant conclusion.

We published the new revised wave-lengths in our issue for January 5th, but we are again reproducing them in this week's issue of *POPULAR WIRELESS* for the benefit of those readers who did not fully note them in our previous issue.

Will Not Affect Sets.

The changes in the British wave-lengths are not very great. In fact, in certain instances, the new wave-lengths show a difference of only a few metres from the old wave-length. For example, the London station, which has been working hitherto on a wave-length of 361.4 metres will, in future, work upon one of 358 metres, and the consequent adjustment to receivers will be very small.

This change, of course, will in no way render obsolete existing receiving sets.

As the "Times" points out in an editorial on the question of the new wave-length changes, the new plan seems to have practically no disadvantages. In fact, the listener who is in the habit of tuning-in foreign stations should, as a result, find it easier to separate foreign stations and, in fact, easier altogether to pick them up and tune them in. Further, the introduction of the exclusive wave-length scheme for the *Relay Stations* will bring relief to some four or five million listeners, chiefly owners of crystal sets in the thickly populated areas where hitherto the most frequent cases of interference from European stations have been noted.

Offenders Not Punished.

It is to be hoped that the B.B.C.'s statement, that steps will be taken to ensure that the wave-lengths adopted are strictly maintained by the various stations concerned in order to put an end to the interference nuisance, will be borne out in practice. But the *Unione Internazionale de Radiophonie*, although a kind of wireless police-station, as the "Times" describes it, is not given any definite authority for punishing offenders.

The most the *Unione* seems to be able to do is to draw the attention of offenders to their misdemeanours, but it would be a great help if some method of punishment could be evolved, whereby careless foreign stations breaking the agreement could be brought to book, and made to realise the error of their ways. It is not much good having a policeman unless there is a magistrate before whom to haul the offender.

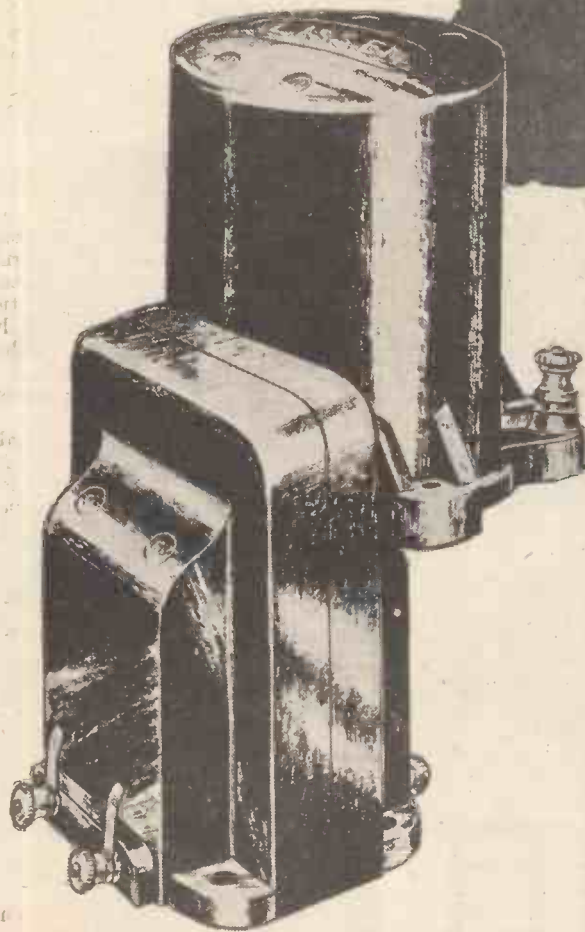
The New Wave-lengths.

Kilohertz.	Metres.	Station.
192	1,562.5	Daventry 5 X X.
622	482.3	" 5 G B.
748	401.1	Glasgow.
793	378.3	Manchester.
838	358	London.
928	323.2	Cardiff.
964	311.2	Aberdeen.
991	302.7	Belfast.
1,040	288.5	Relays and Bournemouth.
1,230	243.9	Newcastle.

N.B.—These changes come into operation on Sunday, January 13th.

YOU COULD HEAR A PIN DROP!

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—and with a Lissen Transformer in your set you do get a background so silent that each note of music, each word of song and speech stands out with a life, a vigour, a clarity such as you can get with no other transformer. That is why Lissen Transformers are used by the expert who seeks to eliminate parasitic noises from the incoming signals, as well as by the musical critic who wishes to achieve perfectly even amplification over the whole band of audible frequencies.

Whatever circuit you are building—for whatever purpose it is designed—you can use a Lissen Transformer and get improved results.

THE LISSEN SUPER TRANSFORMER

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios **19/-**

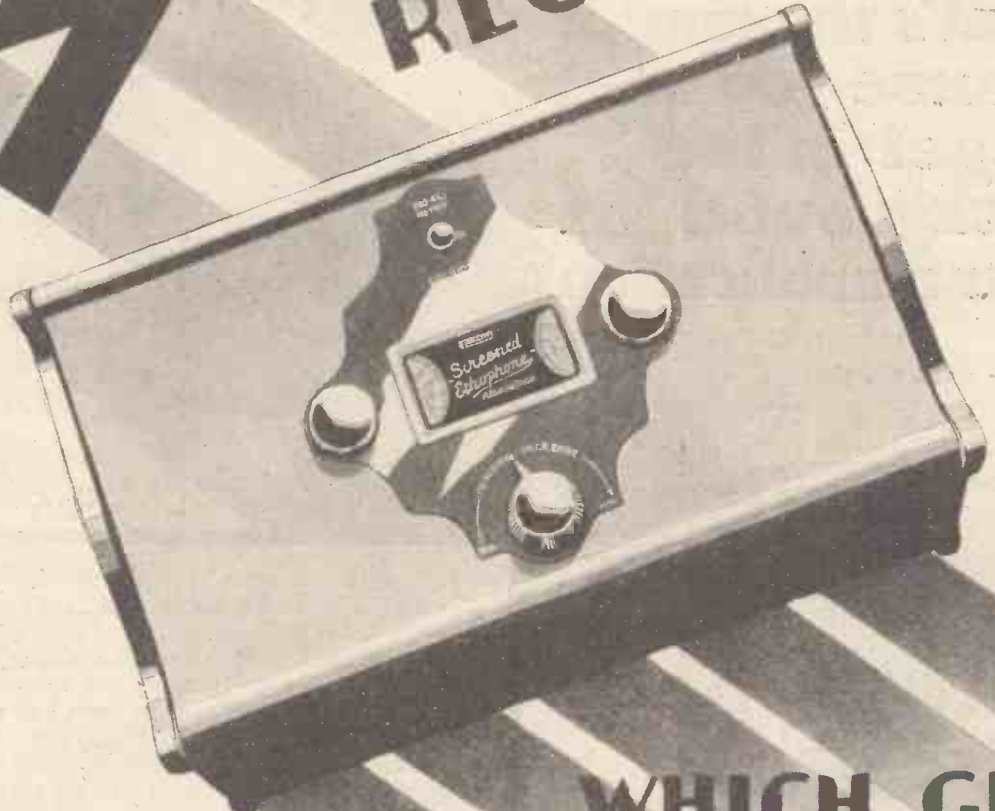
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TRANSATLANTIC TELEPHONY—A WARNING.

The Editor, POPULAR WIRELESS.
 Sir.—The Postmaster-General's attention has been called to your issue of the 22nd December, page 836 of which contains several letters from correspondents concerning their interception of Transatlantic telephony, and he directs me to point out that the deliberate interception of such messages is contrary to condition (1) of wireless receiving licences (and a corresponding condition in experimental licences) which reads as follows:

1. The Licensee shall not allow the station to be used for any purpose other than that of receiving in the premises occupied by the Licensee broadcast programmes and messages sent for general reception and messages sent from an experimental station in connection with experiments carried out by the Licensee.

If a licensee in the course of his wireless reception happens to intercept a private message, he is specifically forbidden to divulge it or allow it to be divulged to any unauthorized person. The relative condition of the licence reads as follows:

4. The Licensee shall not divulge or allow to be divulged to any person (other than a duly authorised officer of His Majesty's Government or a competent legal tribunal) or make any use whatsoever of any message received by means of the station other than broadcast matter sent out for general reception, and messages sent from an experimental station in connection with experiments carried out by the Licensee.

As it seems possible that there may be some misapprehension in regard to the interception or divulging of private messages which are being transmitted by wireless telegraph or wireless telephone services, the Postmaster-General would be much obliged if you would be good enough to draw attention in your Journal to the licence conditions quoted above.

I am, Sir,
 Your Obedient Servant,
 F. W. PHILLIPS.

General Post Office, London.

THE TRANSATLANTIC TELEPHONE.

The Editor, POPULAR WIRELESS.
 Dear Sir—I should like to confirm Mr. Collins' statement that the U.S.A. end of the transatlantic telephone service can be received in this country at quite good strength.

I use the "Sydney." Two short-wave receiver, and do not need to make it oscillate, and the wave-length appears to be more than 22 metres, as the variable condenser reading is 85 degrees.

Herts. E. J.
Ed. Note.—The attention of E.J. and other readers interested in this subject is drawn to the above letter from the G.P.O.

A WATER-PIPE WARNING.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Having been a regular reader of POPULAR WIRELESS for some years, I wondered if you would be interested in the following experience.

Some friends of mine wishing to improve reception, thought of trying another earth connection. Having bought an earth tube they proceeded to hammer it in the ground, when they unfortunately picked the spot where the water main happened to be with the

The New Call Signs.

This being so, I cannot do better than wish a very Happy New Year to all my readers. May your valves never die and threshold howl never cross your threshold!

Little has yet been settled in connection with the new call-signs for the majority of European countries, but I should imagine that early in the new year they will all have

CORRESPONDENCE.

TRANSATLANTIC TELEPHONY

A WATER-PIPE WARNING A CRYSTAL SET IMPROVEMENT.

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

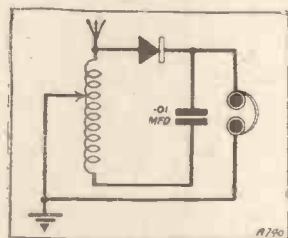
result that the water for five houses had to be turned off for twelve hours or so.

Perhaps you could publish a warning about ascertaining first where the water-pipe runs.

I remain,
 Yours faithfully,
 Leamington Spa. CYRIL LANGLEY.

A CRYSTAL-SET IMPROVEMENT.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Although I use a three-valve set, I often amuse myself tinkering about with a crystal for the amusement of my boy: and, quite incidentally



I seem to have hit upon a way of improving to a very great extent the simple crystal circuit. It is this: Shunt a condenser (about 0.1) across the free end of the coil and the 'phone side of the crystal. The difference this made in both the volume and

quality of a simple little set I recently made for my boy wants hearing to be appreciated.

Yours truly,
 Kennington Cross, S.E.11. E. V.

"FREE GRID BIAS?"

The Editor, POPULAR WIRELESS.
 Dear Sir,—With reference to the article under the above heading in your issue for December 15th, I would like to suggest that the arrangement of obtaining grid bias by means of a resistance connected in the H.T. negative lead is fundamentally bad, and, in fact, it can readily be shown that it introduces very serious back coupling.

SHORT-WAVE NOTES.

By W. L. S.

received their official calls and the old unofficial "intermediates" will never more be heard on the air. The following groups of letters have already been definitely allotted and in most cases are already in use: CN, Morocco. CP, Bolivia. CT, Portugal. D, Germany. F, France and colonies. G, Great Britain. HB, Switzerland. I, Italy and colonies. J, Japan. K, U.S.A. (Outlying possessions). LA, Norway. OH, Finland. OK, Czecho-Slovakia. ON, Belgium. OZ, Denmark. RY, Lithuania. SM, Sweden. SU, Egypt. UO, Austria. VE, Canada. VO, Newfoundland. W, U.S.A. YI, Iraq. ZL, New Zealand.

If you bear in mind that the new scheme brings these two letters into force as an integral part of the call-sign and not as a prefix, you will not be confused between the old and the new rulings.

I often wonder why there is no American

Whether this back coupling produces serious audible distortion depends on the excellence or otherwise of the amplifier used. The effect of a high internal resistance in an H.T. battery is well known, namely, by the production of "whistles" and the generally poor reproduction, which, of course, is caused by feed-back from the output valve due to the alternating voltage generated across the battery by the flow of the alternating current signal through it. The addition of a 1,000 ohms resistance in the negative lead is precisely the same as having a battery of 1,000 ohms internal resistance, and when one's battery has that resistance it is in a very bad way.

The writer has observed that when using an H.T. accumulator the addition of a resistance of even 200 in the negative end of the battery as indicated, cuts down the amplification and generally spoils the reproduction. The fact that there is a by-pass condenser of 2 mfd. or even 4 mfd. across the resistance is of little use, as a 4-mfd. condenser has a resistance of 400 ohms at 50 cycles and 800 ohms at 25 cycles, and consequently if one is using good amplifying devices serious distortion may result.

In conclusion, I would suggest that it cannot be emphasised too strongly that one of the first requirements of a good receiver is that it shall have a separate H.T. tapping for each valve and a separate 2-mfd. by-pass condenser from each H.T. tapping to the H.T. negative, as by this means only can one ensure the relative absence of back coupling in good amplifiers.

Yours faithfully,
 Manchester. J. BAGGS.

MR. ALLINSON'S REPLY.

The Editor, POPULAR WIRELESS.
 Dear Sir,—In answer to your letter of December 18th, re the attached letter, I would like to point out that the method of obtaining grid bias that I described is used in many commercial receivers and in the amplifier included in the B.T.H. Ricc-Kellogg loud speaker.

As regards its effect on quality, even when shunted by a large fixed condenser on the lower frequencies where the impedance of the condenser will be highest, there is little or no tendency for feed-back to produce undesirable effects. Low-frequency oscillation due to battery resistance is usually at a fairly high frequency.

Further, if a common resistance will produce L.F. feed-back, it will not reduce amplification, but the reverse, although it may spoil reproduction by producing a peak in the voltage-frequency amplification characteristic. I have used the method described in an amplifier designed for use with, and actually employed in conjunction with a moving-coil loud speaker without impairing the quality. In the case in question the total plate current was very high, and a resistance of only 400 ohms was required to get the correct value of bias.

In any case the article describes an idea that is actually used in practice as stated above, while though it may not be suitable for use in all cases, it nevertheless has definite scope and has been proved to be useful and practicable when used under the correct conditions.

Yours faithfully,
 C. P. ALLINSON.
 A.M.I.E.E., A.M.I.R.E., F.Inst. P. Inc.
 N.W.S.

broadcast on 42 or 44 metres, particularly for the benefit of European listeners. True, 2 X A F's wave-length is quite suitable for "late-at-night" listening, but 2 X A D is a wash-out at this time of year, unless one is home very early in the evening. And then the "DX-itch" does not begin to irritate one until fairly late in the day. Listening to 2 X A D at 4.30 in cold blood is nothing like so exhilarating as straining one's ears after faint noises in the "wee sma' hours," and then suddenly running across 2 X A F's lusty voice.

Why Is It?

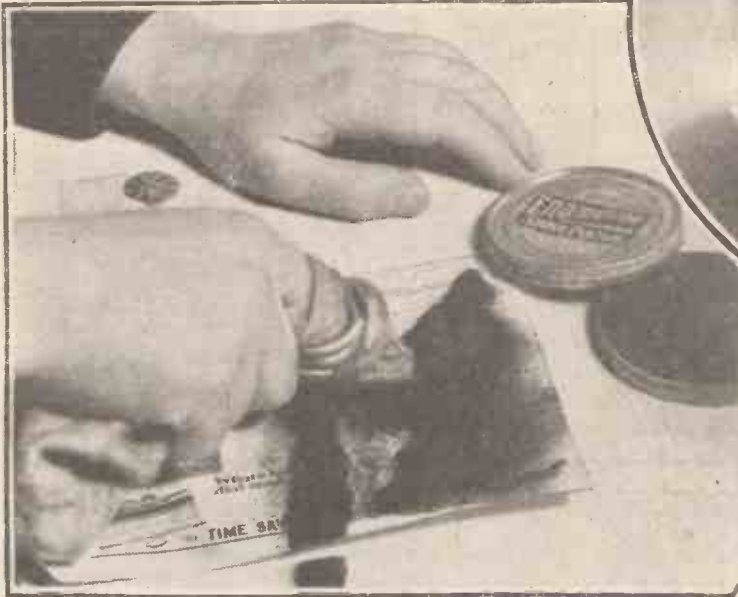
Why is it, too, that whenever I have a new set to test, conditions are invariably bad, and make me think the whole thing is a failure? Time after time I have decided that my latest short-waver is an absolute wash-out and found two or three nights later that there is nothing wrong with it? Further, I believe they change maliciously every fifteen minutes or so, because switching back to the original set seems to improve them again! Seriously, though, to be of any value at all, a test of a new short-waver should last for at least a week, so that one has a chance to judge its behaviour under all conditions.

CONST 7/6^d

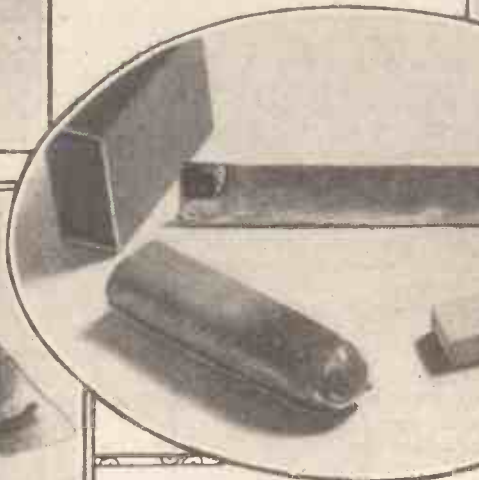
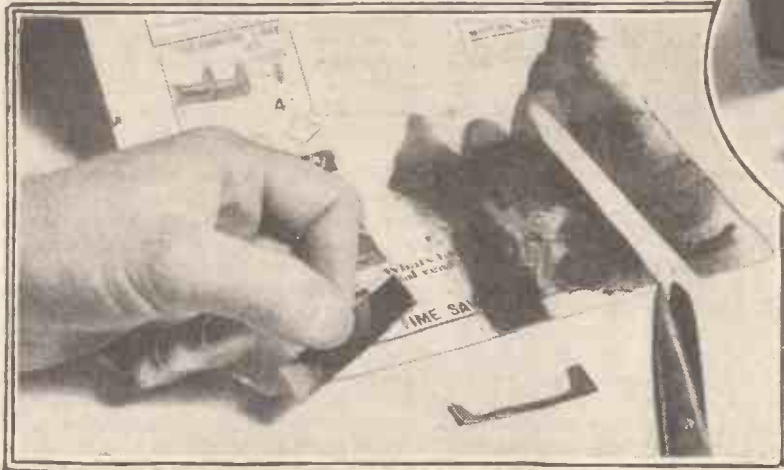


Further Pictorial Details
of the wonderful set
described in "P.W."
last week.

The weirdest collection of components ever seen!



Above: Remove the wax paper very carefully to avoid the risk of tearing.
Left: Rubbing the shoe polish on the paper for making the anode resistances and grid leaks.



Left: An anode resistance (left) and a grid leak (close to the scissors). Above: The folded condenser ready for attachment by means of sealing wax to the wood strip.
Right: Foil is used to make good contact at each end of the resistances and leaks.

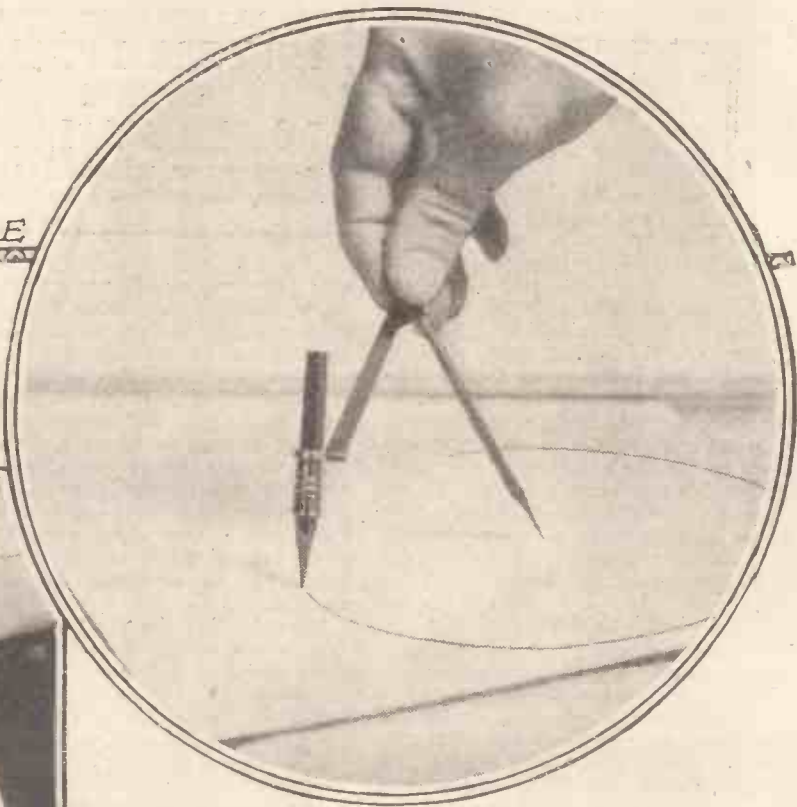
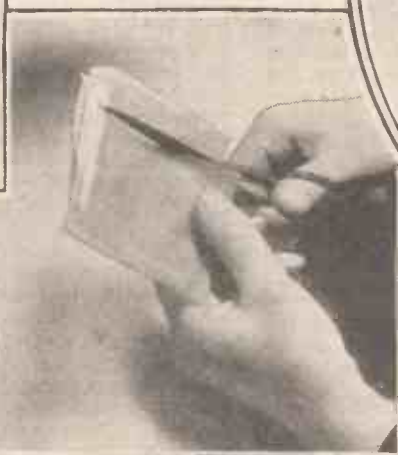
CONSTRUCTING THE THREE VALVER

By PERCY W. HARRIS, M.I.R.E.



Above: Empty out the cigarettes carefully in order to get at the tinfoil.

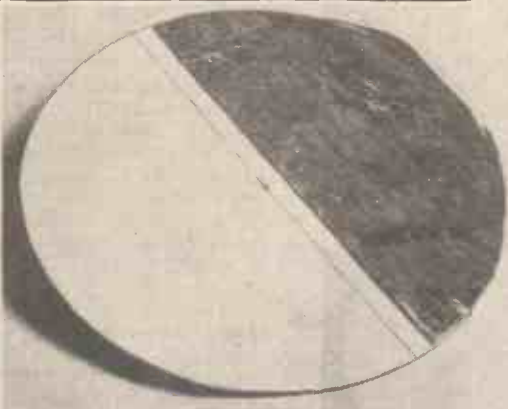
Below: The trimming of the wax paper for the coupling condensers and their subsequent assembly should be done with great care in order that no shorting shall occur.



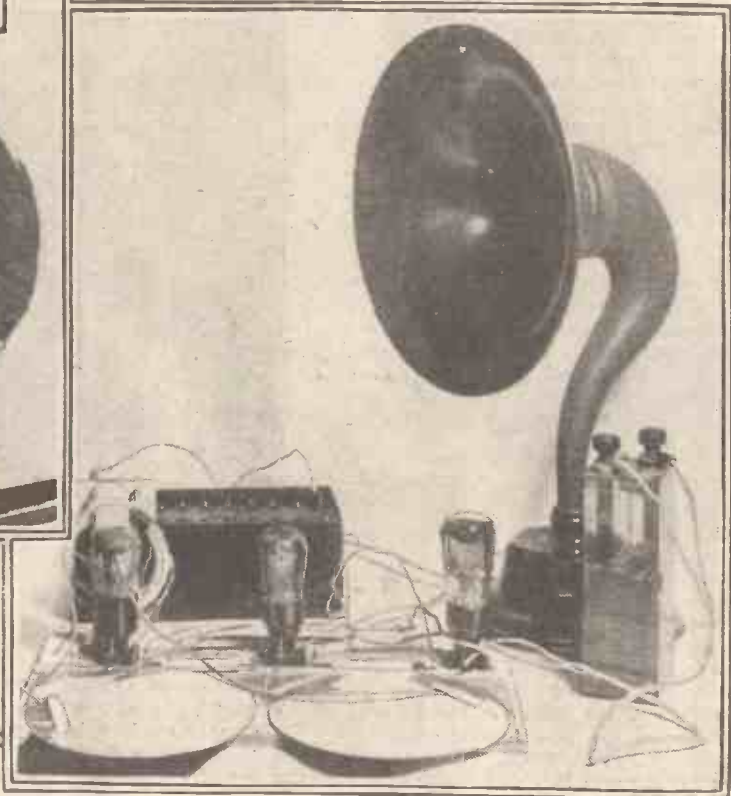
The first step in making the variable condensers is the scribing of the circles for the discs for the moving plates. Two discs are required, one for each condenser.



The "staggered" arrangement of the foil and paper in the coupling condensers is shown above.



Above: The tinfoil on one of the discs of the variable condensers ready to be pressed down.



Here is the completed receiver "ready for action." If ordinary care is taken the construction will be found to be quite easy, while the results are equal to those obtainable from some of the elaborate three-valvers which cost round about £10. It is a real loud-speaker set capable of extraordinary results.

Further constructional details concerning this set will be found on page 970.

LAST week I told you how to make the two variable condensers (one for tuning and the other for reaction); together with other details. This week we will discuss the fixed condensers, anode resistances and grid leaks, and how to finish off the receiver so that it will be ready to work.

Look carefully at the photographs published last week, and you will see that there are two small pieces of wood, nearly touching, placed at the back of the baseboard. These carry the two anode resistances, and at their point of junction are joined to the H.T. battery. Between the first and the second, and between the second and third, valve holders, you will see two other pieces of wood. These carry the grid leaks, while between these and the variable condensers are what appear to be flattened rolls of paper. These are the coupling condensers. To the immediate left of the first valve holder you will see another piece of wood covered with white cardboard. This carries the grid condenser with its leak.

Grid Leak and Condenser.

To make the grid leak and condenser combination take a small piece of wood—the thickness does not matter much, but say a quarter of an inch—and cut out of it a piece 2 in. long by 1 in. wide. Next take a piece of thick cardboard and cut it to the same size, namely, 2 in. by 1 in., but cut away at each end a slot $\frac{1}{2}$ in. wide by $\frac{1}{2}$ in. deep so that the cardboard has an appearance something like the letter "H," but with a very wide cross-piece. Lay this piece of card aside for the time and take a strip of tinfoil $\frac{3}{8}$ in. wide by about 3 in. long. Cut this in half so as to have two pieces $\frac{3}{8}$ in. wide by $1\frac{1}{2}$ in. long and put these aside also.

Next cut two pieces of waxpaper of the exact size of the "H" cardboard, another piece 1 in. by $1\frac{1}{2}$ in., then take six small wood screws and two of the tin soldering lugs. Heat up your soldering iron and tin these lugs carefully, leaving a good blob of solder on each. These also can now be laid aside. Before we can proceed with the final assembly of the grid-leak and condenser combination we must make the grid leak, and as the method of making the grid leaks and anode resistances is practically the same, we will now prepare the necessary resistance materials for all.

Making the Resistances.

This is done by taking a page of POPULAR WIRELESS—from a back number, or advertisement page you do not want—laying it carefully on a flat surface and covering it with a thin uniform rubbing of stove polish. The "Enameline" stove polish used for this purpose is a graphite preparation and a new threepenny tin should be purchased from your oil shop. When you open the tin (probably sticking your thumb into the polish in the process, as I did) you will find Enameline is a very smooth jet black paste. Before actually making the grid leak and anode resistance you should try a few experiments with it.

Take any old sheet of paper and a rag, and wrap two or three layers of the rag round the forefinger of your right hand. Now dip the end of the rag into the Enameline with a slight rubbing motion and rub the black mixture over the paper. Rub it very uniformly but firmly and aim at getting

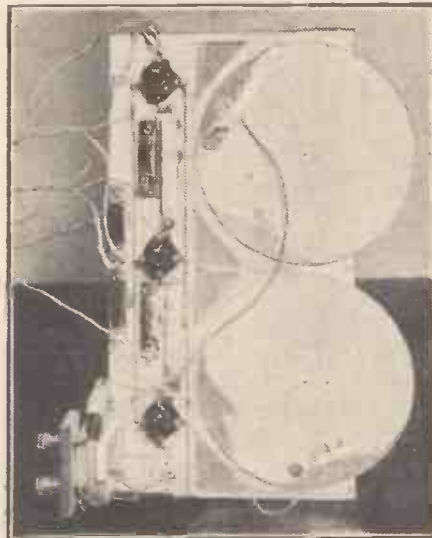
FURTHER DETAILS OF THE 7/6 THREE-VALVER.

By PERCY W. HARRIS, M.I.R.E.
Editor, "The Wireless Constructor."

only just enough on the paper to make the paper jet black. You can easily put far too much on, and if you use too little the paper will look greyish and smeary.

Practice a little so that you can be sure of covering a piece of POPULAR WIRELESS paper with a perfectly uniform thin, black coating, neither too much nor too little. When you are sure of your ability in this direction take another piece of POPULAR WIRELESS paper and make a uniform black coating over about a third or half of a page. You can hold it up to a very strong light to see whether the coating is uniform.

Next, keeping the paper on a smooth, flat surface, rub it vigorously in two or three directions so as to spread the coating and burnish it. It will now shine quite brilliantly, just as will a stove when properly rubbed. You may wonder why I tell you to use POPULAR WIRELESS paper. There is a very good reason, as the paper has a particular texture and the sizes of the strips cut to give a particular resistance value depend upon the texture and how the



A bird's eye view of the 7/6 three-valver, the construction of which is fully illustrated on pages 963 and 969.

polish is rubbed on. I could have used any kind of paper, but the strips would have been a different size for each kind of paper.

For the anode resistances cut two strips, $2\frac{1}{2}$ in. long by $\frac{1}{2}$ in. wide. For the grid leaks in the coupling units cut two strips of the same dimensions, but cut them away in the middle so that you have $\frac{1}{2}$ in. wide ends, but only $\frac{1}{4}$ in. wide for a distance of $1\frac{1}{2}$ in. in the middle. For the grid leak on the grid-leak-and-condenser unit of the detector, cut a strip 2 in. long by $\frac{1}{2}$ in. wide, and in fact make up the leak in exactly the same way as for the coupling leak;

but only 2 in. long, and cut the middle strip thinner, between $\frac{1}{8}$ in. and $\frac{1}{16}$ in. wide for $1\frac{1}{2}$ in. While you are at it, it is just as well to cut several examples of each of these strips, so that you can try a few experiments later.

We will now return to the grid-leak-and-condenser combination for the detector. Take the grid leak, your three pieces of waxpaper, the two pieces of tinfoil, the piece of cardboard, and the screws and lugs. Now, with a sharp object, such as a bradawl, carefully make two small holes $1\frac{1}{2}$ in. apart in the small block of wood so that you have a hole at each end, $\frac{1}{4}$ in. from the end and on a central line.

Careful Assembly Required.

Make these holes so that you can later screw the wood screws into the wood without splitting it. Now take your grid-leak, lay it on top of the wood, and press it firmly down with your finger so that you can feel in the grid-leak paper the positions of the holes beneath. Next pierce the paper carefully so that each hole comes exactly above the corresponding hole in the wood.

Now take the piece of waxpaper, measuring $1\frac{1}{2}$ in. by 1 in., and lay it centrally on the top of the grid leak, so that it occupies the full width of the wood, leaving $\frac{1}{2}$ in. each end. Next take one of the pieces of tinfoil and place it along the centre line of the wood so that one end of the foil projects $\frac{1}{2}$ in. beyond one end of the wood, when the other will, of course, come $\frac{1}{2}$ in. from the other end. Next take the piece of waxpaper which is cut the same size and shape as the cardboard and lay this over the top, being careful in all these operations not to shift the pieces of paper already in position, and take the second piece of foil and lay it along the centre line in such a way that one end is flush, projects $\frac{1}{2}$ in. from the opposite end of the wood, and the other comes $\frac{1}{2}$ in. from the other end.

Now take the third piece of waxpaper which is also cut the same shape as the cardboard, lay this carefully on top and finally place the cardboard in position. With the finger held firmly on top of the cardboard make four holes on the four corners of the cardboard with a sharp instrument, and screw cardboard down with four screws. This grips everything.

The Completed Component.

Next take the remaining two wood screws and the two soldering lugs and, after carefully "feeling" through the tinfoil for the holes beneath, make a small aperture through the foil, and then pass through each hole at each end a wood screw with a soldering lug beneath its head, and the tab of the soldering lug pointing outwards. Be very careful when you screw this into position, for you do not want the soldering lug to rotate, or it will tear the foil. The screws should be screwed down so as to hold the lugs firmly against the tinfoil. The final step is to melt some sealing wax, put a little on the baseboard and, while it is still hot and melted, press the grid leak and condenser combination firmly into position, as shown.

In this assembly we now have a small fixed condenser with waxed paper as a dielectric and across the condenser a grid leak. The method of constructing the anode resistances is much simpler.

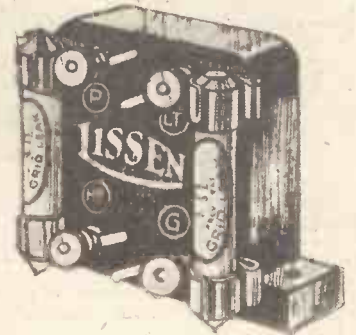
(Continued on page 980.)

Getting the parts together!



THE IMPORTANCE of UNIFORMITY

It is only natural that a circuit built entirely of Lissen parts will give better results than the same circuit built of mixed parts. Because, if you build with all Lissen parts you have a uniformly high standard of accuracy running throughout, you ensure closely matched values in the circuit with all the parts pulling together all the time. And because of this you will find that the receiver when built will retain its original selectivity and quality of reproduction throughout its life.



★ Important CONDENSER VALUES

Particularly do the above remarks apply to condensers, where unvarying accuracy is of utmost importance.

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FROM THE TECHNICAL EDITOR'S NOTE BOOK



NEW GECOPHONE PRODUCTIONS.

QUITE a large parcel of apparatus was recently received from the G.E.C. people, the individual items being dealt with under the following separate headings.

H.T. Mains Unit.

The Gecophone high-tension power units are first-class productions, and are designed in accordance with electrical regulations. During the past year or so all too many mains units have made their appearance which do anything but that. The Gecophone



This is the Gecophone Condenser Bank (Catalogue B.C.1454).

units are contained in solid metal boxes, these being enamelled in black crystalline style.

The A.C. type embodies a full-wave valve rectifier (an Osram U.5). Three H.T. taps are provided, two being variable, the other being a maximum tapping for a power valve.

The unit can operate on any A.C. mains of voltages between 200 and 260, 40 to 100 cycles. At 25 milliamps the maximum output voltage is 180. Thus it will be seen that the unit can provide all the values of H.T. required on the normal kind of set, even including one employing S.G. and Pentode valves.

The variable tappings enable one to obtain smoothly and without noise a close adjustment between unusually wide limits. The price of this A.C. model is £9 10s. This might seem a lot of money; it is, in fact, a lot of money, but the unit is a first-class production, sound in design and construction from all points of view. On test we found it completely satisfactory, the voltage controls operating effectively as mentioned above, and the output being ample for the most powerful of ordinary receivers.

The direct-current type which is suitable for all D.C. mains provides for two output voltages, one of which is variable, the other being fixed to give the maximum voltage possible after smoothing. In its class this D.C. type is just as excellent a production as the A.C. variety. Its price is £6 10s.

L.F. Amplifying Choke Unit.

This Gecophone product is a compact assembly of all the essentials of a first-class low-frequency amplifier. There are three anti-microphonic valve holders and three fixed filament resistances of an interchangeable character mounted on the top panel of a stout metal container. Inside are four L.F. chokes and two fixed condensers arranged so that two valves are double-impedance coupled.

Dual impedance is very similar in diagram form to resistance-capacity coupling except that L.F. chokes replace the anode and grid resistances. It is not a particularly new idea, but is of late receiving more attention, and it certainly has advantages which merit this.

The Gecophone amplifying choke unit is nearly a complete 3-valve amplifier and to put it in use with, for instance, a gramophone pick-up, all that one needs to do is to connect a volume control and, if needed, transformer to its input. Experimenters and constructors should find it of considerable interest. With the proper valves and H.T. it provides three stages of amplification capable of providing a distortionless output suitable for anything from a small living room to a small hall. The price is £4.

A Condenser Bank.

This comprises in one compact assembly five fixed condensers ready wired up for insertion in a mains unit smoothing circuit. There is a 4-mfd. and two 2-mfds. which are provided for the normal smoothing circuit while the two 1-mfds. are embodied for use in connection with the potential dropping resistances in the output circuit in order to eliminate motor-boating.

All these condensers are, of course, of the high voltage-tested type, and the whole are built into one stout metal case. There are six soldering points mounted on a small insulating panel, the one being a common connection to all the condensers,

the others representing the remaining free terminals. These points are clearly marked. The price of this condenser bank is £2 7s. 6d.

New Process H.T. Batteries.

The maker's brief description of these is as follows. "... these Gecophone H.T. Batteries are made of interchangeable units in two sizes, standard and super-capacity. The General Electric Co., Ltd., claim for these batteries robust construction, compactness, uniformity of discharge with silence in operation. In the standard size of cell two types are available, L.4900, a 66-volt battery, and L.4901, a 100-volt battery.

There is a 66-volter with extra large cells which is highly recommended for supplying H.T. to receivers having a super-power valve in the last stage.

It will be noticed that these batteries are described as "new process" and all we can say is that if the "new process" is markedly better than the one employed for the original Gecophone batteries then the new batteries will have extraordinarily long working

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for tests. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

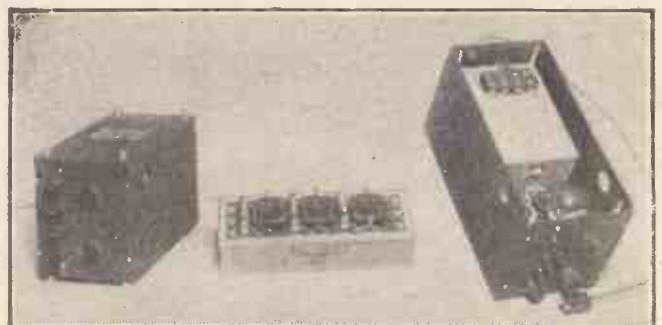
lives. We remember a Gecophone H.T. battery which we placed in service some two years ago and which still had many useful volts in it at the end of twelve months.

Plaque Cone Type Loud Speaker.

The Gecophone plaque loud speaker is especially suitable for suspension from the picture rail. It employs a large balanced-armature driving unit mounted in a walnut frame. The cone diaphragm is of an artistic bronze colour. The price of this speaker is £3 17s. 6d. There is a junior plaque type at £1 12s. 6d.

Calvert's Mechanics' Almanack.

We have just received our 1929 edition of the above useful book. It is published by John Heywood, Ltd., at 6d., and con-

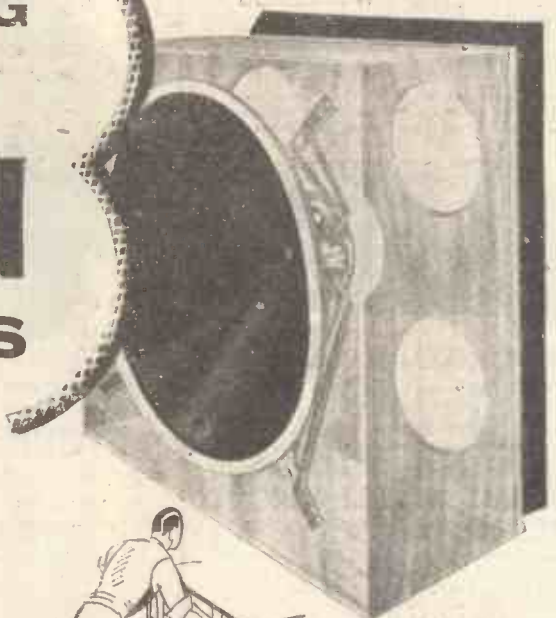


Two others of the Gecophone items dealt with on this page. Left and right, the A.C. H.T. Unit closed and open. Centre, the L.F. Amplifying Choke unit.

sists of 192 pages of most interesting information relative to metals mechanics, and general engineering. It is a book any radio experimenter would find of value.

FOR ANY SETTING ANYWHERE AMPLION "LION" CHASSIS

SIMPLY a Speaker—a *New Amplion* devoid of outward show. The works—and nothing but the works. Think what you can do with this *New Amplion* in Chassis form . . . You have, perhaps, a piece of furniture into which this wonderful Speaker will fit? A corner cupboard, say—an old oak chest—a music case, a book case, a china cabinet . . . Glance round your home and probably some article will suggest itself . . . Perhaps there is some curtained shelf—some odd recess—for *Amplion* to fill . . . Or, maybe, you have some particular design in mind and either wish to make a cabinet yourself or have one made to suit your individual taste . . . Here, then, is the very thing—an inner *Amplion*, the essential *Amplion*, plain of appearance, certainly, but with all that astounding quality of reproduction to which the *New Amplion* owes its supremacy.



There is no limit to the many ways in which existing furniture can be utilised to accommodate the *New Amplion Chassis*. Here, for instance, is a book-case in which the *Chassis* will fit perfectly.

Or that old chiffonier, used nowadays for storage purposes? Why not remove the door, fix a neat curtain, and make a home for *Amplion*?

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EXTRAS REQUIRED

1 S.G. Valve £1.2.6, 1 R.C. Valve 10/6, 1 Power Valve 12/6, 1 Accumulator 13/6, 1 108-volt Sure-a-Lite H.T. Battery 14/3, 1 9-volt Grid Battery 1/6.
Special offer of coils for the 1929 Cossor. B.B.C. 6/- pair. 5 X X 7/6 pair.



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QUESTIONS AND ANSWERS.

"TWITCHING" NOISES AND RAIN.

A. T. H. (Chester).—"Can you tell me what is likely to be the cause of twitching noises, which only come in when there is rain or mist about? I have never been able to trace the cause of these noises, and they are not generally troublesome, but I have discovered that they are at their worst whenever it is wet or very damp and foggy. What could be the cause of that?"

Faulty insulation of the aerial-earth system is the likeliest cause of the trouble, for if you have any leaky insulators and you are using high H.T. (especially if this is taken from the electric light mains) there will be a tendency for the high tension to leak away to earth over the poor insulation, thus giving rise to the noise complained of.

Not only the aerial insulators but all switch contacts, etc., should be examined, keeping a sharp lookout for any place where moisture is likely to settle and make a conductive path across the insulation. If an outdoor switch appears to give rise to the trouble, it is a good plan to give it a protective covering so as to keep it from the inclement weather, because, as you have noticed, noises of this sort are never troublesome when the insulation is dry.

CHANGING WAVE-LENGTH INTO FREQUENCY.

"KILOCYCLE" (Paddington, London, W.1).—"How is it possible to calculate wave-length if the frequency is given, and vice versa?"

If you divide the wave-length into 300,000 the answer will be the number of kilocycles, and similarly any number of kilocycles divided into 300,000 will give the corresponding wave-length.

A DUD VALVE HOLDER.

P. M. A. (Gravesend, Kent).—"The extra amplifying valve you recommended proved to be just what was needed, and I followed the diagram without the slightest difficulty.

Being perfectly satisfied with results, I thought I would put the set and the extra valve into one big cabinet to smarten it up a bit. So I made up the set inside just as it was, and added the extra wiring for the amplifier alongside it, the whole being out of sight when the cabinet was closed. It looks fine, but now the amplifier will not work.

All the parts and connections are as before, except a new valve holder for the amplifier to replace the old one, which I broke in removing. When using the set only it works like it used to, but on joining up the amplifier I cannot get anything at all from the loud speaker, not even the clicks as the H.T. is plugged in and out. The valve lights up all right.

"Do you think the new valve holder could cause this? It is quite a new one."

Yes, probably the valve holder is causing the trouble. It looks as though it had a disconnection inside. Possibly the socket for the plate of the leg of the valve is not making proper contact with its soldering tag or with the terminal to which it should be internally connected. You can easily check this by examination, or by the 'phones and dry cell test, as explained recently in these columns.

CURING HUM FROM AN ELIMINATOR.

B. M. B. (Chadwell Heath, Essex).—"My next-door neighbour always worked his set off the electric light mains, and when he went away I decided to buy his eliminator, as he could not use it in the new district he was

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good" ?

Perhaps some mysterious noise had appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

going to. I did not trouble to connect it up straight away, but left my own H.T. battery to run down first, so I have had it standing in a cupboard for two or three months.

"Last night I tried to get it going, but I found it gave out a loud hum. This I cannot understand, as my set is practically the same as his was, and of course I expected pure reception like my neighbour always had.

"As I do not understand much about this thing I have only tried to connect it up once, as per the enclosed test. What can I do to get it clear?"

Probably you had the unit connected up the wrong way round. Most D.C. mains units of this type have an unequal distribution of smoothing chokes, and sometimes all the smoothing is done on one of the mains,

(Continued on page 976.)

Gift it with "EKCO"

THIS NEW YEAR.

THE NEW SIMPLIFIED RADIO — Switch on — that's all

PRAISE FROM THE PRESS.
HULL EVENING NEWS. "An H.T. Supply, sure and never failing . . ."
MANCHESTER EVENING CHRONICLE. "An exacting test of an 'Ekco' Mains Unit has been conducted and it is pleasing to record that the instrument has done all the Makers claim."
POPULAR WIRELESS. "The most satisfactory unit we have yet had brought to our notice. Very excellent value for money."

THE "EKCO" ALL-FROM-THE-MAINS 3 VALVE RECEIVER

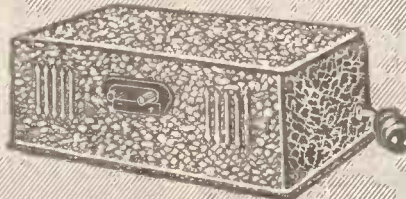
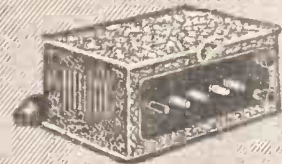
This receiver makes a truly wonderful gift. It operates entirely from the electric supply by simply attaching the adaptor to a light or power socket. Safe, silent, sound, and "fool proof." Radio power becomes as simple and economical as the ordinary Electric Light, and goes on for years. No batteries or accumulators, with their worries and continual expense. Home and Continental stations received at full loud speaker strength, with wonderful clarity and volume.

PRICE COMPLETE, INCLUDING VALVES AND ROYALTY.

D.C. MAINS **19** Gns. A.C. MAINS **21** Gns.

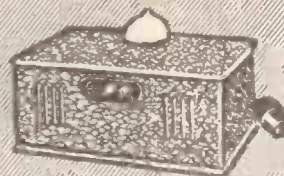
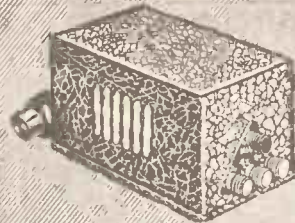
Write for latest "EKCO" Literature to Dept. A,
E.K. COLE LTD "EKCO" WORKS, LEIGH-ON-SEA
WORRYLESS — WIRELESS!

"Ekco" H.T. Unit, D.C. Model 4F.60. 60 Milliamperes. Fixed voltage tapings at 50, 60, 120 "Power." A.C. & D.C. Mains. D.C. £3/12/6; A.C., £7/2/6. Complete.



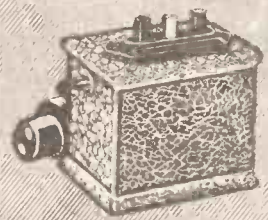
"Ekco" Rectifier Units, No. 21 R.60, for attaching to D.C. Units, for use on A.C. Mains. 60 Milliamp range. £5.

"Ekco" Trickle Charger (incorporating the Westinghouse Metal Rectifier under licence). Model T.500. Charges 2, 4, or 6 volt accumulators from A.C. Mains only at 1 amp. continuously. Price £2/12/6.

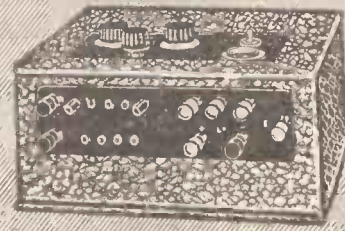


"Ekco" H.T. Units, A.C. Model 2F.10. 10 Milliamperes. 60 and 120 voltage tapings. A.C. and D.C. Mains. D.C., £1/9/6; A.C., £3/13/6.

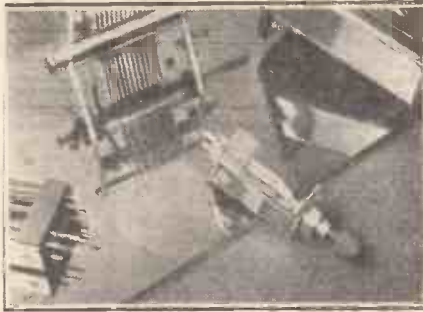
"Ekco" Isolating Transformer. For isolating loud speaker or 'phones from set where power supply unit is in use. Price 15/-.



"Ekco" "All-from-the-Mains" 3-Valve Receiver. Price complete, including valves and Royalty: D.C. Mains, 19 guineas; A.C. Mains, 21 guineas.



"Ekco" All-Power Unit, D.C. Model C.1.A. 85 milliamperes. Voltage tapings, H.T. 0-120 var. 110 fixed "Power." L.T., 1 to 6 volt, up to 6 amp. G.B. up to 21. Price £9/15/0



Will your panel show reflections like this? Think how much a mirror like surface will enhance the appearance of your Set.

Is your panel a credit to you? Does it glisten and gleam as the light falls upon it? Choose "Resiston" and be certain of appearance—and perfect insulation.

Send for new booklet.

Please send me, free, a copy of your new booklet, "The Panel Makes all the Difference." "P.W." Jan. 12.

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American Hard Rubber Co., Ltd., 13a, Fore St., E.C.2
6977.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 974.)

the other having no smoothing chokes at all. In these cases, if hum is experienced it is a good plan to try turning the whole unit round electrically.

All you have to do is to switch off the current at the mains and then turn the adaptor in the lamp socket half-way round, so running the current through to the eliminator in the reverse direction. The polarity of the eliminator's positive and negative plugs will have to be reversed to correspond, and you will then probably find that the hum has disappeared.

REACTION CONDENSER VALUES.

"CONSTRUCTOR" (High Wycombe, Bucks).—"I have a .00025-variable on hand (in good condition), but the instructions give a .0002 variable for reaction. Can I use a .00025 mfd. instead of a .0002 mfd.?"

If the set is an ordinary straightforward circuit there is no reason why you should not use a .0002 mfd. as recommended. The only difference in operation will be that you may require slightly less reaction than would otherwise be the case, so you may have to take a few turns off the reaction coil.

CONDENSER OR FLIP-FLOP REACTION.

L. D. M. (Bakewell, Derbyshire).—"I notice that nowadays practically all the reaction schemes are condenser controlled, instead of by the moving coil as they used to be. What is the difference between these two kinds of reaction, and why is it that the flip-flop coil has gone out of fashion?"

The use of a moving coil for purposes of reaction has several disadvantages. With this type of reaction (which, by the way, is still widely used) energy from the plate circuit of a valve is fed back into the grid circuit by means of the variably coupled coils. But any change in the coupling of the grid and plate coils results not only in a change of the volume of sound due to the feed-back, but also an alteration in the frequency to which the set is tuned, i.e. this form of reaction has a marked effect upon tuning.

Moreover, it is often a matter of difficulty to get the reaction just below the oscillation point, and such a set in the hands of an unskilled user is liable to be a nuisance, quite contrary to the user's intentions.

In capacity-controlled reaction the relative positions of the two coils are fixed and remain stationary, the variation being made by means of the amount of current passing through the variable condenser. The capacity feed-back arrangement has the great advantage that it renders tuning very much simpler, for the reaction control affects only the volume of the reproduction and this for practical purposes, without effect upon the tuning, except on the very short waves.

A UNIT FOR AUSTRALIA.

S. R. (Mansfield, Notts).—"My father used to live near Larwood, the bowler (now in Australia), and he has got so excited about the Test matches, that he has asked me to make up the unit for getting Australia. I think it was called the 'Antipodes Adaptor.' I got the blue print ('P.W.' 49), but it does not give the point-to-point connections in words, and as the print is now worse for wear, I should like these just to trace over for safety sake."

The connections of the "Antipodes Adaptor" will be as follows, when it is fitted up ready for action: Aerial to one side of the coupling coil. Other side of the coupling coil to earth, to the grid coil clip (via screen), to the variable tuning condenser C, and to the reaction condenser C, (moving vanes of both these condensers) and to the slider on the potentiometer.

The other side of the tuning condenser C, is connected to the remaining end of the grid coil and to the 3-megohm leak and .0003 mfd. fixed condenser. The other sides of this grid leak and grid condenser are joined together and to the grid socket of the valve holder.

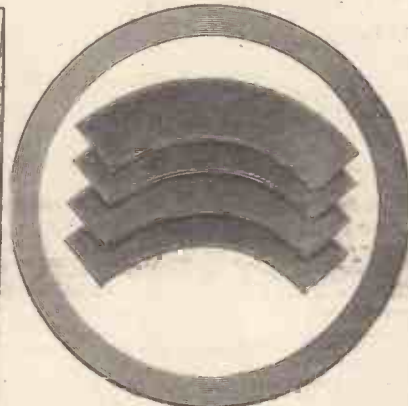
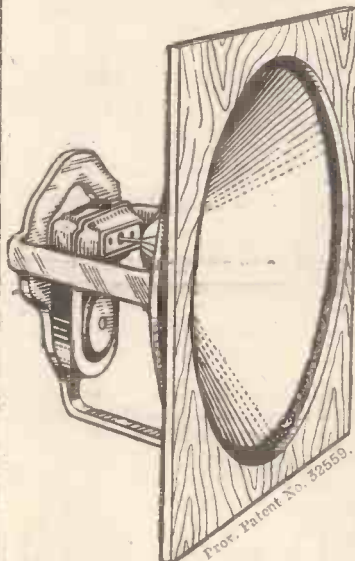
The plate socket of the valve holder is joined to one end of the H.F. choke and to one end of the reaction coil. The other end of the reaction coil is joined to the remaining side of the reaction condenser (fixed plates).

One filament socket of the valve holder is joined to one end of the potentiometer and also to the filament terminal on the valve socket. The other side of the valve holder filament is connected to the other side of the potentiometer and to the remaining filament socket of the valve plug.

(Continued on page 978.)

MOVING COIL SPEAKER RESEMBLANCE FOR A FEW SHILLINGS!

BY USING THE SQUIRE CRADLE AND NO 97 CONE KIT.



Card Ring and Svedlin Segments are included in all Cone Kits.

INSIST ON THE GENUINE SQUIRE KITS IN LABELLED ENVELOPES.
SQUIRE ALUMINIUM CRADLE 12/6



No. 97 CONE.
1 1/2 in. Kraft Diaphragm, forming Cone 9 1/2 in.

2/6 per kit.

Gives moving coil speaker aspect.

"P.W." PURITY CONE.

1 1/2 in. Kraft Diaphragm, forming Cone 7 1/2 in.

2/3 per kit.

Cradle, similar to, but smaller than one shown.

10/-

CONSTRUCTOR CONE, forming to 6 in. diam.

2/- per kit.

Remodelled Cradle especially suitable for portability to take Blue Spot only, unit secured as illustration.

8/6

For various balanced armature speaker units. Takes "Blue Spot," "Triotron," "Bullphone" units, etc., which are secured rigidly and DIRECT to cradle or chassis.

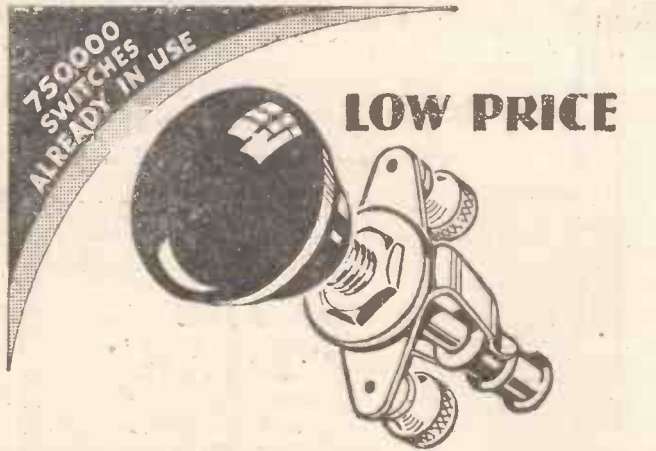
Easy access to nuts on driving rod of unit is provided for.

Setting remains constant and takes full output of set, without chatter.

A plywood clamping washer is included in all complete sets.

SOLE SUPPLIERS:

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HIGH EFFICIENCY

YOU know the price of the Benjamin switch, but do you realise what you are getting for your 1/3? You are obtaining the component which Mullard chose from the whole field of radio switches for use in the Mullard Master Three Star.

That is your guarantee of efficiency. The Benjamin switch has a double contact which gives a definite snap action, while terminals are provided for ease of wiring.

This switch is supplied without terminals. Price 1/-

1'3

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ELECTRIC LIMITED,
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Do not accept a silver grey condenser without the HYDRA label. Others are imitations and we are not responsible in case of breakdown.

Why do most manufacturers of Eliminators employ HYDRA Condensers for their smoothing circuit—in spite of the fact that they are a foreign product?

Because they have proven thoroughly dependable—and the manufacturer cannot risk his reputation in case the condenser fails. Benefit by the manufacturer's experience.



SAFETY FIRST!

HYDRA CONDENSERS

PRICES

2 mfd. 4/-
1 mfd. 3/-
Tested at 500 volts A.C. Work voltage 240 A.C. at 50 M.A.

Hydra Condensers are sold by all good radio dealers. In case of difficulty write—

LOUIS HOLZMAN
24 Kingsway London. W C 2

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WIRELESS PICTURES

(1928) LTD.

HAVE PLEASURE TO ANNOUNCE THAT THE EXPERIMENTAL BROADCASTING OF PICTURES UNDER THE FULTOGRAPH SYSTEM BY THE

B . B . C .

HAS BEEN EXTENDED.

The initial series of experiments which began last October might have been terminated at the end of 1928, the B.B.C. however has agreed to continue these transmissions until October 30, 1929, on the same basis as before.

This should be interesting and re-assuring news for prospective purchasers of Fultograph Wireless Picture Receivers. Arrangements are being made for the daily transmission of cartoons by many leading artists commencing immediately.

Fultograph

WIRELESS PICTURES (1928) LTD.,
Dorland House, 14/16, Regent Street,
London, S.W.1

Finished in black or beautifully grained mahogany.



306

neat-accurate and inexpensive

Watch for Brownie's latest triumph in artistic moulded Bakelite—"The Dominion Vernier Dial." Special non back lash slow motion drive gives very accurate tuning, while the action will fit any condenser and the new design of the dial will enhance the appearance of every set. See this latest Brownie production at your nearest radio dealer.

BROWNIE
WIRELESS

"DOMINION" VERNIER DIAL
The BROWNIE WIRELESS COMPANY (G.B.) Ltd.
MORNINGTON CRESCENT LONDON N.W.1

**RADIOTORIAL
QUESTIONS AND ANSWERS**

(Continued from page 976.)

The grid socket on the valve plug is left vacant, but the plate socket is connected by a lead which goes to the remaining end of the H.F. choke, and this completes the wiring of the "Antipodes Adaptor."

ONE- AND TWO-VALVE BLUE-PRINT SET.

"BLUE-PRINT BILLY" (Seaford, Sussex).— "Will you please tell me the names and numbers of the one-valve and two-valve sets which are obtainable from POPULAR WIRELESS in blue-print form?"

The following blue prints are still in print, and can be obtained, price sixpence per blue print. A stamped, addressed envelope must be enclosed.

- No. 1. Straight Detector with Reaction.
- No. 9. H.F. and Detector (Tuned Anode coupling with reaction on anode).
- No. 10. H.F. and Detector (Transformer coupled with reaction).
- No. 11. Detector and L.F. (with switch to cut out L.F. valve).
- No. 21. The Two-Valve Lodge "N" Circuit.
- No. 23. The One-Valve "Chitos."
- No. 30. A "Reinartz" One-Valver.
- No. 31. A Standard Two-Valver (Detector and L.F.). A simple and moderately selective Reinartz receiver for long-distance work on 'phones, and local reception on the loud speaker.
- No. 34. An H.F. and Detector Two-Valver (Tuned Transformer, Neutralised). A simple receiver for long-distance headphone work.
- No. 39. The "Sydney" Two. A simple and efficient short-wave set tuning from about 15 metres to 70 metres.
- No. 41. This Year's "Chitos" One-Valver. A sensitive set for long-range headphone reception.
- No. 47. The "Wave-Change" One. A neat little one-valver for headphone work, with good long-range capabilities. Covers upper and lower broadcast wave-bands without changing coils.
- No. 50. The "Any Mains" Two. A compact detector and L.F. set for loud-speaker reception of the local station (and 5 G B in the south if the aerial is good), and 'phone work over greater distances. A complete H.T. battery eliminator unit is built into the set and the only external battery needed is the L.T. accumulator. Ordinary valves are used and are

furnished with a constant supply of H.T. which never runs down and costs extremely little once installed.

H.F. FILAMENT AS VOLUME CONTROL.

L. E. (Lowestoft).—"I should like to know of a very inexpensive method of cutting down the volume. Would it be O.K. to dim the filaments of the H.F. valve?"

The method you suggest is not only easy and inexpensive, but in practice it gives very little, if any, distortion. We should place the volume control

The
"TITAN"
THREE
?

rheostat in the negative lead of the two H.F. stages, and if you are using the .1 amp. class of valve you will find that a resistance of about ten to twenty ohms is quite sufficient.

DETAILS OF FRAME AERIALS.

"RADIO" (Cardiff).—"I should like to try my hand at making one of those diamond-shaped frame aerials, but do not know how many turns are required. Can you tell me how much wire and what kind I should use for the ordinary broadcast wave-length?"

The diamond-shaped frame aerial is one of the easiest types to construct, and for the windiness you will require about 3 ounces of No. 20-gauge enamelled wire. The cross-pieces for the frame should consist of two pieces of 1 in. by 1/2 in. oak, and be recessed at the centre to form a rigid support. A convenient size to allow is sides of 2 ft. in length, and to cover the 250-500 band on a former of this size you will require about 14 turns of wire, the turns being spaced about the thickness of the wire apart.

Player's
please



REGD No 154011.

N.C.C 207

TUNING AND THE SET BUILDER

Insist on IGRANIC tuning instruments and know with certainty that you can receive the stations of your choice.



IGRANIC LOKVANE

Variable Condenser—a really sound engineering job that will give years of faultless service.

Price

0003 mfd. 9/6
0005 mfd. 10/6

IGRANIC INDIGRAPH VERNIER KNOB AND DIAL

A handsome dial with a reduction ratio of approximately 8:1 that ensures fine vernier adjustment. It is robustly constructed and cannot get out of order.



Price 6/-

IGRANIC Components are designed and constructed by specialists. Hence their world-wide reputation for excellence.



Have you read "Radio—how it works and how to get the best from it"? Price 6d. Send this coupon with your name and address and get YOUR copy FREE. R. 108.

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For your set choose—

- Lotus Dual Wave Coil, 15-, 16/6, 21-; Lotus Vernier Dial, 4/9; Lotus Variable Condensers, from 5-; Lotus Buoyancy Valve Holders, 1/3 to 1/9; Lotus Jacks, Switches and Plugs; Coil Holders; Single Coil Holders; Lotus Remote Control for reception in every room from any type of set.

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 ALL DAY EVERY DAY Hours 9 a.m. to 8 p.m.
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FERRANTI 3-VALVE RECEIVER

P.W.—5 1 29.
CHART FREE.

KIT OF COMPONENTS

2 Ferranti A.F.A.	115 0	ACCESSORIES
1 " Output, O.P.I. 1	1 0	The Lot 3 6 extra.
3 " Fixed, O.2.	10 6	2 Angl. Brackets,
1 " 50,000 anode	4 0	2 G.B. Clips, 9 En-
1 " 20,000	4 0	graved Terminals,
(with holders)	4 0	Ebonite Panel 21x7
3 Lotus V. Holders	3 9	Baseboard 21x9.
1 Igranite L.T. Switch	2 6	2 Dial Indicators,
Dubilier '0003 (610)	2 6	1 Terminal Strip,
2 Meg. & Clip	3 0	Sufficient screws,
Wearite Tuner	15 0	cable, wire, wander
'0004 Variable & Dial	6 0	plugs, for set.
Total £5. 7. 3.		Above Lot 3/6 extra.

Grand Total £5.10.9
 Can be supplied with 2 AF3 15/- extra or
 2 AF5 for 25/- extra. CARRIAGE EXTRA.

C.O.D. SEND ORDER, PAY
 POSTMAN. (U.K. Only).
 Must be over 5/- value.

ORMOND MULLARD
3 STAR
 See last week's issue,
 or price lists free.

"EMPIRE" TWO
 "P.W.," 8/12/28.
KIT OF COMPONENTS

4 H.B. Coil Sockets, 4/-; Neut. Condenser, 4/6; .0005
 Variable, 6/-; S.M. Dial, 3/6; .0003 Fixed, 1/-; .001
 Iso., 1/-; .001 Reaction, 4/-; H.F. Choke, 5/6; Formo-
 lissen, or DX L.F. at 8/6; W. Change Switch, 1/6;
 2 Sprung V. Holders, 2/6; Terminal Strip and 10 Ter-
 minals, 4/-; Wire, Screws, flex, 2/-; Ebonite Panel, 3/9.

The above lot, post free, 42/6
 COILS, CABINET, and VALVES EXTRA.

WATES' SUNDRIES
3-in-One
RADIO
TEST METER
 Standard Loading Coils, 7/6.
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 (original), 4/6. Master 3
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 4 Short Wave, 7/6. DX
 British L.F. Transformer,
 8/-.

READINGS
 0-150 volts
 0-30 milliamp
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 Res. 5000 ohms
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Ebonite cut while you wait at
 4d. square inch, also 4 in. at
 4d. Only the best supplied,
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KITS of parts for all Circuits.
 Make out LIST for keen quotation.
DON'T worry, if it's Wireless WE HAVE IT.

"Q" COILS
 Lewcos and Finston always in stock. Made under Mr.
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 QA, 15/-; QSP, 21/-; QAR, 21/-; QAM, 21/-;
 Master 3 Star, 17/6. (Leaflets Free.)

BLUE SPOT
66K (101)
BALANCE ARMATURE 25/-
 Squire Cradle Frame,
 12/6 for (Blue Spot).
 Cone Kit, 2/6. Free
 plywood damping
 washer with 15/- kit.

COUPON No. 33.
ONLY ONE COUPON ON ANY ONE ORDER
 If you spend 25/- or more you can buy for
 3d. extra any one (only) of the following:
 S.M. Dial, 100 ft. 7/22 Copper Aerial, 12 yds.
 Lead-in, Fuse and Holder, 12 Nickel Terminals,
 60X Coil, H.F. Choke Permanent Detector Battery
 Switch, .0005 and 2 meg. Leak 5 volt Grid Bias,
 Panel Brackets, 6 pin Coil Base, 100 ft. Insulated
 Aerial, Loud Speaker Silk Cord, 30 ft. Covered Con-
 necting Wire Ebonite Panel 9 x 6, 12 yds. Twin
 Flex, 100 ft. Indoor Aerial—
**OR 1 New Gramophone 10 in. Record (Broadcast,
 Dominion, or Edison) 50/-** Price rate title
 required. (Must be recent issue.)

**CONSTRUCTING THE 7/6
 THREE-VALVER.**

(Continued from page 970).

All we have to do here is to cut four pieces of wood 1/2 in. wide by 2 1/2 in. long and to make preliminary holes in each end 1 1/2 in. apart. Now take each anode resistance strip, and round each end wrap a piece of tinfoil so that the exposed black portion of the strip is now 1 1/2 in. long. Lay the strip with its tinfoil ends on a piece of wood and pass wood screws with soldering lugs into the holes already made, screwing them up tightly, but avoiding any twisting of the soldering lug likely to tear the tinfoil. The two anode resistances are mounted with sealing wax at the back of the board in the positions shown and with the soldering lugs in contact in the middle.

The Coupling Condensers.

The grid leaks are made in precisely the same way as the anode resistances, namely with tinfoil ends, leaving the strip exposed of 1 1/2 in. long with soldering lugs attached here as before. These grid leaks are sealing-waxed to the baseboard adjacent to the grid terminals of the valve holders.

The final components we have to make are the two coupling condensers. For these we must take two pieces of foil of the full size of the wrapping, namely, 7 in. by 3 1/2 in. By the way, if you are collecting the tinfoil off Players' cigarettes from your friends, tell them, when they get the packages, to remove the exterior wax paper very carefully by opening at the top without tearing, gradually unfolding and pulling the final joints apart.

If this is carefully done the wax paper can be removed without being torn, but a slight tear at the very edge will not matter much, as you will see in a moment. When they open the package tell them to pull the inside or sliding portion right out and unfold everything, so as not to spoil the tinfoil. The tissue between the foil and the cigarettes is lightly stuck along one edge, but this can be pulled away, without tearing the foil, quite easily.

Arranging the Plates.

Now take your sheet of tinfoil (of course, you can use any other foil of the same size just as well) and cut it exactly in half. This will give you two pieces 3 1/2 in. by 3 1/2 in. Flatten out your wax paper and carefully examine it. It will probably be torn slightly at one edge or the other.

If you have an untorn edge on the long side, all well and good. If not, trim off the torn portion so as to get a smooth long edge and lay one of the pieces of foil on top of the wax paper so that the tinfoil projects about 1/4 in. over one long edge of the wax paper. At the opposite side, of course, there will be a space of paper. You can now trim off a strip of this paper so as to leave about 1/4 in. beyond the foil. Lift off the piece of foil and fold the wax paper in half so that the shorter edges are together.

Place the foil between the folds of the wax paper so that it projects 1/4 in. as before at one edge and is just covered by the wax paper at the other. Now take the second piece of foil and lay it on top of the folded wax paper so that it projects beyond the foil 1/4 in. at the other end. Now

(Continued on page 982.)



Diameter of Cone 7 1/2 in.
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CONSTRUCTING THE 7/6 THREE-VALVER.

(Continued from page 980.)

fold up the assembly as shown in the photograph into a flat roll $\frac{1}{2}$ in. wide, with tin-foil ends.

Next take two pieces of wood of the same size as those used for mounting the anode resistances and grid leaks, melt some sealing wax, drop it on to the middle of the wood, and while it is still melted press the condenser roll on to it. The roll will tend to spring open slightly at one edge but a further drop of sealing-wx in one of the folds will hold it securely. Sealing-wax the whole assembly to the baseboard as shown.

Making Efficient Contact.

There are two methods of making electrical contact with the ends of the condensers. One is to make a hole through the foil at each end and pass a metal screw with washers at each side and nuts, with soldering lugs. This requires delicate and careful work, otherwise you will tear the foil and this method is not recommended for the beginner.

The easier way is to take a piece of the electric-lighting flex, bare it completely, when you will get a number of fine, soft strands of wire. Scrape or rub these clean and wrap them round the foil, twisting the loop so made, so as to get good contact.

Do this lightly and you will not squash the foil too much. It does not matter if it is pressed together a little, but do not tear it. The strands of wire should be twisted together and made of sufficient length to reach the grid-soldering lug of the valve holder.

The rest of the work is quite simple. Cut two pieces of stiff wire of such a length that one will run from the soldering lug at the extreme left of the baseboard tin-foil assembly and will enable you to make a soldered contact with the three filament lugs of the valve holders. That will be the positive lead.

Completing the Wiring.

Cut another piece to join the three opposite filament lugs and this will be the negative lead. Now take a suitable length of twin electric-lighting flex (say 2 ft.) and untwist the two leads so that you can see which is which. Solder one wire to the positive filament lead and the other to the negative, and finish them off with ordinary positive and negative spade terminals so that you will be able to connect your battery. Take another 2-ft. length of flex fitted with positive and negative wander plugs, solder the lead joined to the negative wander plug to the negative filament lead, and the positive to one of the soldering lugs of the anode resistances where the two come together.

At this point solder a short length of wire so as to join these two soldering lugs. The positive H.T. lead will now be joined to each anode resistance. Now take three short lengths of single flex, say a foot long, finish with a red wander plug and solder this to the negative filament lead. This will be grid-bias positive.

Two other leads of the same length with black wander plugs should be soldered to the first and second of the coupling

(Continued on page 981.)

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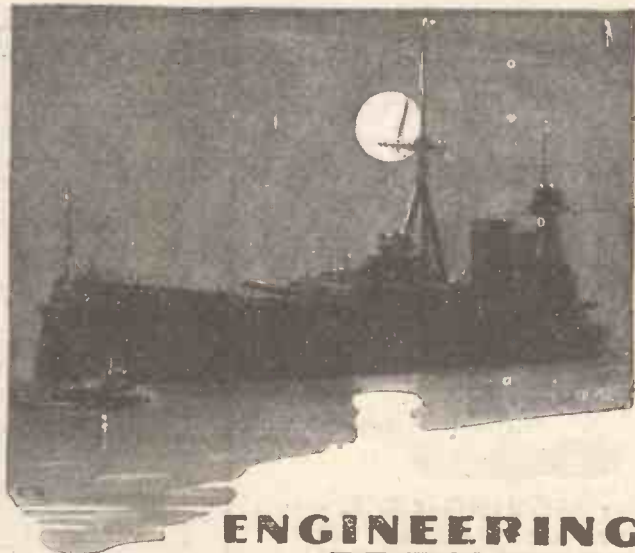
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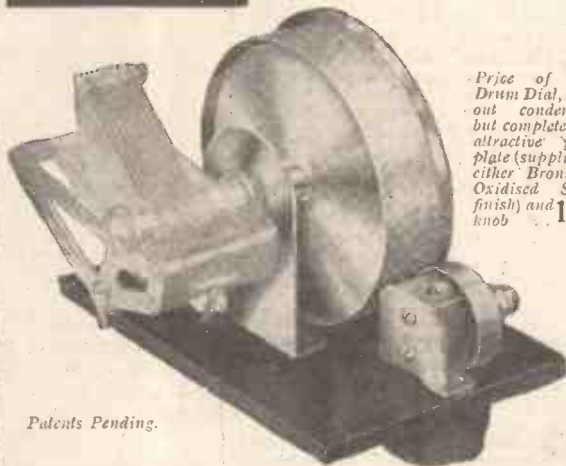
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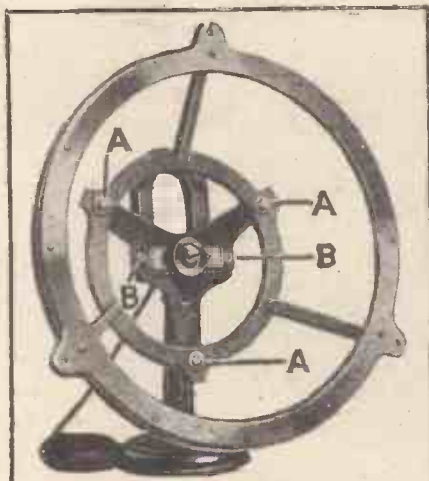
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CONSTRUCTION OF THE 7/6 THREE-VALVER.

(Continued from page 982.)

grid leaks as shown. These will be grid-bias negative 1 and grid-bias negative 2. A single piece of flex will need to be taken from the grid coil to the variable condenser and another from the reaction coil to the variable condenser as shown in the diagram.

The ends of the flexible leads where they join the variable condensers are bared, spread into a fan shape and tucked underneath the cardboard strip so as to make a pressure contact with the upper surface of the tinfoil. Make these leads long enough so that they will reach at any position of the variable condensers. The rest of the wiring is quite simple, and is fully explained in last week's wiring diagram.

Loud-speaker leads are soldered to the plate terminal of the last valve and to the mid-point of the two anode resistances, the lead going to the plate of the last valve being marked with a negative spade terminal and that going to the junction of the two anode resistances, with a positive spade terminal. This will give you your positive and negative loud-speaker leads to obtain the correct polarity when joining up.

NEXT WEEK

the first article written by the inventor, Mr. G. V. Dowding, on his

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If the cardboard is substantial, however, this may not be necessary. You will find tuning is quite sharp. For the first valve I recommend an ordinary detector H.F. valve, or you may experiment with an R.C. valve here, but the detector H.F. type will often give a better effect here. For the second valve I prefer one of the high-frequency types, particularly when the set is being used near a local station, and for the third either a power or super-power valve depending on your high-tension battery. The super-power valve will enable you to get louder signals without distortion, although in itself it will not make signals louder.

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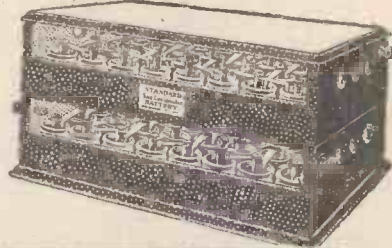
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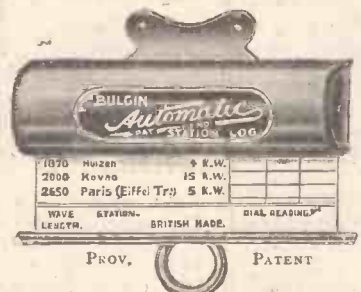


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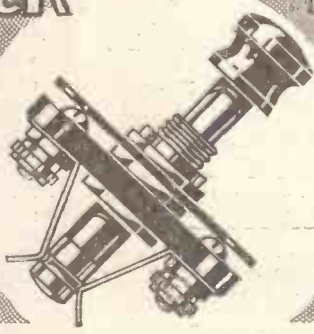


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BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY,
 101, Shakespeare House, Leicester Sq., London, W.C.2.

TECHNICAL NOTES.

(Continued from page 958.)

as when the record is coming to a finish. The linear speed is proportional to the radius, and if you take the case of a 12-in. record (radius 6 in.) with 4-in. of recorded matter (that is, with a 4-in. diameter unrecorded circle at the centre) you see that the radius of the outer edge of the disc is 6 in. whilst the radius where the selection finishes is 2 in.

Consequently the linear speed of the track at the outer edge is three times as great as that when the selection is finishing. It has been asserted that the quality of the reproduction is better when the outer edge of the record is playing than when the inner edge is in action, whilst on the other hand some experts have asserted precisely the opposite.

Gradual Reduction.

With any record made in the ordinary way, it is clear that there must be a reduction in linear speed of at least 2 to 1 between the commencement and the finish of the recorded selection and, therefore, we have to strike a suitable average linear speed.

It is interesting to note that the actual speed with which the record moves under the needle (or, if you like, with which the needle moves over the record, to think of it in a different way) in the case of a 12-in. record rotating at 80 revolutions per minute, is approximately 3 ft. per revolution, or 240 ft. per minute, which is about 4 ft. per second.

At the inner edge of the recorded selection, assuming the radius there is 2 in. instead of 6 in., the linear speed will be one-third, that is about 1 ft. 4 in. per second. The effect of the greater linear speed at the outer edge of the record is to make the waves or sinuosities (representing the sound waves) correspondingly more elongated or drawn out.

Plywood Cone.

A new type of veneer-wood or plywood "cone" diaphragm for loud speakers has now made its appearance. At first you would wonder how a piece of plywood could be shaped into the form of a cone. The secret, however, is very simple. The wood is not forced *strictly* into the shape of a cone, but plane wood is cut into a series of ten or more wedge-shaped pieces, and these are fitted together in such a way as to make up a "cone" with 10 plane facets, so to speak—not unlike the reverse side of a diamond set in a ring.

The veneer strips are glued together and, when complete, the cone is mounted upon a supporting rim. If the speaker is to be of the fixed-edge type the cone will naturally be fixed to the rim, preferably through the medium of a piece of chamois leather. If of the free-edge type, the rim is lined with felt and the cone is free to move.

In order to secure the triangular pieces of plywood together, very small strips of veneer wood or tough brown paper are pasted along the junctions.

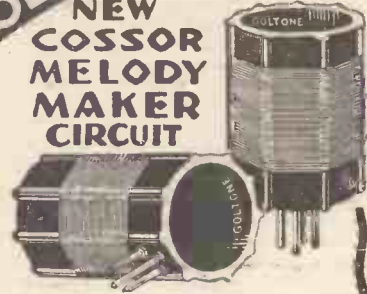
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H.F. Screened Grid Unit specially designed for Monotune. Increases range and selectivity marvellously, making this already wonderful "3" into a superlative distance "4." Complete Kit and Cabt 55/6.

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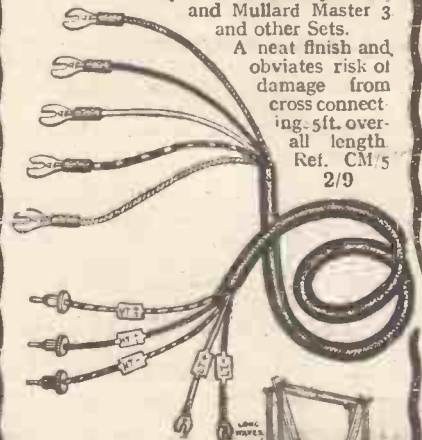


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R4/200 .. 10/6

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THE "P.W." "WHITE PRINTS."

A NEW SERVICE FOR OUR READERS.

White Print No. 6. :: :: A Two-Valve Amplifier.

This week we publish the sixth of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the White Print filed. In due course you will thus have available an encyclopaedic collection of the best circuits used in modern radio practice. A "White Print" will be published on the last page every week in "P.W." until further notice.—THE EDITOR.

ONE of the most useful things you can have about for general experimental work is a good standard two-valve L.F. amplifier. If you always have it at hand you can do all your experimental testing on the loud speaker, and whenever you build up a rough circuit for trial it is only necessary to complete it as far as the detector stage, and then hitch it up to the standard amplifier.

Another special point about a standard L.F. amplifier is that it forms an excellent way of progressing from a headphone receiver to an outfit capable of working a loud speaker. If you already possess a single-valve, a crystal set, or a receiver of the "H.F. and detector" type, the easiest way to get loud-speaker signals is, obviously, to add an amplifier instead of scrapping your present set and building an entirely new one.

A Good Standard Type.

The design which has been worked out for the White Print series is a specially simple and straightforward one, so that you may be sure that there will be no difficulty in using it with any normal type of set whatever. It uses the popular combination of one resistance-coupled stage and one transformer-coupled one, which experience has proved to be a very sound and useful arrangement for all general purposes.

It does not, of course, give as much magnification as two-transformer stages arranged on the latest lines with special stabilising devices, but it is very simple and easy to get going, and is probably the better scheme where the amplifier will be used with all sorts of different sets.

You will find it gives a very good amount of amplification as it stands and, of course, it has the great merit from our present point of view of being considerably cheaper than a modern type of two-transformer amplifier with its special gadgets.

Choosing the Components.

Various questions of component values call for a word or two. First, as to the anode resistance which couples the first valve in the amplifier to the set which precedes it. You will see that a value of 250,000 ohms is indicated for this in the diagrams, and you will find this a good figure for all-round work.

When the amplifier follows a detector valve of the high impedance type (over 30,000 ohms) you will probably find that a distinct improvement can be obtained by using a resistance of 500,000 ohms here, but the quality is then not quite so good as a rule, and moreover

the reaction control of the set is liable to become difficult. The value shown, therefore, is to be taken as a good standard one for general purposes.

The grid leak on this stage is indicated as a 2-megohm one, and this again was chosen as a good figure for general purposes. Here you should remember that if ever you have any difficulty with a combination of set and amplifier which tends to be unstable, giving an L.F. howl or a "motor-boat," it will generally help matters if you reduce the grid leak to 1 or ½ meg.

COMPONENTS.

- 1 Panel, 12 in. × 7 in. × ½ in.
- 1 Cabinet to fit, with baseboard 7 in. deep.
- 1 L.F. transformer (see text as to ratio).
- 1 250,000-ohms anode resistance with holder.
- 1 .01 mfd. fixed condenser (mica, not Mansbridge type).
- 1 2-meg. grid leak and holder (see text as to this).
- 2 Sprung valve holders.
- 1 Terminal strip, 5 in. × 2 in. × ½ in.
- 8 Terminals.
- 3 Battery plugs, 2 black and 1 red.
- 1 L.T. switch.
- Wire, flex, screws, etc.

Now about the L.F. transformer. If you want the very best possible reproduction, especially of the bass, a low ratio transformer of from 2½ to 3½ to 1 should be chosen. If your main aim is volume at a slight sacrifice of bass, a higher ratio of 4 or 5 to 1 is indicated. This, you will see, is a matter which you must decide according to your own requirements.

The amplifier as it stands is about as simple as it very well could be, all special refinements having been omitted to render it as suitable as possible for the particular

requirements we have tried to meet. There is just one point calling for mention in this connection. No provision has been made in the design for keeping stray H.F. currents out of the L.F. circuits, because such "stoppers" are only occasionally needed. In most cases they can be dispensed with, and are only included in most receiver designs to deal with the exceptional case where a constructor might get trouble.

It is just as well to know what to do if ever you strike this trouble, however. The cure is generally fairly simple. Just break the lead marked X on the diagrams, and insert in series with it either an H.F. choke or a ½-meg. grid leak.

Now for the question of valves. If you want the greatest possible magnification you should use a valve of the H.F. type in the first socket and an ordinary power type in the second. Where, however, you want to handle very powerful signals with the least possible chance of overloading, a valve of the L.F. or general-purpose type is better for the first socket and a super power in the second.

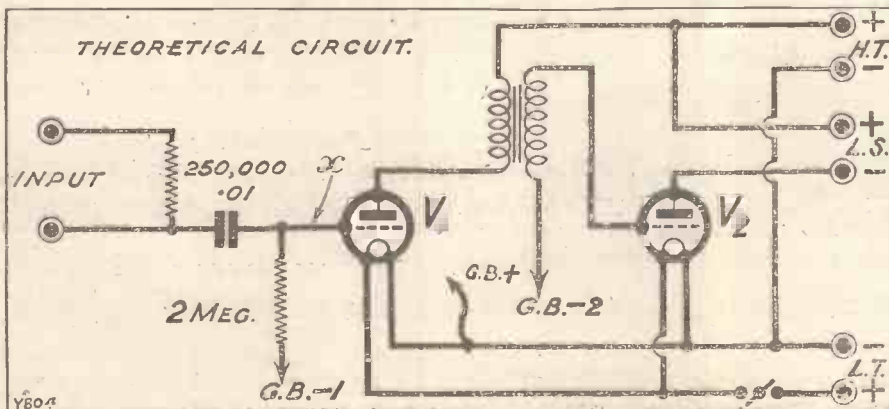
Connecting to Your Set.

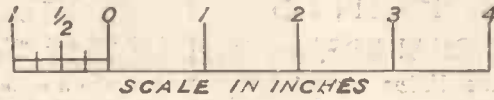
Connections to the amplifier are simple. If at first you get no results, reverse the input leads (there is a right and wrong way round). Battery connections are marked, but remember this: if you are working the amplifier after a valve set do not connect up the H.T. negative terminal on the amplifier, but only on the set.

This is important, for if you connect up H.T. negative on both set and amplifier you may short the L.T. battery, because in some sets H.T. negative is joined to L.T. negative and in others to L.T. positive. If it happens that the set is one in which H.T. minus is joined to L.T. plus, and you connect the H.T. battery to the H.T. minus terminal on both set and amplifier, a short will result.

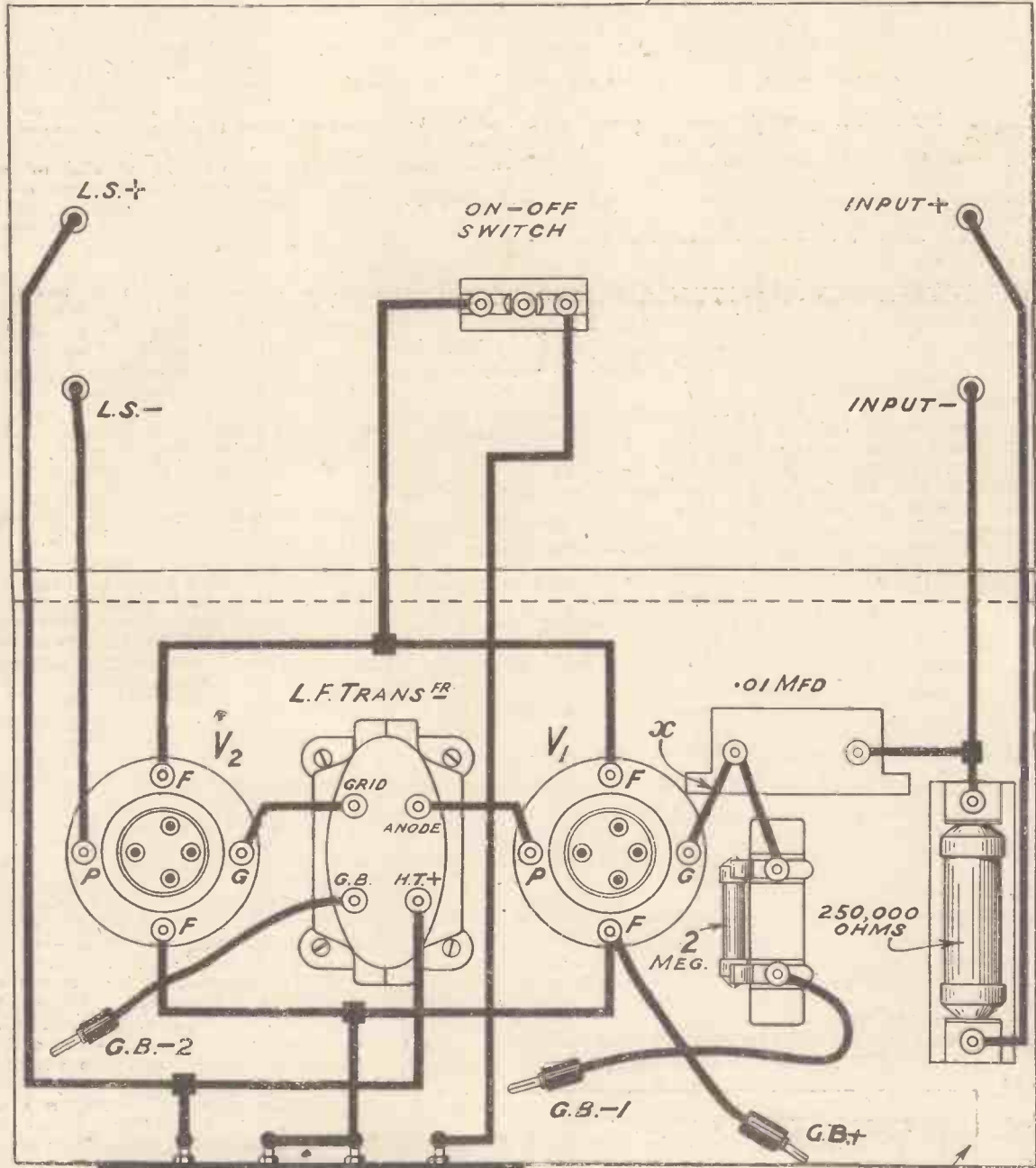
Whenever there is any doubt about the matter, then, play for safety, and do not make any connection to H.T. — on the amplifier. In any case, this connection is quite unnecessary so long as you are using the same H.T. and L.T. batteries for the set and the amplifier. If, on the other hand, you use a separate L.T. or H.T. battery for the amplifier, then you must connect up H.T. —.

Questions of battery voltages will depend very largely on your valves. With a valve of the H.T. type in the first socket about 1½ to 3-volts grid bias will be correct, whereas with one of the L.F. type you may be able to use 4½ volts, depending on the particular type. H.T. should be at least 100 volts, and preferably 120.





PANEL 12x7"



BASEBOARD 12x7"

H.T.+ H.T.- L.T.- L.T.+

WIRING DIAGRAM.

CUT ALONG DOTTED LINE.

METROVICATION

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If only valves would work without accumulators and without H.T. batteries!

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Fully descriptive illustrated literature and name of nearest dealer on request.

MET-VICK

VALVES-SETS-COMPONENTS

Metro-Vick Supplies Ltd., 155, Charing Cross Road, London, W.C.2.



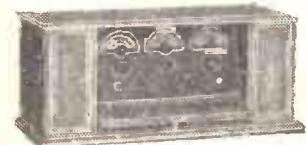
The model "B" Eliminator connected to a wall plug or lamp socket provides heater current for the All-Electric Valves, five tappings for the H.T. supply, up to 180 volts 20 millamps, and automatically regulated grid bias taps for the last stage. Price complete with Met-Vick Rectifying Valve for A.C. £8. For D.C. £7 2 6.



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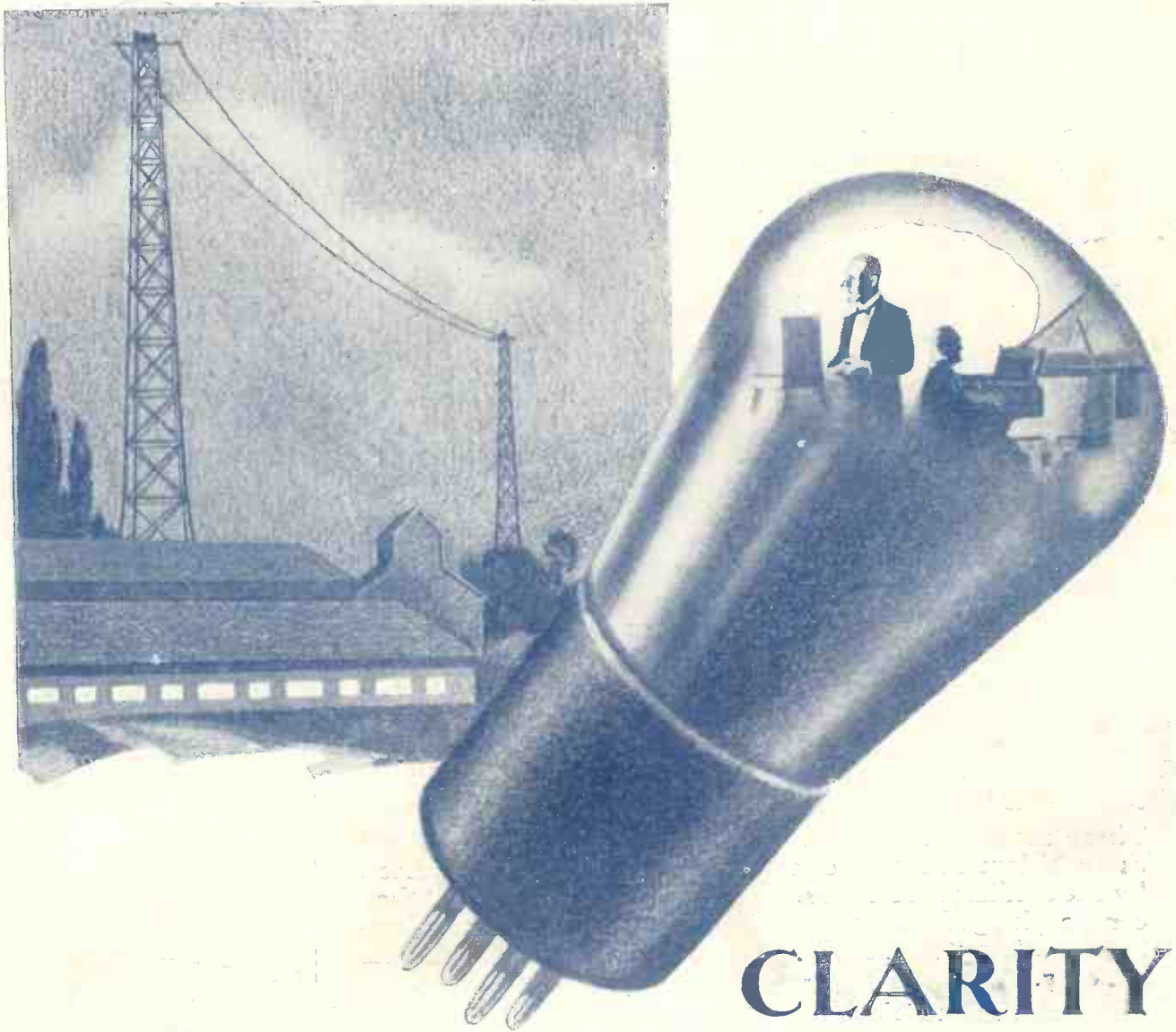


Met-Vick 5 Valve All-Electric. More powerful, of course, than the Met-Vick 4. In beautiful cabinet with cupboards for L.T. and large size H.T. Eliminators, 220 volts 3 5 millamps. For A.C. or D.C. supply price complete with all accessories, except Loud Speaker, and including Royalties. In Oak £47 9 0. In Mahogany £50 19 0.



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R.V. 136.



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Popular Wireless

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No. 346. Vol. XIV.

INCORPORATING "WIRELESS"

January 19th, 1929.

In this issue

**"AN
ALL-
WAVE"
H.F. UNIT**



Special Features in This Issue

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WHITE PRINT No. 7**

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Model "B"
L.T., H.T. & G.B.
Eliminator.

By substituting Met-Vick all-electric Valves for your existing valves the new Met-Vick Model 'B' Eliminator enables you to dispense with batteries altogether, and operate straight off your Electric Supply.

Connected to a wall plug or lamp socket, the model "B" will provide you with heater current for your valve filaments, 5 tapings for the high tension supply to your valves, and automatically regulated grid bias taps for your last stage.

Model "B" Eliminators can also be obtained for supplying H.T. and G.B. only.

<p>L.T., H.T. & G.B. £8 0 0</p> <p>A special model for 25 periods is supplied at £10 0 0 List M.S. 4745</p>	<p>Prices of 'Met-Vick' Model 'B' Eliminators for providing 180 Volts on the last valve. Complete with S.P. 41/U rectifying valves. 100-110 volts or 200-250 volts, 40-100 periods.</p>	<p>H.T. & G.B. £7 7 0</p> <p>A special model for 25 periods is supplied at £9 5 0 List M.S. 4746.</p>
<p>Ask for leaflets shown.</p>		

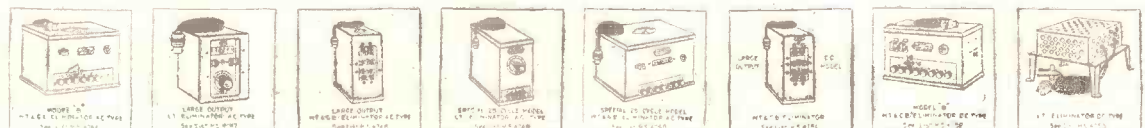
These eliminators are eminently suitable for the operation of the Met-Vick A.N.P. receivers' described in leaflets S.P. 7117/2 and S.P. 7117/4 and for 3 and 4 valve receivers listed in leaflet M.S. 4742.

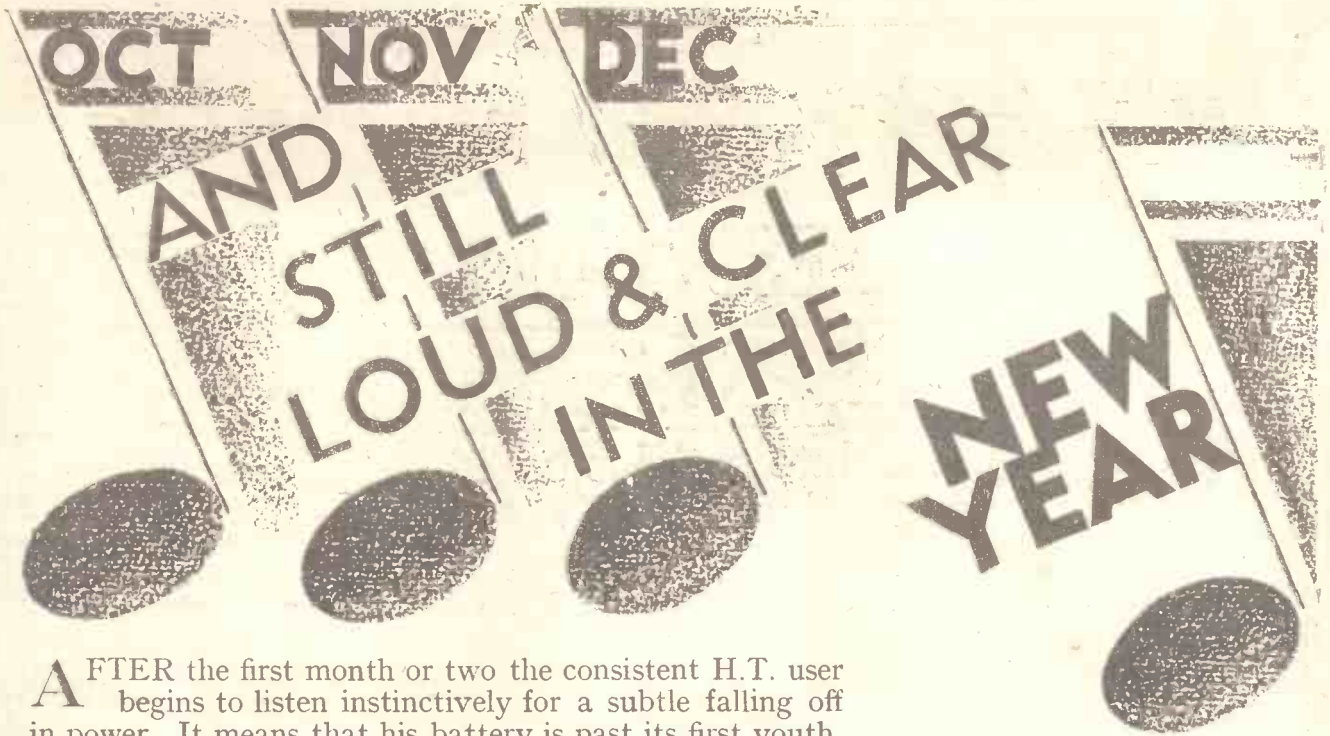
MET-VICK ELIMINATORS

Other types of Met-Vick Eliminators for A.C. and D.C. circuits are briefly referred to below and the corresponding leaflet numbers given.

Ask your own dealer for copies or write direct to

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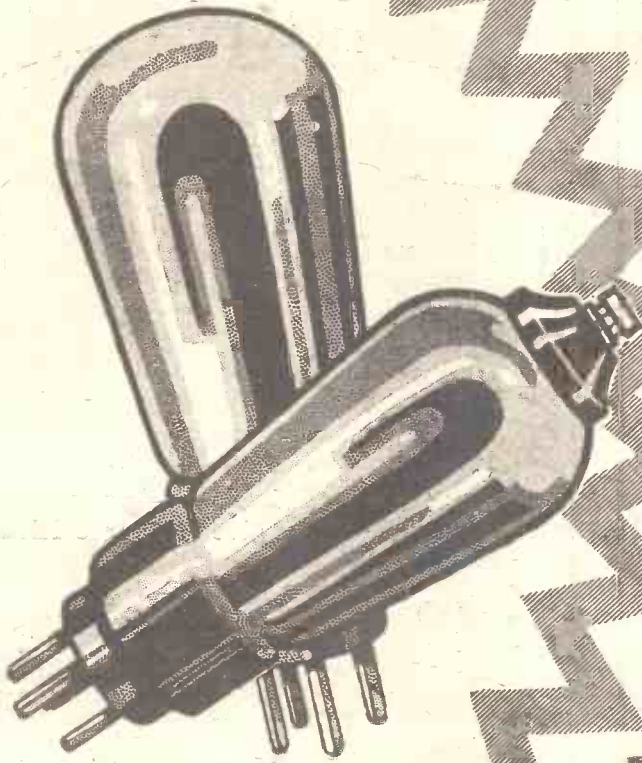
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Extract from article in "Modern Wireless" of December, 1928 — "Further Adventures in Labrador," by Mr. F. Dearlove, Chief Wireless Operator appointed by Sir William Grenfell to link up the Labrador outposts by means of Short-wave Wireless.



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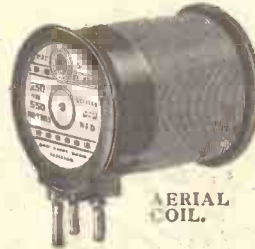
This set incorporates the latest developments in Receiver design — full constructional details free on request.



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USE THESE LEWCO LITZ WOUND COILS IN THE "COSSOR MELODY MAKER"



AERIAL COIL.

Ref. MAC 5, 250-550m. ... 7/6
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From tests made we find that medium wave Litz wound coils 250-550m. give greater efficiency.

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PHILIPS

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S.I.

Make the Melody LOUDER and CLEARER



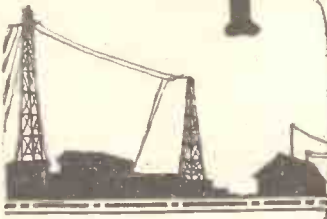
You get surprising volume with
Cossor Valves . . . the Valves
which made possible the won-
derful Cossor Melody Maker.
The melody they give is crystal clear
and loud enough to fill the house.
Whatever type of Set you own, Cossor
Valves will improve reception.
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Popular Wireless



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RADIO NOTES AND NEWS.

Canadian Broadcasting—Beware of Cables—Bathing and Washing—Those Everlasting Foundations—“Ariel” as Young Moore—Bratislava Begins—Round the World for 15s.

Canadian Broadcasting.

I SEE it stated in one of the Canadian papers that an effort is to be made to secure the repatriation of Major Gladstone Murray in connection with a new broadcasting organisation to be formed in Canada. Major Murray, of course, is a member of the B.B.C. Control Board, and has had a good deal to say in the evolution of British broadcasting policy during the last five years.

And when one comes to consider the fact that his origin is Canadian, and that, as a former Rhodes Scholar, he was presumed to be an able and representative Canadian, it looks as though the powers-that-be in Canada regard him as a strong and favourable candidate for the position of Executive Head of a Canadian B.C. if one were approved and set up.

Beware of Cables.

I HOPE that all inexperienced aerial-erectors will learn a lesson from the fatalities which have recently occurred as a result of aerial wires in course of erection coming into contact with cables carrying power. The way to avoid trouble is a simple one, viz., if there is any sort of wire passing across the sphere of your operations, give the job up. If the wires are for telegraph or telephone use get expert help, but if they carry power—get off and stay off. Better an indoor aerial than an untimely grave.

Bathing and Washing.

HERE is something livelier. “Reynolds’ News,” giving its readers advice about preparing the set for action, says, “A poor crystal may be restored by judicious chipping and a bath of strong whisky or brandy if alcohol cannot be got.” This temperance whisky and brandy is just the stuff for America. Also, “The H.T. will often gain renewed strength for a while if stood in water for five minutes and afterwards put before a fire for fifteen.” This process would wash the outside of my H.T. container or dilute the acid inside—or do both. Shan’t try it.

B.B.C. Sensation.

THE news that the B.B.C. is to set up a department to provide it with ideas for improving the programmes is almost stunning to a highly strung person like me. It comes like an unexpected clap

of thunder. I had cherished the belief that the people who have been preparing the programmes up till now were paid to deliver “ideas.” Evidently the Board of Governors feel that, after all, someone with ideas is really needed in the B.B.C. on the entertainment side. Mr. R. E. Jeffrey is to take charge of the new department, and we wish him the best of luck.

Those Everlasting Foundations.

WIRELESSLY speaking, I live only for the weekday when the 2 L O programme will not include “The Foundations of Music,” a feature which has been regularly presented for longer than I care to recollect. Can we not get a bit higher, if only into the basement? Speaking at Bradford in December, Mr. J. H. A. Whitehouse is reported as saying, “You couldn’t run a broadcasting service if you put ‘Annie Laurie’ across all the time.” Mr. Whitehouse is a B.B.C. man, and I hope he will tell his Corporation a similar thing in regard to the subject of this paragraph.

Radio Pictures in U.S.A.

THE broadcasting of pictures is beginning to boom in America. The “Electrical Review” says that according to “Science” twenty-one stations will soon be “on the air” with picture services, of which nine are now in operation. A ten-million dollar company has been formed to make and sell picture-receiving sets. The General Electric Company at Schenectady is broadcasting regularly on three different frequencies, including 790 kilocycles (W.G.Y.).

A Loss to Radio.

OUR readers, and especially those abroad who do not regularly see home newspapers, will regret the death of Mr. Willie Rouse, known as “Wireless Willie,” which occurred in a nursing home on December 22nd. This gentleman was a favourite microphone artiste, a sterling, refined humorist, and his death leaves a

(Continued on next page).

DUBLIN'S DOINGS.



Checking the broadcast transmission from the control room at Dublin, 2 R N.

NOTES AND NEWS.

(Continued from previous page.)

sad gap in the sparse ranks of first-class wireless entertainers. "P.W." proffers its sympathy to his friends and relatives.

Schoolboy Humour.

JANUARY generally sees school reports and the never-failing crop of schoolboy "howlers." Here are a few with an electrical or radio flavour: "Talligraphy is Morse but radio is listening-in to music and other sounds." "An accumulator is a heavy sheet of lead soaked in acid and they charge 1 and 6 to charge it." "A dry cell is in a flashlamp with two brass strips and several volts." "Telephony is two sorts, wireless and ordinary. Ordinary costs two-pence but wireless many £'s and then perhaps you hear nil." "Hertz invented sparks but Marconi went to New South Wales and flew a balloon, thus bridging the Atlantic with a faint S.O.S."

"Ariel" as Young Moore.

ON New Year's Eve, at a party, they made my usual glass of water strong by adding a lump of sugar to it—and I prophesied and said that 1929 would be about as long as 1793, but that more farmers would be ruined; that a great increase in long-distance radio-telephony would be observed; that "P.W." would lead the way with the most ingenious and efficient sets; that Oxford would win provided only that Cambridge lost; that the reception of 3 L O on a "P.W." two-valver would be a commonplace; that picture-reception would be three jumps ahead of television; and that the B.B.C. would continue to be the best of all broadcasting enterprises, bad and good as it is.

A Prince of Talkers.

THE American Academy of Arts and Letters is to award a gold medal for good diction by a radio announcer. This is, I presume, intended as an encouragement of "talkies." In this connection I should like to draw to the notice of the Academy the claims of the Prince of Wales, who, by speaking to the microphone for a few minutes, succeeded in collaring £55,000 for the miners within a few hours. If it is true that "money talks," then our Prince has the diction which should please an American academy.

French Radio Taxes.

MORE talk again of levying taxes on receivers in France; crystal sets 10 francs, and valve sets up to 80 francs, according to the number of valves. The estimated gross revenue from all this is about £360,000 per annum, but it is doubtful whether the French will pay up without some assurance that a large part of the proceeds will be spent on radio interests. As a matter of fact, they don't even pay the existing nominal tax of 1 franc.

Poet v. Jazz.

IT'S amusing to note that someone wrote to a Yorkshire newspaper complaining that the B.B.C. allowed Mr. J. Drinkwater to intone "nonsensical children's verse" for twenty-five minutes over scheduled time, thus robbing his guests of Jack Payne's Dance Band!

A New Year's Treat.

OUR big brother, "Modern Wireless," celebrates the New Year with an absolute buster of a January number. Constructional articles about no less than five different receivers are given, including a particularly topical one entitled "The Any-Mains Four." A special article, "Marconi—the Man and His Work," by the Editor, gives new facts and pictures relating to the great inventor. One of the best resolutions you could make is that you will be a 1929 "M.W."-ite.

Uncle Arthur's Union.

IT was jolly to meet "Uncle" Arthur Burrows again a few weeks ago, as cheery as ever. He is the Secretary-General of the Unione Internationale de Radiophonie and was in London with a commission ap-

SHORT WAVES.

"Ether for a Husband," says a headline. There are probably moments when some of them would welcome it as a substitute for the more usual form of gas.—"Passing Show."

HOW TIMES HAVE CHANGED.

In 1924: "Gee, that's a fine radio you've got; sounds like a phonograph."
In 1929: "Say, that phonograph's all right; sounds just like the radio."—"Radio News."

She was only a wireless fan's daughter, but she knew how to "loud-speak."

The Height of Snobbishness.—The radio announcer who would not announce for a station unless they had an exclusive wave.

WHERE NIGHTS ARE SIX MONTHS LONG.

Explorer: "I knew a fellow who listened to fifteen hundred bedtime stories in one night."
Listener: "He must have been a lunatic."
Explorer: "No, he was an Eskimo."
"Radio News."

"Buy Aerial Self-raising Flour. Easiest and Best."—(Advt.)

Presumably, this should be sprinkled on the mast, or perhaps on the wires?

All the joy in the world,
Is now freely unfurled,
By artists of talent and fame;
And life's worth the living—
One endless thanksgiving—
Since we got in the radio game!

pointed to study programmes and administration. Needless to say, the B.B.C. soon had them in the hands of the radio education cranks, and they had to go and see the kids wasting priceless time on radio lessons at a Council school.

New Central European Station.

A NEW station is to be erected shortly at Bratislava, Czecho-Slovakia. Its power (antenna) will be 12 kw. It will be the largest of a chain of five stations which are contemplated, and will perform a service similar to that of the new B.B.C. high-power regional stations.

Armistice Night in Australia.

I AM very glad to hear from H. W. B. (W. Australia) that the 5 SW broadcast of the Albert Hall Armistice Night proceedings were successfully received at the Antipodes. H. W. B., an old R.F.A. man, lost a lot of sleep over it, but I am sure he does not regret a single wink. It must have been a wonderful experience. He says that PCJJ and 5 SW are about equal there—but he says nothing about the cricket Test teams. (!Nuff said!)

The Big Bang.

MULLARD'S tell me that they had to evacuate Mullard House, by police order, during the bust-up which tore so much of gold-paved London up a few weeks ago. I understand that during the course of the explosions and fire an optimistic employé wanted to put a Mullard valve down the worst manhole in order to demonstrate its (the valve's) invulnerability, but that he was not allowed to waste the firm's time on so easy a test!

The "Hams" Are Alert.

WHENEVER my Barts. and other keen ether-dredgers seem fast asleep I have but to describe what I imagine to be a new DX feat for them to spring to attention and show me how wrong I am. Thus cunningly do I obtain a lot of interesting reports.

For instance, I mentioned the reception of 6 A G (W. Australia) and, as you know, we found that 6 A G was a regular job with a number of readers. Now I can't stop the flood I have let loose. I don't want to; but if I hear much more about 6 A G I shall try a crystal on him.

What is One to Do?

MOST of my correspondents on this subject regard 6 A G as fairly easy meat, though, as a matter of fact, it is good work to get him. But one of them, R. G. B. (Peterculter) has the impression that my original note savoured of scepticism, and he therefore assures me that he himself got 6 A G the same evening as did T. W. M. M. Almost like a Scotch conspiracy, isn't it? "Shikari" (Malpas) gets 6 A G and Nairobi, on 0-v-2, besides Melbourne and the Yanks. He asks why W. L. S. does not have more space for S.W. Notes. Dunno! But think of the quality!

Round the World for 15s.

THE Boy's Brigade continues to shoot at me. A young struggler on the leash, J. A. O. (Burry Port), aged "not yet fifteen," says that when he was twelve he was such a keen radio fan that his father couldn't keep his pipe-spills alight. He says, also, that if he could afford a transmitting licence, he would build a station at a cost of 15s., and would "guarantee reception around the world."

I think that it would pay any amateur transmitter to get the lad his licence so that we could find out about this wonder circuit. J. A. O. has a three-valver which has bagged more than 120 stations, and he is making the "Antipodes Adaptor."

The First Broadcaster.

PLEASE see page 772 of "P.W." for December 15th. I have been lucky enough to discover a man who actually heard what was, perhaps, the first radio broadcast. It was done by Dr. De Forest in 1909, ably assisted by Caruso.

S. C. C., of Plymouth, tells me that as wireless operator on the "Celtic"—now of blessed memory—he received the transmission while in New York Harbour. The receiver was the old "magnetic detector," and the signals were clear though weak. Evidently we must "hand it to" De Forest. Much obliged, S. C. C. How goes it?

ARIEL.

The 1929 "TRINADYNE"



Another of "P.W.'s" most popular and most effective circuits revised and brought right up to date. Using only one valve, this novel set has a wonderful punch. It has all the merits of a dual amplifier without the usual "snags."

Designed and described by The "P.W." RESEARCH DEPARTMENT.

THE fascination of this sort of set is not very far to seek. It is the same attraction which once made the reflex circuit so popular, namely, the fact that you can get loud-speaker results of quite pleasant volume on one valve if your aerial is even a fair one.

People sometimes object that to build such a set costs just as much in components as to make an ordinary two-valver, but even so, there is the price of the extra valve itself to consider, likewise the question of running costs.

The Real Attraction

Anyway, such objectors miss the real point, which is that even if special circuits like this actually cost more to build and run (which they don't), their fascination is still great enough to cause the keen constructor to make them up.

If you are human at all you must find a certain satisfaction in asking people to listen to your set, and then, when they ask how many valves, in replying very casually, "Oh, only one!" The surprise which usually follows is very soothing and enhances your reputation as a wireless wizard wonderfully. Did someone mutter "How

childish!"? Well, why not? What's the good of having a hobby, if you've got to be thoroughly grown-up and dignified-over it?

Anyway, we got lots of fun out of this little set, and the experiments which led up to it, in the "P.W." Research Dept., and we think any reader who builds it will be pretty sure to do likewise. It was quite a surprise to us, even though we knew that much can be done with a circuit of this general type, and it is likely to be something

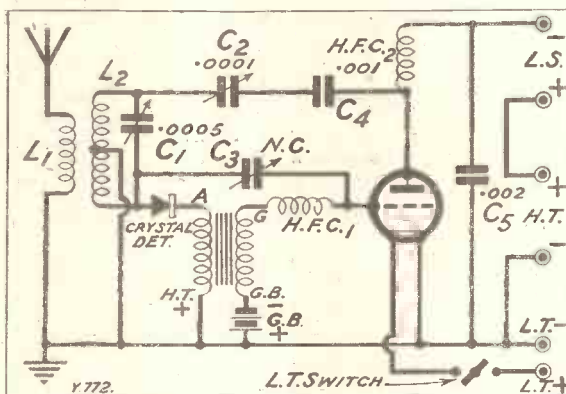
of a revelation to anyone who has only handled one-valvers of the ordinary kind.

The earlier forms of the Trinadyne circuit were remarkable little receivers, as many of the older readers will remember, and there was no real reason why they should go out of fashion as they appear to have done. It is probably just a natural result of the succession of new sets and circuits always appearing that they have been in danger of being forgotten.

We felt so strongly that it was to be regretted that such very useful little circuits should be neglected that we undertook a special series of experiments on their later forms. It was hoped to develop from them something at least as good which should be specially suited to modern requirements and capable of assembly with modern components throughout.

Greater Stability

The task was a rather difficult one, but the final result is a
(Continued on next page).



COMPONENTS AND MATERIALS REQUIRED.

- 1 Panel, 12 in. x 7 in. x 1/2 in. or 1 in. (Radion, Beool, "Kay Ray," Ripault, Trolite, Red Seal, Trolleborg, Ebonart, etc.).
- 1 Cabinet to fit, with baseboard 7 in. deep (Camco, Bond, Raymond, Lock, Peto-Scott, Gilbert, Pickett, Arcraft, Caxton, etc.).
- 1 .0005-mfd. tuning condenser (Formo, Lotus, Cyldon, Lissen, Utility, J.B., Igranic, Ormond, Dubilier, Ripault, G.E.C., Pye, Raymond, Burton, Colvern, Bowyer-Lowe, etc.).
- 1 On-off switch (Benjamin, Lotus, Lissen, Burne-Jones, Igranic, Peto-Scott, etc.).

- 1 .0001 or .00015-mfd. reaction condenser (Peto-Scott, J.B., Lotus, Dubilier, Ormond, Bowyer-Lowe, Igranic, Burndept, Burton, etc.).
- 1 Panel-mounting crystal detector (either cat's-whisker type, such as the G.E.C., or semi-permanent, such as the Brownie or R.I.-Varley).
- 1 Sprung valve holder (W.B., Igranic, Lotus, Burndept, Ashley, Pye, Marconiophone, B.T.H., Bowyer-Lowe, Wearite, Burton, Burne-Jones, etc.).
- 2 H.F. chokes, preferably of different makes (Lissen, Igranic, Burne-Jones, Leweos, Climax, Colvern, Cosmos, Bowyer-Lowe, R.I.-Varley, Peto-Scott, Wearite, etc.).

- 1 Baseboard-mounting neutralising condenser (Gambrell, J.B., Burne-Jones, Peto-Scott, Bowyer-Lowe, etc.).
- 1 L.F. transformer, low ratio (R.I.-Varley, Ferranti, Lissen, Igranic, Marconiophone, Brown, Philips, Mullard, etc.).
- 2 Single-coil sockets (Lotus, Peto-Scott, etc.).
- 1 .002-mfd. fixed condenser and 1 of .001 mfd. (T.C.C., Lissen, Mullard, Dubilier, Igranic, Clarke, Goltone, Magnum, etc.).
- 1 Terminal strip 10 in. x 2 in. x 1/4 in., and 8 terminals (Belling & Lee, Igranic, Eelex, etc.).
- Wire, flex, screws, G.B. plugs, etc.

THE 1929 "TRINADYNE."

(Continued from previous page.)

circuit which we think will get full marks. It possesses all the original circuit's remarkable power and sensitivity; it is more selective; it can be assembled with standard modern components throughout, and it is decidedly "safer," i.e. any good make can be used for any of the parts, and there is nothing unduly critical about it anywhere.

Now let us take a look at the final circuit chosen for the 1929 version, after many comparative tests with alternative forms. First, you will notice that it has an aerial circuit of the modern "semi-aperiodic" type, ensuring a good degree of selectivity.

This circuit consists of the plug-in coil L_1 , and by varying the size of this inductance you can get different degrees of selectivity to suit your own requirements, suit the circuit to your aerial, and so on.

The Secret of the Circuit.

The aperiodic aerial circuit is tightly coupled to a tuned secondary consisting of the centre-tapped plug-in coil L_2 and the variable condenser C_1 , and here we begin to find the special features which distinguish the 1929 circuit. By certain special arrangements we have been able to arrange the

whole circuit with entirely standard components, the key to the whole scheme being the use of a centre-tapped coil for the secondary circuit.

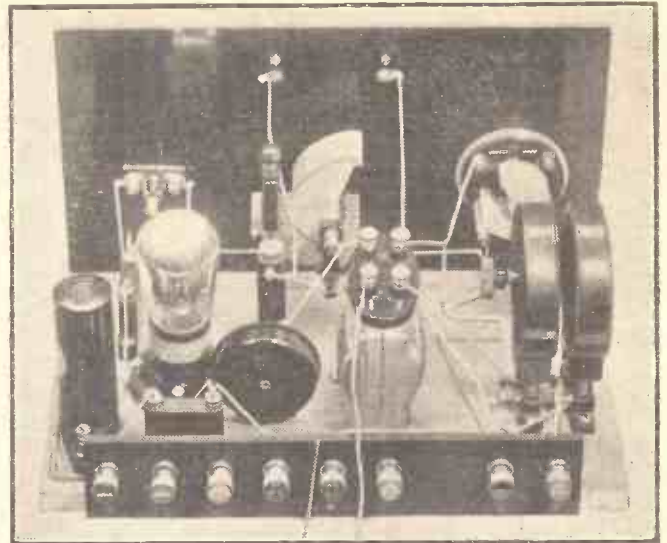
With the aid of this unit we have been able to put the crystal detector across only half the tuned circuit, and so get improved selectivity. The other half of the tuned circuit is thus left free, and we have used this to form a reaction circuit of the Hartley type.

Improved Reaction.

The reaction arrangements are the special feature of the 1929 circuit and are the real reason for its improved performance. You will see that a neutralising type condenser is fitted, and this is for the purpose of feeding a little H.F. energy on to the grid of the valve, which would otherwise act purely as an L.F. amplifier.

It is thus made to carry a little H.F.

current as well, and is so made capable of producing the reaction effects which give the circuit its sensitivity.



Here is the completed set with valves and coils in position: a neat and efficient assembly.

By the way, it may perhaps be as well to explain for the benefit of readers who are not familiar with the circuit that it is not really a reflex at all. The valve acts as an L.F. amplifier, and its only "dual" function is that it is also used to produce reaction. No attempt is made to make it function as an H.F. amplifier.

Actually, better results are obtained in this way, with far greater freedom from "snags." The fact is that the amount of H.F. amplification obtained with the older reflexes was practically nil, and their sensitivity (when they had any!) was almost entirely due to inherent (and often badly controlled) reaction effects.

A Hint for the Constructor.

So much for general points about the new circuit. Now let us get down to practical matters. So far as the constructional work is concerned there is little to be said, for it is a very simple job of assembling and wiring up.

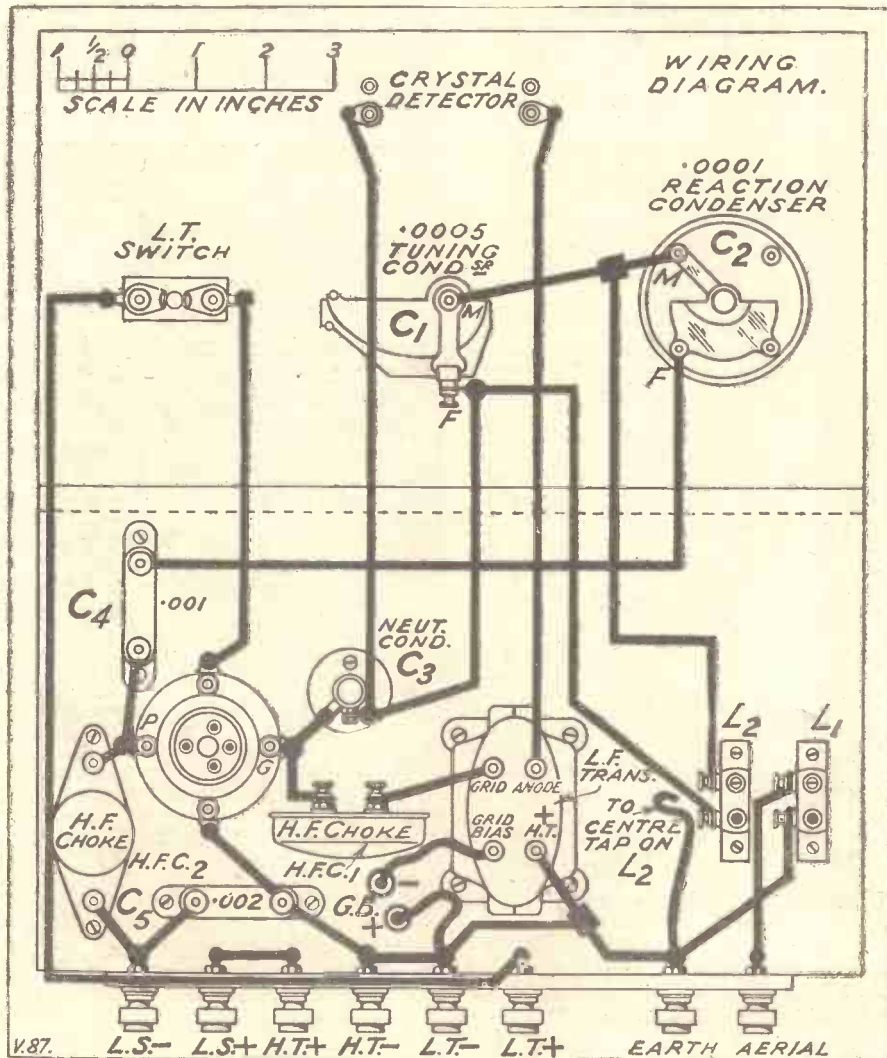
Just one point should perhaps be mentioned, and that is a warning as to alterations to the layout. The set is not really critical, but if you do make any alterations be careful what you do with the two H.F. chokes, and do not put them any closer to each other or to the tuning coils than they were in the original set.

The secret of success with any of these special circuits is largely a matter of correct adjustments, so first of all you must be prepared to spend a little time finding the right setting for the crystal and getting the hang of the circuit generally. Let us start with the question of selectivity.

How to Adjust Selectivity.

This depends upon the size of the aerial coil L_1 , and for an average sized aerial you will want a No. 35 for medium selectivity, and a No. 25 for sharper tuning, but slightly less volume. On a small aerial a No. 40 or even 50 will be the medium selectivity sizes, and No. 35 for high selectivity.

For the secondary coil L_2 you require a
(Continued on next page).



V.87.

THE 1929 "TRINADYNE."

(Continued from previous page.)

No. 60 centre-tapped type for the ordinary broadcast waves. For the long waves the size here is No. 250, with a No. 75 or 100 in the aerial circuit (L_1) according to the degree of selectivity you want.

Correct reaction control is a very important point with this set, and it is well worth while to spend a little time on it. Circuits of this general type cannot, as a rule, be expected to give such smooth and gradual control as the simple Reinartz one-valver, but with care something not far short can be obtained.

An Important Adjustment.

The first point to note in this connection is that the setting of the neutrodyne type condenser has a considerable effect on the reaction control, and enables you to suit the requirements of any given valve. Start operations with this condenser set about half-way between minimum and maximum, and see what sort of reaction control you get.

If the receiver oscillates very easily, and rather fiercely, with only a small setting of the reaction condenser, reduce the setting of the neutrodyne condenser. If, on the contrary, it is difficult to get reaction, increase the setting of the neutrodyne. Once the correct adjustment is found for a particular valve it can be left permanently, and all actual reaction control done on the reaction condenser proper.

The choice of a valve is a question

demanding a little consideration. If you want the best possible quality of reproduction on the local station, a small power-valve should be used (2-volters work well in this set). This will enable you to work a loud speaker on the local at quite pleasant volume and very good quality indeed.

For the greatest volume and sensitivity, on the other hand, particularly on distant stations (when headphones will be used), a valve of rather higher amplification factor and higher impedance is best, in other words, one of the L.F. type, with an

for circuits of this type is always the same: give the valve as high a voltage as you can afford up to the limit of safety fixed by the makers (usually 120 volts).

Until you get at least 100 volts at work you do not really get the full benefit of the circuit, and, moreover, lower voltages may cause the valve to start rectifying instead of amplifying properly.

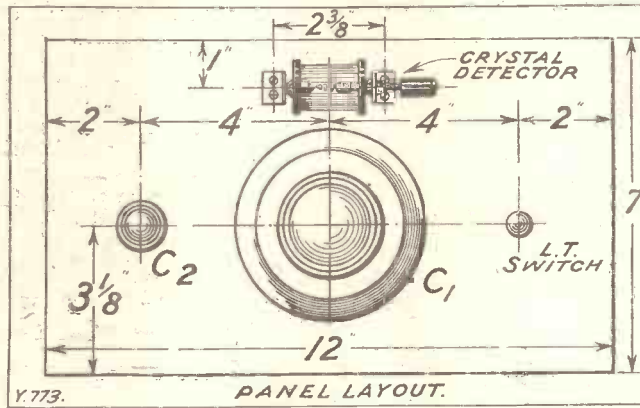
Grid Bias and Reaction.

Grid bias should be adjusted exactly as usual in accordance with the valve maker's instructions. Then test the reaction control, and try a trifle more bias, noting whether it results in a smoother control. It does with some valves, so it is just worth trying.

You should note, by the way, that if you go too far with this over-biasing you will upset the working of the valve and cause it to rectify, just as though the H.T. voltage was not high enough. You can tell whether this is happening by lifting the cat-whisker of the

crystal, and noting whether you can still hear strong signals.

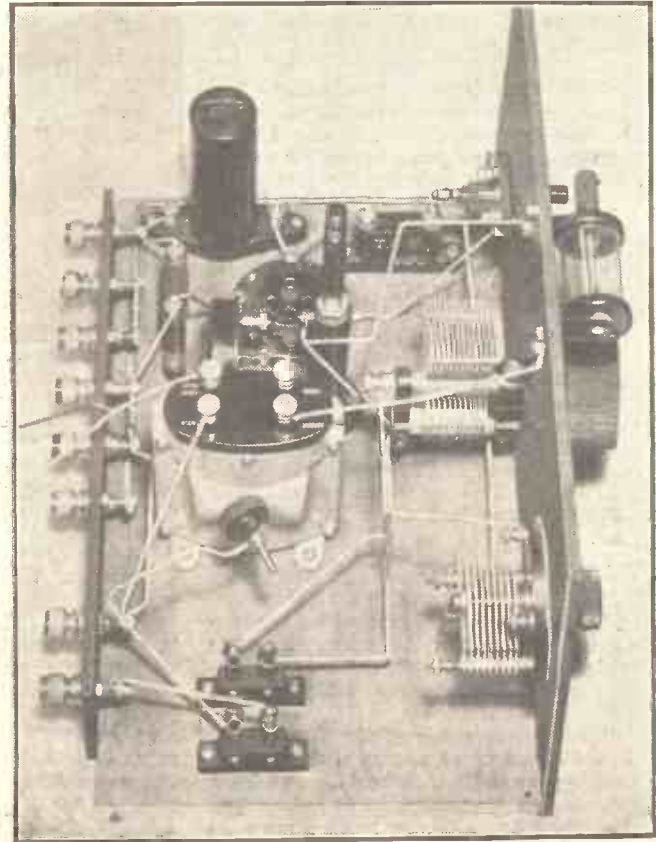
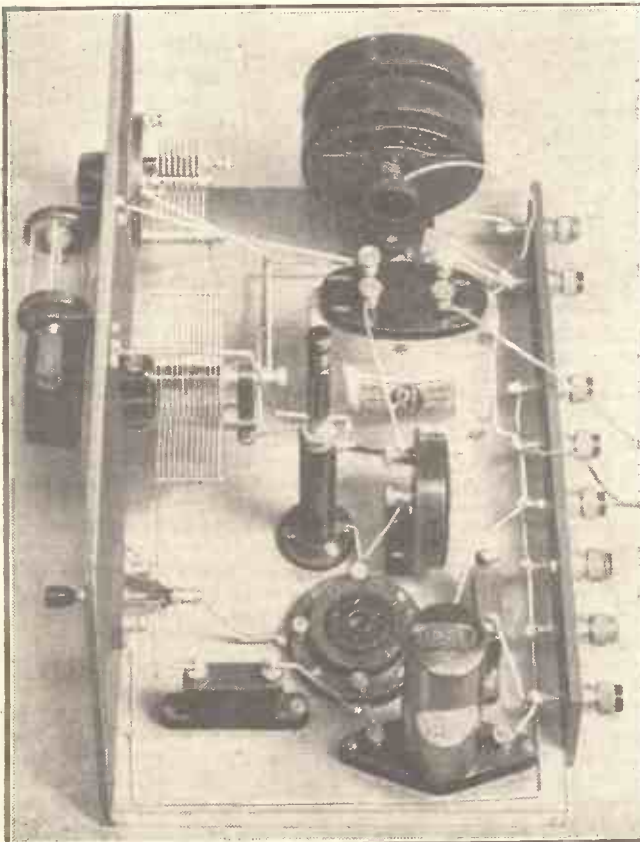
When the circuit is working properly you should only have quite faint signals with the crystal out of action. If they are loud you may be sure that all is not well with the valve, and you should take the necessary steps to make it amplify properly.



impedance of perhaps 7,500 to 15,000 ohms, or a little higher.

The choice will evidently depend largely on how near you are to your local station: If you are within, say, eight miles, a power type is advised, while for greater distances the higher magnification L.F. type will be best.

As regards H.T. voltage, the golden rule



Two views of the 1929 Trinadyne, which show both the layout and wiring of the set very clearly. Note the two different makes (and shapes!) of H.F. choke used and the plug which is taken to a centre-tap on one of the coils.

THE B.B.C. AND PUBLISHING.

The Public and Parliamentary interest in the important question of the B.B.C.'s recent publishing activities is briefly outlined below.

By THE EDITOR.

OUR readers have probably seen in the newspapers that the publication of the B.B.C.'s new journal, "The Listener," has aroused a considerable controversy. It is maintained by newspaper-interests that the B.B.C.'s plan to publish the new weekly journal is unfair, and, furthermore, that the Postmaster-General's action in refusing to receive a deputation of bodies representing the newspaper and printing industries of the country is very much to be deplored.

The Secretary of the Newspaper Proprietors Association wrote to the Postmaster-General on December 15th, stating that it was considered that unfair advantage was being taken of the terms of the B.B.C.'s charter in publishing the new paper, and asking him to receive a deputation. On the 19th a reply was received, stating that the publication of the journal was within the discretion of the Corporation, and that no useful purpose would be served by receiving a deputation.

Permissible Under Charter.

On a further occasion, the Postmaster-General refused to receive a deputation, again reiterating his view that the publication proposed by the B.B.C., i.e. "The Listener," was permissible within the power granted to the B.B.C. by its charter.

On receiving this refusal, the following letter was sent to Mr. Baldwin, the Prime Minister:

"The Association representing the London and Provincial Press, the periodical and weekly newspapers and the Master Printers are much perturbed at the action of the B.B.C. in entering the publishing business, in which they are concerned in a large way. These Associations are satisfied that it was never intended that the Corporation should undertake such operations. They have requested the Postmaster-General to receive a deputation, which he has declined to do. They therefore have no alternative but to appeal to the Prime Minister.

"I will not now develop the reasons which led them to make this request, except to say that the B.B.C.'s activities in this respect are entirely contrary to the industrial and trade policy which you and your colleagues have laid down from time to time.

Unfair Competition.

"The B.B.C. are paying no income tax, and yet they are competing with firms who do, and are diverting trade from legitimate trade channels. They are not only publishing newspapers, but operas, handbooks, and books for use in schools.

"If it is the policy of the Government that these extensive powers, with their far-reaching possibilities, should be run by a Government department, it is just as well that the fact should be made known, as what applies to newspapers and periodicals applies also to other trades.

"I may say that the associations concerned represent, at a low computation, some £200,000,000 to £300,000,000 of capital, and employ vast numbers of men and women.

"On behalf of the Newspaper Proprietors Association (representing the London morning, evening, and Sunday newspapers), the Newspaper Society (representing the provincial newspapers), the Periodical, Trade Press, and Weekly Newspaper Proprietors Association, and the Federation of Master Printers and Allied Trades of Great Britain and Ireland."

B.B.C.'s Reply.

This letter was signed by Mr. T. W. McAra, the Secretary of the Newspaper Proprietors Association.

The B.B.C., in defending their action in producing the new paper, "The Listener,"

THEIR RIGHTFUL ROLE.



It is in bringing famous people to the microphone, and in introducing public personalities into private homes that the benefit of broadcasting is felt. This picture shows Earl Jellicoe in the London Studio.

stated that the new journal is designed to replace a substantial proportion of the educational pamphlets and booklets which have appeared regularly during the last few years. There are no proposals to establish any new series of publications.

POPULAR WIRELESS understands, on excellent authority, that this widespread condemnation of the B.B.C.'s action in bringing out another journal in competition with vested interests has caused quite a stir at Savoy Hill, and that, in consequence, the policy of "The Listener" will be considerably modified. It is quite clear that the storm of protest which has been aroused by this new publication may lead to litigation with a view to altering the terms of the B.B.C.'s charter and in curtailing further publishing activities.

There is no doubt that, from a legal point

of view, the production of this paper, "The Listener," is at the moment justified, but on moral grounds it is to be deplored that the B.B.C. should continue its ill-advised policy of enlarging its publishing activities, thus competing on an unfair basis from the financial point of view with commercial interests.

Not Their Business.

After all, we have to bear in mind that the B.B.C. is a Government Department and, on political grounds, it is unwise that any of the B.B.C. publications should come under the term of subsidised journals by a Government Department. Another point is, of course, that the listener's money is being used to float this publication, and although there is no suggestion that any profits accruing from the paper would be spent on increasing and improving broadcasting in this country, it is felt (and justifiably so) that the income derived by the B.B.C. from licence fees should be sufficient to carry on broadcasting without recourse to securing further income by the publication of journals which compete on an unfair basis with existing ones, and with the existing rights of newspapers and periodicals generally.

We hope that the B.B.C. will take a tip from the storm they have aroused by the publication of this new journal, and that in future they will refrain from producing new publications, and turning themselves into a publishing business, when it is morally understood that their business in life is to give broadcasting entertainment.

New Talks.

In the syllabus of talks and lectures issued by the British Broadcasting Corporation, and covering the period up to next April, several new features will attract the special interest of listeners.

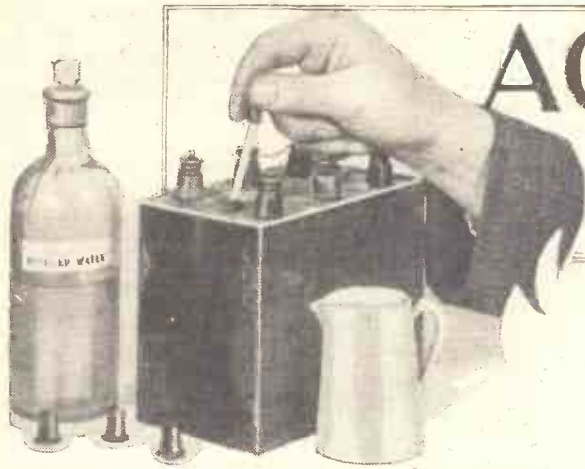
On Monday evenings there will be a special set of talks on "Crime and the Criminal," in which

Mr. Laurence Housman, Dr. Cyril Burt, Lord Feversham, Colonel Turner (of Wakefield Prison), and Lord Lytton will take part. On Tuesday evenings Sir Walford Davies will continue his talks on "Music and the Ordinary Listener."

On Wednesdays, in place of last session's symposium on "My Aims in the Theatre," there will be a series on "The Future of the Cinema."

Another Serial.

Mr. Vernon Bartlett will continue his talks on "The Way of the World" on Thursdays; on Fridays there will be a topical or general talk, and on Saturdays there will be another experiment in broadcast fiction, a serial story in six episodes by Mr. Holt Marvell, called "Six Strange Saturdays."



ACCUMULATOR ECONOMIES

Helpful Hints on the Choice of an Accumulator for Long Life and Efficiency.

By J. F. CORRIGAN, M.Sc., A.I.C.

PERHAPS, in common with nearly every radio amateur and experimenter, you have, at one time or another, echoed the query, "What is the best accumulator?"

Truth to tell, however, there is no "best" accumulator in the strictest sense of the word; for all the secondary batteries of this type which are manufactured by reputable concerns may be depended upon to function efficiently, provided they are given reasonable treatment.

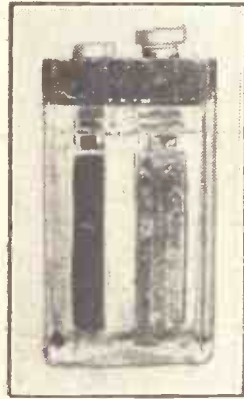
Two Important Factors.

But in purchasing a new accumulator, the amateur has such an overwhelming series of models to choose from, that he is apt to become rather dismayed at the task, particularly so, of course, if he has not completely left the novice stage of the radio art.

To put matters briefly, however, the effective choice of an accumulator depends mainly upon two factors, viz., the type of service for which it is required, and the amount one is willing to pay for the instrument. Cheap foreign-made accumulators are generally a snare and a delusion, and there is no gainsaying the fact that if you want a reliable article of this nature, you have to be prepared to pay a reasonable price for it.

For the man whose purse is limited, the

best value in the accumulator line consists of the glass-box type of accumulator, containing one pair of plates only. These cells are very sturdily built, and they will stand a lot of knocking about without injury. Their disadvantages are that they must be charged very slowly, and that a relatively low charging current must be used. Furthermore, owing to the comparatively wide separation of the plates, the internal resistance of accumulators of this type is rather high, which fact somewhat reduces their working efficiency for power use.



Glass-box single-cell type of accumulator.

Still, however, accumulators of this type are about the cheapest and the most trouble-free of any, and, for such reasons, they make their special appeal to

the beginner with the valve set.

At the same time, however, accumulators of the multi-cell type, enclosed in celluloid cases, are perhaps the more popular articles on account of the fact that they can be put to a more varied number of uses. They are generally easier to charge, and a little variation in their standard rates of charging does not exert so great an influence upon the discharge rates of the cells as it does in the case of the heavy-plate glass-box type of accumulators.

Besides which, of course, accumulators of the celluloid case type are ever so much the more portable articles, especially when a number of accumulator cells are being dealt with.

Details to be Considered.

Such, in general, are the pros and cons of the two types of accumulators. But, of course, there are details which ought to be considered before the purchase of a new accumulator is embarked upon.

Take, for instance, the reasonable life of the accumulator. Even with relatively heavy working, this ought to comprise a good three years. If, however, attention is regularly paid to the careful charging of the accumulator, you may easily rely

upon its lasting a good deal longer than the stipulated three years.

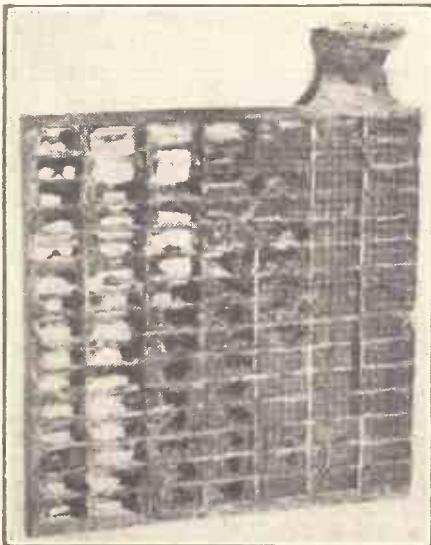
In order to obtain the maximum length of life from an accumulator, its rate of discharge should not appreciably exceed 1-12th of its ampere-hour rating. Which means to say that, in selecting your accumulator, you should multiply the total current you are likely to require by 12, and then choose an accumulator of that rating. Some authorities, of course, stipulate that an accumulator should not be discharged at a greater rate than 1-20th of its capacity, but, for most usages, a discharge rate of 1-12th of an accumulator's capacity will do no harm.

Construction of the Plates.

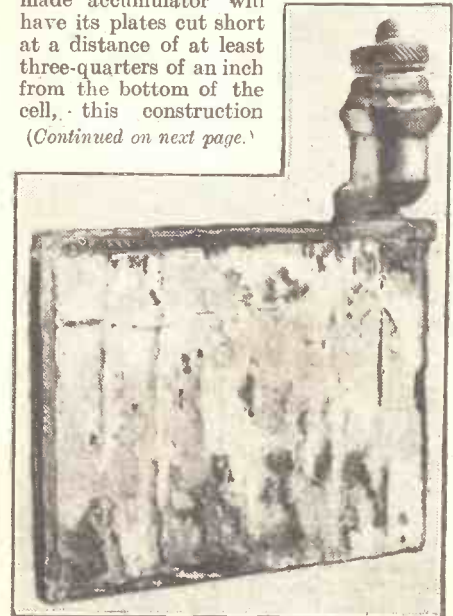
When purchasing a new accumulator, there are several minor details which should be given due attention. Look at the construction of the plates, for instance. Are their internal connections well and sturdily made, or are they merely fastened together anyhow? If a cell is badly made in this respect, corrosion troubles are easily liable to occur at these areas of internal connection within the cell.

Then, again, do the plates reach nearly to the bottom of the cell? If so, it is a bad point, for a well-made accumulator will have its plates cut short at a distance of at least three-quarters of an inch from the bottom of the cell, this construction

(Continued on next page.)



The positive plate of an accumulator with a portion of the active material removed, to show the construction of the plate.



The sulphated plate of an accumulator, this being caused by faulty charging and discharging.

"AND THAT'S THAT!"

By H. J. B. C.

AMONGST my correspondence recently was a letter from a friend in which the following paragraph appeared:

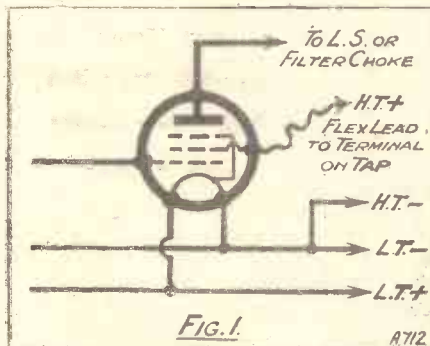
"I am sorry to say that my set has failed to function. Apparently the valves are burnt out, for it was going well and then there was a sudden cessation. I can only suppose that the loose lead from the Pentode valve wobbled a bit, and that's that!"

I knew that he had installed, quite recently, a three-valve set, using a screened-grid valve, a detector, and a pentode valve, so I paid him a visit to see exactly what had happened. Readers are, of course, aware that with a pentode valve there is a terminal on the cap which has to be connected to positive high tension, the exact voltage varying between 80 and 120, the connections being made clear from Fig. 1.

The Pentode's "Flex."

A flexible lead is joined usually between the cap terminal and a convenient point which connects to H.T. +. In some cases this is a separate terminal provided on the terminal strip, while in other cases it is joined to a component terminal passing to H.T. +, for example, the primary H.T. + terminal of an L.F. transformer.

In the set I examined I found that the pentode valve had been removed from its holder and a power valve substituted in its place in order to make comparisons for volume and purity of reproduction. The



flex lead was connected to the L.F. transformer terminal, and had been left inside the set, the disconnection having been effected *only* at the Pentode cap terminal. It is easy to picture what had happened.

Three Valves Destroyed.

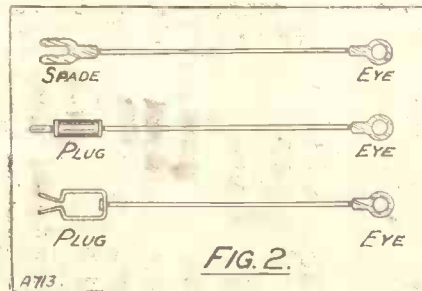
An untoward vibration had been imparted in some manner, with the result that this flexible link which was "alive" to the extent of 80 volts had touched an L.T. + connection, bringing about the demise of three good valves and a financial loss to the tune of between two and three pounds.

If, by chance, this wandering lead had attached itself to an L.T. - connection somewhere in the set, then the H.T. battery would have been shorted out. It is all right to be wise after the event, but the exercise of a little caution would have prevented any damage.

When using pentode valves (or screened-grid valves for that matter, as similar arguments apply to both), be sure and switch off the set before making any adjustments either internally or to the G.B. and H.T. wander plugs. Furthermore, since the connection to the terminal on the cap of the pentode valve, or the terminal on the top of the glass bulb of the screened grid valve, is made usually through the medium of a short length of flex wire, take precautions to ensure that no damage will occur.

Guarding Against Burn-Outs.

One of the safest plans is to provide a spare terminal mounted on ebonite and screwed to the baseboard, and bring the appropriate H.T. connection to this terminal, and then join the flex lead from the valve to it. Another very efficient method is to arrange a socket on the baseboard, suitably insulated from the wood, of course, and let the flex link terminate in a spring which can be conveniently inserted into, or withdrawn from, the socket, as occasion demands.



In addition, see that the connection is made to the valve first before inserting it in the valve holder, and then when ready connect the lead to the point provided. Conversely, if removing a screened-grid or pentode valve, first disconnect the end of the lead remote from the valve and the wire is then rendered "dead."

To jog one's memory that this is the safest course, I find it best to terminate one end of the lead in an eye tag and the other in a spade tag or plug, according to circumstances (see the sketch of Fig. 2). By attaching the eye under the valve terminal, it will not slip off if the terminal head is loosened and this should serve to remind you that the end to disconnect is that attached to the spade tag or plug.

In itself, this may appear a small item, but it should be the means of preventing you from writing a letter couched in terms similar to those of the opening paragraph.

PATENT PROTECTION.

If an inventor or would-be inventor draws up his own provisional specification for a patent, the cost of protecting his idea provisionally is only £1 for the stamp fee.

The filing of a provisional patent specification does not give the inventor the status of a patentee, but it secures his right for a period of nine months, during which he can complete the necessary patent.

ACCUMULATOR ECONOMIES.

(Continued from previous page).

being necessary in order to allow an adequate space for falling sediment, which would otherwise form an accumulation and make contacts between the lower edges of two or more of the plates, thus causing internal short-circuits within the cell.

The terminals of an accumulator, although they may appear to be mere details, exercise a great influence upon the life and usefulness of the cell. Any good make of accumulator will be fitted with terminals which are at once massive and convenient to handle. The best types of accumulators are fitted with non-corrosive terminals—a great saving of time in maintaining them in an electrically clean condition thus being effected. And, of course, when purchasing an accumulator, you will take care to see that the under-connections to the terminals are well made. Otherwise, your instrument may suffer the fate of many others, and have to be scrapped after a year or two's use, owing to the terminals dropping off in virtue of the corrosion of their under connections.

Very Important "Cases."

And finally, if your choice of an accumulator lies in the direction of a celluloid case type of cell, see that the case itself is efficiently made, and that it is likely to hold together throughout the life of the cell. The case should be fairly transparent in order to enable the owner to observe periodically the condition of the plates and to check any tendency to sulphating which perhaps might crop up upon occasion. Flimsy cases are worse than useless. They are always giving trouble, and it is doubtful if they can ever be repaired really satisfactorily.

Accumulators—"de-luxe" of the celluloid variety contain separate celluloid cases for each pair of plates, the whole series then being bound up together in a sort of celluloid crate. This is the type of battery which the amateur should aim at obtaining if funds permit.



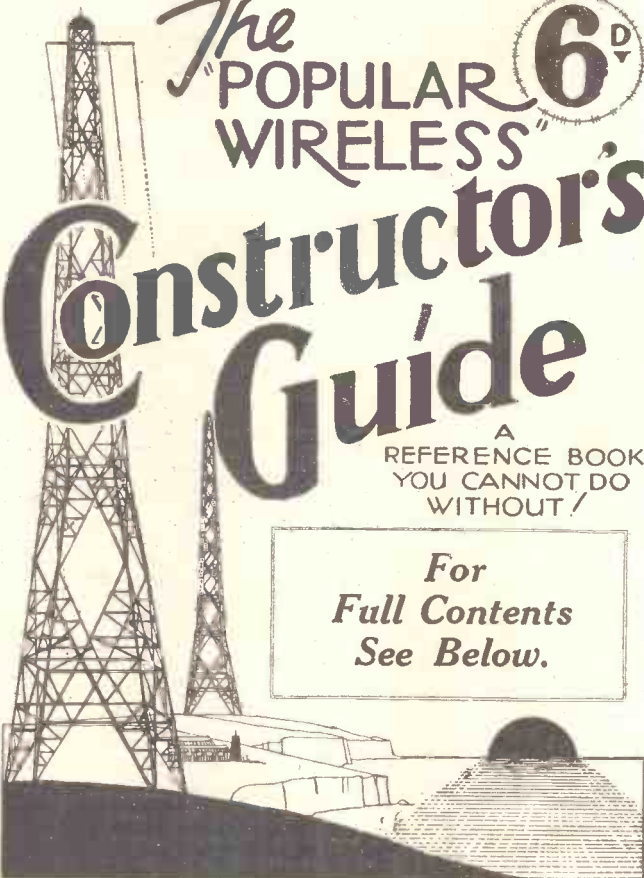
The negative plate of an accumulator.

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LATEST BROADCASTING NEWS.

BURNS NIGHT
ARRANGEMENTS

A GOLF BALL ARGUMENT—
ROMAN CATHOLICS AND
BROADCASTING—NEW
BRIDGE BROADCASTS—
“BALANCED RATIONS” BY
RADIO—WALES v. SCOT-
LAND RUGGER COM-
MENTARY.

Burns Night Arrangements.

FRIDAY, January 25th, Burns' Night, will receive extra special attention from the B.B.C. this year. The programme will be relayed from Poosie Nancy's Inn, the home of "Tam O'Shanter." Dr. Joseph Hunter, President of the Dumfries Burns Club, will give the "Immortal Memory" toast.

On the same evening, Welsh listeners will hear speeches relayed from the Cardiff Caledonian Society's Dinner, and dance music from the ball which will follow on. Newcastle will take a similar flood of oratory from a local Caledonian function. Aberdeen is going one better. There a party of "aborigines" from the far north-east are giving a local Burns programme on Wednesday, January 23rd.

A Golf Ball Argument.

At 9.20 p.m. on Friday, January 25th, Mr. Bernard Darwin and Captain Harry Graham will discuss the size of golf balls at 2 L O.

Roman Catholics and Broadcasting.

Since the appointment of the Rev. C. C. Martindale, S.J., to represent the Roman Catholics on the B.B.C. headquarters' Religious Advisory Committee, there has been a marked revival of interest in radio possibilities among Catholics. Father Martindale is taking the London studio service to-morrow evening, Sunday, January 20th. Notable Catholics in the B.B.C. include Mr. Cecil Graves, Lord Grey's nephew.

New Bridge Broadcasts.

The B.B.C. is arranging a series of Bridge broadcasts, the first of which will take place at 11 p.m. on Monday next, January 21st. Specially selected hands will be published beforehand, and listeners will be invited to play them according to their own ideas afterwards listening to the way in which they are played by experts.

Each hand will contain some point of general interest either in the bid or in the play of the cards, and perhaps in both. Then at the end of the game the experts, whose names, Mrs. Stafford Northcote, Major Browning, Mr. Manning Foster, and Mr. Jack Dalton, are familiar to all who follow the game seriously, will each explain why the bids were made and the cards played in a particular manner. Altogether there will be six broadcasts in the series, and they will be given fortnightly from 2 L O and most other stations.

“Balanced Rations” by Radio.

Some months ago Professor V. H. Mottram gave a series of talks on Food Values, in the course of which he mentioned a bewildering number of things we should consume in order to supply our bodily carbureters and gear-boxes with the requisite quantities of vitamins and other essential, though mysteriously worded, products of calorific worth.

The only question left for listeners to decide was whether to eat cabbages for breakfast or porridge for supper and generally to determine for themselves the best method of preparing meals containing the right proportion of everything required to

DUBLIN CALLING.



Mr. Hughes, the announcer at the Dublin station. No doubt a great proportion of our readers will have heard announcements from Dublin, which is now working on a wave-length of 319 metres and a power of 1 kilowatt.

produce the correct results. The outcome was that Professor Mottram and the B.B.C. had a pretty hefty postbag asking for recipes incorporating the various food-stuffs, so that while the talks were extremely valuable in educating people on what to eat and what to avoid, they left listeners somewhat in the air as to how to do so.

Professor Mottram is not going to be caught like that again in his next series of talks, which are to be given on Wednesday evenings, and he has accordingly arranged a number of what he describes as “balanced ration” recipes, and these are to be broadcast on Friday mornings from 5 X X.

The recipes will be framed on the lines of the previous Wednesday evenings' talks, and should do much to assist the ever-growing number of people who are adopting the sensible view that unless we employ science in food preparation we can easily lose much of what it can give us in other ways. The first batch of “Balanced Ration” recipes will be broadcast on Friday morning, January 25th.

Wales v. Scotland Rugger Commentary.

Mr. L. J. Corbett, captain of the England Rugby XV in 1927-28, is giving a running commentary on the Wales v. Scotland “Rugger” International match which is to be played on Saturday, February 2nd, on St. Helen's Ground, Swansea.

This is the ground where, owing to its being used for cricket during the summer, the spectators are kept some distance from the touchline in order that the turf shall not be damaged.

Visiting players are sometimes adversely affected by these strange conditions during the first part of the game, and once, some years ago—also in a Wales v. Scotland fixture—the crowd broke down the fence. The broadcast description of the game will be heard from London and Daventry as well as from the Welsh stations.

TECHNICAL NOTES.

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

VARIABLE CONDENSER DESIGN

NOISELESS CONTACT—CONTROLLING REGENERATION, ETC., ETC.

Variable Condenser Design.

WITH all the improvements which have taken place during the past two or three years in variable condensers, you might think there was little left to improve. But I have before me particulars of some of the new variable condensers appearing on the American market in which several important changes in design and construction have been made.

The needs of the U.S. amateur in the New Year, what with changed frequency bands and more limited territory, call for a higher standard of performance, and in consequence a great deal of new apparatus is coming forward, designed to fulfil the more stringent requirements.

The condenser in question is issued by the Radio Engineering Laboratories.

Noiseless Contact.

It departs from the normal practice in that it is fitted with a rugged die-cast “Y”-shaped end-plate in which is mounted the double conical bearing. An unusual feature

of this bearing is that the shaft runs in a tiny pool of mercury and so is free from the electrically noisy contact which is so often a bugbear in tuning elements.

Several types of condenser are provided, each with this end-plate assembled as standard. In one of these, which is fitted with a single stator and a single rotor plate, the capacity range is made adjustable by provision for the longitudinal movement of the stator plate. In a second type the capacity range can be varied by the adjustment of a lumped adjustable capacity built into the condenser. In all the models the plates are of heavy brass.

Controlling Regeneration.

In most regenerative receivers there is a tendency to produce excessive regeneration on the lower wave-lengths, that is, on the high-frequency range of the condenser. As many of such receivers incorporate a fixed condenser across the primary of the first L.F. transformer, the removal of this

(Continued on page 1032.)

A single note from over eighty strings

SILENCE BEFORE and SILENCE AFTER



A single note is struck upon the keyboard—a single string vibrates—notice how sharply defined the note is against the background of the succeeding silence.

It is just like that when a note impinges upon the background of silence in which a Lissen Transformer amplifies. Each note is given its full value, each instrument its characteristic tone; high notes suffer no distortion, low notes come through in all their sonorous beauty.

Whatever set you have or whatever circuit you are building, this is the kind of amplification you want, and a Lissen Transformer will give it to you.

The LISSEN SUPER TRANSFORMER

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios.

19/-

The famous 8/6 LISSEN Transformer

Has won for itself the reputation of "The Transformer that will never break down." Suitable for all ordinary purposes. Turns ratio 3 to 1. Resistance ratio 4 to 1

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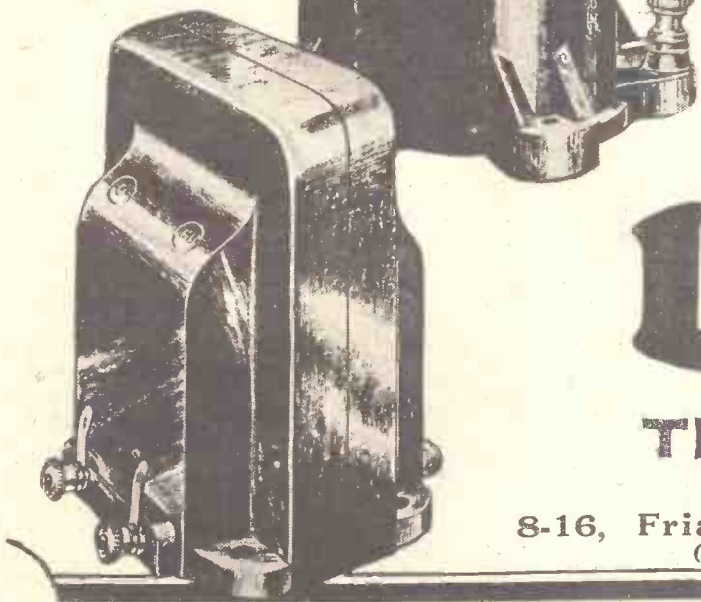
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T.C.C. Electrolytic Condenser. Capacity 2,000 mfd. In a case 5 inches high. Price 15/-.



T.C.C. Flat Type Mica Condenser. Capacities from .001 mfd., 1/10 to .01 mfd., 3/6.

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JOSIAH WEDGWOOD was a specialist. He devoted his whole life to one thing—the making of pottery. Again and again he failed, but, undaunted, he persevered until ultimately his pottery became the fashion of the period and is still to-day in great demand.

Like the Burslem potter, we are specialists. For nearly a quarter of a century we have made nothing but condensers. And because we have never deviated from our task.—never expended our energy in the making of other components—the name T.C.C. on a condenser is accepted throughout the world as the undisputed hall-mark of accuracy and dependability. For this reason the Admiralty, the G.P.O., and the Cable Companies of the World consistently use T.C.C. Condensers. For this same reason, too, it will pay you to use T.C.C. Condensers in your next Set.

FOR OVER 22 YEARS WE HAVE MADE NOTHING BUT

T.C.C. CONDENSERS

**THIS COUPON
BRINGS FREE**

BOOK

I enclose 1d. stamp. Please send me book which tells me how I can build an L.T. or H.T. Eliminator.

P.W., 19/1/29.



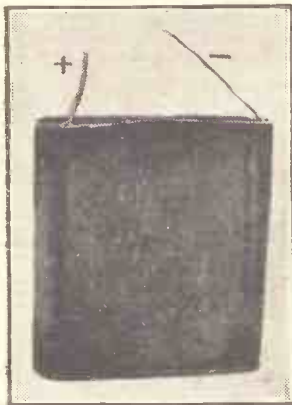
Positive and Negative

MANY amateurs experience a difficulty in remembering which is the positive electrode of an ordinary flashlamp battery, and which is the negative one.

The matter is not a difficult one to remember, however, if due attention is paid to the construction of the battery. Flashlamp batteries, in common with all forms of dry cells, are, in reality, modifications of the wet Leclanché type of cell. Now, in this cell the carbon rod forms the positive element, and the zinc rod the negative one.

Consider now an ordinary flashlamp battery. Here, also, the inner carbon rod of each component cell is the positive electrode of that cell, whilst the outer zinc covers of the cells are the negative electrodes.

In flashlamp batteries, however, the various positive and negative electrodes are all joined up in series, and the result is that the positive electrode of the battery comprises the shorter strip of brass on its outer surface, whilst the negative electrode is the longer



A typical flashlamp battery.

brass strip which is connected underneath to the zinc casing.

Perhaps this may be somewhat tedious to remember as it stands. But if you bear in mind the fact that the longer brass strip of the battery always originates right at the edge of the battery, and that it is thus obviously directly connected to the zinc casing under the cardboard cover, you will not have much trouble in retaining the polarity of a flashlamp battery in your mind.

In a word, therefore:

Longer Strip of Battery .. **NEGATIVE**
Shorter Strip .. **POSITIVE**

Threshold Howl.

One of the best ways of getting smooth reaction effects on short waves is to fit a potentiometer across the low-tension leads and connect the slider of this to the filament end of the grid leak.

Amongst the alterations which may be tried to cure a threshold howl in a short-wave set are, alteration of the grid leak, of L.F. transformers, the insertion of by-pass condensers into the circuit, and alterations in the spacing.

* * * * *

A selection of short articles covering many subjects of especial interest to the home-constructor of radio receivers, contributed by various of "P.W.'s" well-known technicians.

* * * * *

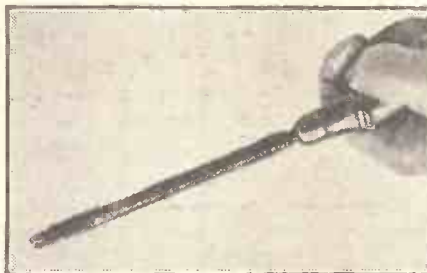
Very often a low-frequency filter output of the type used for loud speakers will prove equally advantageous for the 'phones in a short-wave set in preventing threshold howl.

Insulating the Screwdriver.

Ofttimes enough there exists a certain amount of danger in attempting to tighten up some refractory screw amid the "innards" of a receiver which is already connected up and is, in fact, in working order. The danger, of course, lying in the fact that a long screwdriver might very easily slip off the screw—particularly if the latter occupies an inconvenient position—and might, therefore, short across the H.T. and L.T. circuits of one or more valves, thus causing the filaments to burn out in an instant.

Complete protection from this possible danger, however, can be obtained by insulating the screwdriver in the manner shown in the illustration. All you require for the purpose is about an 18-in. length of oiled silk, or, better still, rubber tape. Secure one end of the tape to the end of the screwdriver blade by means of a dab of some firm adhesive, such as Chatterton's compound. Then neatly wrap the tape around the blade until it covers all but half an inch or so of the metal at the end. This done, another dab of Chatterton's compound will fasten down the remaining end of the insulating tape with adequate security.

It is, in fact, always useful to have one or two screwdrivers prepared in this fashion, for they allow greater freedom of movement when working among H.T. circuits, and for dealing with electrical mains they serve a very excellent purpose, shortly lessening, as they do, the danger of short circuits being made across two or more of the mains leads or cables.



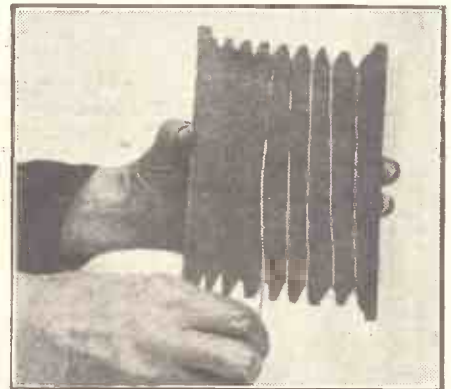
A screwdriver with its blade covered with insulating tape.

A Useful Wire Measurer.

The little readily-made gadget illustrated herewith will serve a most useful purpose, in the hands of any busy constructor, saving, as it is capable of doing, much time which would otherwise be taken up in the measuring off of approximate lengths of wire.

As will be seen by a glance at the picture, all this handy wire measurer consists of is a piece of stout cardboard, which is rigid enough to be handled rather roughly without bending or cracking.

Having procured a piece of such material about 7 in. or 8 in. in length, and about 6 in. broad, cut out on its upper and lower edge



Measuring wire with the very simple device described.

a series of V slots, the distance from the bottom of the one row of slots to the bottom of the opposite row being exactly 6 in. Cut, also, in the piece of cardboard two projecting pieces on each side of the row of slots in order to prevent the wire from slipping off. The wire measurer will now be ready for use, and if it is given a coating of varnish of one variety or another, it will become moisture proof, and will remain in good condition indefinitely.

A length of wire wound once round this gadget will measure just 1 ft. Thus, supposing you have to measure off quickly 4 ft. of wire or flex, all you have to do is to run the wire round the measurer four times, and your length of wire will be more or less accurately measured out.

A Precaution.

Be careful not to leave your set connected to aerial and earth when it is not in use for receiving at any time of year. Thunderstorms are apt to come not only in summer and when they are about the aerial may become charged to a very high potential. Though there is little real risk of fire, the set may be seriously damaged if these large voltages are applied to it.

(Continued on next page.)

FOR THE SET BUILDER.

(Continued from page 1007.)

An earthing switch, provided that it is large and well-insulated, is quite a good protection; but the best method of all is to disconnect down-lead and earth wire from the outside terminals of their respective leading-in tubes, and to devise some means of hooking them together. They then swing clear away from the house, and a good path to earth is provided for anything that may come along.

Keeping the Soldering Iron Warm.

How the outer container of an old and broken thermos flask can serve a really tremendously useful purpose will be seen in the illustration below. Every radio amateur is more or less only too familiar with the difficulty which is always experienced in keeping even a heavy soldering iron sufficiently hot enough when it is used for outdoor work. Such a task is bad enough during the warm days of the summer, but in the winter it becomes almost impossible of attainment.

However, the use of the device described here will be found to make matters very considerably easier in this particular respect.

Obtain the container of an old thermos flask, and, after cleaning it out, cut a piece



The Thermos Soldering Iron Container.

of wool or flannel to line the interior sides. Glue the fabric to the sides, and then set the container apart for a few hours in order to enable the glue to dry. In drying, the glue will contract the fabric, so that careful working in this respect will result in a nice flat surface being given to the wool lining of the container.

Next, obtain a small quantity of sheet asbestos. This can generally be procured at any ironmonger's emporium. Cut the asbestos to a suitable size, and then glue it

to the wool lining of the thermos flask container. In this instance, however, allow for an overlap of the asbestos at the neck of the container, as shown in the photograph. This latter will go a long way towards preventing the cold air from entering the container.

Holds Heat Well.

The device will now be ready for use. After heating the iron to a slightly higher temperature than that required for the actual soldering operation, place the iron in the heat-insulated container, and carry it out to the area of operations. You will find that by these simple means, the iron will keep sufficiently hot for a surprisingly long time.

The device is, of course, equally useful when employed for ordinary soldering work at the bench, the double layer of heat-insulating materials within the thermos container retaining the iron's heat very efficiently.

PRACTICAL PARS.

IN modern sets, especially of the multi-valve type, the H.T. positive plug should never be altered while the set is working, but the L.T. switch should always be in the off position when this is done.

Where power or super-power valves are employed it is not advisable to alter the grid-bias plugs while the set is working owing to the very great effect upon the resistance of the valve and consequently upon the filament plate current of the valve.

The reproduction from a loud speaker depends not only upon the instrument itself, but also in a degree upon its position in regard to neighbouring walls.

If you have a cone cabinet with a hole at the back by means of which the reed unit may be adjusted, you will possibly find it is not advisable to stand this close up against the wall.

SAFETY FIRST.

Owing to the way in which electric light, etc., switching is installed it is not generally safe to rely upon the switch which cuts out the input to a mains unit, etc. (It is safer to pull the plug right away from the house wiring socket, than merely to switch off.)

If you use a mains unit do not forget that fog and mist across the switch terminals of an external aerial-earth switch may form a conductive path capable of carrying quite a considerable current.

Where high tension is taken from direct-current mains it is advisable to have a fixed condenser in the earth lead and another in the aerial lead, so that leakage cannot take place from either of these points.

Never make any adjustments inside a set which is deriving H.T. from the mains unless both the filament and the high-tension current are switched off.

Remember, that if you are deriving current from the D.C. mains, your aerial may be at high potential and capable of giving a shock to anyone standing on the ground and touching the wire, especially if the ground is moist.

Reading and Plotting Valve Curves.

I am sure that there are quite a number of readers who are not familiar with the art of reading valve curves, and a very simple explanation of how to do this may be helpful.

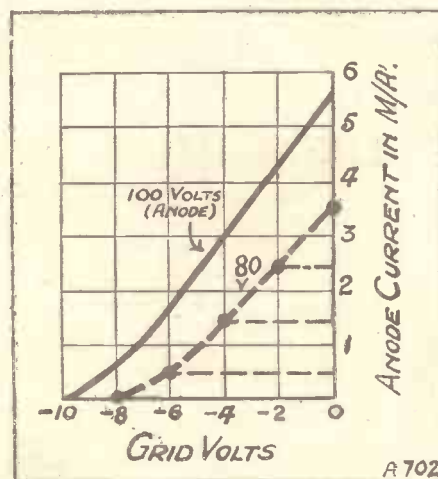
First have at hand a valve curve such as is usually supplied in printed form with most of the valves which are supplied by our manufacturers. Along the bottom horizontal scale you will read grid volts negative from a zero point on the right hand. From this point is a vertical scale which reads anode current in milliamps.

Simple Procedure.

Having grasped this the rest is simple. On the chart you will find plotted a number of curves which are representative of different H.T. voltages applied to the plate of the valve or valves.

Supposing you apply 80 volts H.T. and decide to use, say, a negative grid bias of 4 volts. To find the consumption factor you simply draw a line straight up from the 4-volt negative point on the bottom scale until it meets the 80-volt H.T. curve, and then travel straight across horizontally to the vertical scale, which will indicate how many milliamps are consumed by the particular valve in use under these conditions.

If, however, the filament of the valve is being under run, or over run, this reading will not be correct, as the filament heating



as specified for the valve also has a direct bearing upon the anode current consumption factor, although this is not commonly realised.

The best thing to do in this respect is to see that the correct filament voltage is applied.

Checking Emission.

Now, supposing we wish to provide a curve for a valve for which we have no curve as a reference. For this a milliammeter should be placed in series with the H.T. lead and a reading taken with a minimum negative grid voltage applied; or we may start at zero grid volts.

By reading the milliammeter a point may be marked on a chart. This process is repeated at various stages of applied negative grid voltages, and the points marked each time, then the various points are joined up to form a curve. The whole process is quite simple and is a useful check on the emission of the valve under test.

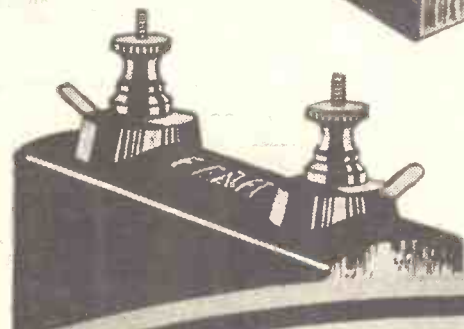


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"EVERYBODY'S" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have looked through your columns during the last week or two for a constructor's report on the "Everybody's" Three, but have failed to see one, and the thought that nobody, perhaps has written prompts me to pen this.

There are so many good points about it, that it is really difficult to choose which to give prominence to, but the main one is, it certainly does all you claim for it.

The tuning range with one suitable set of coils is: 1,000 to 2,000 (approximately) and 250 to 550 metres (A1, 40 coil; A2, 60; and reaction 30); and these two wave-bands have brought me over forty stations during the past week, all on the loud speaker, but I have no means of identifying at least half of these.

It was as you stated in the latter part of the text, the volume given by this set was so great that it would overload an ordinary power valve. I tried firstly two in parallel with marked improvement, but have had to substitute these with one of the super-power class to get the present A1 results.

I have departed from your instructions in two cases, namely, a 32-henry choke instead of the 20, and a 100,000-ohm resistance in place of the 50,000, as I had both these components on hand, but with these departures the results are exceptionally good.

The reproduction I am getting at present with this set coupled to a large cone speaker of the floating edge-baffle type, is far and away better than I have ever experienced before.

The only fault I can see is, that reaction is very sharp, but I am hoping you will suggest a remedy for this, as it makes tuning at present rather a ticklish job.

Hoping other readers of your paper have had the same measure of success, I remain, sir,

Yours truly,

Lancashire. R. H. WHALLEY.

TESTING POLARITY.

The Editor, POPULAR WIRELESS.

Dear Sir,—For testing polarity, I generally use a piece of "blue-print" paper (the genuine ferro-prussiate kind, not the ink-printed variety so largely used for circuit diagrams, etc.).

To use, moisten the paper (just lick it!) and apply to leads; a white mark will appear at the place touched by negative lead.

This is much more convenient than the glass of water method, which requires wires, as a piece of paper can be applied in any position, for instance, to the pins of an ordinary lampholder.

Yours truly,

S. PIERRE SMITH
(Reader of "P.W." from No. 1)

Brighton.

REGARDING LOUD SPEAKERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have never seen in any of the wireless journals an explanation of why a loud speaker reproduces the volume and quality of sound that it does. I have in mind the average cone speaker, a piece of paper not under any great tension such as the string of an instrument, reproducing in quality and volume the notes of all instruments including the drum, which is a well stretched skin fixed on its carrier.

CORRESPONDENCE.

"EVERYBODY'S" THREE.

TESTING POLARITY—REGARDING LOUD SPEAKERS—THE "OLYMPIA" FOUR—PCJ'S TRANSMISSIONS.

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

The surface idea of the strings and drums and the resonance of their carriers, and the volume of air displaced by the wind instruments, is very different from that of the paper of the cone.

This might interest some of your readers.

Yours faithfully,

Bexhill-on-Sea. P. W. L. ANDREW.

THE "OLYMPIA" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just completed the construction of the "Olympia" Four, published in your issue of September 22nd, and feel I must write and congratulate the "P.W." Research and Constructional Dept. on a really first-class set.

Although I have been for a matter of two years a keen reader and constructor of "P.W." sets I have always been something of a "sceptic"—never quite getting what I expected, always dissatisfied until now. From crystal set I worked up through the "Chitos" One and Two, "Handyman" Two, several 3's including the "Sceptic's" Three, and always grumbling. Finally I built the "Everybody's" Three, and found that I still wanted more. I wanted pure reproduction with a good choice of programmes, and was willing to keep on until I got it. Well, to cut a long story short the "Olympia" Four has given me all I ask, at last, and I am fully satisfied and deeply grateful. As for quality—I listened all this evening to music from Langenberg and every instrument was clear and faithfully reproduced. What has surprised me most is the deep, rich tone, and remarkable selectivity, with a wave trap. I have used a Lissen L.F. choke and wound my own coils, as given with the "Derby" Three. Thanking you again.

Gratefully yours,

Manchester. H. W. MILLS.

PCJ'S TRANSMISSIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a short-wave enthusiast I am interested each week by the usual short-wave article in POPULAR WIRELESS. I turn automatically to this particular page every week as soon as POPULAR

WIRELESS arrives, to devour its contents. You will remember, probably, that in the early summer I wrote you stating that I was receiving PCJJ on the "General Purpose" Three (using two valves), at loud-speaker strength, and I hold confirmation of programme from this station. You will now see why I am interested in the short-wave articles, as for the last two months this station, which was my pride and joy, has completely disappeared, and cannot even be heard in 'phones. Your correspondent, Mr. Brownsword, of Carmarthen, is not alone in not hearing the Dutch short-waver at present. The remarkable part is that 2 X A F 2 X A D, and 3 L O come in as usual. There must be hundreds of enthusiasts who would like to know the reason of this phenomenon, and I for one would be grateful to POPULAR WIRELESS if you could supply the reason or likely reason.

Regarding the "General Purpose" Three, this is a wonderful set. What about a long-wave-no-coil-change version of it?

Wishing yourself and POPULAR WIRELESS a continued prosperous New Year.

Yours faithfully,

Plymouth. P. LOCKYER.

The Editor, POPULAR WIRELESS.

Dear Sir,—In answer to Mr. H. W. Brownsword's question in "P.W." of December 29th, I can give him some information. PCJJ has been very erratic this last month here, sometimes I have had him at full loud-speaker strength and sometimes I could get his carrier-wave only, on headphones. Last night (January 3rd) I could only just get him on 'phones at 6.30, to-night I am getting him at full speaker strength at 6.30 to 7.30, with little fading. I do not agree with W. L. S. rebuilding another set if one can't get PCJJ. Lately I could not get PCJJ, but Melbourne (3 L O) was plain on the loud speaker, which proves that my set is not at fault. I am using a Mullard Master Three, which has answered very well for all wave-lengths.

Could the correspondents when speaking of finding stations state if they receive them on 'phones or speaker?

Yours truly,

J. STEAD-LEAKE.

Guernsey, Channel Islands.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to Mr. Brownsword's letter in a recent issue of "P.W." I have not been able to receive PCJJ for some five weeks past, and reception previous to that fell off very badly. It is certainly not a fault of receivers which I anticipated in my case, nor is it a "dead spot," as Morse stations either side of Eindhoven's dial setting have a tremendous amount of "punch." Condenser readings have not altered and 2 X A D and 2 X A F come over very well indeed. The unit used is the premier model of the "Antipodes Adaptor" on which I have done some very good work. 3 L O, 2 F C, 2 X A D, 2 X A F, 2 X G, 5 S W, A F K, 7 M K, being among the stations received. I have, however, not yet picked up the Dutch station your correspondent mentions. Wishing "P.W." every success during the coming year.

Yours faithfully,

Bristol. R. W. FELLENDER.
(Note: PCJJ is now called PCJI—Ed.)

HAVING now embarked upon 1929 (although 1929 conditions, as far as Washington is concerned, have been with us for some time), we may settle down to make a review of the position as a whole. My own feelings in the matter are that the short-wave listener is better off altogether than he was in 1928, while the amateur short-wave transmitter is in a distinctly worse plight than was ever the case before.

Amateur Band Invaders.

While the commercial short-wave stations have now moved well away from the majority of the short-wave broadcasters, the amateur bands are by no means free of invaders. The amateurs were told, in a semi-apologetic way, that although the bands allotted to them would be narrow, the lower ones at least would be exclusive. At present, at any rate, this is very far from being the case. A G J, Nauen, U O K, Vienna, and all our own Air Ministry stations are settled comfortably right in the 40-metre amateur wave-band. The latter particularly are turning out signals that would be sufficient evidence for the cancellation of the licence of any amateur transmitter. Their notes are practically "raw A.C." which is now forbidden.

SHORT-WAVE NOTES.

By W. L. S.

The question is, are the commercial stations knowingly straying outside the bands allotted for their use, or is it that their frequency-measuring apparatus is not so accurate as that which is held to be necessary for amateur use by our G.P.O.?

I have recently been using a very interesting and promising scheme for short-wave C.W. reception, although it is of no interest whatever to those who only wish to listen to broadcast. It consists of the use of a tuned 1,000-cycle amplifier in place of a note-magnifier, utilising a screened-grid valve for the purpose.

The whole thing is arranged in quite a "straight" circuit, the 1,000-cycle tuned circuit (in series with the anode of the screened-grid valve) consisting of the secondary winding of a Ford coil (with core removed) shunted by a .02 fixed condenser. This gives tuning sufficiently

sharp for the purpose and has the effect of "peaking" all C.W. signals more or less strongly at 1,000 cycles or so.

Naturally, with a very efficient amplifier producing a very sharply defined peak, it would be difficult to read any C.W. stations except those that are rock-steady, like the crystal-controlled ones. With the Ford coil, however, the peak is not too sharp, and the effect is simply one of increasing the selectivity of the receiver by a great amount.

Separating C.W. Signals.

Two C.W. signals that would normally be interfering with each other quite seriously can be completely separated, simply by the expedient of tuning one of them till a beat-note of roughly 1,000 cycles (quite a comfortable note to read) is produced, and thus making full use of the amplifier.

Speaking roughly, I should say that a given signal is 200 per cent stronger when tuned to produce a 1,000-cycle beat-note than when a beat-note of 400 or 500 cycles is given. The effect of tuning in musical broadcast on this amplifier is absolutely indescribable! It reminds one forcibly of the very early days of broadcasting and carbon microphones at their worst.

MY RADIO-CINEMA.

"Fireside Talkies," cheap picture receivers and other fascinating things are made possible by the Technical Editor's latest invention. In this article he describes his scheme and gives a few details regarding the proposed B.B.C. test.

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

A WEEK or two ago there were brief Press references to one of my latest inventions, and no doubt those "P.W." readers who noticed them wondered why it was that nothing had appeared about it in our own journals. Let me assure them right away that neither myself nor any of my present activities are disassociated from "P.W." The Press merely recorded the fact that the B.B.C. are going to test the invention and the description of the scheme was sketchy because I had supplied but meagre details.

So far you could count the number of people who are acquainted with the full technical details on the fingers of one hand—and, at that, on the one hand of a man minus a few digits! Readers may certainly rest assured that the first intimate description of the invention will appear in these pages.

Concerning Demonstrations.

There are several reasons why I am withholding the telling of the full story until the B.B.C. test is concluded and one is connected with the securing of foreign patents, while another is quite a personal reason. I may be quite wrong in thinking so, but my experience has tended to make me believe that there are a lot of people who will leap forward with criticisms (generally quite futile) about an invention before closely studying the matter, and without any other evidence before them than that of second-hand, word-of-mouth information.

Therefore, I am going to make criticism impossible until the whole business is demonstrated. The B.B.C. test is to be carried out very shortly, and immediately following this, demonstrations will willingly be given to any committee, scientist, etc., who cares to ask for one, and who can offer a satisfactory reason for so doing—obviously we cannot give a series of free entertainments to mere sensation-mongers!

Also, let me add, there will be no commercialisation of the scheme until it is generally admitted to be completely satisfactory in every way. Already I have been approached by numerous financiers and some well-known business men, but to every one of these I have returned the same answer—"Nothing doing until the idea is tried out under stringent conditions," or words to that effect. To those who have asked me what I am going to do with the patents providing everything proves O.K., I have said that in this country at least the B.B.C. should have some say.

No Landlines Needed.

Regarding the B.B.C. test—the first official one—I should like to make it clear that the demonstration will be carried out under conditions as closely approaching normality as possible. Thus, the transmitting and receiving ends will be connected by ether throughout the investigation. There will be no landline link or even a multi-wave radio channel.

It matters not to me whether the transmitter is in America and the receiver in London, or the two points are in the same street. Place the transmitter at Aberdeen, if you like, and wherever normal broadcasting can be picked up on a normal valve set, I can dump down my receiving end just as happily without upsetting the normal transmission effects of the "emitter."

Simple Synchronising.

But perhaps some of you did not read the Press announcements, and do not yet know what my scheme is, so I will give you a very brief summary of its main features. The invention definitely is NOT the combination of radio and the home cinema projector. That, in my opinion at least, does not constitute an original idea. No doubt many hundreds have mentally connected together these two forms of entertainment, and probably there have been attempts to do it.

No; my patents relate primarily to an extremely simple method of synchronising which I hope to be able to prove makes the

which synchronism is needed other than automatic telegraphs?

Thus Baudet synchronism, the correcting cam of the Hughes' gear, vibrators and phonic wheels, shift-the-hands correction, the modified Western Union, Western Electric, Murray, and the Sims-Reeves arrangements and I are moderately well acquainted. And if you fire a hundred questions at me regarding synchronising by magnetic pendulums, synchronous motors, isochronous trip-relays, and etc., I will guarantee to answer a good many of them.

And when it first occurred to me some time ago that broadcasting was waiting for a simple synchroniser in order to simplify radio-cinemas, picture receivers and other such things, I carefully reviewed all the above systems—without hitting one useful idea! It is not practical to ask a listener to lumber himself up with fifty or a hundred pounds worth of complicated instruments. A telegraph office can stand for a five-hundred-pound box of tricks, but most broadcasters would surely shudder at the idea of spending as many shillings on an accessory. I would for one! You can do all sorts of wonderful things with complicated mechanism, but simplicity as well as reliability must be the keynotes of public service.

Robust Mechanism Wanted.

The listener would quite rightly decide to wait until something of a simple, unforbidding character was invented—apparatus which could be switched on and left to its own devices and would not be staggered by a static or need gentle nursing. He doesn't even want one delicate relay; he wants robust mechanism that the younger son can jab pencils into without serious ill-effects—to the mechanism, anyway!

Is there such apparatus which will synchronise a Berlin broadcaster with a Littlehampton listener if needs be? Apparatus which will work a home talkie (if you want and can afford a home projector costing £8 upwards), work in addition a four or five-pound picture receiver, a broadcasting race game costing still less, other eminently practical and

fascinating things, and yet itself come within the region of the pockets of most listeners? I trust shortly to be able to prove that there is.

Does it make television possible? It might some day, but there are other problems to be solved before television can arrive. In the meantime, I hope to be able to give you something that ostensibly will have the appearance of true television. A brilliantly lighted screen drama in the drawing-room every bit as technically perfect as one projected in a West End cinema with voices and noises as good as the B.B.C. can send them out, and as good as you can get them on your set. Should be better than the best ordinary "talkie," shouldn't it?



Mr. Dowding (right) discussing with Mr. Kendall the design of the simple three-valve set which will probably be used in connection with the Radio Cinema and Picture test.

"home-talkie" a really practical proposition. It also can be applied to other things. The same apparatus can be used, for instance, for the reception of the still pictures now being transmitted from 5 X X, Vienna, etc. Given simple synchronising apparatus, many things become practical which were before of merely academic interest.

The science of synchronisation is by no means new to me. In fact, in all humility, I think I can say that I know a fair amount about it. For quite a number of years it was my lot to tinker about with telegraph apparatus at the Central Telegraph Office. And synchronisation cannot be met with anywhere else in such bulk as in telegraphic gear. Can you think of anything else for

AN "ALL-WAVE" H.F. UNIT

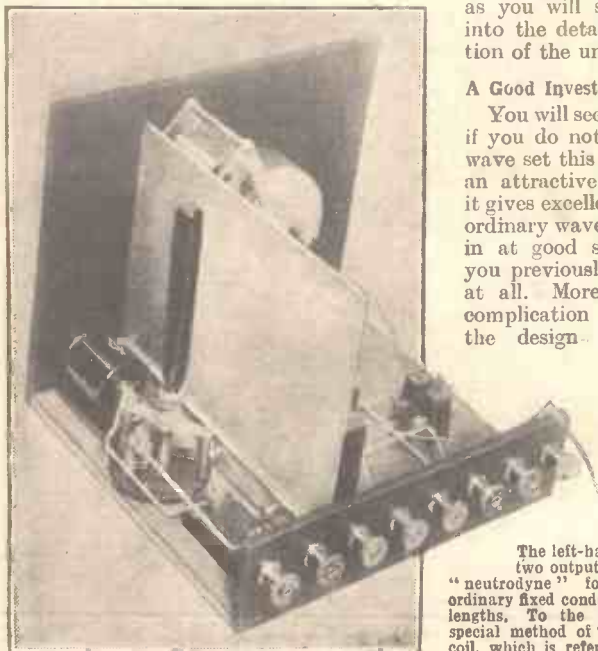


To get real H.F. amplification on waves below 50 metres has long been the cherished dream of the short-wave enthusiast, and a dream it has remained until comparatively recently. The arrival of the screened-grid valve, however, has put a very different complexion on the business, and the dream is beginning at last to come true in sober fact.

The possibilities of the valve for short-wave work were recognised some considerable time ago in the "P.W." Research Dept., and we have carried out experiments with a great many different kinds of circuits. We have got results of some sort with practically every circuit tried, better in some cases than others, of course, but with most they were quite encouraging.

Producing a Universal Design.

So many of the different schemes tested gave good results that it could only be concluded that the difficulty of getting a screened-grid H.F. valve to work on short waves was much less than could have been expected. Accordingly, we were encouraged to proceed and try to work out a more or less universal type of design for a unit which could safely be put in the hands of our readers with the assurance that it could be depended upon to work with practically any set.



* * * * *

H.F. Units of the past have been unsuitable for short-wave amplification, but this novel "P.W." Unit strengthens up American and other stations in a wonderful way. It is easy to build, too, and inexpensive!

**Designed and described by
The "P.W." RESEARCH DEPT.**

* * * * *

In this we have succeeded to a greater degree than we had dared to hope, after a series of experiments, and have also gone further and produced a unit which can be used on any wave-length from about 17 metres upwards. The change from one wave-band to another is perfectly simple, and merely means changing a single-coil and moving a couple of tapping clips.

The results which the unit will give on the ordinary broadcast band and on the long waves used by 5XX and similar stations are well up to standard, for nothing has been sacrificed here to make it suitable for the shorter waves. The only changes necessary on going down to short waves, apart from changing the single coil, are a matter of moving the tapping clips, as you will see when we go into the details of the operation of the unit.

A Good Investment.

You will see, then, that even if you do not possess a short-wave set this H.F. unit is still an attractive proposition, for it gives excellent results on the ordinary waves, and will bring in at good strength stations you previously could not find at all. Moreover, the extra complication introduced into the design by the special features which fit it for short-wave work are very slight indeed. By



The left-hand picture shows the two output coupling condensers, "neutrodyne" for short waves, and ordinary fixed condenser for other wave-lengths. To the right is shown the special method of "clipping" the grid coil, which is referred to in the article.

building such a unit you will provide, remember, for the day when you *do* decide to go in for short waves.

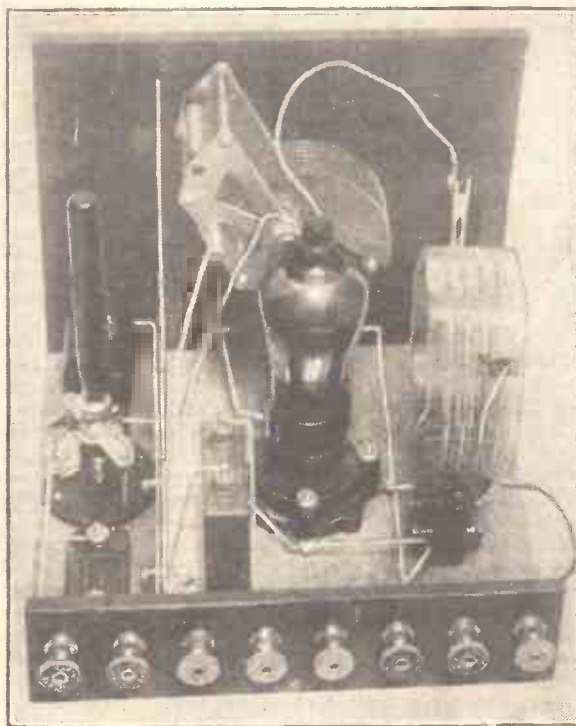
Just what the unit will do is a point of interest to possible constructors, and we will endeavour to give you an idea of its capabilities under average conditions. On the broadcast waves this is what you may expect if your set is of the detector and L.F. type (the one for which the unit is intended): all those stations which you previously got on the loud speaker will come in at increased volume and improved quality, since you will no longer need to use so much reaction.

What It Will Do.

Those stations which previously were weak, even with the full permissible amount of reaction, should come up to good speaker strength, while a whole string which previously you could not hear at all, should be heard at quite fair strength with just a little delicate tuning, and a moderate amount of reaction.

On the short waves the amplification is not so great (this seems inevitable), but it

(Continued on next page.)

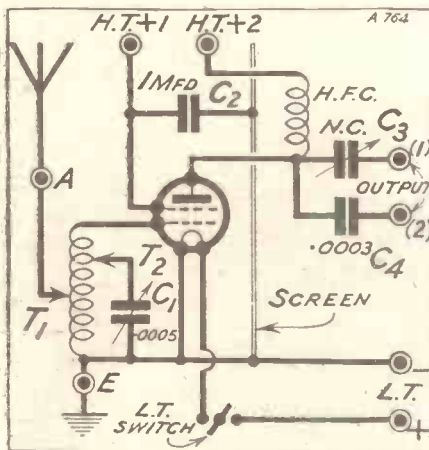


AN ALL-WAVE H.F. UNIT.

(Continued from previous page.)

is still sufficient to make a simply amazing difference to the performance of any short-wave set which does not already incorporate a stage of H.F.

Those elusive American stations which previously you could only hear in a distorted uncertain fashion because you had to work on the very edge of oscillation (except on very good nights), can now be heard almost any night at greater strength and with far better quality. This, of course, is simply because you do not need to use so much reaction to get the necessary volume, and so tuning is less critical, quality much better, and also fading is not nearly so bad.



Actually, on good nights they often come in almost as well as a strong station on the broadcast band, and can be put on the loud speaker far more often than you would believe until you try a stage of H.F. A unit like this quite changes one's ideas of the possibilities of short-wave work.

Just one word of warning: Don't expect an H.F. unit to make the local station appreciably louder, for in most cases it won't. It may even make it a trifle weaker if you live very close to the local, because it will feed such a strong amplified carrier-wave into your set as partly to choke your detector valve. (If this happens, of course, the cure is simple: just de-tune the H.F. unit a little.)

The Secret of Success

Now for the details of the circuit. The whole secret of the universal usefulness of this unit depends on the fact that we have found it possible to use one of the perfectly standard H.F. amplifying circuits, with only very slight modifications, as you will see as we go through it in detail.

The H.F. valve has the usual tuned grid circuit, made up of the variable condenser on the panel and the plug-in coil on the baseboard. To this the aerial is auto-coupled in a very simple manner. On the ordinary waves an "X" coil is used, and the aerial tapping clip is then attached to one or other of the special terminals on the coil.

For short waves one of the special bare wire coils such as the Atlas or Igranic is

used, and the aerial clip is then attached to a turn near the middle of the coil. Its exact position for the best results, of course, can be determined by trial when a station has been tuned in, but it is not critical, and a point near the middle usually serves quite well.

The tuning of this circuit calls for a word of explanation. On the ordinary waves it is done in just the usual way, with the condenser across the whole coil. To do this, the tapping clip on the end of the flex lead from the fixed vanes of the variable condenser is put on the grid terminal of the valve socket.

Special Tuning Circuit.

For short-wave work a better effect is obtained by tuning only about half the coil, and this is easy to arrange. Just transfer the tapping clip mentioned above to one of the turns of the bare wire coil somewhere near the middle. Tuning is then much less critical and the unit becomes easier to handle in consequence (it is actually quite easy, for reasons which we shall see later).

All this part of the unit constitutes the "input" side of the circuit, and is on one side of the screen. On the other is the "output" circuit, and this is very simple, since the scheme is the one known as "parallel feed."

In the anode circuit of the valve is an H.F. choke, and from the anode end of this two leads are taken off, one to a small variable condenser of the neutrodyne type and the other to a fixed condenser of .0003 mfd. These are the two alternative output leads, and it is arranged that you can take the output of the unit across to your set through either the neutrodyne type condenser or the larger capacity fixed one. (Note the two alternative output terminals.) These two terminals are intended to meet different conditions, as we shall see later.

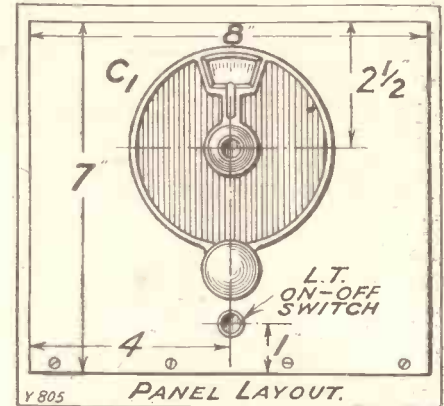
Constructional work need not detain us long, for the unit is simplicity itself to make. Just one point: You will notice a screen across the baseboard at one point, and this is one of our standard type with a row of perforations across the lower edge, so you need have no fear of any difficulty here. There is no drilling whatever to be done, but just remember to use covered wire for, at any rate, all the wires which pass through holes in the screen.

Success on the short-waves is always to some extent a matter of making just the right adjustments, and this unit is no exception. However, it is much less critical than the average "det. and L.F." short waver, and it is just a matter of carrying out a few adjustments in a systematic way before you settle down to use the unit.

First of all comes the question of the

H.F. valve and its working conditions. The unit is designed for the upright type of S.G. valve, the 2-volt type having been used for all our tests.

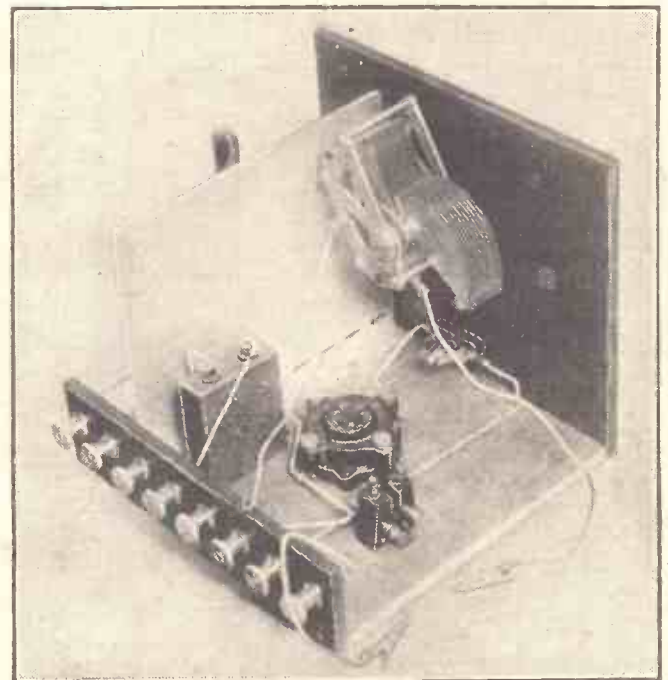
This type has been found to work best in this unit with a voltage of 100-110 on the anode and 70-75 on the screening electrode (terminals H.T. +₂ and H.T. +₁ respectively). These voltages are not a bit critical, and a few minutes spent adjusting them after you have picked up a station will settle the matter once and for all.



Now, about coil sizes: For the 5 X X range you want a No. 250, and a No 60 for the ordinary broadcast waves, both these to be "X" coils. For the interesting band of short waves between 20 and 35 metres a 4-turn coil is correct. For the next range above, which takes in certain amateur waves (45 metres, chiefly) a 6-turn coil is wanted.

For the lower half of each of these short-wave tuning ranges you should place the tapping lead from the variable condenser on a point near the middle of the coil, but for stations near the upper end of each range it is as well to put the clip on the grid terminal of the valve. Otherwise you

(Continued on page 1017).



Here you see all the components which make up the input circuit, the output components being on the other side of the screen.

A WORD ABOUT BACKGROUND and its importance in true reception

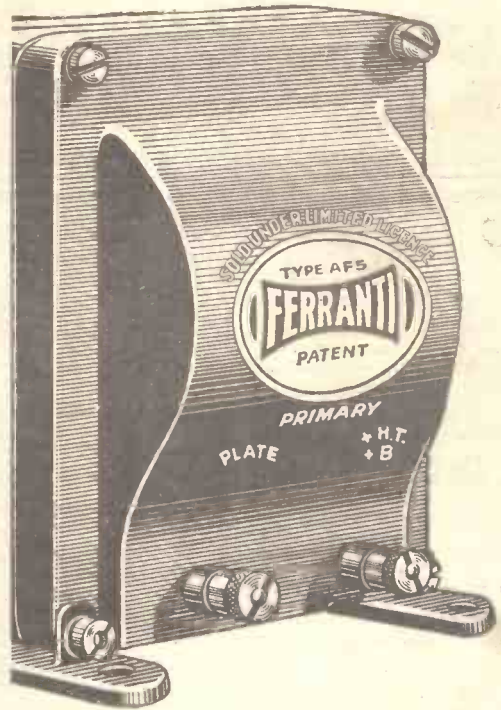
Listen to the orchestral rendering of a selection that is broadcast from a studio.

Let the same orchestra broadcast the same selection from, say, the Queen's Hall, and how different the reception will be!

This difference is largely due to the echo, the drapings, the "atmosphere"—the background. And the difference is essential to faithful reproduction. In the case of the Queen's Hall broadcast, it is the presence of the background in its true proportion that makes for the *true* rendering.

The "dead silent background" fetish is misleading, because it suggests that a Transformer *could, of itself,* generate parasitic noises, which in a good Transformer is impossible.

The Transformer designer's aim is to capture every note, each minute signal variation, the true "atmosphere," and to amplify it faithfully—whether it be at a frequency of fifty cycles per second or eight thousand. Before investing in a Transformer send for a copy of the Ferranti book—"True Radio Reproduction," and learn the reasons why the Ferranti curves are the envy and admiration of the whole wireless world.

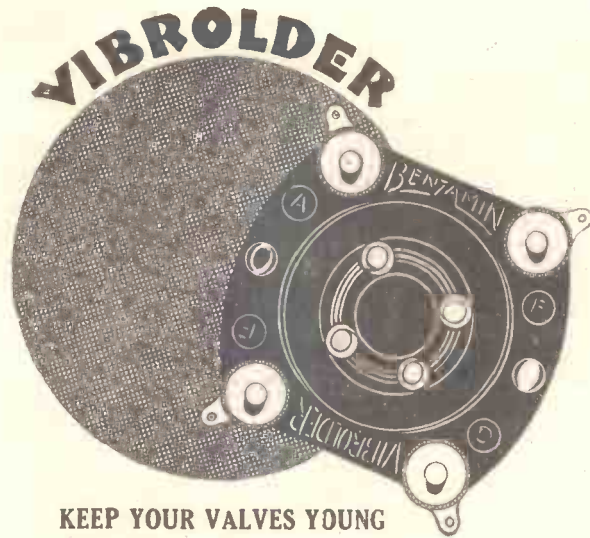


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THE FORMO CO.,
Crown Works, CRICKLEWOOD LANE, N.W.2

AN ALL-WAVE H.F. UNIT.

(Continued from page 1014.)

may find difficulty in reaching up to a station near the top of the ranges specified.

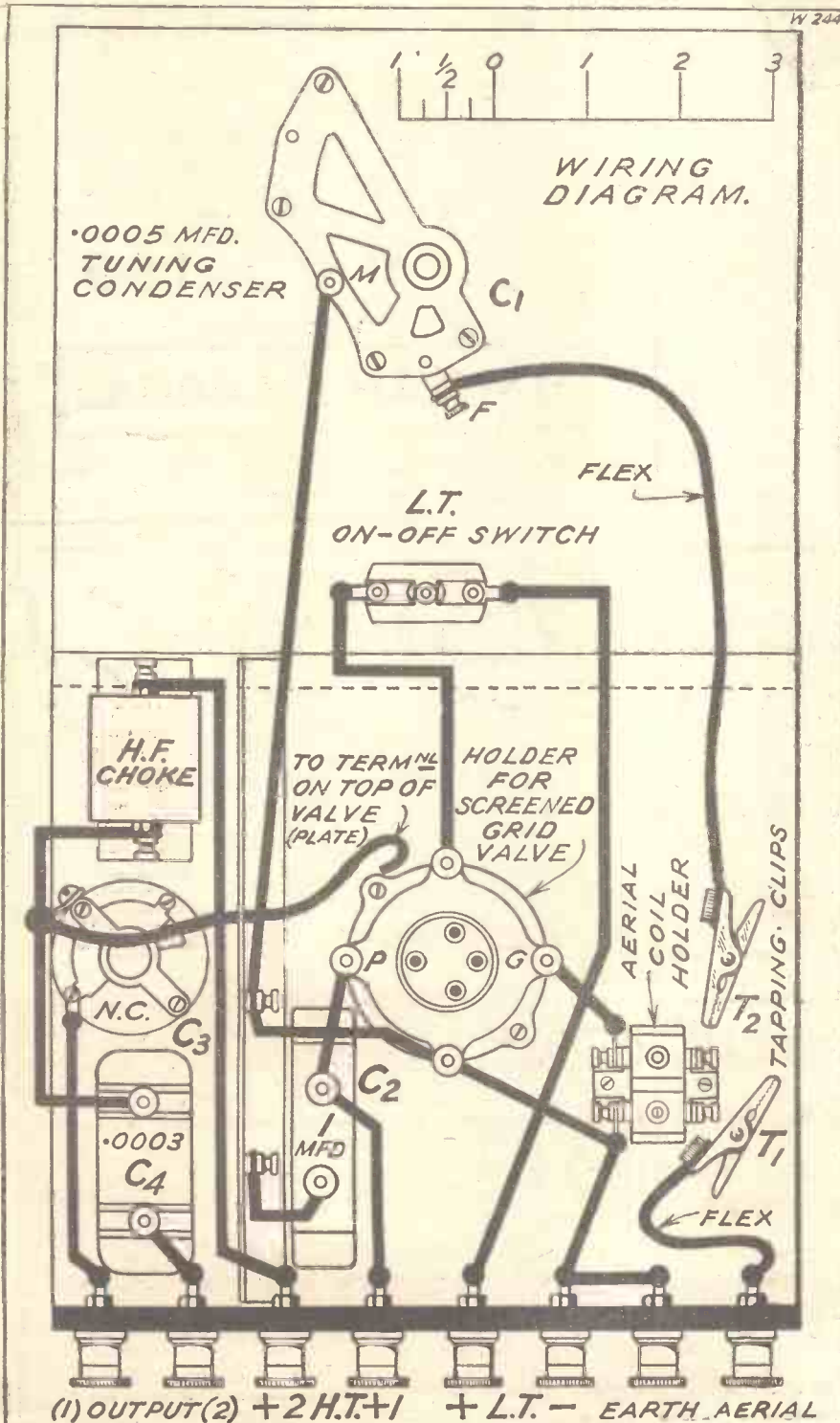
Now about those alternative output terminals. Well, No. 2 is the one to use whenever you can, both for short and ordinary wave work, since this usually gives the strongest signals. However, on

short waves it generally pays to use No. 1 when atmospheric are very bad, for although signals are slightly weakened thereby, the atmospheric are weakened still more, and so you get a better ratio of signals to noise.

To connect up the unit to your set, proceed as follows: Disconnect aerial and earth from your set, and connect them to the approximate terminals on the unit instead. Wire up to the batteries (the same L.T. must be used for both set and unit, otherwise you must remember to run a wire from E on the unit to E on your set), and then join one of the output

terminals on the unit to a suitable point on the set.

This last is a vital point. For a short-wave set which has a separate aerial coil it will be OK in most cases to connect the output terminal to the aerial terminal on the set and use in the old aerial coil socket a coil of the same size as the one in the secondary socket, coupling the coils as tightly as possible (assuming that one of them is movable). For a set such as the "Sydney" Two in which the aerial lead was tapped on to the tuned grid coil, connect up as before and set the tapping about two-thirds of the way up the coil towards the grid end.



COMPONENTS REQUIRED.

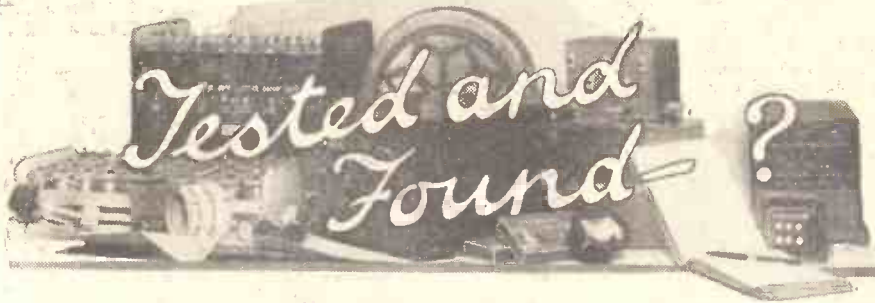
- 1 Panel, 7 in. x 8 in. x $\frac{1}{8}$ in. or $\frac{1}{4}$ in. (Beclon, Resisten, "Kay Ray," Tro-lite, Trelleborg, Ebonart, etc.).
- 1 Cabinet to fit, with baseboard 7 in. deep (Raymond, Pickett, Cameco, Lock, Artercraft, Gilbert, Caxton, Bond, Peto-Scott, etc.).
- 1 .0005-mfd. variable condenser, slow-motion, or with vernier dial (Lotus, Igranic, Cyldon, Utility, J.B., Lissen, G.E.C., Colvern, Marconiphone, Pye, Burton, Ormond, Bowyer-Lowe, Ripault, etc.).
- 1 L.T. switch (Lissen, Benjamin, Lotus, Burne-Jones, Burton, etc.).
- 1 Sprung valve holder (W.B., Benjamin, Lotus, Igranic, Wearite, Burton, Formo, Pye, Ashley, Burndept, B.T.H., Marconiphone, Burne-Jones, Bowyer-Lowe, etc.).
- 1 Single coil holder (Burne-Jones, Igranic, Lotus, etc.).
- 1 Fixed condenser of .0003 mfd. (Mullard, Dubilier, T.C.C., Lissen, Igranic, Goltone, etc.).
- 1 Mansbridge type condenser of 1 mfd. (Any size between .2 and 1 mfd. will serve). (Lissen, Ferranti, Dubilier, T.C.C., Mullard, Hydra, etc.).
- 1 Standard "P.W." screen, 6 in. x 7 in. (Ready Radio, Paroussi, Burne-Jones, etc.).
- 1 Neutrodyne type condenser.
- 1 H.F. choke capable of working well on both long and short waves (A few examples are the Bowyer-Lowe "Long Range," Wearite All-Wave model, Lewcos, etc.).
- 1 Terminal strip, 8 in. x 2 in. x $\frac{1}{4}$ in., and 8 terminals (Eelex, Igranic, Burton, Belling & Lee, etc.).
- 2 Tapping clips, wire, flex, screws, etc.

For the broadcast waves the input lead should be connected straight to the grid side of the tuning condenser in the set (usually the fixed vanes). To enable you to do this easily it is suggested that a special lead should be brought out of the set, either to a new terminal, or through a flex lead.

This may seem a bit of a nuisance, but it is inevitable with any screened grid H.F. unit.

You will not find that tuning in stations with the H.F. unit in place is at all difficult on the short waves, contrary to one's natural expectations. Curiously enough, the tuning of the unit is comparatively flat. Consequently, it makes the operation of a short-wave set really easier since signals are stronger and easier to find. However, this really calls for a short separate article, which will appear next week.

FROM THE TECHNICAL EDITORS NOTE BOOK



PHILIPS LAMPS LTD.

THERE are quite a lot of novel points about the Philips Gramophone Pick-up type 4005. To begin with it is rather small and is unusually light in weight, while its rectangular shape is uncommon. It resembles no other pick-up in appearance. Externally, another unusual feature is that it has not got the set screw type of needle holder, but has instead a chuck arrangement which grips or releases the needle in an instant. Internally it has a filter arrangement for eliminating needle scratch.

It did not take us long to discover that the Philips pick-up provides a very excellent performance. Indeed, we are inclined to think that it is the best that has yet come to our notice. It is remarkably sensitive, and both the high and the low register are clean and bright. Also it appears to be extremely light on the records with regard to wear.

With the Philips pick-up we also re-

ceived a Philips gramophone amplifier, type 2781. In its way this instrument is just as unique. It incorporates a Philips transformer and makes use of a pentode valve. Thus, with only the two stages, considerable amplification is obtained. The amplifier is contained in a metal case, and is most compact.

It is fitted with a multi-flex cable having substantial terminals on it for battery

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for tests. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

connection purposes. At the one end are the input sockets, on-and-off switch and volume control, and at the other end the output sockets. The Philips pick-up and amplifier operate remarkably well together, as is only to be expected.



This is the Philips Gramophone Amplifier.

AN EARTHING TUBE.

Most listeners find that a water-pipe makes an excellent earth connection, but in many instances a "direct" earth to the ground will provide much better results as well as being almost essential for complete protection against lightning. One way of arranging the second kind of earth is to bury a metal pail, bath or other such object and connect a lead to it. A somewhat easier scheme is to use an earthing tube.

One such device was recently sent us for testing purposes by Quint Tube, Ltd., of Cannon Street, London. This tube, the full description of which is the Quint

(Continued on page 1020)

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the makers of the famous
COSSOR VALVES

The COSSOR L.F. Transformer

Adv. A. C. Cossor Ltd., Highbury Grove, London, N.5.

TESTED AND FOUND.

Continued from page 1018.)

Biflex Earth Tube, is made of pure copper, but its construction is reinforced by the provision of longitudinal flutes or corrugations so that it is as capable of resisting driving shocks as a steel tube. It does not tend to buckle when driven into the ground. The price of this earth tube is 2s. 6d.

ELODEN LOUD SPEAKER.

Messrs. Eloden Muller & Co., of Berlin, are the manufacturers of the Eloden Loud Speaker and the sole agent for the United Kingdom is F. L. Lesingham of Victoria Street, London, S.W.1. The price of the speaker is £3 15s. 0d., and there is a more powerful type for use in large halls for dancing, etc., at £6 5s. 0d. Mr. Lesingham



The Philips Amplifier with its metal cover removed.

recently brought one of these Elodens along to our laboratory.

The speaker is of somewhat unusual appearance, being rectangular in shape, and having dull coloured gauze over practically the whole of its surface. Apart from the speaker appearing to have a slightly predominant peak at a point not indicated in its laboratory response curve, the results are of a high order of merit. In fact, they are very close to good moving-coil standard of perfection. It is stated that the Eloden speakers are completely covered by licence from the Standard Telephones & Cables Co., Ltd., and that the trade in this respect are fully protected.

LEWCOS LOADING COIL.

After designing the "P.W." Standard Loading Coil, we drew up a full specification, copies of which were circulated to the trade. This specification asked for a coil having a certain inductance and with certain definite tappings. The majority of the standard loading coils produced by the trade very closely followed the actual dimensions of our original design, but the Lewcos version has broken completely away from this. That, of course, does not matter so long as the coil conforms electrically with the specification. And this it does!

The Lewcos coil has the appearance of a plug-in type fitted, instead of with the usual socket and pin, with a small base, enabling it to be directly mounted on the baseboard of a set. The coil is of the completely enclosed type somewhat like an ordinary Lewcos tapped coil.

Thus the 216-turn end of the coil has its terminal brought out at the centre, while

the 25, 60, and 80-turn tapping terminals are distributed around the periphery of the device. The 0 terminal is at the base. Altogether the design is a complete departure from the usual make-up of the "P.W." Standard Loading Coil. Nevertheless, we have found it fulfils its requirements every bit as well as our own shape of coil.

In some layouts this different make-up may easily be an advantage, while many constructors may perhaps prefer its appearance. The price is 7s. 6d. In the sample coil we have before us as we write, we notice that two of the terminals are very loose in their settings, but presume that this fault does not occur in the production specimens.



The Lewcos Loading Coil.

BATTERY BOOKLETS.

The Standard Wet Battery Co., recently sent us copies of two new booklets they have produced. One deals with the maintenance and use of wet batteries and the other describes the products of the firm. The booklets are available free to all interested "P.W." readers who care to write for them.

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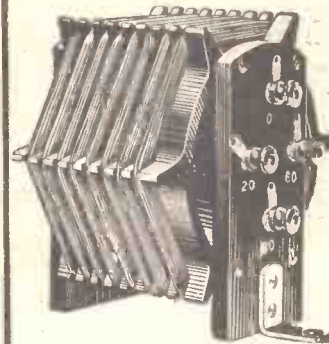
SET A.—The New Cossor Melody Maker Kit in Sealed Carton, complete with every component, including valves for making the above three-valve screened-grid set (for further description send for Maker's pamphlet). CASH £7:15:0
TERMS—20/- with order and 9 monthly payments of 16/6

SET B.—The New Cossor Melody Maker Kit complete as above, and with M.P.A. Cone Loud Speaker, EXIDE 2-Volt L.T. Accumulator and 2 60-Volt British "long life" H.T. Batteries. CASH £10:10:0
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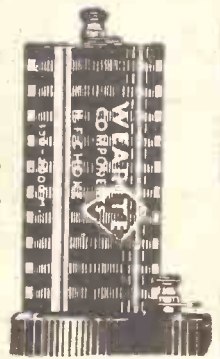
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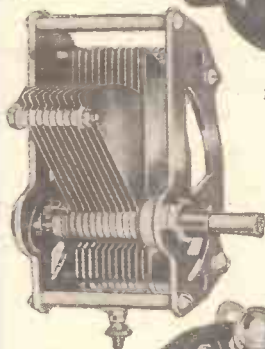
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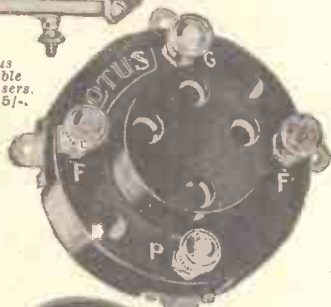
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To Mr. V. ENGLAND-RICHARDS,
The England-Richards Co., Ltd.,
1112, King's Lynn, Norfolk.

Sir—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage.

Print your name and address boldly in capital letters on a plain sheet of paper and pin this Coupon to it.

"Popular Wireless," Jan. 19th, 1929.

All Manufacturers' WIRELESS GOODS
advertised in
"POPULAR WIRELESS"
can be obtained
BY POST from YOUNG'S C.O.D. Send us a note of your requirements and goods will be dispatched per return of post.—You pay the postman.—
No Extra Charge.



1929 COSSOR MELODY MAKER
Complete Kit with 3 Cossor Valves in Sealed Cartons **£7.15.0**
Any part sold separately.

PARTS for the NEW COSSOR MELODY MAKER CIRCUIT

1 Push-Pull Switch 1/-, 2 Var. Condensers 7/-, 2 Slow Motion Dials 7/-, 1 '0001 Reaction Condenser 5/6, 1 6-ohm Rheostat 2/-, 1 H.F. Choke 5/-, 5 Valveholders 4/-, 3 T.C.C. Condensers 8/-, 1 Grid Leak 3 Meg. 1/-, 1 Ignitic Transformer 14/-, Wire, Terminals, etc., 3/-.

Young's Special Price, £2-17-6

EXTRAS REQUIRED

1 S.G. Valve £1.2.6, 1 R.C. Valve 10/6, 1 Power Valve 12/6, 1 Accumulator 13/6, 1 108-volt Sure-a-Lite H.T. Battery 14/3, 1 9-volt Grid Battery 1/6.

Special offer of coils for the 1929 Cossor. B.B.C. 6/- pair. 5 X X 7/6 pair.



MULLARD MASTER 3 STAR

Components as specified by Mullard:—3 Lotus Valveholders 3/9, Colvern Combined Wave Coil 17/6, Permascrope Transformer 25/-, Climax L.F.A. Transformer 25/-, Climax H.F. Choke 7/6, Benja. in Battery Switch 1/3, '0005 Ormond Log Condenser 6/-, '00035 5/9, 2 Slow Motion Dials 10/-, Mullard '0003 and 2 Meg. 5/-, Panel Bracket, 6d., Mullard '0001 Fixed 2/6.

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Q Coils: Finston 17/6, Lewcos 21/-, Colvern all-wave 17/6.

CABINETS FREE with above KITS

200 Page Catalogue Free.

BLUE SPOT UNITS

SPECIAL .. 21/- .. 66k .. 17/6
66a .. 21/- .. 66k .. 25/-

66-VOLT H.T. BATTERIES, 3/11
Postage 1/- extra

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Telegrams, "AERIAL." GLASGOW



RADIOTORIAL

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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sale Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

A SHORT-WAVE PROBLEM.

SHORT-WAVE CONVERT (Warwickshire).—"I am strictly limited as to expenditure, and with the amount I am prepared to spend I am unable to buy both a good H.F. choke and a variable condenser. Left over from a previous set I have a good '0003 mfd. variable condenser with vernier, which I thought would do for the reaction, but either I shall need to make my own H.F. choke or else I shall have to get a very cheap variable condenser for the aerial circuit.

"Which is my best plan—to buy a really good variable condenser and to make my own H.F. choke, or should I be wise in putting up with a less expensive condenser and purchasing a really first-class H.F. choke with the money so saved?"

For short-wave work it is absolutely essential to use a first-class variable condenser for tuning the grid circuit. Furthermore, it is necessary to use a choke of low self-capacity, but as this latter need have only a comparatively small inductance it is quite possible to make a good H.F. choke for a few shillings. You can wind a suitable choke with wire of fine gauge, say 32 or 34 D.S.O.

About an ounce of the wire will be required, and a former for it can be an ordinary glass test tube (obtainable at any chemist for a few pence). About one hundred turns of the wire should be wound on the tube, and in order that each turn shall be separated from the next, a thread of about the same thickness as the wire should be wound on at the same time.

Each turn of wire will thus be separated from the next by the thickness of a thread, and when the coil is finished the thread can be removed, leaving a spaced winding. The test tube can easily be mounted by means of a cork which is screwed down on to the baseboard.

THE SPARKING ACCUMULATOR.

B. J. (London, E.11).—"When I collected the accumulator they told me that the connecting strips had not been brought with it, so I took it home and started to connect it up there. It happened that I was using 2-volt valves, so I started to connect the different cells up in parallel, but when I connected the positive of one cell to the positive of the next a spark occurred, so I took the connecting bar off again!

"A moment's thought convinced me that no spark should have occurred when two terminals of the same polarity were connected together, so I thought I must have been mistaken and tried to connect the negative of the first cell to the negative of the next. This time there was no doubt whatever—a large spark took place directly the two negatives were connected together. The spark is so big that I am certain it is quite unwise to connect the two together, and I am wondering whatever

can be the cause of it and what I can do to overcome the difficulty?"

From your description we are afraid that the cell has been charged backwards. That is to say, that its polarity has been reversed by careless charging.

Probably what happened was that when on charge the central cell was turned round so that its negative was placed where its positive should have been. Consequently, when the heavy charge passed through the cells, the centre one, connected wrongly, was rapidly discharged, and then charged in the opposite direction by the current flowing through it.

In consequence the pole of it which should be positive and is marked positive, is probably much more negative than the other terminal. We should

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good" ?

Perhaps some mysterious noise had appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., **POPULAR WIRELESS**, The Fleetway House, Farringdon Street, London, E.C.4.

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

take it back to the charging station and demonstrate what happens when the two cells are connected in parallel.

REDUCING SELF CAPACITY.

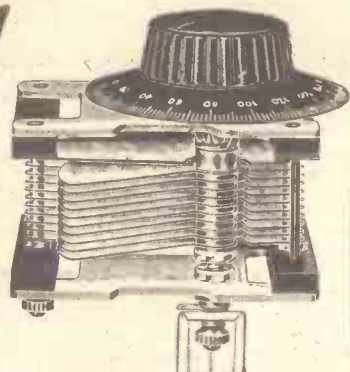
E. G. T. (Bournemouth, Hants).—"To construct the H.F. choke I want about 1,500 turns of the fine wire, wound upon a solenoid tube. I have no means of winding except by hand, but I should like to keep the self-capacity as low as possible. Which is the best way of winding by hand—to put the turns on side by side as far as possible, in several layers if necessary, or wound on 'anyhow'?"

The best method of keeping the self-capacity low in ordinary methods of winding is to make the coil in spaced sections. First of all mark off the former across the space the wire will take into fifteen equal sections.

(Continued on page 1024.)

PERFECT PRECISION COMPONENTS

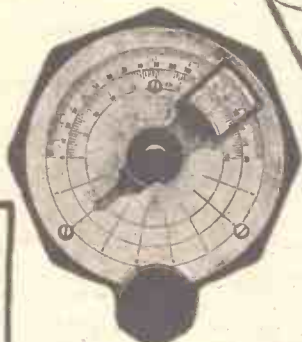
ENSURE ULTIMATE SUCCESS!



ORMOND LOW-LOSS CONDENSER. Capacities .00025, .0003, .0005, .001, with or without friction control. Prices from 6/6.



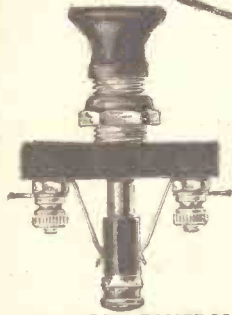
The **ORMOND LOUD-SPEAKER** for quality and power. Supplied in Oak or Mahogany. Price £4-4-0.



The Popular Ormond **SLOW MOTION DUAL INDICATOR DIAL** (Ratio 16-1) as illustrated, or in black. Price 5/-.



Fit the Ormond **BALL-BEARING TURN-TABLE** to your portable or frame Aerial Receiver, 6/-.



PUSH-PULL SWITCH. Two-point type, price 1/3; Three-point type, price 1/6 (one-hole fixing).



FRICION CONTROL DIAL: 4-in. Dial with direct drive and slow motion (Ra. 55-1), 7/6.



You will agree that makeshift methods never pay—carelessness in the construction of any set is the precedent of troubles galore. But has it occurred to you that the same truth is equally applicable to every component you use?

Why ask for trouble? Insist upon Ormond—the finest components made—and enjoy that security and satisfaction which none but the best can afford.

All Good Dealers Stock them!

Leaflets and Booklets on request also details of our complete Receiving Sets



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£10,000 SALE GOVERNMENT SURPLUS RADIO AND ELECTRICAL BARGAINS

The new List just issued offers a wonderful opportunity of purchasing at extraordinarily low prices which can never be repeated.

AERIAL EQUIPMENT, ACCUMULATORS, CONDENSERS, DYNAMOS AND MOTORS, ENGINES, INSTRUMENTS AND LABORATORY EQUIPMENT, LAMPS, PHONES AND SPEAKERS, MICROPHONES, RELAYS, RESISTANCES, SWITCHES, RECORDERS, TRANSMITTERS, VALVES, ETC.

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St. Paul's and Blackfriars Stns. Phone: City 0191.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1022.)

Then wind the first 100 turns in a pile in the first section, the second 100 in the second section, and so on until all the turns are on and the former is filled.

"EKCO" D.C. MAINS UNITS.

We have been requested by Messrs. E. K. Cole, Ltd., manufacturers of Mains Power Radio, to rectify an erroneous description of their D.C. Model 1F.10 which appeared in their advertisement in the January 12th issue of "Popular Wireless." The description given was that of the "Ekco" Isolating Transformer, but should have read as follows: "Ekco" D.C. Model 1F.10.10. milliamperes. Voltage tappings at 60, 90 or 120. D.C. Mains only. Price 17s. 6d.

CONNECTIONS FOR A TWO-VALVE AMPLIFIER.

I. M. (Birmingham).—"Can you give the connections in words for a good two-valve amplifier employing the following parts: L.F. transformer, one wire-wound resistance, 250,000 ohms, one grid leak, 1.5 megohms, one mica condenser, .01 mfd., two valve holders, terminals, etc.?"

In addition to two input terminals and the two output terminals you will need an L.T. negative and an L.T. positive terminal, a grid-bias positive and a grid-bias negative 1 and 2, and also an H.T. positive terminal.

The wiring should be carried out as follows: The positive input terminal to one side of the wire-wound resistance. The negative input terminal to the remaining side of this resistance and to the .01 mica condenser.

The grid of the first amplifying valve is connected to the other side of this condenser and to one side of the grid leak. The remaining side of the grid leak goes to grid-bias negative 1 terminal.

L.T. positive terminal is joined to both of the valve holders, the remaining side of each filament terminal of the valve holders going direct to L.T. negative,

which is also joined to grid-bias positive. The plate terminal of the first valve holder is joined to one side of the primary of the L.F. transformer, the other side of which is joined to positive output terminal and to H.T. positive.

One secondary terminal of this L.F. transformer goes to the grid of V_2 , and the other secondary terminal to grid-bias negative 2. The final connection is the plate of the second valve holder to the negative output terminal.

LOOKING AFTER THE L.T. BATTERY.

M. T. W. (Henley-on-Thames).—"I certainly have got no kick against Father Christmas this year, for the family have clubbed together and presented me with a fine one-valve set, through which I have been introduced to uncles and aunts I never heard of, church services that I would not have missed on any account, and some extremely interesting foreign people occasionally (with whom I should feel a great deal more at home if I could only understand a word they said).

"Being rather a long way from the town, I am anxious that the accumulator should last as long as possible in good condition, and as I have never looked after anything of the kind before I should be glad if you would give me some hints on the proper way to treat the accumulator."

One of the most important things to remember is that charging and discharging the battery should be done only within the limits laid down by the maker. No accumulator should stand for long periods when discharged or partly discharged or sulphation is sure to commence.

A watch should be kept to see that a sediment does not form at the bottom of the cell, as if it is allowed there is a possibility of serious damage. A cheap voltmeter should enable you to watch the voltage pretty accurately, and this should be checked while the accumulator is supplying current to the set. When newly charged the voltmeter should show 2.1, and as it runs down this voltage slowly drops until it reaches the lowest safety limit of 1.18 volts. On no account allow the voltage to drop below this.

In addition to a voltage test the specific gravity or "strength" of the acid should be tested frequently with a hydrometer, which can be obtained for a few

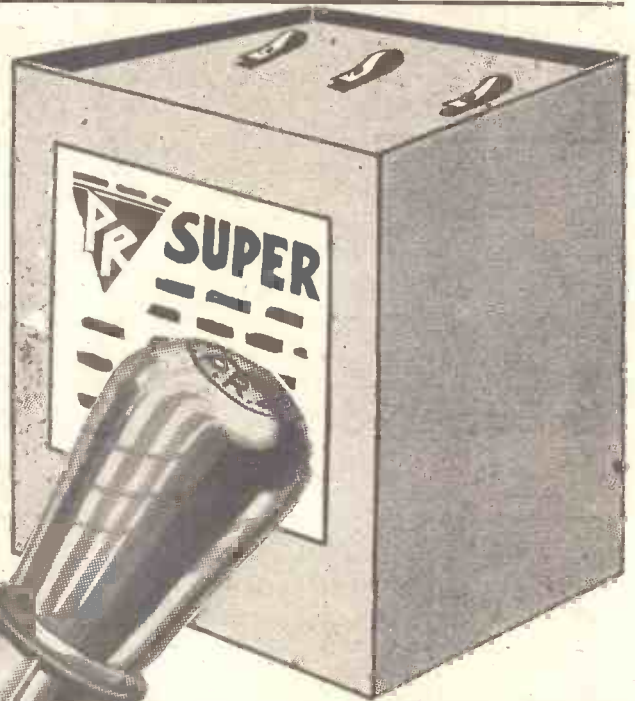
(Continued on page 1026.)

25' MASSIVE SUPER H.T. BATTERY FOR 13'9

Carriage Paid

TO ALL PURCHASERS OF P.R. VALVES

As an advertisement we will send one of these 25/- SUPER H.T. Batteries and a P.R. Valve for one inclusive sum of 16/3. In other words, the Battery costs 13/9 and the valve the usual 3/6. These Batteries are better than anything else ever offered, and must not be compared with the ordinary H.T. Dry Batteries, which are only about a quarter the size. "P.R." Batteries are SOMETHING NEW. They absolutely cannot "bulge" or "blow" because they are built not to. There can be no weeping because there is no sal-ammoniac. The internal parts are separated by a non-porous, non-conducting thoroughly insulating material which no other Battery possesses, consequently "P.R." Batteries have long life, great recuperative power, and give a steady current all the time. "P.R." H.T. IS THE CHEAPEST FORM OF H.T. YOU CAN FORGET IT FOR A YEAR.



45-volt Super. Effective voltage after 6 months' use, 39 volts. Heavy, discharge type for multi-valve sets, effective life 1 year. Weight, 12 lb. Carriage paid.

13/9

Three of these Batteries are ample for the biggest multiple valve set with super-power valves. Their amperage is enormous.

L.F., H.F., R.C., AND DETECTOR IN 2, 4 and 6 VOLTS. P.R. DULL EMITTER (British made) VALVES challenge comparison with ANY OTHER VALVE ON THE MARKET. It was only by new methods of manufacture that the P.R. Valve at 3/6 became an established fact.

OUR GUARANTEE.

All valves despatched by return of post under guarantee of Money Back in Full if not satisfied. All valves are carefully packed and breakages replaced. Callers invited.

LIST OF DULL EMITTERS

	Type	Fil. Volts	Amp.	Imp. Ohms	Amp. Fac.	
3/6 Post 4d.	PR 2	2	.095	28,000	13	H.F.
	PR 3	2	.095	15,000	8	Det.
	PR 4	2	.095	120,000	32	L.F.
Post on 2 valves, 6d.	PR 9	3.5-4	.063	18,000	14	H.F.
	PR 10	3.5-4	.063	10,000	8.7	Det.
3 " 6d.	PR 11	3.5-4	.063	88,000	40	L.F.
	PR 17	5-6	.1	18,000	17	R.C.
POWER 7/6 Post 4d.	PR 18	5-6	.1	9,500	9	H.F.
	PR 19	5-6	.1	80,000	40	Det.
	PR 20	2	.15	7,000	6	L.F.
SUPER- POWER 12/6 Post 4d.	PR 40	4	.15	7,000	6	R.C.
	PR 60	6	.1	5,000	6	Power
PR 120	2	.3	2,750	4	S.P.	
	PR 140	4	.2	2,500	4	S.P.

Call, Write or Phone. Telephone: City 3788. (Opposite Post Office Tube.)

P.R. VALVES, 17-44, PATERNOSTER SQUARE, NEWGATE ST., LONDON, E.C.4.

BEST WAY TO ALL STATIONS

DARIO

VALVES

—AND THE CHEAPEST WAY, TOO,

guaranteeing utmost satisfaction. Just look at the prices below—made possible by reason of the biggest valve output in the world. Radio without Dario can never be radio at its best. SUPERLATIVE FINISH - LOWEST CONSUMPTION

TWO VOLTS.		FOUR VOLTS.	
General Purpose, '05 amp.	5/6	General Purpose, '05 amp.	5/6
R.C.C., '06 amp.	5/6	R.C.C., '07 amp.	5/6
Super-Power, '18 amp.	7/6	Super-Power, '1 amp.	7/6
Super H.F. & R.C.C., '18 amp.	7/6	Super H.F. & R.C.C., '1 amp.	7/6
Pentodion, '15 amp.	21/-	Pentodion, '15 amp.	21/-

From your dealer or direct:

IMPEX ELECTRICAL, LTD.

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MAKE YOUR OWN CONE SPEAKER

The New Wonder "Nightingale"

CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker. Guaranteed to give results equal to the most expensive Loud-Speakers yet made.

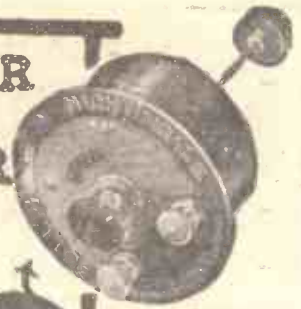
Full constructional details with each Unit.

GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure, undistorted volume which must be heard to be believed.



15/-

SATISFACTION GUARANTEED or money refunded!



AS FITTED TO OUR £6 POST HORN

BUY ON EASY TERMS

5/- Secures this Speaker

Mahogany finish with plated arm and stand.



The Nightingale "DE LUXE"

50/-

CASH

or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished with plated arm and stand.

Send Deposit NOW!

Obtainable from your Local Dealer or direct from:—

BULLPHONE LIMITED

38, HOLYWELL LANE, LONDON E.C.2.

NIGHTINGALE SPEAKERS

A Superlatively good valve-holder for



1/3

A widely used and recommended product has come down in price. The W.B. Antiphonic Valve-holder now costs 1/3—an unusually reasonable price for a first-class Valve-holder.

Manufacturers of the famous Whiteley Boneham Loud-speakers. Prices from 4/6.

WHITELEY BONEHAM

WHITELEY BONEHAM & CO., LTD., Nottingham Road, Mansfield, Notts.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1024.)

shillings from any electrical shop. The plates of the accumulator should always be covered by the acid, and any losses by evaporation should be made good by distilled water.

Finally, remember that the exterior of the battery should be kept in good condition, the terminals being kept clean by being thinly coated with petroleum jelly to prevent them being attacked by the acid.

SOME GRID-BIAS HINTS.

R. S. T. (Coventry).—“Is it possible to do without grid bias? The battery always seems in the way, and I wonder if it is really necessary or whether the set would be just as good without it?”

Correct grid bias effects a very great saving of high-tension battery current, and in addition it exercises a marked improvement on the quality of reproduction and safeguards the set against noises which otherwise might mar reception.

If the following hints are observed your grid-bias troubles will automatically disappear. Make sure that the plugs fit tightly into the sockets and that they are reasonably clean. Cut away the frayed edges of the flexible wire, for these “whiskers” may give rise to short-circuiting troubles. Long flexible leads, which are apt to shake and to move the plug about, can easily be held securely if an ordinary elastic band is fitted over the battery, and the plugs are drawn under this before being placed in position.

In many batteries the positive plug is placed so close to the 13-volt negative socket that if the grid-bias positive plug is carelessly adjusted it will bridge the gap between the two and short the 13-volt cell. This of course should be guarded against, as a faulty cell here may affect reception in the whole set.

Grid-bias batteries when stood upon the baseboard should not be allowed to slide about when the set is moved, nor should they be hung in place only by their connections. It is very easy to mount a grid-bias battery securely and may save expensive accidents. Most grid-bias batteries have a cardboard lid to protect them from metallic contact whilst in the dealer's hands. The purchaser very often throws such lids away, but if screwed direct to a baseboard they make convenient stands in which this battery may be held in position on the baseboard.

A WAVE CHANGE ADAPTATION.

CRYSTAL SET (Watford).—“At present my crystal set will not tune to the long waves but it uses two coils, one of which has one end connected only to the aerial, the other end being connected to the other (tuning) coil, to earth, to the condenser and the telephones. I think it is called loose coupling, and I should like to know if it is possible to put in a loading coil for 5 X X, and also a switch to bring the set down to the short waves at a moment's notice.

“If this is possible, what will the connections be?”

The alterations can very easily be carried out as follows:

At the point where the two coils are joined together disconnect them from the earth, condenser and telephones, and join them instead to a coil holder for the loading coil, the other side of which goes to earth, etc. Across this extra loading coil holder connect an on-off switch, so that when the switch is on it shorts right across the coil holder.

The final connections will then be as follows: Aerial to one side of the aerial coil, the other side of this to one side of the small tuning coil, to one side of the switch and to the loading coil. Remaining side of the loading coil and remaining side of the switch are joined to earth, to tuning condenser and the telephones. The other telephone terminal goes to one side of the crystal, the other side of this goes to the remaining side of the variable tuning condenser and to the free side of the small tuning coil.

NOT NEUTRALISED PROPERLY.

T. F. A. (Pembroke).—“The set is evidently a long-distance getter, but the trouble is I cannot get it neutralised properly, because I am not sure of the way to do this. I have seen a method in ‘P.W.’ but, unfortunately, cannot find that back number and should be glad if you would tell me how I am to make sure that the H.F. valve really is neutralised properly.”

The following method of neutralising is recommended for use in sets employing one stage of H.F. and provided with a reaction control.

(Continued on page 1028.)

All the best radio reading of the month will be found in the January issue of

MODERN WIRELESS

Profusely illustrated, the contents include

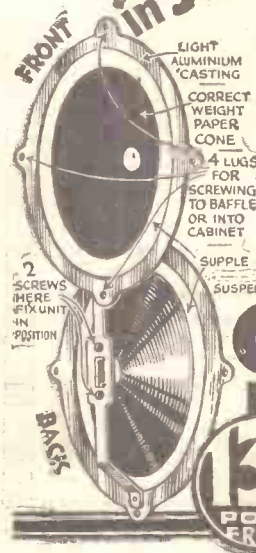
- Editorial.
- On the Short Waves.
- Put Radio into Cold Storage.
- The “New-Year” Three.
- The Quest for Quality
- The Trend of Development.
- The Cooley Picture-Transmitter.
- Switch Off!
- Questions Answered.
- The “World-Wide” Five.
- Marconi—the Man and His Work.
- Cross-Road Components.
- The “Selective” One.
- Be Kind to Your Valves!
- Five Million Volts.
- The Search for Selectivity.
- The Concerts of Europe.

- Have You Heard WHO? A Talk on Tellurium.
- In Passing.
- The “Any-Mains” Four.
- A Magnifying Dial Indicator.
- Testing Tetrodes.
- What Readers Think.
- The “Six-Sixty” Receiver.
- My Broadcasting Diary.
- In Our Test Room.
- Radio Abroad.
- Operating the “Invincible” Five.
- Television Notes of the Month.
- Radio Notes and News.
- Making a Wireless Work-Bench.

And a special supplement for the Music-lover, “RADIO AND THE GRAMOPHONE.”

JANUARY ISSUE. ON SALE EVERYWHERE. PRICE 1/-

BLUE-SPOT USERS! Get the Floating Cone that makes a perfect Loud Speaker in 5 minutes—TO-DAY!



THIS IS NOT A KIT OF PARTS, BUT AN EFFICIENT, COMPLETELY ASSEMBLED FLOATING CONE.

Simply two screws and the unit is in place—and the whole ready to screw on to a baffle board or into a cabinet, making a first-class loud speaker that will reproduce with fascinating realism at infinitesimal cost! A sound job, too—perfectly assembled—light aluminium casting, correct weight pure rubber suspension, post paid and ready for fixing at once.

GILMAN'S FLOATING CONE

Send P.O. for 13/- to-day to Manfrs., J. S. Gilman, Portland House, 73, Basinghall Street, E.C.2. Orders in strict rotation. “Blue-Spot” Unit (adjustable type, 66K), supplied at 25/- extra if desired. Phone: London Wall 9892.



OR FROM YOUR DEALER

Making a New Cabinet ?

If so, stain it with Johnson's Wood Dye and be assured of 100% perfect results. JOHNSON'S WOOD DYE is the standard for all woodwork, furniture and floors where a permanent, penetrating stain is required. It is easy to use, does not show laps or streaks, and penetrates so deeply that scratches cannot reveal the natural colour of the wood. Johnson's Wood Dye dries in four hours and brings out the beauty of the grain without raising it. Makes inexpensive soft woods look as artistic as hard woods.



JOHNSON'S WOOD DYE

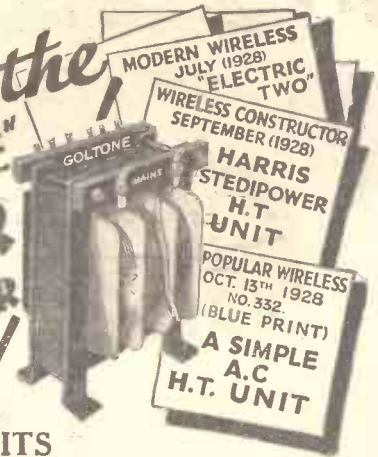
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(Described in this issue)

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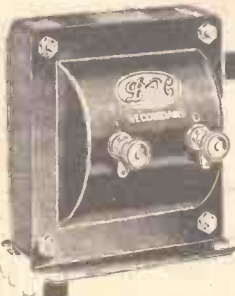
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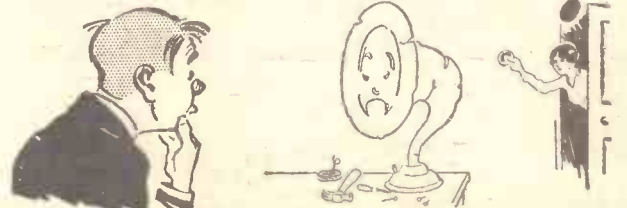
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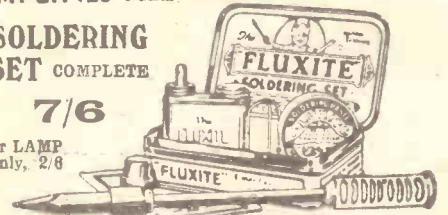
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1026.)

The unquestioned merit of Celestion lies not only in the refined beauty of its appearance but more



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FIRST ON MERIT
ON DEMONSTRATION.

First, set the reaction control at minimum and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other, it will probably be found that the set is oscillating.

To test for oscillation touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set).

You will probably find that the set will only oscillate under the above conditions when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to perform the operation at some point near the middle of the tuning range.

Now, 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.

Now 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 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 "overshot."

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 such an adjustment of the neutralising condenser as will permit 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

The "TITAN" THREE!

brought to the verge of oscillation a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

It is to be understood that in the preceding notes, where a reaction condenser is spoken of, any form of reaction control may be understood.

"NEWCOMER TO RADIO."

H. J. R. (Peckham).—"In reference to the articles written by Mr. G. V. Dowding entitled 'The Newcomer to Radio,' commencing September 1st in POPULAR WIRELESS, I am a bit puzzled as to the correct wiring of the set.

"I have completed the one-valve stage and cannot get a sound. My reaction condenser has three terminals like the one in the actual set, but two are connected to the fixed vanes, and the other to the movable. I should like to know which of the two fixed terminals should be connected to high tension or earth.

"Concerning the H.F. choke, I have a Lissen. Does it matter which way round the choke is connected? If you could give me some idea on the above questions I shall be extremely obliged."

Regarding the reaction condenser terminals, it does not matter much which way the condenser is connected, provided you use one wire to the moving plates and the other to the fixed plates. As there are two fixed plate terminals it does not matter which one of these you use and regard as the "fixed," but make sure that your other reaction condenser connection comes from the moving and not from the other fixed vane connection.

The choke that you have is quite suitable and it does not matter in the least which way round it is connected. The reason that you have so far been unable to get any signals would appear to be either a faulty connection or a dud component.

This does not necessarily mean bad workmanship on your part, but it sometimes happens that even when for instance, a valve, is plugged into the valve holder, one of its legs does not make contact with the corresponding socket of the holder, and consequently the valve is either getting no current, or no input or no output.

Similarly, it sometimes happens that a coil does not make contact in its coil holder, so that apart from

(Continued on next page.)



EVERY VALVE SET USER NEEDS A WATES "three in one" VOLT-AMP RADIO TEST METER

YOU may have a baseboard full of components— BUT you cannot hope to obtain really perfect QUALITY in reception unless you have that perfect set control ensured by accurate Volt and Amp readings! All you want is a Wates Meter. With its three readings on one dial feature it has an immensely wider range of usefulness—yet it costs no more than single-purpose instruments. Obtain one now and let it reveal what a world of difference lies in the expert handling of your set. Obtainable from your dealer or direct, complete with explanatory leaflet.

Stocked by Halford's Stores, Curry's Stores, and all Radio Dealers.

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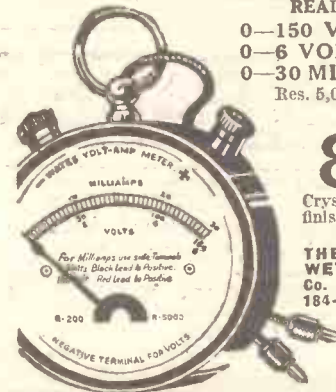
- 0—150 VOLTS.
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DARIO Super H.F. means Super Radio

See page 1025.

RADIO ODDS AND ENDS.

WHAT a wonderful hobby wireless is! It doesn't matter in what aspect of wireless your chief interest lies, you will always find ample to interest you, new developments to follow and fresh ideas to investigate.

Are you mechanically inclined? Then you will find in wireless all the opportunities for constructional work you could possibly desire. There is little in a wireless set that the enthusiast with the little necessary skill, few tools and some patience cannot make. Brass parts to be worked, turned, filed and polished. Some of them intricate, some simple. Copper switch blades, spring clips and contacts to be made. Ebonite coil formers, bushes, framework for valve holders. Aluminium brackets, screens, or even condenser parts. Fixed condensers to be made, coils to be wound, chokes to be constructed.

Theoretical Possibilities.

The above are but a few of the pleasant tasks that surround the experimenter with the constructional bent.

Perhaps your particular strength lies more along theoretical lines. Then here is a wide field indeed for your analysis. The simpler problems deal with questions of receiver design, the winding of efficient inductances, the construction of L.F. transformers, the combination of apparatus of different characteristics to produce certain desired results, the examination of circuits which have inherent drawbacks either in construction or operation, and the solution of the problems that thereby arise. More complex problems are those involving the use of advanced mathematics and they deal with anything under the sun relating to wireless, from the Heaviside layer to electron emission.

On the other hand you may be keen on actual practical experimental work, comparing different H.F. amplifying circuits as regards their efficiency, stability and selectivity, or L.F. circuits as to their behaviour when dealing with different frequencies, and other work of this description. Here again there is sufficient to keep you occupied for years, and faster than you settle one set of problems new discoveries and fresh developments give rise to new.

Collecting Meters.

Work of this description often results in new inventions, for difficulties may be encountered during such experiments that eventually lead to a means of overcoming them, and a new contribution has been made to the wireless science.

For myself, I study and practice every possible aspect of wireless—but I have one weakness that presents a fascinating side to wireless research, and is, in fact, a hobby within a hobby.

I collect meters!

Notwithstanding the fact that I have a Universal meter that gives me everything from microamps to 150 amperes, I also possess three—no, four—milliammeters giving ranges of 0-3, 0-10, 0-25, and 0-50 milliamps, to say nothing of a meter which

gives me 0-150 milliamps, 0-5 amps, 0-50 amps and 0-500 amps.

The Universal also gives me milli-volts to 600 volts. Yet I have managed to acquire four other voltmeters, one of which only supplies a range not covered by the other. This, again, is an instrument which gives me up to 1,000 volts.

Then I must not forget the micro-ammeter which gives readings of 25 micro-amps per division. This is an extremely valuable instrument for making really fine measurements. It can be used for measuring weak crystal currents, or for showing small changes in current. In this case it must of course be carefully backed off, and the greatest care has to be taken in handling it. It is also necessary when using a slide-back voltmeter since it enables very accurate results to be obtained.

Besides these I have three thermo-electric meters; two hot wire, with different ranges, and one thermo-couple.

Bargain Hunting.

It might be thought that all these meters represent a considerable outlay, but this is where the particular pleasure of this kind of collecting comes in. They have almost all been acquired at figures representing only a tithe of their actual value. Some I have bought down the Farringdon Road, some in the Caledonian Market, others at all kinds of odd junk shops all over town.

Other apparatus that I have also acquired in this manner are such instruments as a megger, a Wheatstone bridge, a Seibt condenser, a calibrated resistance box, a Weston relay, an old P.O. relay and a multi-circuit P.O. key; also microphone transformers, transmitters, and all kinds of other useful apparatus which can be picked up for nominal prices.

NEXT WEEK

Be sure not to miss your copy of "Popular Wireless," containing our Great FREE GIFT to readers.

In Farringdon Road, for instance, I bought for 6d. a set of brass "bits" which were all that remained of an old P.O. key. I polished and lacquered them, made a new return spring adjuster and fitted a new spring, mounted it on a thick piece of ebonite with three terminals which I bought for another 6d.—and there I had a good, solid, smooth-working key that is the envy of many.

The only real outlay that was required was for the contacts, and these need not cost much if the key is only going to be used for low-power work.

The chief thing to remember when buying this kind of apparatus is that you must examine it very carefully before buying, and even then you must be prepared to take the risk of being "had." Weigh up the price they are asking against the price it would cost new, and this will give you an indication as to what condition it may be in.

Beware of "Dud" Stuff.

Never pay what they ask for it if you buy it in a street or open market. You can always get it about a third cheaper.

If you buy in an auction take more care than ever if you cannot test the component or get a guarantee that it is in working order. I once wasted a hard-earned pound by buying an ex-Marconi hot-wire ammeter which was burnt out! C. P. A.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

the actual wiring of the set it will be necessary for you to look over it very carefully and try to check the connections through, if necessary by means of the 'phones or dry-cell method. Another point which it is worth the newcomer's while to notice is that the fault may not lie inside the set itself but in one of the batteries or one of the leads to these.

If your valve is one of the kind that lights up when it is switched on you can easily observe whether it is getting current from the accumulator, but some dull-emitter valves do not give any glow to indicate whether they are alight, and in such cases it sometimes happens that a bad contact at the L.T. battery may go undetected and so starve the valve of its necessary filament current.

If the accumulator terminals appear to be dirty, wipe them over with a cloth which has been dipped in a strong solution of soda, or gently remove any impurities from the terminals with a file or emery paper. Make sure also that none of the wire is frayed or broken and that the aerial comes straight down to the set, without touching any metal gutter or anything of that kind which would short away all the signals to earth.

If you watch all these points you will doubtless discover that somewhere there is a complete break or short in the circuit which has been preventing you hearing the programmes, and when this is put right you will find the set O.K.

Do not forget that if the wiring and components are all in order it is absolutely impossible for the set to fail to give you the results you desire, and although a difficulty in getting these at first is very discouraging then it is all the more pleasure when the set does work to think that you were able to find the trouble and put it right.

THE B.B.C. AND TELEVISION.

The following statement, issued on October 17th, 1928, by the B.B.C., has been sent to the Press, with a request for publication.—The Editor.

"In agreement with the Post Office, the B.B.C. required a studio demonstration of the Baird television apparatus before considering whether there should be public experiments in which a B.B.C. station would participate. A demonstration took place at the offices of the Baird Television Development Company, Ltd., on October 9th, and was attended by administrative and technical officials of the Corporation.

"The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfill the conditions which would justify trial through a B.B.C. station.

"The Board of the Corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present. The Corporation would be ready to review this decision if and when development justified it."

The Baird Television Company has not yet intimated to the B.B.C. any claim of improvement. Any such claim would be examined by the B.B.C. with a view to determining whether the above decision should be modified.

A WAVE-TRAP COIL.

M. E. P. (near Twyross).—"How many turns of wire were there on the actual coil of the 'P.W.' wave-trap, and where should the tappings be?"

The coil itself consisted of .04 turns in a single layer of No. 28 D.C.C. wire. As the coil is wound on the 2-in. diameter former, tappings are made at the sixteenth and twenty-fourth turns, these being the alternative positions for the aerial tap.

The ends of the coil winding are secured by the simple process of passing them through two small holes drilled in the tube at the correct points, whilst the two tappings may be made in a variety of ways. If desired, for example, the whole coil can be wound without making any tappings whatever, and the sixteenth and twenty-fourth turns can be prised up slightly with the blade of a pocket-knife, two short pieces of matchstick, about half an inch long, being driven underneath them.

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LEWCO'S O.A.C.5. 10/6;
O.A.C.20. 12/6; O.S.P.5.
10/6; O.S.P.20. 12/6;
P4 to 14. 3/- each; P16
to 22. 4/- each. Touch-
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Coils, 3/6, 5/3. Q Coils:
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stats, 6, 15, 30 ohm, 2/-;
Midget .0001 max., 4/-;
Log. .0005 and 4" Dial,
8/-; Log. .0003 and 4"
Dial, 5/6. S.L.F. No. 3
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"P.W." 8/12/28.

KIT OF COMPONENTS

4 B.B. Coil Sockets, 4/-; Neut. Condenser, 4/6; .0005
Variable, 6/-; S.M. Dial, 3/6; .0003 Fixed, 1/-; .001
do., 1/-; .0001 Reaction, 4/-; H.F. Choke, 5/6; Formo,
Lissen, or DX L.F. at 8/6; W. Change Switch, 1/6;
2 Sprung V. Holders, 2/6; Terminal Strip and 10 Ter-
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READINGS
0-150 volts
0-30 milliamps
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Res. 5000 ohms

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Squire Cradle Frame,
12/6 for (Blue Spot).
Cone Kit, 2/6. Free
plywood damping
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3d. extra any one (only) of the following:

S.M. Dial, 100 ft. 7/22 Copper Aerial, 12 yds.
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Aerial, Loud Speaker Silk Cord, 30 ft. Covered Con-
necting Wire, Ebonite Panel, 9 x 6, 12 yds. Twin
Flex, 100 ft. Indoor Aerial.

OPERATING THE 1929 FILADYNE

Further notes on the novel and effective two-valve set described in last week's issue of "P.W."

By J. ENGLISH.

WHEN making the battery connections the third H.T. + terminal is used for the connection to the inner grid terminal of the tetrode via a flexible lead terminating in a spade terminal. Where the tetrode is not used this flexible lead is omitted and the terminal used for the H.T. negative connection, joining it to the adjacent L.T. negative terminal. Otherwise the H.T. negative lead must be taken to L.T. negative of the accumulator.

We will now presume that all constructional work has been completed, and that the receiver is set up on the bench for testing. First of all you require the necessary valves, which for the second stage are the tetrodes A.P.412 L.F., for average volume, and the A.P.412 Power for larger inputs, or a three-electrode power valve of the type S.P.18/R, Dario Super-Power, etc. In some cases a larger power valve may be advisable where the volume from the local station is considerable, to avoid overloading

The "TITAN" THREE!

and consequent "blasting," but the valves already mentioned will handle quite an appreciable input without distortion.

Modern Valves.

For the detector stage we have the usual Filadyne valves, such as the D.E.R., D.E.3, D.E.2 L.F., etc. These valves, although obsolete types, are very efficient Filadyne detectors, so that if you have one of these old valves amongst your stock it can now be put to good use.

Of the modern valves, a particularly good specimen is the Dario Super H.F., which I can thoroughly recommend for this set. This valve has an unusual double-electrode assembly (two anodes, two grids and two filaments in parallel) which appears to be particularly suitable for Filadyne conditions.

Economical to Run.

This type of valve certainly gives very good results on low anode voltages, and I have obtained a good loud-speaker output from the two valves with only 6 volts H.T. on the detector! Moreover, under Filadyne conditions it requires barely half its normal filament current so that it is anything but wasteful of battery power.

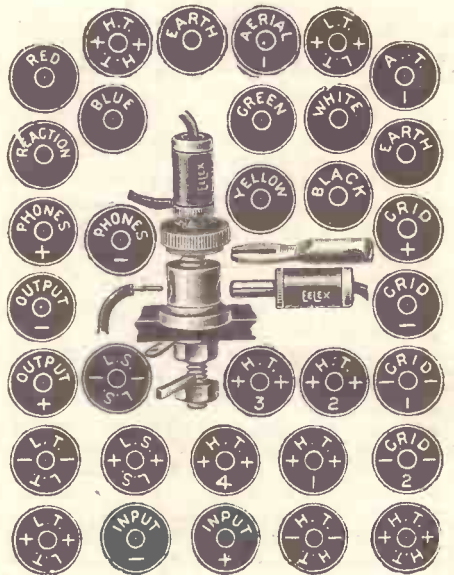
You can also try a P.M.2 D.X., if you have one handy, using a low anode voltage up to 25 volts, with a maximum filament voltage of 1 volt.

Several other modern valves refused to work at all in the detector stage, but the valves which I have found to be particularly

(Continued on next page)

EELEX TREBLE-DUTY TERMINALS

Eelex Treble Duty Terminals are different and better. 40 indicating tops to the Terminal can be obtained, all different wording, and six coloured tops for any special uses. By using coloured flex in conjunction with Eelex Treble Duty Terminals, the possibility of a wrong or accidental connection is minimised and you have the ideal "safety" system of connections.



Eelex Treble-Duty Terminals are nickel-plated and hold securely spade, plug, pin eye or just plain wires. (T2LC) 4½d. each. With plain top only (T2LN) 3d. each.

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OPERATING THE 1929 FILADYNE.

(Continued from previous page.)

suitable are not the only ones, as it has not been possible to try every one of the multitude of modern valves. You can easily try out your stock of valves, and I shall be very interested to hear of any additions to my list.

In the table were given the correct filament voltages for the Filadyne valves, with suitable anode voltages. The filament voltage can be adjusted with a voltmeter temporarily connected across the detector valve-holder filament terminals, but if you do not possess such a thing you will find in the table another column giving the approximate rheostat settings, the figures being the fraction of the resistance element in circuit.

The right way to get the set working, having given the valves the proper filament and anode voltages, is to push the reaction coil almost inside the 4-in. former, put the aerial clip on the lowest tapping and rotate the potentiometer knob until the familiar rushing sound of oscillation is heard. Then it should be easy to pick up the strong carrier of the local station, reducing reaction by moving the potentiometer towards the negative side. Always work as near to the negative end as possible.

Coming Shortly.

THE "TITAN" THREE

DON'T MISS IT!

If reaction is too fierce pull out the reaction coil slightly; too much filament current produces the same result. Louder signals are obtained when the aerial clip is moved on to the fourth tapping near the middle of the coil, with some loss of selectivity, of course. If you want the local station only this does not matter, and you can even connect the aerial clip to the top of the filament coil, if the aerial is small, for maximum volume. When searching for weak signals you will find tuning easier if you decrease the reaction coupling, although the closer the coupling the louder will be your signals up to the point where "backlash" occurs.

The Set in Action.

I have intentionally tested this receiver under very unfavourable conditions, using a small indoor aerial and a long earth lead with a poor earth connection. This aerial system, situated about 12 miles from 2 L O was not one that any self-respecting amateur would use, but in spite of that, ample volume was obtained on 2 L O, and comfortable volume from 5 G B. A considerable number of stations was received on the 'phones, several being quite audible on the loud speaker.

Obviously, given a good aerial and earth system, these results can be surpassed, so that the set should give you satisfactory volume on the local station, the choice of a few alternative stations, and plenty of "pull" for 'phone reception of the more distant ones.

YOU NEED HELP

It is very difficult to prosper in life without a little help.



LET ME BE YOUR FATHER

I have acted as father and adviser to thousands of others. I give advice free and when I do so I feel the responsibility of a father, either in advising a career or in guiding our students to success. Having been the self-constituted father and adviser to thousands of others, it is possible I may be able to help you and guide your footsteps so that you may make a success of your life.

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CORRESPONDENCE COLLEGE IN THE WORLD.**

**IT IS
QUITE TRUE**

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply. Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well-trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free; simply tell me your age, your employment and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the World, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address, The Bennett College, Dept. 106, Sheffield.

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The BROWNIE WIRELESS COMPANY (G.B.) Ltd.
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The Picture Paper with the MOST News

SUNDAY GRAPHIC

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

TECHNICAL NOTES.

(Continued from page 1004.)

condenser will help considerably in keeping down oscillation on the shorter waves.

A correspondent sends me a hint which is useful in this connection. It has for its object to retain the fixed condenser in circuit at longer wave-lengths and to cut it out as the wave-length increases.

Automatic Connection.

The fixed condenser is assembled in position on the baseboard, close to the variable tuning condenser and a short piece of springy brass strip or steel strip (such as watch-spring) is attached to the shaft of the tuning condenser. A similar piece of spring strip is attached to one of the terminals of the fixed condenser and these springs are so bent and arranged (I am sorry I have no diagrams with these notes) that the two spring strips make contact, whilst the variable condenser is in the longer wave-length range and cease contact when the variable condenser moves into the shorter wave-length range. You

The "TITAN" THREE!

will have no difficulty in figuring out how to arrange these spring contacts to meet the case.

Shielding.

Shielding is one of the most important considerations in the design of a receiver using screened grid valves in the H.F. circuit. When properly employed these valves are capable of providing several times as much amplification as the usual type but, of course, if the circuits have not been designed with corresponding care, the anticipated results will not be obtained.

Plate shielding is essential in the circuits using these valves if high efficiency is to be obtained. Not only is it necessary to place all components of the circuit within shielded compartments, but the valve itself and the control grid lead must also be shielded.

Control-Grid Lead.

It is a comparatively straightforward matter to make the shielded compartments, but the shielding of the grid lead sometimes presents a problem. This useful object can, however, be quite easily achieved by using fairly heavily insulated wire for the control-grid lead and then winding strips of tinfoil (or "silver paper") in spiral fashion over the insulation.

When the control-grid lead has been "bandaged" in this way, contact with the

(Continued on next page).

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Your Neighbour's Wireless Set
BUILD YOUR OWN RECEIVER—
BUT BE SURE to Buy on the Best Terms from THE P.D.P. CO., LTD.
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MONOTUNE ENVELOPE FREE. INCREASE YOUR RANGE. ORDER YOUR PARTS C.O.D.

Send 1/2 for comp. Construct. Envelope of this 40-station single tuning Set by Allinson. 1/- allowed off first 10/- order for any radio goods. Circular and List parts free. Particulars of my new SCREENED GRID UNIT which gives great selectivity and almost unlimited range to Monotune, Melody Master-3 or any similar Set. Immediate despatch of Polar, Colvern, Mullard Telsen, Lotus, McMichael, Du-bilier Radlax or other standard goods, cash on delivery or Easy Payments for lists of parts.

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The "P.R." Loudspeaker Unit is driven by a fully balanced electro-magnetic armature under the influence of powerful cobalt-steel, permanent magnets, hermetically sealed and absolutely foolproof. It swings to the weakest impulse, bringing out the treble notes and the rich double bass of the organ. Fitted with a simple tonal adjustment that "stays put." Most powerful Unit giving full strength from a 2-valve set! No extra H.T.

Ask your dealer for one or send your remittance direct
P.R. PRODUCTS, 17D, Paternoster Sq., London, E.C.4

Write for the New DARIO Folder
See page 1025

Advertisements

As far as possible all advertisements appearing in "Popular Wireless" are subject to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," 4, Ludgate Circus, London, E.C.4.

STANDARD HIGH TENSION BATTERIES with GRID BIAS

No. 16217 "Daimon" Battery 60 volt with Grid Bias 7/3 each
No. 16219 "Daimon" Battery 100 volt with Grid Bias 12/3 each

From all good dealers.



TECHNICAL NOTES.

(Continued from previous page.)

silver paper or tinfoil may be obtained by winding the bared end of another piece of wire several times around it, and making a secure mechanical joint. Care should be taken that where one strip of silver paper ends and another commences there is good contact between them, and it may even be desirable to wind two or three turns of fairly fine wire around the control-grid lead at each junction of the shielding strips, so as to make doubly sure.

Soldering to Iron.

Experimenters occasionally find it necessary to make a soldered joint to iron or steel. Using the ordinary practice you will generally find that it is not nearly so easy to get the solder to "wet" the iron in the way which it does with brass or copper. The following is a way in which the process is much simplified and a neat and permanent soldered connection may be made.

Copper Plating.

The part of the iron or steel which is to be soldered is first cleaned thoroughly with a file or sandpaper. It is then dipped in a strong solution of copper sulphate, made by dissolving about one teaspoonful of copper sulphate crystals in an ounce of water. Copper sulphate is obtained in the form of deep-blue crystals and can be bought very cheaply from any chemist. Remember, however, that it is rather poisonous and, therefore, should not be left lying about. The solution should be stirred with a small wooden stick or with a piece of copper strip.

You will find that when the iron or steel is dipped into the copper sulphate solution it will soon acquire a copper deposit, and this forms an excellent basis for the solder which will then be found to "run" much more easily and uniformly.

A New Battery.

A new type of H.T. dry battery is being turned out by the Burgess Battery Company in a form which occupies very little "floor space," but which is very tall. It has been aptly described as being of the "skyscraper" design.

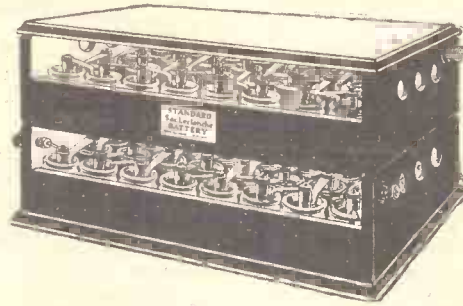
A significant note in the production of these batteries may be found in the fact that they are specified for use with the photo-electric cell and the Neon tube. Also, they are found to be a space-and-weight saving factor in radio-equipped aeroplanes, for which they were originally designed. They are marketed in two types; one is a battery having a voltage of 108, which measures 15 in. x 3½ in. x 2½ in., and weighs 6½ lb. It is equipped with four terminals and provides the following values: 36, 72 and 108 volts.

The Skyscraper.

The other is similar in design but has a maximum of 144 volts with a 54-volt tap. It measures 13½ in. x 3 in. x 3 in. and weighs 5½ lb. A novel method of construction is used in these batteries which consists of combining the cylindrical cells in stick form, not unlike a roman candle. Seventy-two cells, ¾ in. x 2½ in., are used in the 108-volt battery. The 144-volt battery consists of 96 cells, ¾ in. x 1½ in., corresponding in size to those used in the most compact H.T. batteries.

(Continued on next page.)

THIS AMAZING BATTERY SUPPLIES AMPLE CURRENT FOR "MOVING COIL" & "PENTODE" WORK



96 VOLT "UNIBLOC" UNIT

(No. 2 Cells.)

Assembled complete ready for use. Delivered on first payment of 7s. 6d. and five monthly instalments.

Cash Price **£2/3/11**

For Moving Coil and Pentode Work No. 3 or 4 Cells are recommended.

NON-VARYING H.T. SUPPLY

It delivers a smooth, non-varying H.T. supply, free from the ripple and voltage drop associated with ordinary H.T. work.

The current is smooth and powerful, and puts a real punch into your reception.

It contains no acid—every cell and every part is instantly interchangeable—and it re-charges itself over night.

LONG LIFE

It will outlive any H.T. Battery made, and deliver its full current to the last moment, after which it is easily and cheaply replenished at a fraction of the cost of replacing a dry H.T. Battery.

Hardly known two years ago, these batteries are now giving constant service to thousands of delighted owners, all over Great Britain.

CASH OR DEFERRED TERMS

Halford's Cycle Stores, Curry's Stores, and good class Wireless Dealers can supply same on cash or deferred terms.

Any voltage supplied. If any difficulty, write to us.

FREE BOOK

Send for our interesting Free Book, full of data on H.T. Supply, details of Spare Parts, and simple maintenance, etc.

STANDARD

SAC RECLANCHE

(The Wet H.T. Battery Co.)

Head Offices, Showrooms and Warehouse (Dept. P.W.), 184-188, Shaftesbury Avenue (Near New Oxford Street end), London, W.C.2.

DARIO

This week's best bargain
See page 1025.

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T.P.'s WEEKLY is the paper for thinking people—it will keep you up to date with everything in the worlds of art, music, and literature. It is an intellectual entertainment—a kindly guide to richer and fuller knowledge.

NEW COSSOR MELODY MAKER

PROMPT DELIVERY.

We are in a position to give immediate delivery of the New Cossor Melody Maker Kit.

CASH PRICE **£7-15-0** Carriage Free

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We also supply all other Wireless Apparatus that is on the market, under our easy payment scheme.

Send list of requirements to:—

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WET H.T. BATTERIES

Solve all H.T. Troubles.

SELF-CHARGING, SILENT, ECONOMICAL.

JARS (waxed) 2 1/2" x 1 1/2" sq. 1/3 doz.

ZINGS, new type 11d. doz. SACS 1/2 doz.

Sample doz. (18 volts), complete with

bands and electrolyte, 4/3, post 9d.

Sample unit, 6d. illus. booklet free.

Bargain list free.

AMPLIFIERS 30/.. 2-VALVE SET 24.

P. TAYLOR, 57, Studley Road,

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FOR MOUNTING ON METAL OR WOOD

PERFECT INSULATION

Two required for each hole.

Orders under 1/- send 1d. postage.

NUMBER 1 2 3 4 5 6 14

Hole in Bush: 4BA, 2BA, 3/8, 5/16, 3/8, 7/16, 1/2.

Price each: 1d. 1d. 1d. 2d. 2d. 2d. 2d.

(Complete List of sizes free on application.)

DAREX RADIO CO.,

Waldram Rd., Forest Hill, London, S.E.23.

TRADE SUPPLIED.



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VARIABLE RESISTANCES FOR VOLUME, TONE, DISTANT CONTROL, ELIMINATORS ETC.,

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New 20 Page Brochure free on request.

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CLAUDE LYONS LTD.
76, OLDHALL ST., LIVERPOOL.

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

TECHNICAL NOTES.

(Continued from previous page).

Indicators.

The usual polarity indicator consists of a solution of phenol thalein in a small glass tube with a stopper at each end and suitable electrodes pushed through the stoppers.

A somewhat simpler polarity indicator consists of a glass tube, say, 2 in. long and 1/2 in. diameter, with a stopper at each end, and electrodes as before, but the electrolyte consisting of a solution of ammonium chloride. When the indicator is used, bubbles will appear at the negative pole.

Speaker Improvements.

Notwithstanding the great popularity of moving-coil-type loud speakers, progress in loud-speaker design still continues, and I listened recently to a new type of loud speaker which is certainly in advance of anything which I have previously heard.

Heavy Field Drain.

Talking about moving-coil loud speakers, many experimenters hesitate to employ a speaker of this type owing to the fact that—if he is to rely upon low-tension current from his L.T. battery for energising the field—he is afraid that the current consumption will be altogether too heavy for his battery.

I have seen speakers in which the field-windings require a current up to 5 amperes which, of course, is a very heavy drain on any ordinary L.T. battery such as is used for radio purposes. Where this condition exists, it is due either to bad design of the speaker or—what perhaps should be included in the same heading—to the magnetic material being unsuitable.

Cast steel should be used for the pot and, in fact, steel may be used for one part of the magnetic circuit and soft iron for another. But the point to bear in mind is that, unless the magnetic circuit is designed for efficiency, there will be a great wastage of energising current.

There are many moving-coil loudspeakers working from 6-volt supply which consume no more than about 1/2 ampere of field current and which give excellent results and compare quite favourably for sensitivity with the best of cone-type speakers.

THE NEW CROXSONIA RADIO PANEL SENSATION

ASTOUNDINGLY LOW PRICES



ANY SIZE CUT

POSTAGE FREE

WRITE FOR NEW FOLDER "P"

Mahogany Finish - 4d. square inch or part inch
 Black Gloss Finish - 4d. " " " " "
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 "Wireless World" writes:—
 "Good insulation, infinite resistance. Free from leakage. Exceedingly strong. Not liable to warp. Recommended."
 Recommended for all specified sets, including Cossor Melody Maker and Mullard Master Sets, as being efficient and satisfactory in every respect.
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The Technological Institute of Great Britain, 209, Temple Bar House, London, E.C.4.

Keep on Saying DARIO for Radio

See page 1025.

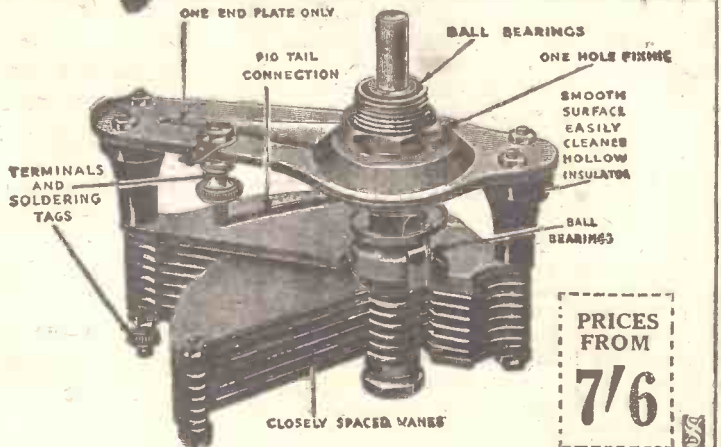
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Insist on "Utility" Condensers

You can obtain "Utility" Condensers in Square Law, S.L.F., or Logarithmic pattern illustrated. The unique mechanical features of these instruments are emphasised in the illustration; you can mount them for Thumb-control or Baseboard operation. If Vernier adjustment is required we fit the "Utility" 4-in. slow-motion Dial for the purpose. Ask to see "Utility" Guaranteed Components at your dealers.

Write for "Utility" Catalogue.

WILKINS & WRIGHT, Ltd.
"Utility Works," Holyhead Road, Birmingham



THIS design is one which will be found specially attractive to the more advanced constructor, giving a high degree of selectivity on both wave-bands with exceptionally good amplification. Correspondingly, it requires a little more skill to operate it to the best advantage than the simpler type.

It incorporates one high-frequency valve, detector with reaction, and two L.F. stages (one resistance and one transformer coupled). It tunes over both the 250-550 metres and 1,000 to 2,000 metres wave-band without changing of coils, two simple push-pull switches on the panel accomplishing the change-over whenever desired.

The H.F. stage employs a circuit arrangement which has been found extremely efficient, with special features which enable the best results to be obtained on both wave-bands. On the lower waves the simple form of the parallel feed circuit is used, with a variable feed tapping on the coil L_4 which enables you to suit different types of valves and also control the degree of selectivity.

Special Long-Wave Circuit.

On switching over to the long waves the circuit is altered somewhat. Stability is no longer obtained by adjusting the feed tap on the detector grid coil (the adjustment found best for the low waves is left permanently set), but by means of the neutrodyne condenser, N.C. This condenser, by the way, only functions on the long waves, and is put out of action by the switching arrangement on going over to the lower wave-band.

The coils for the lower wave-band (L_1 and L_2 , L_3 and L_4) are specially wound ones to suit the circuit, while the additional long-wave coils (L_5 and L_6) are "P.W." standard loading coils. The low-

THE "P.W." "WHITE PRINTS."

A NEW SERVICE FOR OUR READERS.

White Print No. 7. :: :: A Wave-Change Four-Valver.

This week we publish the seventh of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the White Print filed. In due course you will thus have available an encyclopaedic collection of the best circuits used in modern radio practice. A "White Print" will be published on the last page every week in "P.W." until further notice—THE EDITOR.

wave coils are of the type originally used in a set called the "Quick Change" Four, and can be bought ready made if desired.

COMPONENTS.

- 1 Panel, 21 in. x 7 in. x 1/4 in.
- 1 Cabine (with baseboard, 12 in. deep, and panel brackets).
- 2 .0005 mfd. variable condensers.
- 1 .0001 or .00015 mfd. reaction condenser.
- 2 Push-pull on-off switches of usual wave-change type.
- 1 L.T. on-off switch.
- 4 Sprung valve holders.
- 1 Copper or aluminium screen, 12 in. x 6 in.
- 1 Neutralising condenser.
- 2 H.F. chokes.
- 2 Standard loading coils.
- 1 Pair "Quick Change" Four coils.
- 1 R.C.C. unit (see diagram for values).
- 1 L.F. transformer, low ratio.
- 1 Output filter choke, about 20 H.
- 1 Fixed condenser, .0003 mfd.
- 2 Fixed condensers, .001 mfd.
- 2 Mansbridge type condensers, 2 mfd.
- 1 Grid leak, 1/2 meg. and holder.
- 1 Grid leak, 2 meg., and holder.
- 1 Terminal strip, 19 in. x 2 in. x 1/4 in., and 10 terminals.
- Wire, screws, flex, G.B. plugs, etc.
- Materials for coils, if desired.

For the benefit of those who may desire to wind their own, a very brief specification

follows. Both units are wound on tubes 3 in. diameter and 3 1/2 in. long. L_2 is of 60 turns of No. 24 D.C.C., and L_1 has 25 turns of the same wire with tapings at 10, 15, 20 turns. L_4 is the same as L_2 , except that it has tapings at 10, 15, 20, 25, 30 turns.

The reaction winding L_5 has 30 turns of any fine gauge of wire, such as No. 32 D.S.C., and is in the same direction as L_4 . General details of mechanical make-up you will be able to gather from the drawing.

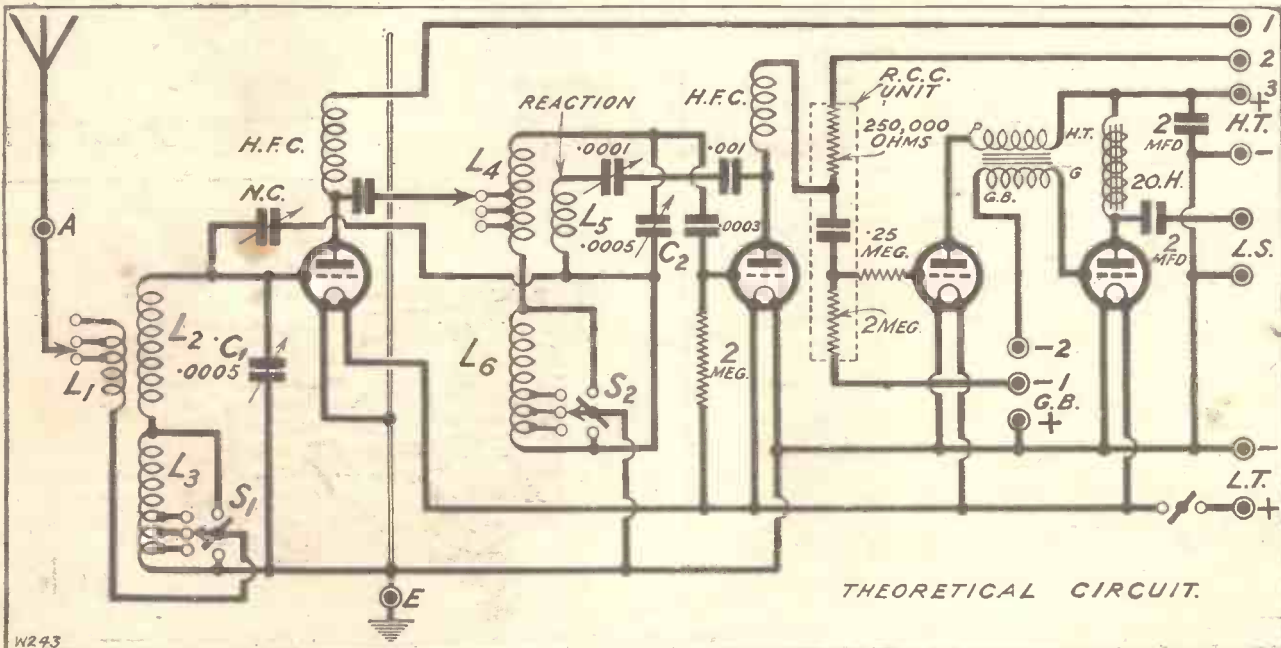
Valves and Voltages.

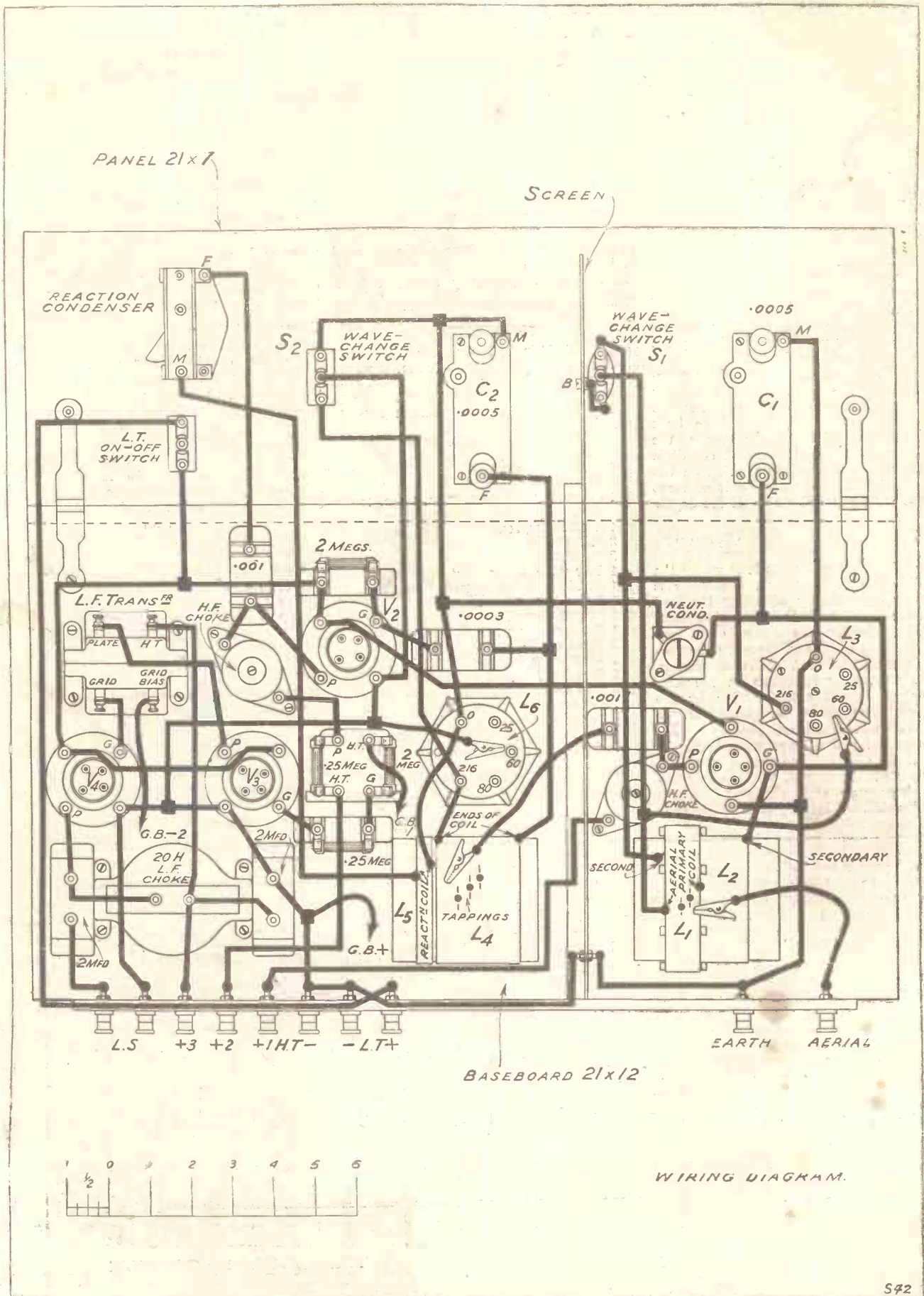
The L.F. side is of quite a standard type, while the constructional work is quite straightforward and calls for no special explanations, so we can go on next to operating matters. Suitable types of valves are these: for V_1 and V_2 , H.F. type, impedance about 20,000 ohms. For V_3 (first L.F.) one of the L.F. or G.P. type, impedance about 7,500 to 15,000 ohms. For the last stage a power or preferably even a super-power is advised.

Battery voltages should be just the normal ones, i.e. H.T. + 1 (H.F.) 80-100 volts, H.T. + 2 (det.) 60-80 volts, H.T. + 3 (L.F.) 100-120 volts. The only point really here is to adjust the H.T. on the detector with a little care to get the smoothest reaction control.

The Output Circuit.

You will notice that the last valve is provided with an output filter circuit for feeding the loud-speaker, and this is a very desirable feature whenever the last valve is a fairly large one. Not merely does it protect the speaker from the possibly harmful effects of the large anode current, but it also enables a higher effective H.T. voltage to reach the power valve. The reason, of course, is to be found in the low D.C. resistance of the output choke.





ENDURANCE



In a recent Cape to Cairo and London car endurance test Mullard Valves were unhesitatingly chosen for the radio installation in the car.

A seven months' journey—over mountains, through rivers, across some of the roughest country in the world—and not a single valve breakage or replacement during the whole journey.

Mullard Valves were chosen because experience had proved their reliability; this severe test again confirmed their supremacy. Under the most adverse conditions the travellers were able to maintain communication and to enjoy the B.B.C. programmes in their lonely camps.

Use Mullard Valves in your receiver. Use them for reliability, for strength, for tone, volume and distance.

Mullard
THE MASTER VALVE

Carries 15 Milliamps
without Saturation



The
BI-DUPLEX L.F. TRANSFORMER

This workmanlike piece of engineering represents a new and improved Transformer design. Bi-duplex is a name to conjure with all over the world and it is the employment of this exclusive system of winding that has caused its success.

It can be used after a power or super-power Valve, and will carry anode currents up to 15 m.a. without becoming saturated.

When experimenters are striving to obtain the utmost purity of reproduction, they take care to avoid overloading the last valve, but often lose sight of the fact that one of the earlier valves may be overloaded. By employing a power valve in this stage one can ensure that the input to the last valve is undistorted, and thus obtain full benefit from the super-power Valve in the last stage.

The use of two transformer-coupled stages is becoming increasingly popular. In this case we recommend using our Straight Line Transformer in the first stage and the Bi-duplex in the second, especially when the last stages push-pull.



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28/14 Henries, 0.103 m/a
260 ohms D.C. Resistance,
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14/7 Henries, 0.100 m/a,
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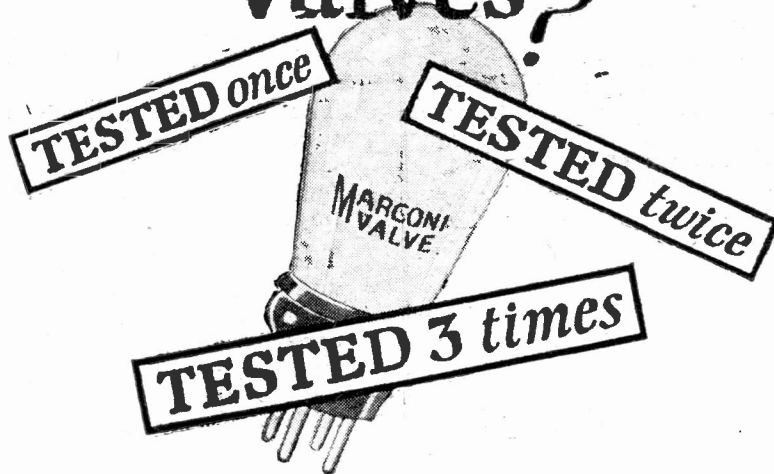
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THE most brilliant achievements of thermionic valve invention are incorporated in Marconi Valves, including a toughened filament with the newest type of coating. Extreme durability is thus assured with exceptional electron emission at low temperatures.

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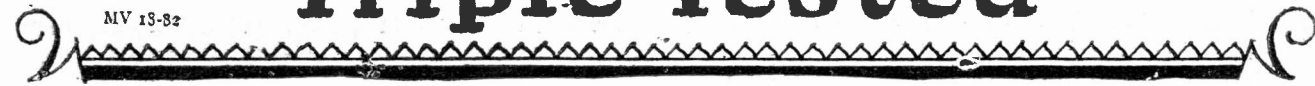
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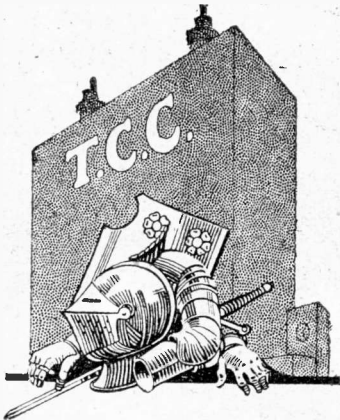
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MARCONI VALVES
"Triple Tested"

MV 13-32



177



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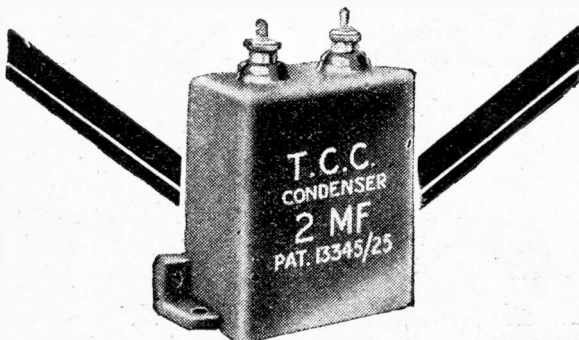
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Used for the Cossor "Melody Maker"



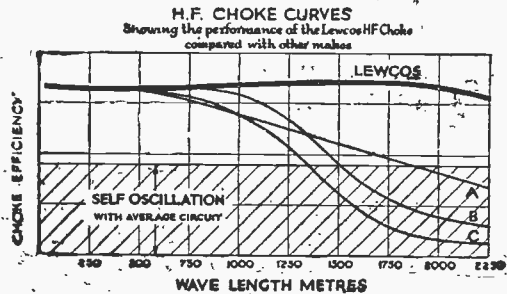
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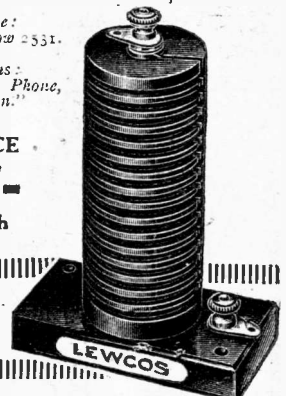
'Phone: Walthamstow 2531.

'Grams: "Lewcos," Phone, London."

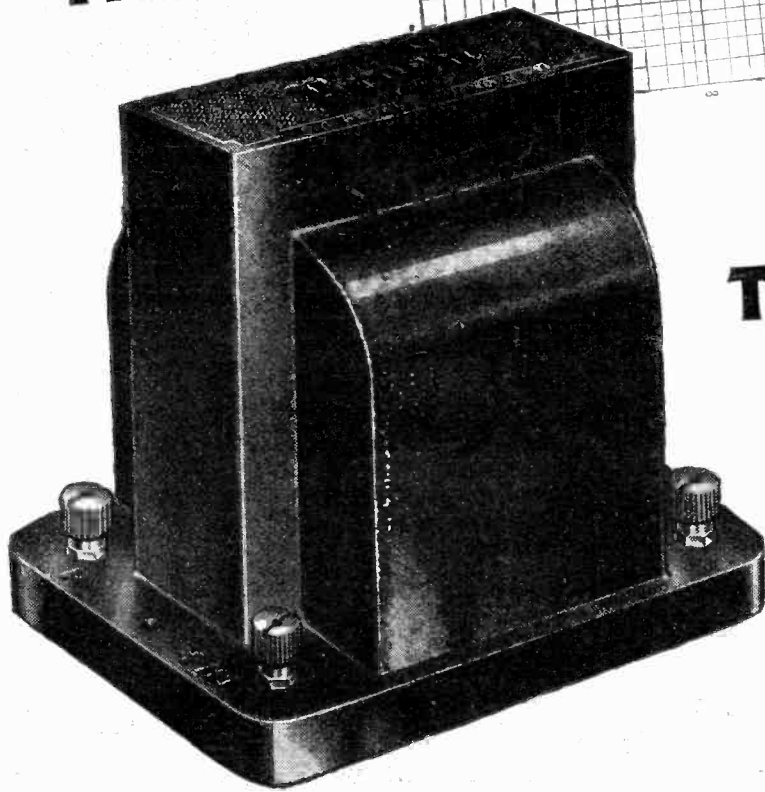
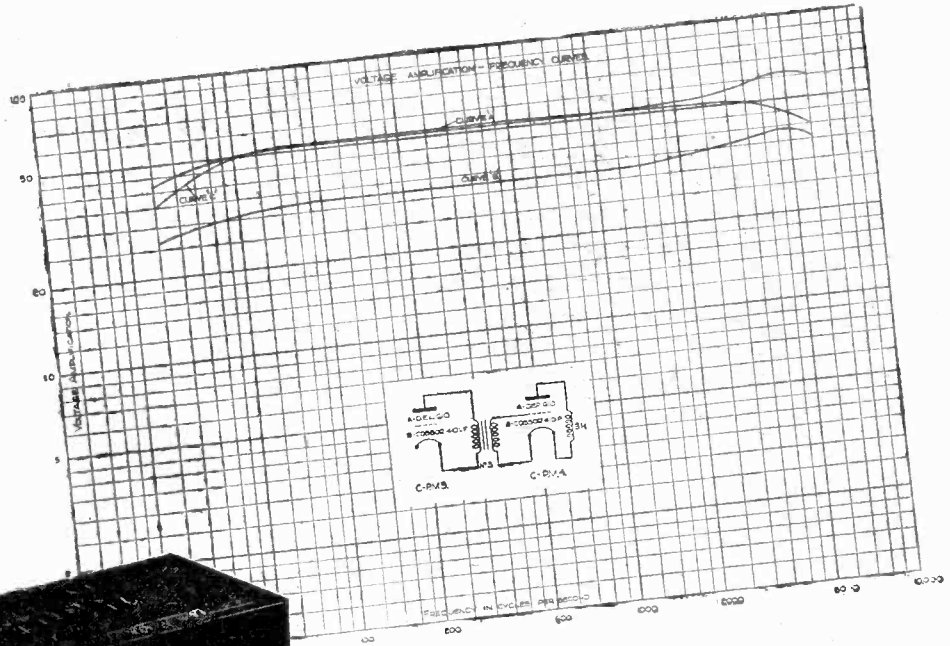
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TRUTH**



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“... Once I actually communicated with a Station in Pittsburg, using no aerial or counterpoise, but simply plugged by means of a “Ducon” adaptor to the lighting circuit! ...”

Extract from article in “Modern Wireless” of December, 1928 — “Further Adventures in Labrador,” by Mr. F. Dearlove, Chief Wireless Operator appointed by Sir William Grenfell to link up the Labrador outposts by means of Short-wave Wireless.



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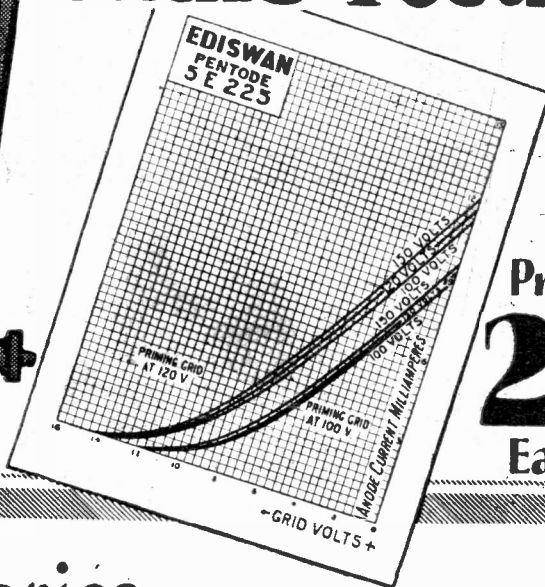
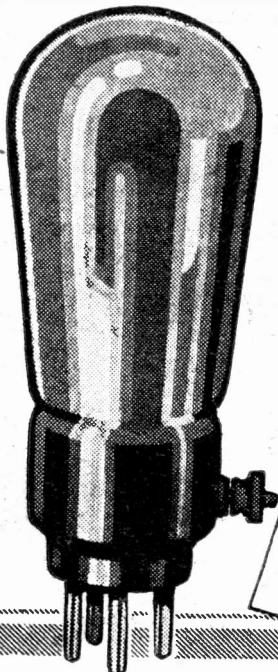
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 Slope, 1.2 ma/v.

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 Filament Volts, 4.
 Filament Current, 0.15 amp.
 Max. Anode Volts, 150.
 Priming Grid Volts, 100-150.
 Amplification Factor, 50.
 Impedance, 27,000 ohms.
 Slope, 1.3 ma/v.



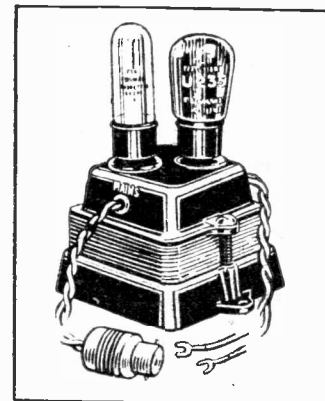
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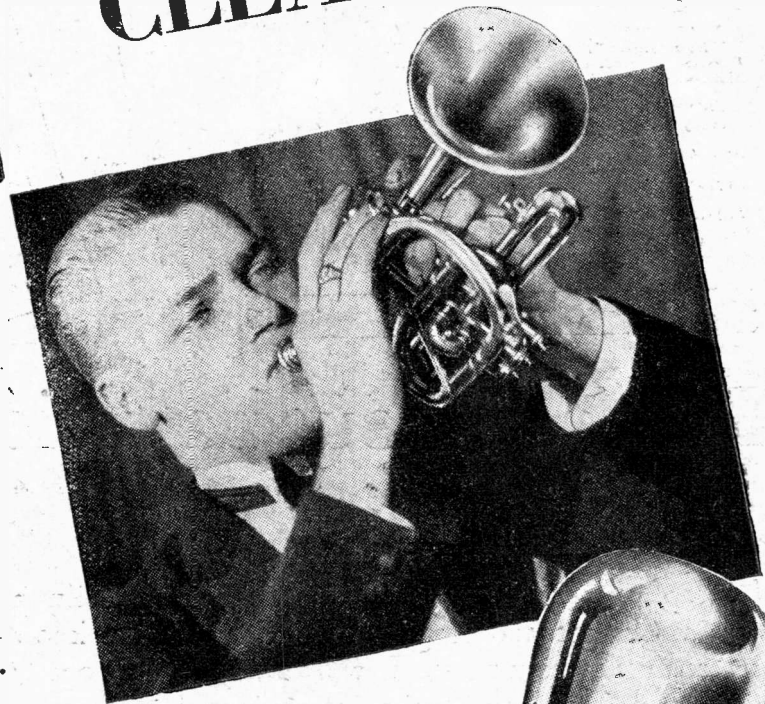
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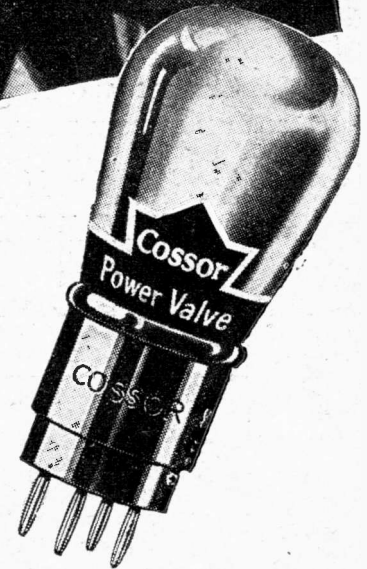
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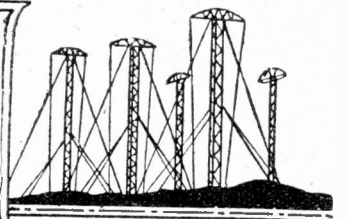
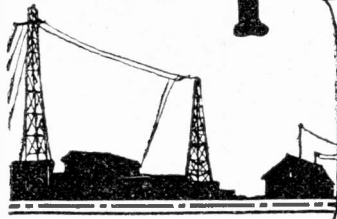
Cossor Valves bring in distant stations with amazing volume—they increase the range of any Receiver. They give enormous volume and purity as well. Cossor Valves made possible the wonderful Cossor Melody Maker. They improve any Receiver — use them in yours—your Dealer will tell you the types you need.

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Popular Wireless



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RADIO NOTES AND NEWS.

Secret of the Beam—A Transmitting "Pirate"—Primitive Wireless—Cupid and the Chink—
 Very Portable Sets—Listeners Still Increasing—The Fan of Ajmere.

New Harry Tate in Motoring.

APPARENTLY the folk who go to motoring papers for advice about wireless have to be a credulous breed. Our serene and withered "John Gilpin, Junr." is still conducting his "Little Dot's Corner" in "The Motor," and has recently told his little innocents that he has not seen in the wireless journals a screened-grid circuit which "really got to the bottom of the difficulty." "P.W." did, with the "Pentode" Three; it has also got to the bottom of "John Gilpin, Junr."—not very far to dig, either. He says that an up-to-date set must have a pentode in the last stage "unless it is intended for portable work." Sly dog! As he says he knows what the manufacturers are doing he must know that many commercial portables use pentodes.

Oh, Ethyl!

HE says that the super-let. is almost universal in the United States. He must have been reading some old first editions, picked out of the "twopenny box," for super-lets. are almost obsolete in the States. But it is in writing profoundly about the "Magnavox" loud speaker that he cracks his best joke. In reference to some tests another party had made, one of his readers advised that the output transformer should be changed. J Gilpin thereupon gravely replied, "tests were made with a resistance-capacity coupled set in which there was no output transformer to be changed." Of course there wasn't. The darned thing was in the "Magnavox" under an assumed name—but our horsey friend didn't know it. Gee up!

News Bulletin.

IT is reported that M. Citroën, the manufacturer of the well-known motor-car, is intending to launch out into the radio trade with a cheap mass-produced set.

The Union Radiotélégraphique Scientifique Internationale will hold a radio congress at Liège next year.

A high-power station is to be erected in Teheran for the Persian Post Office.

Our own P.O. is to build a station at Fleetwood to serve as an emergency standby for the cables to Ireland and the Isle of Man.

A New Process.

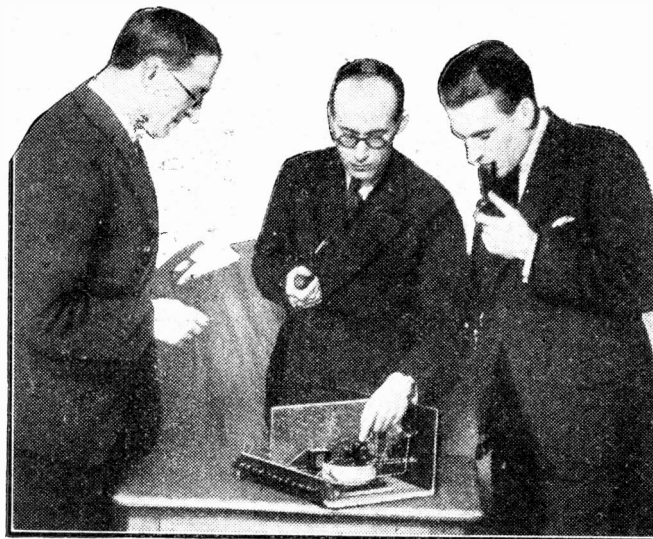
I WAS greatly interested in the announcements made about the new "Einstein" process which enables non-conductors of electricity to be electro-plated. The field of application must be enormously wide, and I should think that a lot of uses could be found for it in the manufacture of radio apparatus. Think, for example, of wire made from plated spider's web, and condenser vanes made of plated rice-paper or butterflies' wings. And what about

Can this be Ter-rue?

I READ a report from Oslo, Norway, to the effect that the police have been called in on the biggest licence-dodging case ever heard of. According to the returns of the authorities, there were some 62,800 licences, of which about 27,000 were not renewed. In addition to this, it is estimated that there are at least 20,000 listeners who never took out a licence. Roughly speaking, about 50 per cent of listeners are now evading payment. The difficulty of rounding them up lies in the fact that they are widely scattered on lonely farms, etc.

Secret of the Beam.

INTERESTING details about how absolute constancy of frequency is secured on the Marconi Beam are just to hand. Vibrations of a tuning fork are maintained electrically, the fork being kept at constant temperature in a heat-insulating box by means of a toluol regulator which closes a contact when the heat reaches a certain value and, by means of a relay, switches off the heater lamps. When the temperature falls the process reverses. Fans keep the air constantly circulating. From the early Rhumkorff coil transmitter to this super-refinement is a long road indeed.



The Technical Editor of "P.W."—Mr. G. V. Dowding—is here shown (left) discussing with members of the Technical Staff the layout of the "Titan" Three—a great new set to be described next week.

ping-pong balls made of soap bubbles coated with silver?

We Live and Learn.

OUR little helper, whom we call "Lady Jane Grey," because she is apt to lose her head, is by way of being a second Mrs. Malaprop. Whilst prattling in the kitchen recently, she announced that her "boy" had fitted a "two-val" set inside a "taxi-case." She divulged also that the ingenious youth is "a France-corporal in the Aerial Corps."

A Transmitting "Pirate."

MR E. WOODS, 190, Liverpool Road, Ilam, near Manchester, writes to ask "P.W." readers to help him and the authorities to find the unauthorised person who transmits on 45 metres using his call sign G 2 U A. Mr. Woods says that his station has not been in action for six

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

months, and will not be for some months yet. I hope that anyone hearing Morse sent out by G 2 U A will try to locate the transmitter. Perhaps some club would D.F. the beggar in the interests of law and order.

Another Transmitting Note.

MR. E. F. BRADLEY, 10, Montenotte Road, London, N.8, should by now be in the middle of some tests he is carrying out on low power on 160 metres every Sunday from January 13th to February 3rd. Transmission will take place for periods of ten minutes at 11.00, 19.00 and 23.00 (G.M.T.), each period being split into five minutes of C.W. and five minutes telephony. Call sign G 2 A X. Reports are asked for and may be sent to him or to the R.S.G.B., 53, Victoria Street, S.W.1. They will be acknowledged.

Primitive Wireless.

WHILST seeing the film made by the Citroën African Expedition, I was vastly interested in some nigger signalling. The party wished to send a message to its next stopping-place, but as they could themselves travel faster than a native runner, they induced a shiny black gentleman to "radio" their message. This he did by beating on a hollowed tree-trunk with two heavy, short sticks. The strokes were too rapid for me to analyse, but he did not take long, and I am wondering whether the "benighted heathen" has something better than Samuel Morse ever dreamed of. Does any "white" know the code used?

The Mysterious East.

THAT note recalls the yarns which are continually coming from the East, notably India and China, of extraordinary feats of news-transmission achieved by natives. A bit of news started, say, in Bombay, gets all over India in a few hours—in the bazaars. How is it done? Tongue-wagging alone cannot account for it. As to China, I have known cases of news being spread at a speed which apparently can only be explained by pre-supposing that the Chinese have discovered and mastered telephathy.

Cupid and the Chink.

PERMIT me to give an instance of this remarkable broadcasting—or is it "beam"? Years ago in Hong Kong my Chinese "boy" said to me, "Me thinking Misseo C— be wife along Mister B— Shanghai-side." On general principles I aimed a kick at his receding rear and told him to confine his observations to matters within his legitimate sphere. I mentioned the incident to Mrs. C—, a charming widow who owned to a married daughter. She said, "Heavens, I'm old enough to be his mother." A few months later I met her in Shanghai, when she told me that B— had proposed to her! Now, my "boy" had never seen or heard of B—, so far as I know. What made him connect the two people? I ask you!

Post Office Interference.

A BRISTOL reader (G. W. N.) calls our attention to the interference caused by the Post Office station at Portishead, which jams 5 X X badly. As Algiers heterodynes Cardiff the listeners in the

Bristol area are reduced to 5 G B. He took up the matter with the B.B.C., who referred it to the P.O., who suggested that the station should not jam "reasonably selective" receivers. The Chief Engineer of the B.B.C. agreed with the P.O., but apparently both he and the P.O. prefer theory to facts, for the jamming does actually happen, whereas it is hardly likely that none of the complainants has a selective set. I think the matter might well be investigated by the P.O. man at Portishead.

Very Portable Sets.

OBSERVATION of trade papers shows that the criminal world has been testing the portability of portable receivers in a very determined way. The Halcyon Wireless Co. has been robbed of six during the past six months, not to mention fourteen empty cases which the thieves must have imagined to be the haul of their dreams. McMichaels have suffered

SHORT WAVES.

WHERE WILL THAT BROADCASTING STOP?

The B.B.C.'s ambitions are becoming a bit 2 L O-fy.

"Daily Mirror."

Lawyer (on breach of promise case): "But surely you can let me have some of his letters?"

Fair Client: "No; there weren't any. We both had wireless sets."

A correspondent from Cricklewood writes to ask how he can increase his listening distance.

Well, of course, he can get longer telephone cords.

Radio-frequency writes one of our contemporaries, is a term applied to the appalling number of times a broadcasting station can put over a dud number.

Mrs. Phanne: "What lovely music! I've a mind to send that station an applause card."

Mr. Phanne (wearily): "Yeah! Send a card to all six of 'em!"

"Radio News."

Judge: "What is your name?"

Prisoner: "Sparks, sir."

Judge: "Your occupation?"

Prisoner: "Electrician, sir."

Judge (to policeman): "And what is he charged with?"

Policeman: "Battery, your worship."

Judge: "Seven days in a dry cell!"

"London does not always have everything its own way: sometimes it is glad to welcome Liverpool effort—in radio as in other things." (Liverpool paper.)

Type-setting, for one!

"Punch."

"Re the transformer in my set," writes a correspondent. "When I put my finger on one of the terminals the set works twice as loudly. When I take it off the volume drops again. Can you tell me what to do?"

Good gracious, the man must be simple! Put your finger on again, of course!

and so have Wallace Heaton. The remedy is to line the cases with lead an inch thick and call the things "unportable portables."

Naughty Lancashire.

DURING the proceedings which culminated in the infliction of a £5 fine plus £5 5s. costs upon a Boiton man for operating a wireless transmitter without a licence, the prosecutor alleged that there were more unauthorised transmitting stations in South Lancashire than in all the rest of England. Shocking! But, oh, my

friends, what red-hot enthusiasts! Let them mend their ways, pay up, and show the world what English transmitters can do. I am amused to note that it took the Post Office only two years to locate the evil-doer. Experts, what?

Listeners Still Increasing.

DESPITE the fact that nearly every person one questions complains of the B.B.C. programmes there was an increase in November, 1928, of 34,706 licences. That is really wonderful considering that the B.B.C. is six years' old, and is the soundest criticism of broadcasting one could have. But there are still diehards. I know one who insists on his gramophone, which I heard during Christmas. It cost him £40—and it needle scraped beautifully. There is nasality in most of the gramophone reproductions I have ever heard, which keep them streets behind the best radio.

Down with Loud Speakers.

THIS is the slogan of H. C. (Forest Hill) who puts in a plea for "those who are really lovers of music and nature, and therefore are horrified at the hearing of the distorted and unnatural rendering of loud speakers." In short, he evidently has never heard what a good L.S. can do when properly fed by a good receiver, and he wants the technical mob to produce a set with two or three H.F. stages and no L.F. at all, for use with 'phones. I hope he won't get it because 'phones are so bad for the ears, producing "flat car," corns, and carache, besides tethering a fellow like a dog to a kennel.

The Expert.

ONE of my neighbours has conceived a great contempt for wireless experts. She tells me that just before Christmas her receiver was struck dumb and that therefore she called in the nearest ironmonger, who gives out that he is a wireless expert. After putting his spectacles well down on the tip of his nose and staring at the inside of the set he uttered these words: "Well, marm, one thing's certain, and that is, something ain't done it no good." Couldn't do better myself.

The "Fan" of Ajmere.

NOT a play by the author of "Hassan." I refer to Mr. S. S. B., who writes an excellent letter from Ajmere, Rajputana. Somewhat flowery in expression, nevertheless our far-off friend writes like a true enthusiast. "'P.W.'" he says, "was the first ray of sunshine delivered to me by post," and, "since then I always look forward with a lover's impatience for the next number." I don't think we were ever praised so sweetly before. The office-boy is still blushing!

Patents and Trade.

GEE & COMPANY, of Chancery Lane, the well-known patent agents, tell me that 1928 was a record for the number of patents applied for, namely, 38,593, the previous record being in 1920, when 36,672 applications were made. Gee's say that patent activity is often regarded as an index of the state of trade; on that basis, therefore, we many consider that things are "looking up." Anyhow, it shows that brains are still working well, despite jazz and the cocktail habit. **ARIEL.**

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FILM "TALKIES" BY RADIO



In this exclusive article the inventor of the new Home Talkies and Picture Scheme has something to say regarding the practical application of the idea.
By G. V. DOWDING, Grad.I.E.E.

ALTHOUGH my invention has other applications, as I have already hinted in a previous article, it is with the rather spectacular Fireside Talkie with which I am going to deal in some detail in this article.

This is how I visualise the scheme operating in practice. At the present moment there are at least two plays per week from every station—and many have proved quite popular. One of these plays could be framed up as a Radio-Cinema production, so that once a week from every station one Radio-Film Play could be transmitted.

Each play could be announced two weeks before its broadcasting, so that those listeners having home-projectors could obtain the necessary film or films.

Listeners not having projectors would listen to the play in the usual way if they wanted to, and their only intimation that it was a Radio-Cinema drama would be that the announcer would give the reel number for the guidance of all those concerned.

If you had a projector you would switch this and its control gear on, and then sit back to look at the pictorial drama and be thrilled by the voices and sound effects keeping in perfect synchronism with it. You would not be asked to make adjustments while the performance was taking place.

Doesn't Upset Programmes.

Thus, you see, those fortunate enough to have the film apparatus would have their Fireside Talkie, while those who were restricted to ordinary radio receivers would still have the play to listen to in the usual way. There would be no sacrifice of programme time in favour of what would, at first, at any rate, be a minority. Later more and more people might have projectors, but we have in these new things always to look at the "blackest" side.

Small provincial cinemas, country town concert halls, mission halls, schools, etc., should very soon help to swell the above-mentioned minority, for ordinary talkies are beyond their resources, while mine would be very much within their reach.

A one-reel drama would last between fifteen and twenty minutes and this, I think, would prove an ample length for

at least the first few broadcasts. Later on, if popular demand warranted it, there could be a few two, three or even four-reelers now and then. I can assure you that the same apparatus could as easily handle a twelve-reeler lasting four or so hours. But let us hope the B.B.C. will not be too ambitious!

The operation of a home cinema-projector is a remarkably simple business. You just put on the reel and switch the current on. The rest is purely automatic. And the films themselves are non-inflammable—there is no danger of fire.

The Financial Aspect.

The B.B.C. could handle the whole scheme themselves, including the sale of apparatus, but this would probably prove an unpopular method. It would be better for a reputable group of manufacturers to do this.

The cost of taking the film should not prove excessive—the money spent in this way would be in proportion with the sale of apparatus and the revenue from film hiring. The more popular the entertainment the more elaborate the film. The two would march in parallel.

The B.B.C. would merely have to instal some very simple apparatus and use this when the play was broadcast. Their



A piece of "Talking" film. It embodies both sounds and pictures in the form of photographic impressions. The sounds are recorded in the wavy lines to be seen on the left.

expenses would be negligibly increased, while their programme interest would at least to some extent increase.

Now the cost of the apparatus involved I have already indicated (in my first article); it may be less if there is a considerable demand for it.

At the present time it costs about 3s. to hire a fifteen to twenty-minute film to

the somewhat restricted circle of home-cinema enthusiasts. When the Radio-Cinema plan augments this circle, there should be little difficulty in bringing the figure down.

And when America starts her Fireside Talkies, in the big way that only such a country can tackle a new thing, an exchange of films, with a consequent increase in the number of hirings, should bring the price down still further. A shilling per time is the figure I would aim at, and if it could be brought down to pence so much the *considerably* better!

But there is another possible source of revenue, or, at least, possible source of very cheap "talking" films, and that is in the direction of the big commercial "talkies." The ordinary talking film is rapidly gaining popularity, and there are several possible links between these and the wireless varieties.

One of the big corporations concerned might be prepared to pay and pay heavily to broadcast selected excerpts from its special films. There might easily be great competition to do this, with proportionately great revenue for the radio-talkie.

A Ghastly Thought!

Reverting to the film for the home-cinema some of you may wonder how enough copies could be produced economically in order to cope with the demand of all those needing the same film the same night. Perhaps you may wonder if the scheme calls for constant repetition of the same play. A ghastly thought!

Fortunately, no such blot darkens our prospects, all the above figures and details are based on the normal production of radio plays. And if you never have a projector you should never notice the difference of programme arrangements the scheme will necessitate.

As a matter of fact, the Radio-Cinema calls for no special effort on the part of the B.B.C., does not cut into programme-time, does not affect in any way anybody not interested in the business, and surely is one of the soundest things financially one could hope to find.

In view of this no one can object to the B.B.C. trying out the scheme, and they
(Continued on next page.)

FILM "TALKIES" BY RADIO.

(Continued from previous page.)

themselves can have no objection against so doing. If they don't want the slight trouble of adapting some of their dramas to the new conditions, the organisation running the show could build their films around existing dramas, although naturally it would be better to have closer co-operation between the two than that.

Should the B.B.C. not want to take even that slight amount of trouble, then specially prepared talkie-films could be run through at the broadcasting station. And the words and other "effects" could be as good as ordinary broadcasting. Don't

country. But by adding still-picture reception and other things at but little extra cost, then I can foresee the majority of present valve-set listeners being radio-cinema-picture, etc., users.

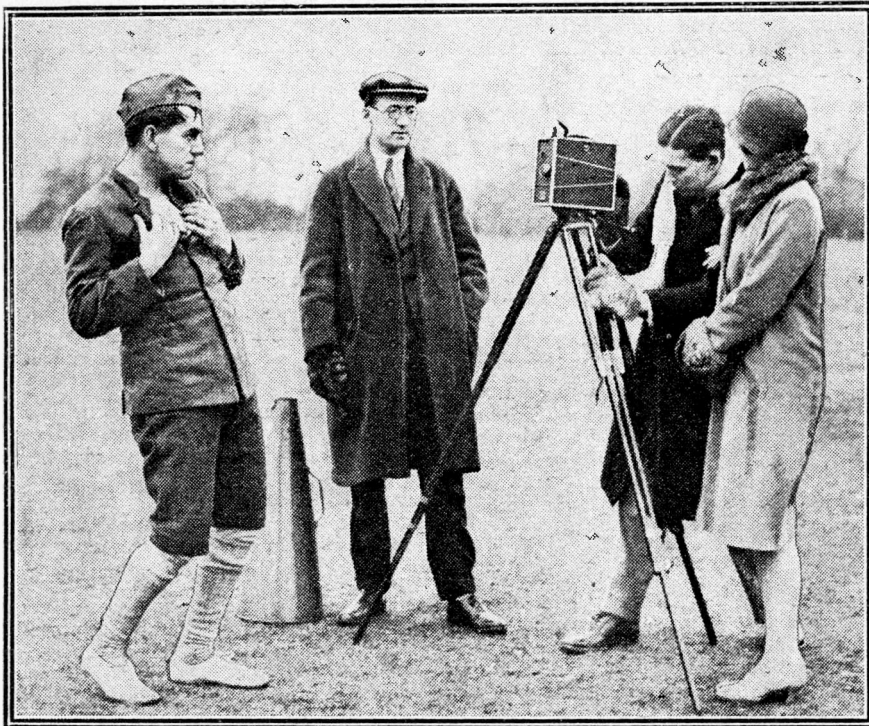
All the above entertainments at a cost no greater and perhaps a little less than the present price of just a still-picture instrument is my ambition, and as far as I can see there is no reason why it should not be done.

By the way, telephone-receiver addicts can enjoy the fireside-talkie. You can work it just as well in conjunction with 'phones as with a loud speaker.

"Shooting" a Film.

Before I conclude this article I would like to make brief mention of the film we are preparing, entitled "A Dash for Liberty," which has been specially planned and written for the Radio-Cinema.

"A DASH FOR LIBERTY."



Mr. G. V. Dowding, second from left, watching the "shooting" of a "close-up" which occurs in "A Dash for Liberty," an amateur-acted play written especially for the Radio-Cinema.

anticipate results no better than those achieved by some of the ordinary "talkies"!

But the B.B.C. can hardly object to the trying out of the scheme—to give it a few months' run; especially in view of the fact that everything connected with it is so straightforward and inexpensive, and that its applications are wider than any ordinary broadcasting scheme.

If the scheme really "caught on" in this country as well as in others, it should eventually prove possible to loan listeners two or three films each per week at a yearly fee of but a guinea or two. But that is looking at the very bright side of the thing.

The Other Attractions.

Personally, I am of the opinion that it will take a little more than the inducements of even a perfect home "talkie" to make the scheme as a whole sufficiently attractive to be of universal interest in this

country. But I should like to make it clear that the B.B.C. has had nothing whatever to do with this film.

It is being taken purely for experimental purposes—to prove that a play can be presented both by radio and by the film, and in each case prove good entertainment and yet combine equally well to make a really first-class "talkie."

Previously we had been testing with existing film stories and with short "shots" of special characters; "A Dash For Liberty" was the first drama produced with the requirements of the new Radio-Cinema technique well in mind by the author, producer, artistes, etc. Nevertheless, the production is entirely in the hands of amateurs, and it goes without saying that it will only give a rough indication of the scheme's great possibilities.

Plans are already laid down for the building of more professional productions

with the assistance of experts in the various branches of the art concerned.

Reverting to "A Dash for Liberty," perhaps readers will find a few details of this of interest.

The "shots" taken up to the time of writing were acted at Stanmore, Middlesex. This is a rather bleak, deserted piece of country, but ideal for the story.

An Exciting Chase.

The scenes photographed showed a convict escaping from prison and meeting his fiancée, who was standing by in a deserted lane with a fast car.

Prison warders appear on the scene, but just too late to stop the car. They hold up another car and request the driver to chase the runaway. Then follows exciting scenes on the road, the two powerful cars tearing along at top speed.

Just as they are about to overhaul the convict and his fiancée, the warders' car breaks down. Then follows roadside telephoning, police-station and other "shots." Barricades are built in the road to stop the fugitives, but such obstacles are overcome. And so the "run-away" scenes continue.

But all this occupies barely a quarter of the film and is really but the introduction or prologue to a very exciting film which lends itself admirably to breathless incident, animated conversation, and striking scenes and other effects.

Dependent on the Weather.

The pieces where there are slight blanks in the "talkie" thread will be filled by a commentator, so that even without the pictures the drama will be intensely absorbing. You can imagine a play of something of the character of that successful broadcast drama "Speed," which could be supplemented with pictures—in the case of those having projectors.

So far the weather has been kind to us, but if it "lets us down" we are going to be badly held up. You see the whole of the scenes of the drama are to be played in the open, and it is difficult to get our amateur actors together just at the right time.

Later, when studios become available, this difficulty will vanish and the whole thing become very much easier.

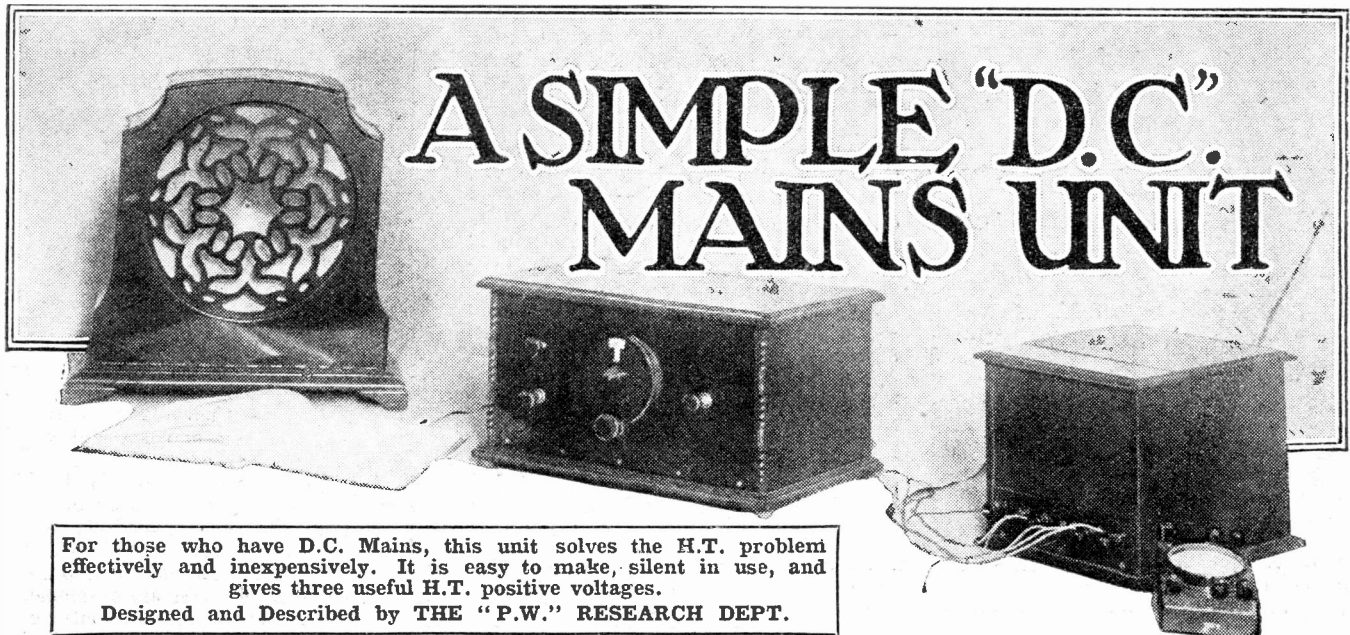
CURRENT SUPPLY ITEMS.

If an accumulator is stood aside for a time it should be given a really good charge every eight weeks or so to keep it in good condition.

Most electric-light supply companies expect the consumer to notify them when making any alteration to the wiring, such as when fitting a charging board for accumulators, etc.

If one of the plugs from an accumulator is lost do not block up the hole with a cork or a wooden stopper, but drill a small hole in this, or otherwise the gases formed inside the cell will have no opportunity to escape.

Usually the little alterations to the wiring of a house necessary for fitting up a charging board or other similar scheme are very easily carried out by an electrician, and can therefore be done cheaply by skilled workmen, thus avoiding danger in the installing and consequent use.



For those who have D.C. Mains, this unit solves the H.T. problem effectively and inexpensively. It is easy to make, silent in use, and gives three useful H.T. positive voltages.

Designed and Described by THE "P.W." RESEARCH DEPT.

"DO it now" may be an aggravating sort of motto to have pinned over your desk in the American fashion, but there is one part of the wireless user's affairs to which it can be applied and forms very sound advice indeed. It is just this: If you have electric light in your house you

of chokes and condensers, and it does not seem justifiable to do this in a design intended for the general use of our readers.

Instead, we have provided enough smoothing to give a reasonable degree of silence on ordinary mains, and you will find that in such cases you will hardly hear any hum at all, and that only in the intervals of the programme. On good mains, of course, you may expect to hear no hum whatever unless you listen on 'phones with a large set.

This, we think, is sufficient for a general design, since if we put in enough smoothing for the very bad mains met with here and there, it would simply mean a much more expensive unit than the majority of people would need. Instead, we will give some suggestions later for increasing the thoroughness of the smoothing for the benefit of the few constructors who may find it necessary to do so.

The general features of the unit make it suitable for use with even quite large sets, and you can take considerable currents from it without the slightest risk of overloading anything or causing bad hum to start. It gives you three separate positive tappings, each of which can be adjusted in steps from quite a low voltage up to something only a little below that of the mains.

Hence, you can provide separate taps for your H.F., Detector, and L.F. valves, which is so desirable for the prevention of motor-boating and other forms of howling due to coupling between stages.

Across each of these three positive terminals is an extra 2-mfd. condenser, and these serve two important purposes. First, they provide a little extra smooth-

ing, and so help to reduce hum, and, secondly, they act as by-passes, and so prevent any serious coupling effects in the eliminator if more than one valve is run off each tap. For example, it is usually quite safe to run the H.F. valve (if any) from one tap, the detector from another, and two L.F. stages from the third.

Good Choice of Voltages.

Just occasionally you may come across a set which motor-boats under these conditions, but it is very rare, and usually means that the receiver itself is a little unstable, or else it is one giving unusually high magnification, and so very easily sent into L.F. oscillation. The remedy in either case is usually quite simple, and we will give it towards the end of this article.

The three positive tappings we have been talking about are the terminals on the front strip marked H.T. + 1, H.T. + 2, and H.T. + 3. If you look at the wiring you will see that running from the wiring on each of these terminals there is a flex lead which has an ordinary battery plug-

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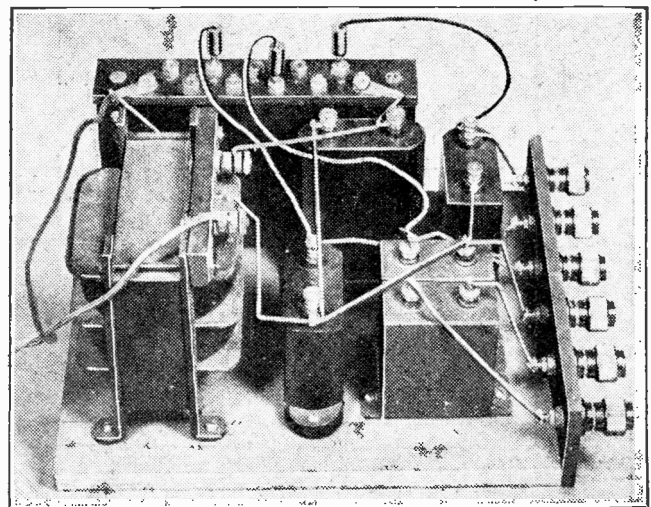
COMPONENTS.

- 1 Cabinet to take panel 7 in. x 7 in., and baseboard 9 in. deep (Lock, Camco, Raymond, Bond, Gilbert, Pickett, Peto-Scott, Caxton, Artercraft, etc.).
- 1 Ebonite terminal strip, 7 in. x 2 in. x 1/4 in., and piece of wood 7 in. x 5 in. x 1/4 in., or alternatively, a complete ebonite panel 7 in. x 7 in. x 1/4 in. (see text). (Any good branded material.)
- 6 Completely insulated terminals, suitably engraved (see diagram). (Belling & Lee.)
- 1 Heavy-duty smoothing choke (British General, R.I. Varley 28/14, etc.).
- 1 Potential divider (Igranic).
- 5 2-mfd. Mansbridge-type condensers (T.C.C., Dubilier, Lissen, Ferranti, Mullard, Hydra, etc.). (Note: These must be rated at a working voltage of at least 250.)
- 3 Battery-type plugs, wire, flex, screws, adaptor plug, etc.

will certainly get the H.T. for your set from the mains sooner or later, so why postpone the change-over beyond the life of your present batteries?

Simple and Inexpensive.

We have produced the H.T. unit you see in the photos specially to serve the purpose of anyone who may be considering the change to mains supply. We have tried to make it as simple as it can be, yet large enough to be really useful, and at the same time not too expensive. Cost in a D.C. unit, of course, is largely a matter of the amount of "smoothing" it incorporates. To make certain of an absolutely silent background on even the worst and noisiest of mains means using a decidedly expensive number



Construction of the unit is really only a matter of mounting the components, as shown, and wiring up!

A SIMPLE "D.C." MAINS UNIT.

(Continued from previous page)

on its end, and it is by means of these plugs that the voltages can be adjusted. They fit in the sockets along the top of a component inside called a potential divider. This is really just a resistance, with a connection to each end and a number of tapings, the total resistance of the particular make used here being 15,000 ohms.

The two ends of this resistance are connected to the positive and negative sides of the smoothing circuit, i.e. it is put right across the mains so that a constant steady current flows through it. (Quite a small one, because the resistance is so high.) This means that there must be a constant fall of voltage all the way along the resistance, and so by plugging in at a suitable point we can get the adjustment we want.

Voltage Controls.

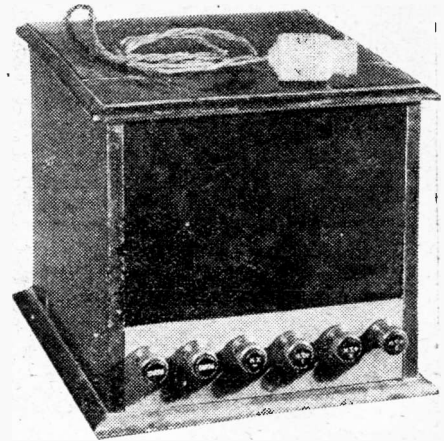
This adjustment of voltage is in steps, of course, but it is quite gradual enough for the vast majority of sets; ordinary valves are not critical as to H.T. nowadays. There are only two cases where a finer adjustment

is sometimes needed, one being for the detector in a short-wave set, and the other the screening electrode in a screened-grid valve.

An H.T. unit with a continuously variable voltage tap is sometimes helpful in these cases, and it is very easy to modify the present one to include it. You will find instructions a little farther on for incorporating an anti-motor-boating resistance, and what you do is this: Instead of a fixed resistance wire fit a continuously variable one in exactly the same way, and then by turning the knob of this control you will be able to get a perfect variation of voltage on this particular terminal. A suitable resistance, by the way, is one with a maximum of perhaps 100,000 or 250,000 ohms (higher still will do), and examples are the "Bradleyohm" (Rothermel) and "Clarostat" (Holzman, Claude Lyons, etc.).

An Extra Tapping.

This extra adjustment is all that you can ever need for short-wave work (many short-wavers will work quite well with just the plain tapping scheme you see in the photos), but for the average screened-grid set you may wonder just how all the valves can be supplied with only three positive terminals. Well, in most cases the following arrangement is quite satisfactory. Run the detector off one of the step-by-step controlled terminals, the H.F. and L.F. valves together off another, and the



Only a terminal strip is required for the "panel," the remainder of the space being filled with a suitable piece of wood.

screening electrode of the S.G. valve off the continuously variable tap.

The only case in which this is not satisfactory is where your last valve is of the super-power type requiring a higher voltage than is desirable for the H.F. stage. Here you really want four separate H.T. positive terminals, and this again is very simply done. Just add another terminal, provide it with a 2-mfd. condenser and tapping lead connected exactly like the others, and the modification is complete.

We are going into these questions of modifications of the design to suit various special purposes rather fully, because we wish to impress upon the reader the fact that to get real satisfaction from mains working is largely a matter of seeing that the unit is really well suited to his own particular requirements.

A Universal Design.

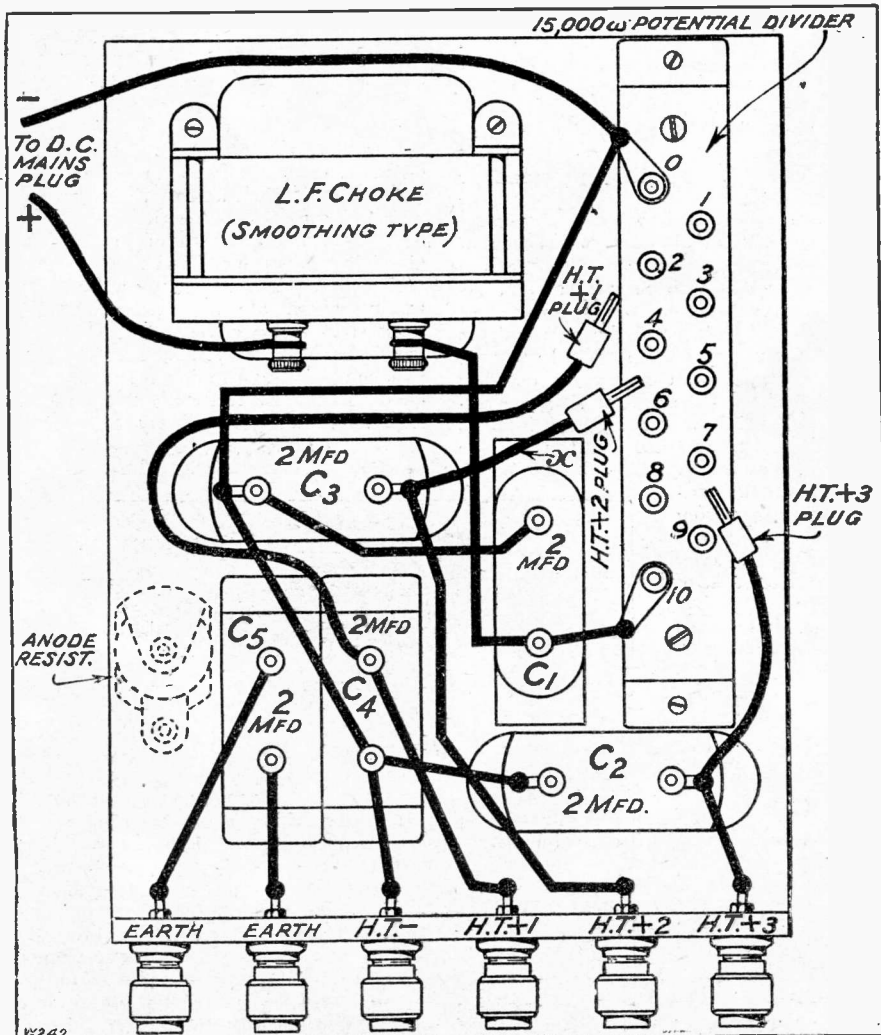
The design exactly as it stands will suit the great majority of users, but we are describing exactly how to make these various little alterations in order that it may be regarded as something of a standard design. Then, if any reader finds his requirements are not quite covered by the simple version, he can just make the appropriate modification without having to search further for a design exactly like the one he wants.

The smoothing arrangements are comparatively simple, but quite effective on most mains. They consist of a large heavy-duty choke, and a main smoothing condenser of 2 mfd. This is the one which you will see is wired on one side to the No. 10 socket on the potential divider, and we shall be referring to this again in a moment. The other condensers, it will be remembered, also act as additional smoothers, so that the total capacity available for levelling out the hum is 8 mfd.

This arrangement is good enough for ordinary mains, but where the supply is a bad one something more may be needed, and we will detail this for the benefit of the few readers who may need it. The first step is to increase the main smoothing condenser to 4 mfd. and this is easily done by connecting another 2-mfd. unit in parallel with the one shown. There is plenty of room for another.

If this does not do the trick the next step is to add another choke, and the simplest way to do this is to put it in series with the

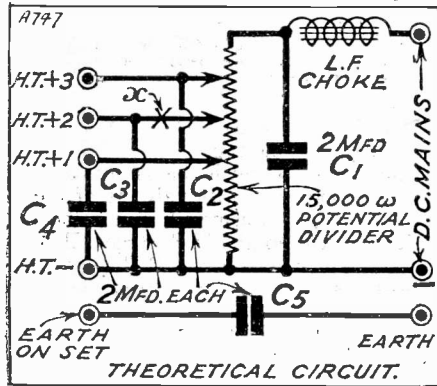
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A SIMPLE "D.C." MAINS UNIT.

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lead to the tapping intended for the detector valve. This is a particularly good position for three reasons: (1) Since it only has to carry a small current here it can be a small and inexpensive choke; (2) if a choke is provided here it replaces the anti-motor-boating resistance we shall be dealing with



later; (3) so long as you ensure a smooth and clean supply to the detector valve you will hear little hum, as a rule, since this is by far the most critical part of the set.

To insert this extra choke is simple. Just compress the layout a bit (we made it very open on purpose) and you will find that the same size of baseboard will do. Connect the choke in circuit exactly as the anti-motor-boating resistance would be wired, and that is all.

Now about the anti-motor-boating resistance to which we have referred several times. The point is this: some sets are more critical and less stable than others, and may tend to go into a howl, make popping noises, give squawky reaction control, or otherwise misbehave when run from a plain and simple type of H.T. unit. To stop this it is usually quite sufficient to put an anti-motor-boating resistance in the lead to the tapping for the detector valve (H.T.+2).

Anti Motor-Boating.

This is to be placed inside the unit, and can quite well be an ordinary wire-wound anode resistance, or one of the special resistances sold for the purpose (an example is the Ferranti). A suitable value is about 100,000 ohms, and a dotted outline on the wiring diagram indicates a good position for it. To connect it in circuit, note that one of the flex tapping leads is marked x. Cut this and take the two ends so formed to the terminals of the resistance. That's all.

There, those are all the modifications of the standard design which we shall be considering. Don't be alarmed by the number of them, or the apparently complicated nature of the business, for it is really simple enough when you come to put all this into practice. Nine times out of ten the standard unit will serve your purpose exactly as it stands, and you can just disregard all this long story about modifications. We have only included it because we

wanted to make the design as generally useful as possible.

So far as the constructional work is concerned there is very little to be said, because it is such a straightforward job of screwing down components and wiring them up. Just one or two special points would perhaps be the better for a word of explanation, however. First, note carefully how the mains are connected to the unit. No terminals are provided, and instead, the ends of a twin-flex lead (good grade lighting type) are connected directly to suitable points on the wiring. The other end of this flex, of course, carries a plug or adaptor for plugging into a mains point.

The Unit to Use.

You will see that the unit fits into an ordinary type of cabinet, but since the front merely carries a few terminals there is no need to use a full-sized ebonite panel. We used a simple ebonite terminal strip and filled the rest of the front with a piece of wood cut to fit and stained to match the rest of the cabinet. If you like, of course, you can make the work easier by using a complete ebonite panel instead of this composite arrangement. (It will be desirable to do so where you desire to fit the variable resistance mentioned as one of the possible modifications.)

Just one more hint: For the wiring it is strongly recommended that a fairly stiff gauge of wire be used, with Systoflex sleeving. This combination is advised in the interests of safety. Bare wire, especially of a thin gauge, is rather risky, and makes short circuits a possibility.

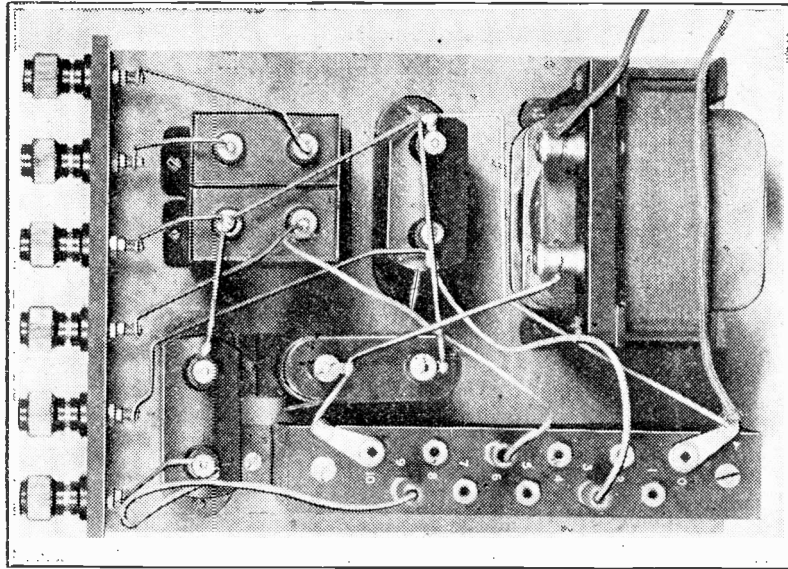
potential to earth, and must on no account be touched when the H.T. is switched on. This even applies to the L.T. accumulator, which should be placed in a box or cabinet to make sure it is not touched.

"If you have electric light in your house you will certainly get your H.T. from the mains sooner or later. Why postpone the change-over?"

Always, therefore, switch off the H.T. and take the plug right out of the mains point before you do anything whatever inside either the set or the H.T. unit. Further, to make sure that all the various reservoir condensers have been emptied, always switch off the H.T. first and the L.T. last. Also, if you then want to do anything inside the set, just take a piece of wire, and join together for a moment the two earth terminals on the H.T. unit.

Beware of Metal Panels.

Be careful, too, not to touch any metal parts on the panel, such as grub screws in knobs, L.T. switch shanks, etc., while the set is working. Sets with metal panels, of course, are definitely too dangerous to use with a D.C. mains unit (safe with the A.C. type), unless the internal wiring is completely separated from the panel, all con-



Note the plugs on the potential divider, which provide the variable H.T. positive potentials.

Finally, a few hints about the use of the finished unit. First of all, note carefully the two earth terminals on the unit. To one of these connect the earth terminal of your set, and to the other your earth lead. This has the effect of placing in series in the earth lead one of the 2-mfd. condensers, a very essential safety precaution indeed, which must on no account be forgotten.

At this point you must be reminded of the risk of shocks from the internal wiring of the set when a D.C. eliminator is working. Remember that practically every single wire in the set may be at considerable

denser spindles insulated where they pass through the metal, and so on.

One last point: The unit must, of course, be connected to the mains the right way round. In other words, if at first you get no results, just take the plug or adaptor out of its socket, turn it round and replace, so reversing the connections.

This is a much easier way of finding the correct polarity than the usual scheme with a glass of water, and is just as certain. Once the correct direction is found, of course, you can mark the adapter for future reference.

A FULL SIZE BLUE PRINT FREE

OF

The "TITAN" THREE

The Finest Three Valver ever designed, full details of which will be given for the first time in next week's issue of "Popular Wireless."

This receiver, the outcome of many months of research work, completely renders obsolescent all other sets of a similar kind. It is an entirely new design and employs a screened-grid H.F. valve, with arrangements for using either an ordinary valve or a Pentode valve in the L.F. stage.

Amongst the special advantages of the "Titan" Three are:—

A really remarkable wave-change system has been evolved by the technical experts of "Popular Wireless," and by means of a very simple switch the set can be made immediately available, without coil changing, for reception of long or short waves.

A novel method of coupling enables one tuning circuit to be dispensed with, so that one-knob tuning is achieved without any sacrifice of sensitivity and without the introduction of any complicated system of condenser ganging.

For all its wonderful technical efficiency, the "Titan" Three is one of the cheapest and easiest-to-build three-valve sets ever placed before the home constructor, and in performance it is easily equal to a five-valve set of last year's design.

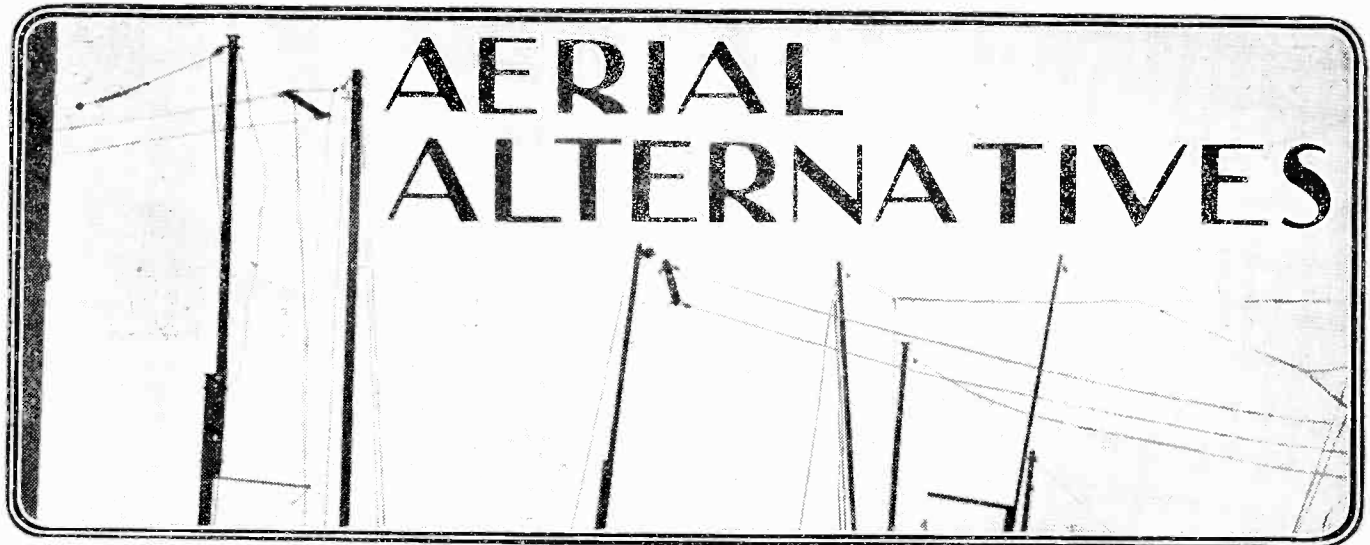
A cursory examination of this receiver will convince the amateur that it is the last word in set design, and that not for a long, long time will another receiver be designed which will make it out-of-date.

Be sure to get next week's copy of
"POPULAR WIRELESS"

Don't miss this opportunity, but learn how to build cheaply and quickly a receiver which will open up new possibilities for you in the art of radio reception.

**USUAL PRICE
THREEPENCE**

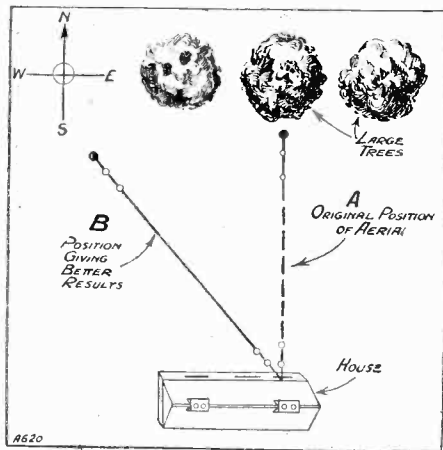




AERIAL ALTERNATIVES

HOW many readers put up an aerial when they first installed wireless sets, and have been content to let it remain exactly as it was ever since? A good many, I am willing to wager.

The position chosen for an aerial by anyone who has just started wireless depends usually upon two main considerations: (1) where the mast will be least in the way, and (2) where it will be least unsightly. Up goes the mast in a chosen place, the aerial is erected and reception obtained, though it by no means always follows that the best is being got out of whatever the set may be used in conjunction with the aerial occupying the position thus chosen for it.



The diagram illustrates a case in point. Some time ago a friend of mine put up an aerial in the position shown at A. The work of erection took place in the autumn, and he had no particular quarrel with his set for some months. When, however, the gay spring came along he began to feel that though his neighbours could hear the Northern stations quite well he was becoming less and less able to do so. Can you spot the reason why?

Trees Cause Screening.

What was happening was simply this. During the colder months the trees, devoid of both sap and leaves, did no particular harm; but in the spring, as their trunks and branches became filled with moisture and the covering of leaves grew denser and

The position and form of your aerial seriously affect your reception, and an easily-made alteration may make your results very much better.

By R. W. HALLOWS.

denser the trees formed an admirable screen from the north.

So pronounced was the screening effect that so long as the leaves were on the trees he was almost as severely handicapped as if he had reduced the number of his valves by one. The case was so interesting that he and I spent a considerable amount of time in experimenting with aerial positions, using as temporary masts very light jointed poles. We eventually found that the position shown at B in the drawing gave very much better results, and that reception was well up to the average all through the year.

The Interference Problem.

Trees are by no means the only form of screening that one encounters when erecting an aerial. High walls or buildings may blanket it just as effectively, and should the buildings be iron-framed the results may be even more surprising. If, therefore, you want to have, as doubtless you do, an aerial that will really give an efficient receiving set a chance of showing what it can do you will find it well worth while to experiment a little with the position of your mast.

Other interesting points arise in connection with aerial experiments. Do not reach down for a half-brick when I say that it is possible for an aerial to be too good. In certain circumstances this is really a fact. The higher the aerial the more efficient it is as a collector. But don't forget that if it collects signals that you do want it also collects those that you don't.

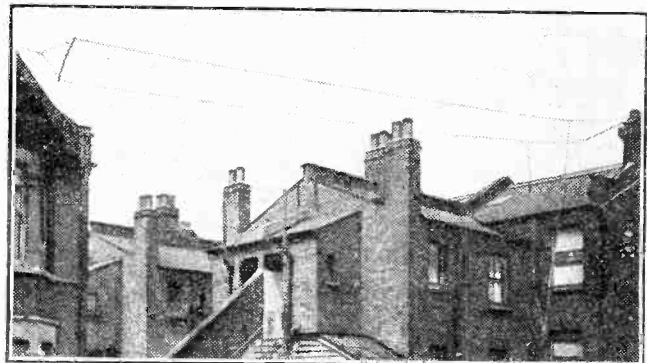
There is, in fact, no finer picker up of spark signals than the lofty aerial carefully erected with a view to the utmost efficiency. Those who live near the sea or in any neighbourhood where spark interference is bad may find it worth their while to experiment with lower aerials than they are at present using.

With the aerial in the worst position for the local station ample signal strength will be secured, but it will be far easier to cut out these powerful signals when long-distance work is toward.

Improving Selectivity.

Now as regards selectivity. An enormous number of the aerials that one sees have a very long "roof" (the roof is the horizontal portion) and consist of two, three, or even more parallel wires. If your set can only just bring in the local station with the volume that you desire then the long-roofed, multi-wired aerial may be what is needed. On the other hand, where there is plenty of power in reserve it is generally far better to use a single wire and to make the roof portion not over long.

My own station is roughly thirty miles north-west of London. As the aerial was first put up a good many years ago, it consisted of two parallel wires with a roof some 80 ft. in length. Since then I have reduced it to a single wire with a roof of only 40 ft., and I find that whilst there is no diminution worth mentioning in signal strength, selectivity is enormously improved.



A twin-wire aerial which passes over a fairly considerable expanse of roof may be insensitive, and no more sensitive than a single wire aerial similarly placed.

LATEST BROADCASTING NEWS.

PRESS VERSUS B.B.C.

**EMPTINESS; OR VACUUM—
STRANGE BIRTHDAY HAPPENING
—POLITICS FOR WOMEN—THE
LORD CHIEF JUSTICE TO BROADCAST—
A SALVATION ARMY APPEAL—INDIAN NATIVE DRAMA BY
RADIO—ENGLAND v. IRELAND AT
TWICKENHAM.**

Press versus B.B.C.

THE mistake of the B.B.C. in expanding its publications beyond the point of necessity produced the explosion frequently prophesied in this page. It is probably true to suggest that Savoy Hill would have been glad to have dispensed with the "Literary Weekly"; but the very thoroughness and unanimity of the Press campaign made early withdrawal difficult if not impossible.

Now that a new concordat has been reached it is interesting to reflect what might have happened if events had taken another course. The newspaper interests made no secret of their intention to weaken the B.B.C. in every way possible.

They would have begun by demanding advertisement rates for the publication of broadcasting programmes. Simultaneously they would have attacked the B.B.C. monopoly and insisted on it becoming the major election issue next June. Realising the possibility of "war" the B.B.C. had laid its counter plans. The microphone was to be used against the Press. One wonders what would have happened. It would have been a nice test of strength. In addition, it is believed the B.B.C. was ready to withdraw all information from the hostile Press, to suspend the news agreements, set up a competitive news service with bulletins at any time, and create its own printing and distribution facilities.

While hostilities on this wide scale are deferred because of the arrangement of the joint committee, it remains to be seen whether it is only an armed truce preliminary to a devastating campaign. There is much bitterness on both sides.

Emptiness ; or Vacuum.

A limited number of the public will be admitted to the Bournemouth studio on Tuesday evening, January 29th, when Sir Oliver Lodge gives an address on "Emptiness; or Vacuum." An informal discussion in which Sir Oliver will take part will follow the address.

Strange Birthday Happening.

It is an almost inflexible rule that birthday greetings are broadcast only to members of the children's radio circles. Past experience showed the wisdom of this decision in a few isolated instances of grown-ups using this happy medium of entertainment for their own unworthy ends, thus revealing the fact that some people are more ready to display stupidity than sense.

But when a letter arrived at the Cardiff Station a few weeks ago from some children asking that their grandfather's birthday should be "read out" on Monday, January

7th, the officials after due consideration decided to stretch a point. It was the old man's 91st birthday, and he was a Welsh bard. So it happened that his name was included in the list on his birthday and a special message in Welsh was sent to him, together with the usual good-night message to the children, "Sleep well, pleasant dreams."

The following day the broadcaster was spoken to by a listener in Swansea who said, "I heard your words to Merfyn. They were very appropriate. Evidently the family forgot to tell you he was dead." Grandfather was buried an hour or so before his birthday greetings were broadcast.

Politics for Women.

The uncertainty of the way in which the thousands of new women electors will vote at the General Election which, according to the most recent prophecies, will take place in June, is the vital factor of the hopes and fears of our politicians.

Who can say that broadcasting will not play an important part in returning the next

NOT A "TITANIC" TASK!

A view of the construction of the "Titan" Three, to be described in "P.W." next week.

Government, by the series of talks and debates for women voters that have been going on for some months. Another debate is in the London programme for Tuesday evening, February 5th, when Mrs. Abbott, Chairman of the Open Door Council, and Dr. Marion Phillips, Chief Woman Officer of the Labour Party, will discuss "Protective Legislation."

The Lord Chief Justice to Broadcast.

The Lord Chief Justice of England (Lord Hewart) has several times spoken at functions which have come into the programmes as outside broadcasts. Lord Hewart will be heard again by 2 L O and 5 X X listeners on Thursday, February 7th, when he speaks at the annual dinner of the Dickens' Fellowship at the Piccadilly Hotel.

A Salvation Army Appeal.

Commissioner E. J. Higgins, Chief of the Staff of the Salvation Army, who was nominated as President of the Committee of five which General Booth suggested to the High Council should manage the affairs of the "Army" until he himself is able to do so again, is to give the address at a service to be held by the Salvation Army in the London Studio on Sunday evening, February 3rd. The service will be followed by a self-denial appeal on behalf of the Army's funds.

Indian Native Drama by Radio.

A translation by Sir A. Monier-Williams of Khalidasa's "Sakuntala," an Indian native drama written, it is believed, about the time of Christ's birth, will be broadcast from London on Wednesday, February 13th. The play has been acted by Indians for hundreds of years and was once produced in England, Mr. Howard Rose, a member of the Productions Staff at Savoy Hill, taking part in it.

England v. Ireland at Twickenham.

The running commentary on the England versus Ireland Rugby match, which takes place at Twickenham on Saturday, February 9th, will be broadcast from London and Daventry.

TECHNICAL NOTES.

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

VALVE CHARACTERISTICS

SPECIAL CONDITIONS—MAKING A CHOICE—ETC., ETC.

Valve Characteristics.

ALTHOUGH the operation of the ordinary triode or three-electrode valve is now quite generally understood by the vast majority of radio enthusiasts, there are still a number who sometimes have difficulty in appreciating how valves even of the same general type may have totally different characteristics.

Owing to this fact, although the general principles of the operation are identical, they may and do operate entirely differently, according to the conditions in which they are used. For instance, everyone knows that some valves are specified for a high amplification factor, whilst others are principally characterised by low impedance.

Special Conditions.

In view of the almost bewildering variety of data available in connection with the many types of valve now on the market, it is not surprising that beginners especially should find themselves rather at a loss to know which valves to choose for any particular purpose.

Making a Choice.

It would take a long time to go into all the details of the different conditions which arise and the way in which these affect the choice of the most suitable valves. Moreover, many excellent articles on different

(Continued on page 1080.)



The Studio is velvet draped!

TO SECURE SILENCE IN THE BACKGROUND

and the way a Lissen Transformer amplifies, keeps that background just as silent as it was in the Studio.

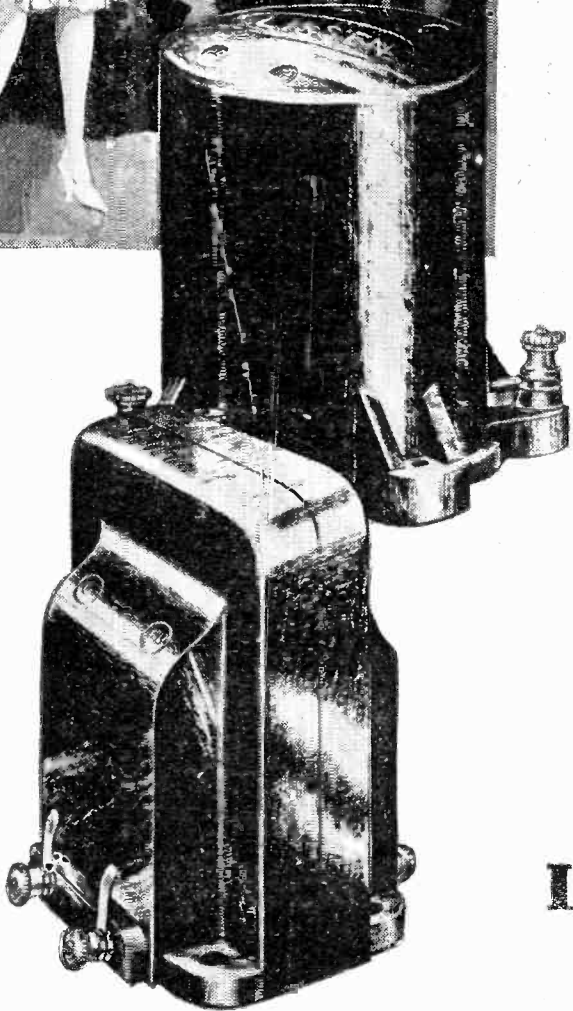
The acoustic experts of the broadcast studios use every effort to obtain a background of absolute silence for each item of the programme. To obtain the same effect from your receiver, use Lissen Transformers for each stage of amplification. Then you get a silence upon which the broadcast instrument or voice can paint a living picture, building up the melody without a trace of extraneous sound to interfere with it, every word and every note standing out in stereoscopic relief.

Lissen Transformers can be used in every receiver and in every published circuit—use them whatever receiver you are building and you will always get the true effect of every broadcast item.

The famous 8/6 Lissen Transformer has won for itself the reputation of "The Transformer that will never break down." Suitable for all ordinary purposes. Turns ratio 3 to 1. Resistance ratio 4 to 1 . . . **8/6**

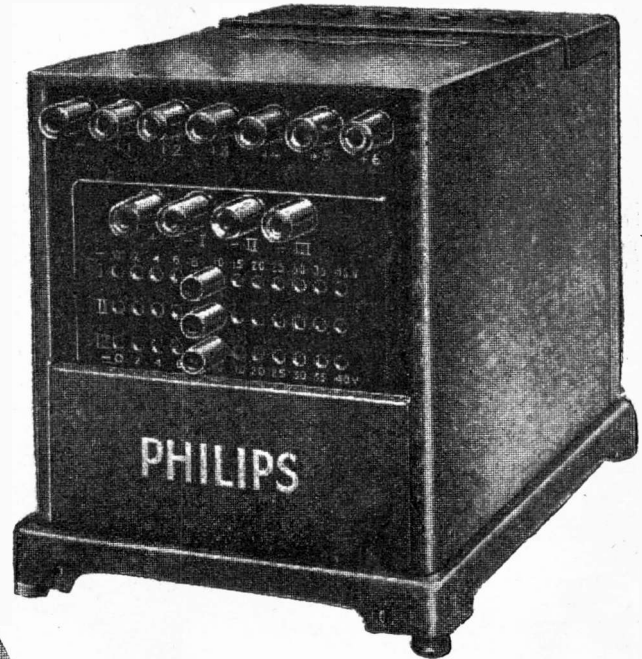
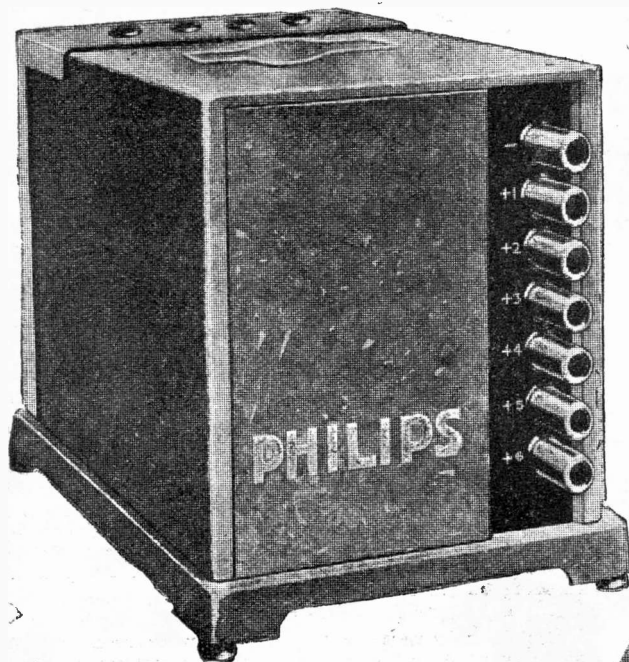
THE LISSEN SUPER TRANSFORMER

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same **19/-** for both ratios



LISSEN
TRANSFORMERS
LISSEN LIMITED
8-16, FRIARS LANE
RICHMOND, Surrey.
(Managing Director—Thos. N. Cole)

PHILIPS H.T. UNITS



SAVE money and improve your reception by using a **PHILIPS** High Tension Supply Unit, made by the manufacturers of the famous Philips Receiving Sets and Loudspeakers. No battery renewal problems, but a constant and powerful current direct from the mains sufficient for any type of receiver. Built to last!

Ask your dealer for further particulars.

TYPE 3002 FOR A.C. MAINS.

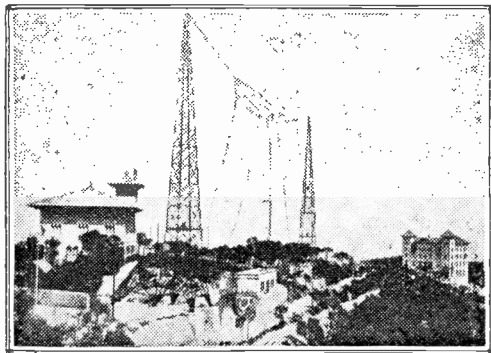
6 different positive anode voltages. Price complete **£7.0.0**

TYPE 3003 FOR A.C. MAINS.

For H.T. and Grid Bias Supply. Similar in design to Type 3002 with the addition of 3 different variable tappings, giving voltages between 0 and 40 Grid Bias. Price complete **£8.15.0**

PHILIPS

for Radio



RADIO BARCELONA

Some interesting details of one of Europe's most popular broadcasting stations.

From A SPECIAL CORRESPONDENT.

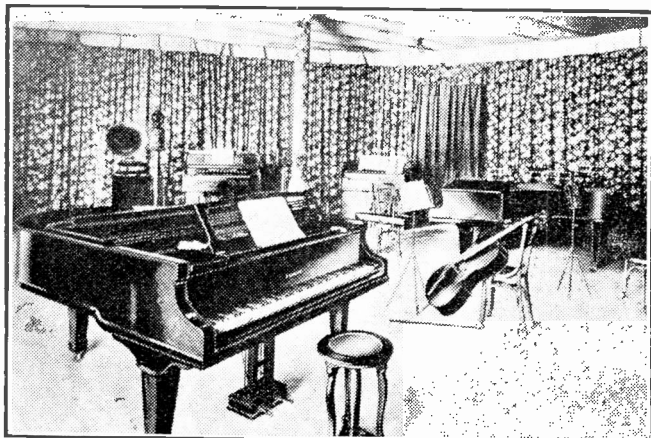
MORE things come from Barcelona than the proverbial filberts. In the radio line, at any rate, the town is famed for the possession of a radio broadcasting station which is second only in importance to the Madrid station.

Most English amateurs, I would imagine, are familiar enough with the Madrid station, E A J 7, and probably a goodly number of them have been able to pick up Barcelona during their nightly radio tours around Europe. After all, the station is not a difficult one to pick out of the radio medley of Europe. Transmitting on a wave-length of 344.8 metres (or, if you prefer it, 870 kilocycles frequency), the Barcelona station, E A J 1, is on the air during the greater portion of every evening, and very frequently during the daytime as well.

The entire equipment and organisation of the Barcelona station is owned, controlled, and operated by the Union Radio of Spain, a radio organisation which has been active in that country from the very earliest days of broadcasting. In fact, Radio Barcelona was the station with which the Union Radio commenced its activities in the broadcasting of general entertainment, this inauguration taking place early in 1924. Thus, for all practical purposes, we may say that the Barcelona broadcasting station was the first of its type to be erected and operated in the country.

Some Aerial

High up above the town of Barcelona, the twin aerial towers of the station stand out over the countryside, comprising a landmark with which every traveller in the neighbourhood cannot but have noticed. The aerial system of the station comprises a four-wire "flat-top" span, the aerial itself being of the T-type and possessing nearly 130 ft. of down-lead.



The Barcelona studio from which many a lively jig and jazz tune has been broadcast over Europe.

At the foot of the steel towers supporting the aerial lies the transmitting house of the station, a building which, in addition to containing the usual generating, operating, and control rooms, also contains a very elegantly appointed studio.

The Lady Announcer

Hardly a musical celebrity in Spain is unfamiliar with the Barcelona studio, with its heavy draped walls and roof. At the time of writing, however, plans are on foot to pull down and re-erect this studio on more extensive and up-to-date lines, the present apartment having become too small and unnecessarily inconvenient for daily use. Yet the permanent studio at Barcelona is a happy sort of affair, and, as the reader will observe from the photograph, there are many studios which, to say the least, are far worse.

I suppose I must say something about the transmitter which operates the Barcelona station, although this technical department of radio is rather beyond my province. Anyway, the station obtains its initial source of power from the local electrical mains, subsequently stepping-up and modifying the initial energy by means of a series of motor generators. Like every other station of any importance, an emergency generating outfit is maintained, this being operated by a petrol motor.

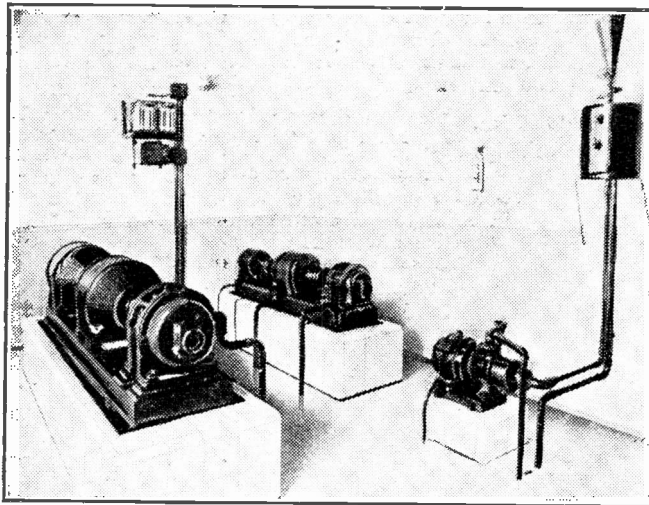
Then concerning the transmitting equipment proper. It is of the ever-popular Marconi type, built in unit fashion, and effectively caged in along both sides of the room. The transmitter sends up into the aerial a power of 1½ kilowatts, this being the operating power of the Union Radio's main station at Madrid.

The transmitter controls are arranged on a special series of panels in much the same way as they are found in any other station, but, in the case of Barcelona, there is a sort of system of dual

control, by means of which the majority of the transmitter's controls can also be worked from a smaller room adjoining the studio proper.

Barcelona is rather famed for its lady announcer. Have you heard her calling? Listen-in for the station about 10 p.m. some evening, and you will probably hear the female voice calling "Allo! Allo! Aqui estacion Radio Barcelona—Eh-ah-hota oono," the latter being spelled phonetically, and meaning, of course, E A J 1, the station's call-sign.

Radio Barcelona generally closes down about midnight, ending sometimes with the playing of the Spanish National Anthem and at other times with the momentary



Some of the power-house plant at E A J 1, Barcelona.

relaying of the chimes from the local cathedral.

Union Radio, E A J 1, Barcelona, has, however, its competitors, although, during recent times, a working arrangement has been effected between the rival stations.

Goodnight Everybody

This state of affairs in Spanish broadcasting, however, renders it a matter of some difficulty for the amateur in England to identify accurately the Spanish station which he has picked up. However, if one keeps on the alert for the call-sign of the station, which is announced every few items with unflinching regularity, the information gained thereby, together with a reference to a book of European stations, will generally enable the amateur readily to identify the station in question.

And now, *Buenas noches a todos*—Goodnight, everybody! Radio Barcelona, E A J 1, may not be built on the scale of the American stations, or even on that of 2 L O, but, all the same, it is one which is certainly worth while looking out for if you want a pleasant programme of music, sweetly rendered.

THE PARIS PROGRAMMES.

The Plight of Eiffel Tower—Further Television Tests to be Made?—Post Office Said to be "Satisfied."

By THE EDITOR.

IT came as a surprising announcement that broadcasting from the Eiffel Tower would cease at 9 p.m. on January 12th in order to avoid inconveniencing listeners in Paris. The Eiffel Tower is probably one of the most famous wireless stations in the world, and has, as our readers know, been transmitting since January 1st on the new wave-length of 1,485 metres. A considerable number of complaints have been received in consequence of the change by the French and British broadcasting authorities. Especially in Britain was this change of wave-length objected to because the danger of interference between the Eiffel Tower and Daventry was enhanced.

The Eiffel Tower was originally working on a wave-length of 2,650 metres which, for most ordinary wireless sets, was outside the wave-length range. At that time, when the wave-length was chosen, ships used only spark stations with wave-lengths between 600 and 800 metres.

A Difficult Position.

When the ships were fitted with modern high-power transmitting apparatus and began to work on wave-lengths of more than 2,000 metres, in order to cut down interference, the International Wireless Conference held at Washington in 1927 assigned to all European broadcasters wave-lengths between 1,340 and 1,875 metres, and consequently the Eiffel Tower had to conform to these new regulations. Attempts were made to transmit from the Eiffel Tower on shorter wave-lengths, but again this alteration was found to interfere with the wireless service of the Air Transport Line.

In fact, any transmission from the Eiffel Tower over 1,485 metres was found to interfere, not only with Daventry 5XX but with Königswusterhausen and Radio Paris.

Consequently, the Eiffel Tower will have to keep to its wave-length of 1,485 metres, but with the result that it will have to close down every night at 9 p.m. Whether some more satisfactory compromise will be reached in the near future remains to be seen.

Further Television Tests?

We reproduced in last week's issue of POPULAR WIRELESS a notice sent out by the B.B.C. on October 17th, which read as follows:

"In agreement with the Post Office, the B.B.C. required a studio demonstration of the Baird television apparatus before considering whether there should be public experiments in which a B.B.C. station would participate. A demonstration took place at the offices of the Baird Television Development Company, Ltd., on October 9th, and was attended by administrative and technical officials of the Corporation.

"The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station.

"The Board of the Corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present. The Corporation would be ready to review this decision if and when development justified it."

The B.B.C. asked that all newspapers would reproduce this in view of the fact that a rumour was current last week that an agreement had been reached by the B.B.C. and the Baird Television Company with regard to broadcasting secret television transmissions through B.B.C. stations. However, the B.B.C. emphatically denied that any such agreement had been reached.

A FULL SIZE BLUE PRINT

is given FREE with every copy of next week's issue of "P.W." This magnificent gift is supplemented by a long illustrated article describing the construction of

THE 'TITAN' THREE

a remarkable new receiver which has more outstanding features than any receiver "P.W." has hitherto produced.

DON'T MISS THIS CHANCE
of securing your 'Titan'
Three blue print, but
ORDER YOUR COPY NOW

In reply to the B.B.C.'s re-issued statement and comments, the Baird Television Company also issued a statement as follows:

"In view of the real facts which are within the knowledge of the B.B.C. as well as ourselves regarding the broadcasting of television in conjunction with music, singing, and speech in this country, which facts we are under a pledge of secrecy not to reveal, and have not revealed, we are extremely surprised that such a statement should have been repeated and issued.

"Important negotiations have been successfully concluded with seven important Continental broadcasting stations for the regular broadcasting of television under the Baird system, in conjunction with music, singing, and speech. It is significant that these negotiations were concluded after the experts representing these stations had been to London and thoroughly investigated the Baird system.

"Our system was considered of such importance that within the past two weeks

the German Government sent to London an official deputation consisting of Dr. Bredow, the German Secretary of State for Wireless, Dr. Baneth and Dr. Reisser, leading radio engineers, to investigate the Baird system. As a result of the tests which they witnessed, we have been asked to instal a television transmitter in their Berlin studios for the purpose of public demonstrations, and with a view to their adopting the system generally."

In other words, Germany is going to give the Baird system a trial. What the result will be remains to be seen.

Post Office Satisfaction.

It was also stated by a leading official of the Baird Company that an official report from the Post Office engineers expressing satisfaction with the Baird system is in the hands of the officials of the Baird Company. In which case we suggest that the first thing the Baird Company should do is to issue a copy of this letter for publication in the press.

Further, the B.B.C. state the Baird Company has not yet intimated to the B.B.C. any claim to improvement in their system. The B.B.C. also state that any such claim would be examined with a view to determining whether the B.B.C.'s decision should be modified.

We have been accused more than once by disappointed admirers of the Baird Television system of adopting an unfriendly attitude. But we again point out that we are as much interested as anybody in this country in the progress of television, and if the Baird Company have made definite improvements in the apparatus and system generally, they should at once intimate such a fact to the B.B.C., and, further, should most decidedly publish any correspondence they may hold from the engineers of the Post Office in which, it is alleged, full approval of the system may be found.

The Best Policy.

In any case, however, if the Baird Company are so definitely certain of the efficacy of their present system, then surely their most convincing line of policy would be to await the result of the installation in the Berlin studio of the Baird system, and its consequent reception, favourable or unfavourable, by the German public.

If the Baird system is all that is claimed for it, another invitation should at once be sent to the B.B.C., but if no further improvement has been made since the original B.B.C. test, then the matter should be dropped, and definitely dropped, until such a time as an improvement has been made.

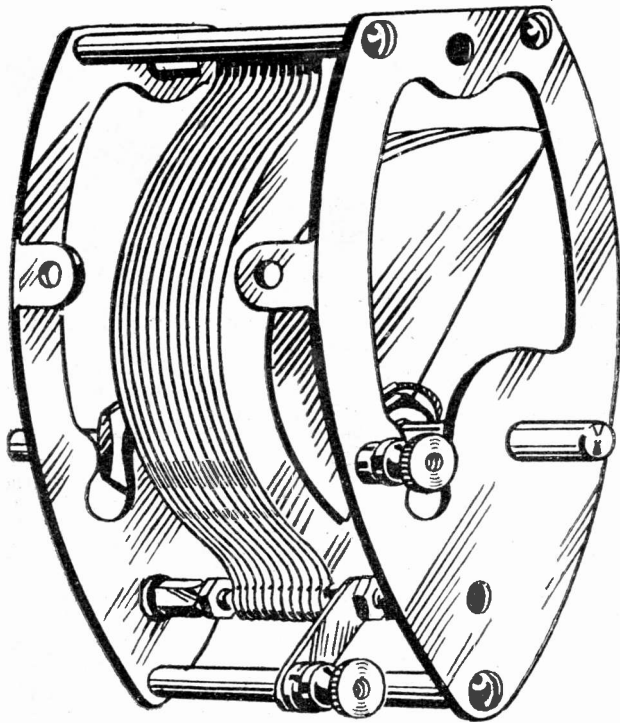
THREE USEFUL TIPS.

When charging accumulators from the mains or other source of electric supply the positive of the cell is always connected towards the positive of the supply.

If you charge your accumulator at home make sure that the charging board is situated in that mains lead which is earthed.

Generally speaking, it is most unwise for any unskilled person to tamper with the electric-light mains, as serious damage can be done by shock and by fire.

Instant public recognition



OF THE OUTSTANDING VALUE OF THE LISSEN VARIABLE CONDENSER TEMPORARILY OVERWHELMED THE LISSEN PRODUCTIVE ORGANISATION.

THE Variable Condenser which Lissen introduced at the beginning of the season so clearly revolutionised condenser values that trade and public alike immediately recognised that it brought within the reach of every amateur constructor a condenser with technical advantages which had previously been available only in condensers costing in some cases even three times the price of the Lissen.

The result was that even the great Lissen organisation was temporarily overwhelmed with orders; and thousands who wished to incorporate such a low-loss condenser in their chosen circuit were disappointed.

By working day and night the output of this condenser has been increased and increased until now

AMPLE STOCKS ARE AVAILABLE AT ALL LISSEN DEALERS

And the Lissen Condenser which is now available is even better than that which was so well received at first; in the course of manufacture Lissen have found it possible to improve on the original design without increase of cost.

DO NOT THEREFORE BUY A VARIABLE CONDENSER UNTIL YOU HAVE EXAMINED THE NEW LISSEN.

A REAL LOW-LOSS CONDENSER

You can use it as a standard condenser in any circuit.

You can gang it—two or three of them together.

You can use a drum control for it instead of a dial.

You can mount it on a panel and it has feet for baseboard mounting, too.

·0001 mfd. capacity	5/9
·0002 " " "	5/9
·0003 " " "	6/-
·00035 " " "	6/3
·0005 " " "	6/6

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Friars Lane, Richmond, Surrey.

(Managing Director: Thos. N. Cole)

and now a new

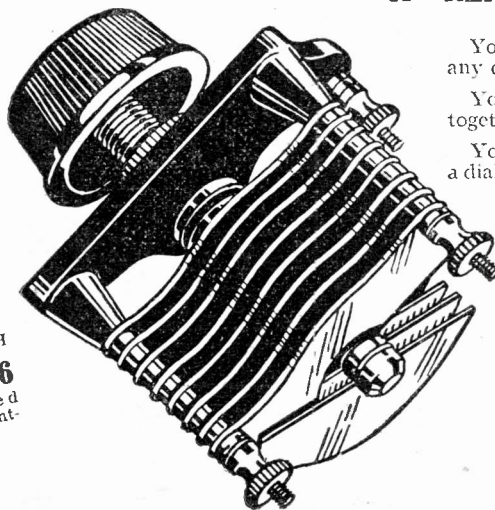
LISSEN

REACTION CONDENSER

Embodies many of the exclusive features of the big Lissen Condenser, including no end pressure on any end plate to distort frame or vanes.

Type "A" **4/-** EACH

Type "B" **4/6** with insulated bushes for mounting on panel.



If you have a good radio receiver

you can enjoy all the advantages of an expensive electric gramophone for £1.0.0



If you have a good radio receiver and a gramophone (even an obsolete one) you can enjoy richer, cleaner, more lifelike reproduction of gramophone records by fitting the Burndept Electric Soundbox.

Electrical recordings are capable of a much greater volume and have a wider compass. The Burndept Electric Soundbox (working through your radio set) makes the most of these and strengthens every detail.

Ask your local radio dealer to demonstrate the Burndept Electric Soundbox. No other is as good.

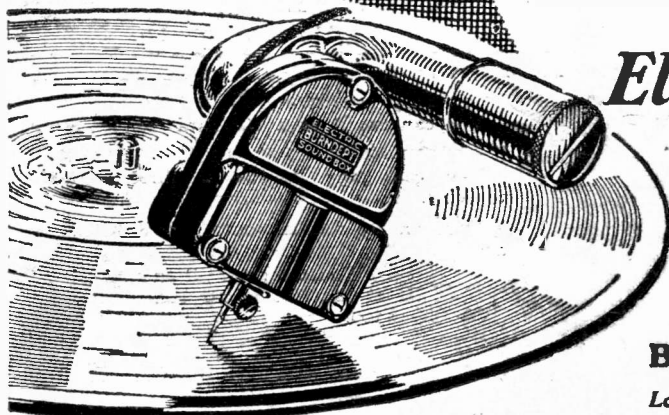
BURNDEPT

Electric Soundbox

PRICE .. £1:0:0

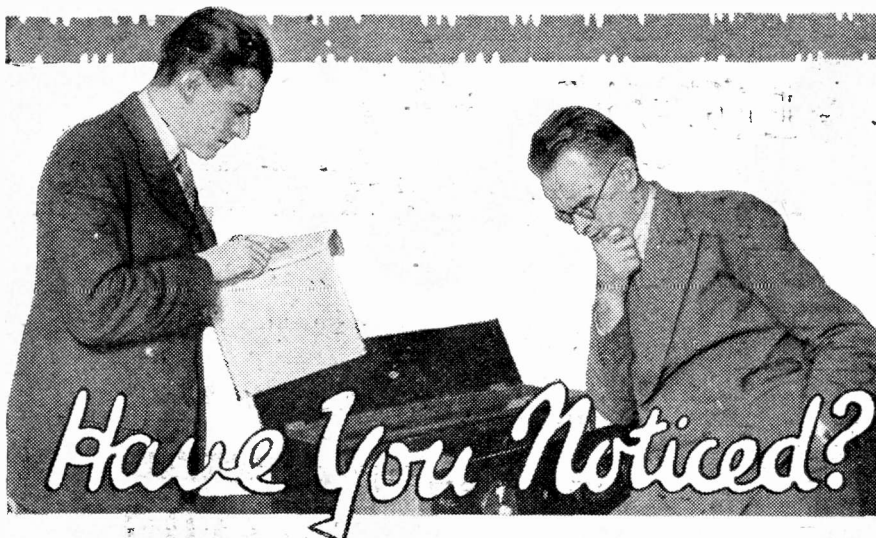
VOLUME CONTROL .. 8:6

ADAPTER 4:0



BLACKHEATH, LONDON, S.E.3

London Showrooms : 15, Bedford Street, Strand, W.C.2.



Some curious effects met with in the construction and operation of radio sets, and what they indicate.

From A CORRESPONDENT.

THAT in using condensers with ebonite or bakelite end plates with screened-grid H.F. circuits the set is liable to go into oscillation when the hands are brought up to the two tuning condensers. This is owing to the fact that the body is a conductor, if a poor one, of electricity and, therefore, introduces capacity coupling between the two condensers when the hand is brought up to them, even though the spindles be connected to earth.

That a large condenser such as used in an H.T. eliminator will hold its charge for many hours. Even if short-circuited immediately and so discharged, it will be found after another half hour has elapsed that a further spark can be obtained from it. This is owing to the fact that the energy in a condenser is stored in the dielectric, and what is known as "dielectric absorption" takes place. After the condenser has been discharged this absorbed energy is once again liberated, owing to the reduction in potential, and a further discharge is then to be obtained.

That genuine 27/42 Litzendraht is made up in a peculiar manner. If you examine it you will find that it is made of three main strands. Each of these strands consists of three further strands, which consist of three single wires laid together. If the wire is merely a number of strands twisted together and not made up in this particular manner it is not genuine Litzendraht, and it will not give you the same efficiency when used for winding an inductance.

Avoid Stray Capacities.

That when using R.C. valves with very high anode resistances in the neighbourhood of 1 or 2 megohms it is most important that the stray capacities in the anode circuit be kept down to the lowest possible value. Even a small addition of capacity is sufficient to by-pass the higher frequencies thus resulting in woolly or muffled reproduction of speech and music.

That hard-drawn copper wire or sheet may be softened by heating it to red heat and plunging it into cold water; the result of doing this to copper is exactly the reverse of what happens when it is done to steel. In the case of steel the metal is

hardened, while in the case of copper it is annealed or softened.

That a ribbed former need not necessarily be more efficient than a plain former. The losses are chiefly due to the presence of the dielectric within the field of the coil, and not to the fact that the wire is lying on its surface. At the same time a certain extra amount of efficiency does result from the use of a ribbed former, but the ideal arrangement of course is to use a skeleton former, where the total amount of dielectric is reduced to a minimum.

A Peculiar "Fault."

That the gettering on the inside of a valve may often give rise to trouble from instability owing to its capacity to external objects. In some cases part of the electron emission from the filament may fall on the gettering and charge it up, and produce all kinds of incomprehensible effects.

That it is usually the most obvious faults in a receiver that are the most difficult to trace. Short-circuited condensers, broken windings, and so on, are usually easily traced. But when you forget to connect your low-tension battery, or leave some of the wander plugs out of your high-tension battery, forget to put the aerial on, or forget to connect the loud speaker, then it usually takes about half an hour to find out what's wrong.

That when running a set off an H.T. eliminator, which is only just capable of delivering the full anode current required by the set, speech and music will be overlaid with a queer burbling noise, while the transformer in the eliminator begins to hum loudly. It is advisable that an H.T. eliminator should be capable of supplying nearly twice the current actually required by the set, especially if the set is a big one, and the output stage consists of big valves taking heavy current.

That glass towel rails make very efficient aerial insulators. An 18-in. rail obtainable at Woolworths' for 6d. can be cut in half, the ends heated till soft and then bulged out by pushing the glass rod against something hard, which enables the halyards and the aerial to be fastened on to the glass without the possibility of their slipping over the ends.

These glass rods also have another use in making efficient supports for inductances in short-wave transmitters and receivers.

That an efficient short-wave choke can be made by winding 36-gauge D.S.C. wire on to an ordinary chemical test tube. The ends of the windings are secured by means of a little celluloid cement and the whole choke can conveniently be mounted on a cork fixed to the baseboard of the receiver.

Unloaded Output Circuit.

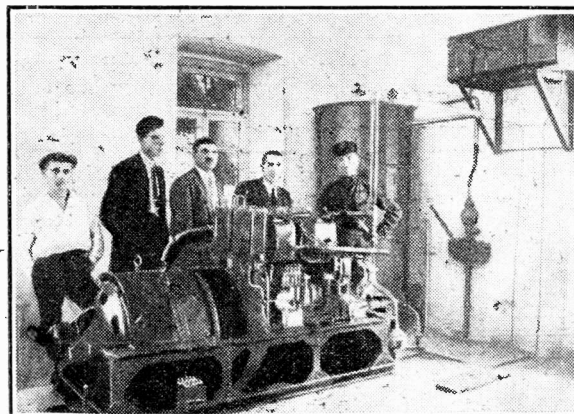
That an increase in H.F. amplification is often to be obtained from a screened-grid H.F. stage, when using somewhat inefficient coils. By reducing the screen voltage, this brings the valve on to the negative characteristic of its curve, and so introduces a little regeneration or natural reaction, which boosts up the amplification obtained.

That a faulty moving coil in an M.C. loud speaker is generally indicated by extreme unsteadiness of the milliammeter needle on output, which previously left it completely steady. This is due to a short occurring between layers in the coil, which has the effect of reducing the impedance, and, therefore, reducing the load on the output valve.

That you can demonstrate this fact very clearly by short-circuiting the loud speaker in the output circuit of your set, and watching the milliammeter needle, which will now be found to kick violently, whereas before it was steady.

I once spent three hours on a receiver trying to trace trouble either in the set or in the eliminator through a fault of this description. It wasn't till I put the moving

IN A PERSIAN STATION.



The staff and the generating plant at the Persian Radio station. (1915.)

coil on the "bridge" and found that its resistance was 600 instead of 1,500 ohms that I traced the trouble.

That there is generally quite a definite difference in potential between an earthed D.C. main and the earth on your wireless set. This may be anything from 5 to 40 volts, depending on the condition of your line the load carried, and so on.

STOPPING HUM IN D.C. SETS.

By C. P. ALLINSON, A.M.I.E.E.,
A.M.I.R.E., F.Inst.P.Inc.



ONE of the main difficulties encountered in working a receiver from mains, especially in the case of D.C. mains, is the hum which is introduced by the rectifier valve.

As you know, in the case of D.C. mains the hum which is experienced is due to commutator ripple, and this is due to a number of different frequencies which are often far more difficult to smooth out than the rectified output from an A.C. eliminator.

The results from hum are particularly bad when a set is being worked entirely from D.C. mains where the filament current has also to be supplied, and a little experiment will usually show that the worst interference is originated in the detector stage.

A Curious Fact.

In the ordinary way one would expect that grid-leak rectification would be far more liable to give rise to interference from hum than anode bend, owing to the fact that the former type of rectification is cumulative; but curiously enough it has been found in practice that grid-leak

rectification is less liable to give rise to this form of interference.

It would appear that this is due to the fact that the usual grid condenser is included in the grid lead, thus keeping the low-frequency impulses from passing on to the grid and being amplified by the detector valve, which otherwise happens when anode-bend rectification is employed.

There are occasions, however, when it is desirable to use anode bend owing to the type of valve to be used as rectifier and the

this has a stopping effect as regards L.F. potentials being passed on to the grid.

Instead, however, of a grid leak being used and negative bias being applied to the grid through it, as is very often done, we can employ another method which is far superior.

True anode-bend rectification is not always obtainable when a grid leak is used, even though the correct value of negative bias be applied, owing to the cumulative action in part, and in part owing to the time constant of the grid leak and condenser combination. At the same time, the grid leak presents a high resistance to all frequencies, whether they be high frequencies or low frequencies, in fact, its resistance to the low frequencies will be greater, in view of the fact that its self capacity will then be negligible.

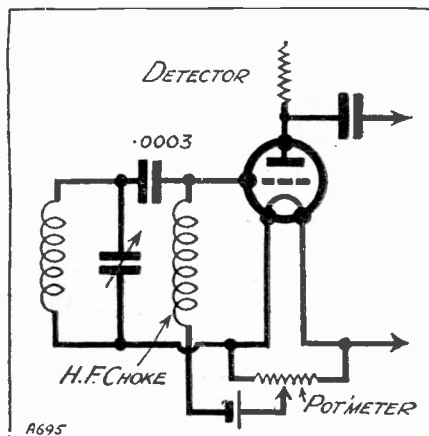
An Ideal Method.

If, however, we connect an H.F. choke instead of a grid leak between the grid and our potentiometer, so as to obtain anode-bend rectification we have what is an ideal method to use in a receiver being worked off electric-lighting mains.

This H.F. choke acts as a dead short circuit to all low frequencies, so that even the small amount of L.F. voltage which may get past the grid condenser on to the grid will be short circuited by this choke. A good H.F. choke, however, presents a very high impedance to the H.F. potentials which you are rectifying. I have made careful tests and no audible difference between the two (i.e. leak and choke) as regards signal strength was to be noticed.

The H.F. choke further has a low D.C. resistance, thus preventing any unpleasant time period effects, and of course makes it impossible for the grid condenser to charge up.

An H.F. choke is certainly more expensive than a grid leak, but even so, you can get a good one nowadays for about 4s., and it is well worth incorporating it in your receiver on the lines described above.



type of coupling used between it and the first L.F. valve, and in this case the method shown in the circuit diagram should be employed.

The usual grid condenser is retained, as

THAT RESISTANCE QUESTION.

By H. BRAMFORD.

THERE still seems to be an element of doubt about the question of resistance and its application to the filament lighting of valves. The fixed resistor is most commonly used in place of the variable type, but the latter has its advantages as a single control and combined "on-off" switch. The point, however, is this: Is the fixed resistor necessary?

Supposing we are using three 1.8 valves to be fed from a 2-volt accumulator, there are still other points to be reckoned with. By way of example, we will introduce Ohm's Law in the following formulæ. Unless the valves are fed from the mains the filament circuits of each valve used will be in parallel.

Very well, then, we must first deduct the voltage of the valve from the voltage of the accumulator, and the remainder is divided by the total consumption factor in amps. of the valves used. Assume that this factor is 1 amp. per valve, the formulæ in brief is as follows:

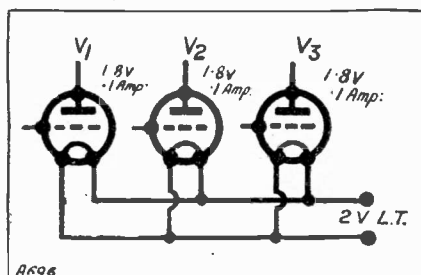
$$\frac{2 \text{ minus } 1.8}{.3} \text{ equals } \frac{.2}{.3} \text{ ohms.}$$

Resistance then is a negligible quantity, while for two valves the answer would be 1. Only in the case of one valve, then, do we really require resistance.

Existing Resistance.

The reason for this is that we have to consider in our calculation the existing resistance factor of the actual filaments in parallel for which a drop in voltage must be allowed.

In addition to this, however, we have given no consideration at all to the natural resistance of the circuit, as represented in the actual wiring of the set and contact



points, so we are well on the safe side if this simple calculation is followed in all instances.

Using a valve or valves of equal rating to the accumulator, they are in actual fact being under fed, but there is, of course, the satisfaction of knowing that we are working on the safe side.

It is, however, misleading to apply a calculation of this nature to the one valve only, where a single resistance is employed with a number of other valves in parallel.

THREE ACCUMULATOR TIPS.

It is unwise to hold a naked light, such as a match or cigarette, near to an accumulator, and it is dangerous to do so when this is being charged.

On no account should the plates of an accumulator be exposed to the air, as oxidation will tend to make the negatives hot.

When an accumulator's polarity has been reversed (that is to say, the positive has become negative and the negative positive) it has been either excessively discharged or else charged up in the wrong direction.

Curing "Motor-Boating"

Most readers know what "motor-boating" is, and that it is always a possibility in some circumstances with mains units, but what about remedies? Here are some really practical instructions for making and using two of the most useful types of "anti-coupling" devices.

By G. P. KENDALL, B.Sc.

HAVE you ever heard the rhythmical "pop, pop, pop," noise from the loud speaker which some unknown genius so aptly christened "motor-boating"? If you have, you will know only too well the feeling of helpless fury which seizes one when a previously well-behaved set suddenly starts to carry on in this way, and will need no urging to study the hints I am going to give in this article.

If you have never run across this aggravating trouble you should first thank your luck, and then resolve to look into the various cures which follow with a view to being prepared in case you do strike it in the future. I am not trying to make your flesh creep, but it may happen to anybody, you know.

It is not at all difficult to cure as a rule, in a perfectly straightforward way, but before we concern ourselves with remedies, it might be a good idea to see what motor-boating really is, because we shall then understand better what we must do to stop it. Well, it is actually our old friend the L.F. howl in a slightly different form, and one of the standard cures for such a howl will often stop motor-boating likewise.

When It Happens.

For practical purposes there is really no need to make any distinction between the ordinary L.F. howl and the slower vibration we call motor-boating. The fact is, however, that a properly designed and reasonably well made set ought not to give an L.F. howl, but certain more or less external factors may start it off, either as a true howl or a slow popping. It is when this happens that we want to know what to do, and that is what I am going to try to tell you.

Now, the usual cause of the trouble is what the highbrows call "back coupling," due to the resistance of the H.T. battery or mains unit, and how this happens is not really difficult to understand. In the case of a battery source of H.T. you will see that the resistance of the battery is included in the anode circuits of all the valves in the set, so "coupling" all the stages together, and producing what is really a reaction effect.

If the resistance is high enough the result

may be actual L.F. oscillation, taking the form of a whistle or slow popping according to circumstances. A rather lower battery resistance, on the other hand, may not be quite sufficient to start actual howling or motor-boating, but may yet produce enough L.F. reaction to have a very bad effect on quality, making it muffled or jarring.

Mains Unit Troubles.

Obviously, then, motor-boating is a thing which may happen with any set containing two or more L.F. stages if no special precautions are taken and the H.T. battery chances to develop a high internal resistance. In the case of a mains H.T. unit, again, it may happen as a natural result of running two or more of the valves from a single positive terminal on the unit. This is often quite safe, of course, but there

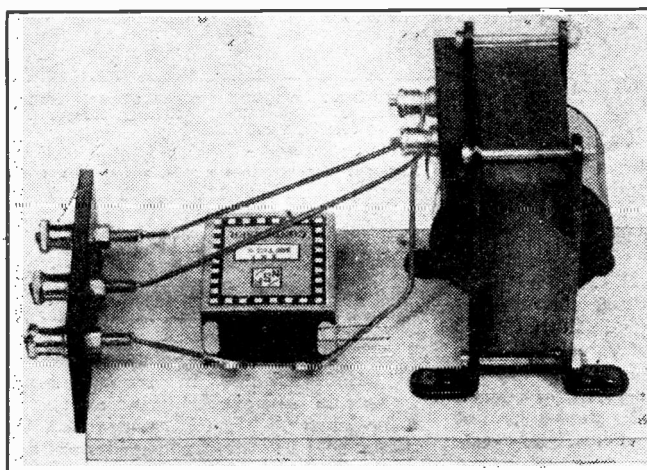
comes across sets which begin to howl or motor-boat as soon as the battery resistance rises even a little, and while the battery is still in quite passable condition. Again, if one possesses a mains unit with only two positive taps and it is found to produce motor-boating with a new four-valver, it is poor comfort to be told to buy a new H.T. unit.

Fortunately, there is a simple remedy for these troubles which can be applied externally and works a cure in almost every case. This is the use of an anti-motor-boating filter in one or more of the H.T. positive leads. A device of this sort can be made up for a very reasonable expenditure in the form of a little unit which will prove a very handy thing to have about the house ready for any emergency.

I have two of these units which have proved invaluable of recent months, and the reader may like to have details of them, and some hints on their use. The first unit is a filter of the resistance-capacity type, which is intended for use in series in the detector H.T. lead.

A Useful Type.

This alone will almost always stop howling or motor-boating due to a high resistance H.T. supply, and is by far the most useful of the two. It consists of a small wooden base-board, a strip carrying three terminals, a 2 microfarad condenser, and an anode



A simple unit for stopping motor-boating. By using a choke and condenser coupling effects are removed without any serious loss of H.T. voltage.

are occasions when it leads to trouble, and it should not be forgotten as a possible cause.

The obvious remedy for motor-boating, of course, is a new H.T. battery or the use of a mains unit with plenty of separate positive terminals, but this is not always practicable. For example, one occasionally

resistance of about 50,000 ohms.

The terminals should be marked L.T.—, H.T.+1, and H.T.+2, and these are the connections: H.T.+1 to one side of resistance, H.T.+2 to other side of resistance and one side of condenser, other side of condenser to L.T.— terminal.

(Continued on next page)

CURING "MOTOR-BOATING."

(Continued from previous page).

To use the unit, connect it up thus: join H.T. +2 to the positive terminal on the set for the detector valve, connect H.T. +1 to the H.T. battery or mains unit, and the L.T. - terminal on the unit to the L.T. - terminal on the set. Just one point: the resistance in the anti-motor-boating filter drops the voltage on the detector, so remember to allow for this by connecting to a suitable point on the H.T. battery. If your detector valve usually takes about 50 volts, you will probably find that about 100 should be applied when the special unit is used, to make sure that the necessary volts are still reaching the detector.

Simplifying the Battery Leads.

This is really rather a convenience, because it means that in most cases you can give the detector lead the same voltage as that to the L.F. valves, i.e. just join the lead from the H.T. +1 terminal on the special unit to the maximum voltage point on the battery. In practice you will find that this means that you only need one positive connection to the battery instead of two.

This one unit will, as we have seen, cure most ordinary cases of motor-boating, but where it proves insufficient, as may sometimes be the case with a mains unit originally designed for a smaller set than the one in use, another device is needed. This can take the form of another exactly similar unit connected in series with the H.T. lead to another of the valves, but a difficulty arises here.

The point is this: we have seen that a resistance-capacity type of filter drops the voltage on the valve, and this is not always desirable. It does not matter in the case of the ordinary detector, because this valve does not require a high voltage, and we can compensate for the drop by going up to the top of the battery or using a higher tap on the mains unit (by the way, when this device is in use, it is generally quite safe to connect it to the maximum voltage terminal on the H.T. unit, even if other valves are already being fed from that terminal).

In the case of the other valves in the set we usually want all the volts we can get (the H.F. valve is an exception, of course, but an anti-motor-boating device is not often used here), and so a slightly different unit is suggested.

Using a Choke.

True, the same type can often be used if the resistance is reduced to 10,000 or 20,000 ohms, but this is not always sufficient to stop the trouble, and I personally prefer to use a choke-capacity filter instead.

The second of the two units you see in the photos was made up on these lines, and

the only difference is that a good-sized L.F. choke takes the place of the anode resistance. The connections remain exactly the same.

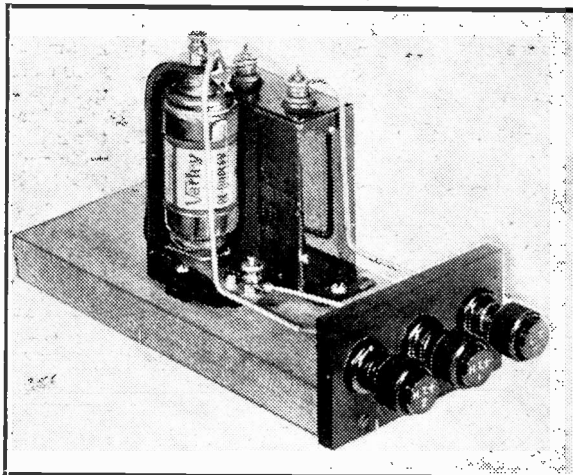
Alterations to Wiring.

The method of using this type of unit is also just the same as before, but it should perhaps be pointed out that you will probably need to break into the wiring of the set to get in series with the H.T. lead to either the first or second L.F. valves. The reason is, of course, that these are usually provided with a common H.T. positive terminal.

The best place to put the unit is generally in the lead to the last valve. This may sound a rather troublesome business, but, of course, it will very rarely be necessary, since the ordinary unit on the detector stage will almost always be sufficient to stop motor-boating.

One final point: the two units described have all their parts and wiring exposed, and although this is probably safe enough where H.T. batteries are used, it is not good enough with mains units.

In this case the unit should be enclosed in a box with a small ebonite top, and the terminals should be of the insulated type such as the Belling-Lee variety.



This unit uses a resistance instead of a choke, and so drops the H.T. voltage considerably. It is therefore of most use for the detector valve feed.

THIS PICK-UP BUSINESS

From A Correspondent.

I AM just an ordinary listener, one who waits until a new thing has really caught on and then decides it is time he tried it for himself. Thus it came about, that after much persuasion I managed to extract a gramophone pick-up out of an expert friend.

Having handed the instrument to me, he asked on what set it was going to be used. I explained it was an ordinary "det. and one transformer L.F." with plenty of H.T. and a modern cone loud-speaker. Imagine my surprise therefore, when he said:

"There's no point in your using an electrical pick-up then," and holding out his hand continued, "so you might as well give it back to me."

However, having got hold of the instrument I intended to try it out for myself, although my friend explained that a set capable of handling great volume, and a loud speaker of the super-quality type (such as a moving-coil) were necessary.

He also explained that a set and loud speaker capable of reproducing frequencies beyond those handled by a gramophone were essentials if a pick-up were to be appreciated. Nevertheless, he told me to go ahead and see for myself. He was partly right but mainly wrong, as the following paragraphs show.

We Start Experiments.

Arrived home, we—that is, myself and others members of the household—got the gramophone out and prepared for the worst. Snag number one, the rubber fitting on the pick-up was not a suitable size for the fitting on the tone arm. So a piece of wood was brought to the rescue and shoved down. Soon we were expertly adjusting the angle of the needle. We made it slope at approximately the same angle as it would if the soundbox were being used.

The next step was to remove the detector valve, plug in the special adaptor and place the valve in the top of the adaptor. It was necessary that one of the pick-up leads went to the negative filament pin of the valve holder. As I traced the wiring out I felt sorry, in a superior manner, for the absolute novice attempting a similar job.

We now started the motor going, placed the tone arm in position, switched on the set and—from the next room came very, very feeble music.

So this was the end of the performance I thought, and imagined myself crawling back with the pick-up to admit my set could not deliver the goods, when my eye fell on the volume control standing on the table.

In the excitement this had been completely overlooked. Just a twist of the knob and good volume poured forth from the loud speaker, easily up to the radio performance.

It was certainly difficult to decide whether it was really better than the gramophone itself, but some cheap records were certainly clearer, and others decidedly more mellow.

The Pick-up Preferred.

At this point in the proceedings, the master of the house walked in and on the spur of the moment we decided to "kid" him. Although he recognised the tunes immediately as being similar to some of our records, he thought they were really coming over the wireless.

The scratch noise apparently was not sufficient to attract attention. Not until the fifth tune did he "twig" what was happening, and amid much laughter he came into the control room to look into matters.

The next one to be taken in was the young lady of the house, but she was naturally more eute, and we only got as far as the beginning of the second record.

Well, that was that! I certainly intend to pawn my present soundbox to get an electrical pick-up. And what fun we had. Yes, I think I must most decidedly invest in one of these gadgets, somehow or other, for although I have not a super set, they undoubtedly hold many attractions as far as I am concerned.

“The bass notes and the drums, on which so much attention is concentrated nowadays, were found to be reproduced in the Amplion ‘Lion’ in a more natural fashion than by some of the coil drive speakers I have heard, while the notes in the middle and upper registers were always pure, and represented accurately the tonal quality of the instrument producing them.”

AMPLION

“LION” CHASSIS

“CRYSTAL,” who wrote the above, is the well-known wireless expert and critic of the *Manchester Evening Chronicle*, from which paper the extract is reprinted. His high opinion of the New Amplion’s qualities is shared by critics, experts, musicians and listeners everywhere . . . Mr Ernest Newman, the eminent music critic, writes of the “astounding results” obtained by Amplion. “I have had greater pleasure from listening-in than I have ever had before,” he says. Dr. N. W. McLachlan, the famous authority on loud speakers, says: “The New Amplion ‘Lion’ Loud Speaker reproduces sound better than any other loud speaker now on the market” . . . Everyone is agreed on Amplion’s supremacy. Amplion means better reproduction, better Radio.

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Width 17½ins. Depth 8½ins. ...

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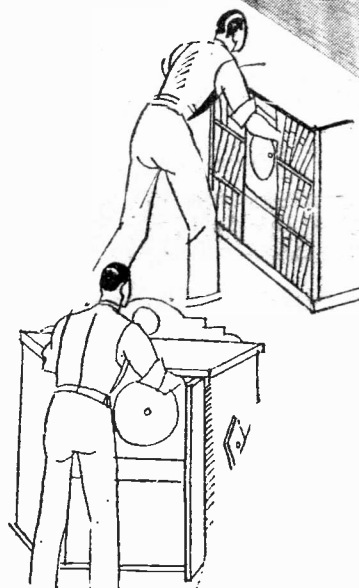
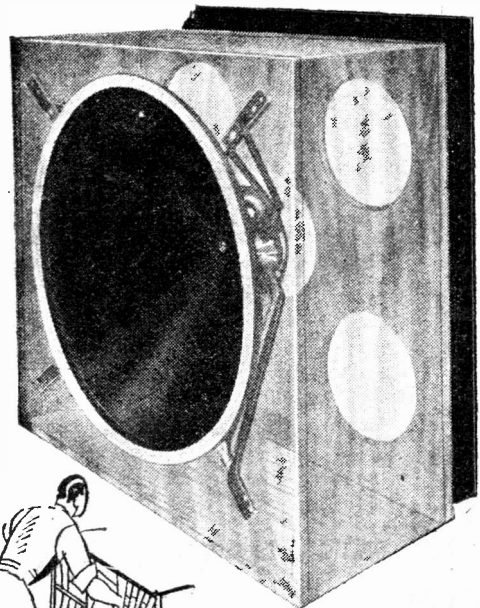
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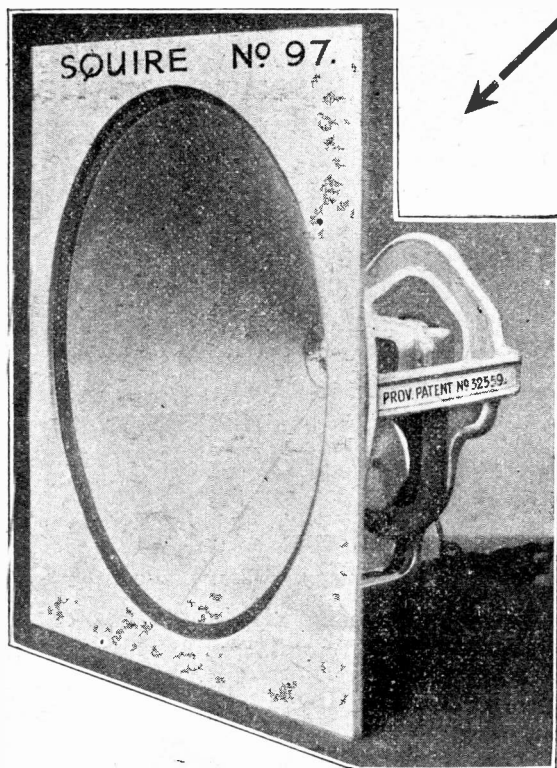
There is no limit to the many ways in which existing furniture can be utilised to accommodate the New Amplion Chassis. Here, for instance, is a book-case in which the Chassis will fit perfectly.

Or that old chiffonier, used nowadays for storage purposes? Why not remove the door, fix a neat curtain, and make a home for Amplion?

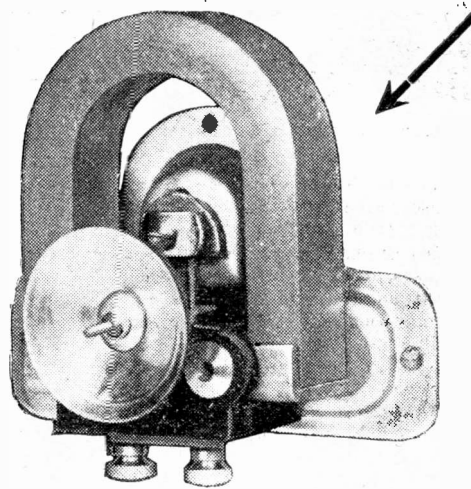


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Which, used in conjunction with The **TRIOTRON BALANCED ARMATURE REED UNIT**



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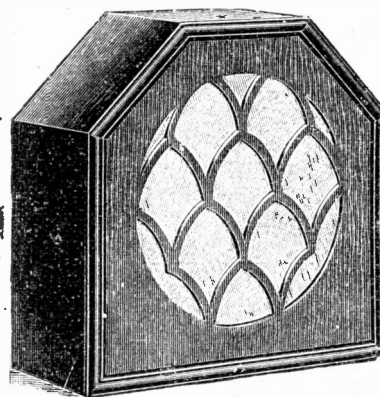
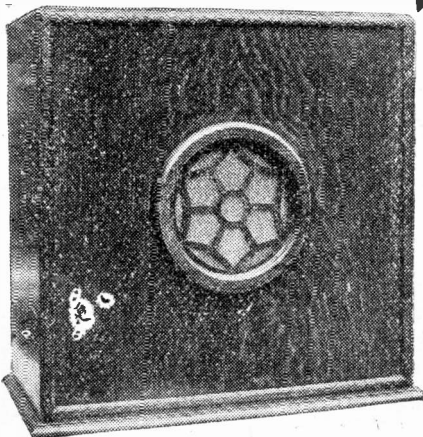
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No backboard, to avoid box effects in reproduction. Cabinet can be supplied with fret 6½ inch dia. or for Squire No. 97 frame.

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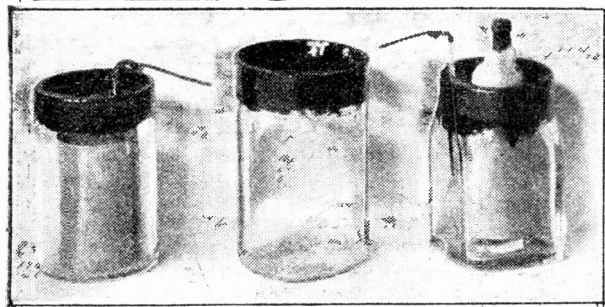
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YOUR SHOPPING LIST ALTERNATIVE LIST OF PARTS

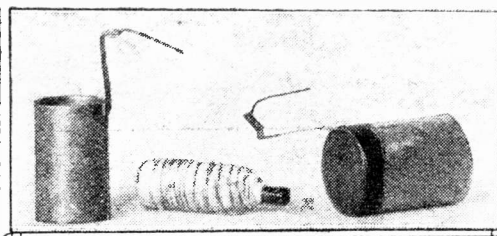
Squire No. 97 Cradle ..	s. d.	12	6	Squire No. 97 Cradle ..	s. d.	12	6
(And front Plywood Board as shown above at top)				Squire 9½ in. Cone Kit ..		2	6
Squire 9½ in. Cone Kit ..		2	6	Kabilock Cabinet (W. & T. Lock) Oak, 23'6, or Mahogany		27	6
Cabinet as illustrated ..		25	0	Blue Spot Adjustable Unit ..		25	0
(Our own make)							
Triotron Unit ..		17	6				
Total cost of parts ..		£2	17 6	Total ..		£3	7 6

LECLANCHÉS LT.

for



An Article for the Economist.
By
H. W. DEAN.



THERE must still be many people who do not use valve-receiving sets, for the simple reason that they are out of reach of facilities for charging accumulators. This, in many cases, means that a wireless set cannot be used at all since the crystal cannot provide strong enough signals to make it possible to listen to broadcast transmissions with any pleasure. Or, again, it may happen that the crystal does pretty well, but that loud-speaker reception cannot be obtained owing to the difficulty of using valves.

Two Alternatives.

There are two possible ways in which those who live in remote places may give themselves all the joys provided by the valve set without the use of accumulators. The modern dull-emitter valve requires a very small amount of heating current for its filament, the average nowadays being only about one-tenth of an ampere as against three-quarters of an ampere or more for the old-fashioned bright valve.

There are probably no parts of the country in which an efficient three-valve set consuming about one-third of an ampere of filament current will not provide loud-speaker reception of one or more stations and telephone reception of a very large number.

Now one-third of an ampere is an amount of current that can be supplied not only from an accumulator or secondary battery, but also from a properly-designed primary battery of suitable size. The two possible methods, then, of heating filaments without an accumulator are to make use either of a dry or of a wet primary battery in place of an accumulator.

Dry Batteries.

The dry battery has several advantages. It is as fool-proof as any battery can possibly be; it cannot be upset and there is nothing messy about it. On the other hand, a dry cell to deliver economically .2 or .3 ampere must be of large size, and since at least two are required for the work even when 2-volt valves are used, the expense is considerable, especially when one considers that once a dry battery is run down it is completely useless and must be thrown away.

The ordinary type of wet Leclanché battery that is used for working electric bells is quite useless for filament-heating purposes, for it is designed to operate only for a few seconds at a time, and then to have a comparatively long period in which

to recover or "recuperate." If placed under a load of, say, a quarter of an ampere for an hour or two, its voltage falls like the proverbial stone since the depolariser cannot deal sufficiently rapidly with the accumulation of hydrogen bubbles about the positive carbon rod.

In order to enable a Leclanché cell to deliver such current for several hours on end without an appreciable fall, the depolariser must be especially effective, and there must be plenty of it. In other words, instead of the porous pot of the commercial Leclanché cell, a very large sac filled with depolarising compound is required. Again, the little zinc rod of the standard cell will not do. In order to reduce the internal resistance of the cell and to provide a large metallic surface for the electrolyte to act upon the zinc must assume a cylindrical shape surrounding the sac and the carbon rod.

A Difficult Problem.

Recently, certain manufacturers of wet cells have devoted a good deal of attention to the problem of producing large cells capable of delivering a fairly heavy amount of current for long periods on end without showing a big drop in voltage.

Only those who have done any work upon the chemistry of the Leclanché cell can appreciate the difficulty of the problem to be tackled. It has, however, been very successfully dealt with and the writer has just

finished a very searching test upon two cells designed for filament-heating purposes, which have emerged from their ordeal with flying colours.

The containers of the cells are glazed earthenware pots with a capacity of about a quart apiece. The zincs are cylindrical in shape and the sacs are very large. The test consisted in discharging each cell continuously through a fixed resistance of 10 ohms.

A Thorough Test.

That is to say, at its beginning the cells, whose voltage was a little more than 1.5 each, were delivering rather more than 150 milliamperes of current.

The test went on night and day until the voltage fell to .75 for each cell, by which time, of course, the current had fallen to 75 milliamperes. No cell in actual use will receive such treatment, for it would be used only for three or possibly four hours a day, and have twenty or twenty-one hours out of the twenty-four in which to recuperate.

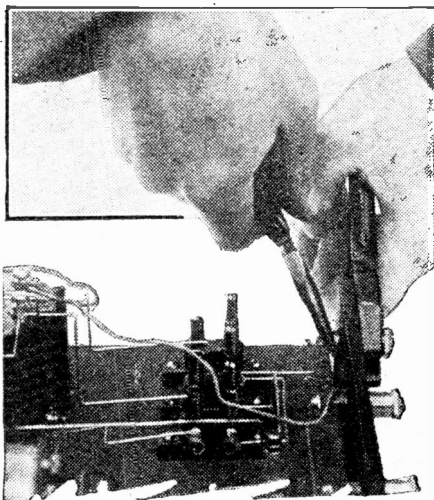
The continuous test, however, is a very good one since it shows up as no other can the way in which cells will stand up to a load, and it finds out any weak spots in the armour of the depolariser.

The results were surprising. Under this load, and with no rest whatever, the average life of the pair was 1,324 hours. The capacity of the cells, then, works out under continuous load to over 100 ampere hours, and this would be considerably greater if the load were intermittent. In other words, one pair should give, on one charge, over a year's working with a single-valve set, from six to eight months with two valves, and from three to four months with three.

At the end of the test the zincs were in pretty good shape and would probably have stood up to as much work again. The electrolyte, however, was saturated and the sacs were found to be practically done for. This means that the first re-charge will necessitate a new sac costing about five shillings, and two or three-pennyworth of sal ammoniac mixed with water.

At the second re-charge, a new zinc will also be required, at a cost of about one shilling and ninepence. Assuming that a pair of cells is used to run a three-valve set, and that re-charging is necessary every four months, expenses over two years work out at an annual cost of about 18s. 6d., or 1s. 6d. a month for filament heating, which must be regarded as distinctly economical in the circumstances.

TIGHTENING TERMINALS.



Showing how, with two pairs of pliers, terminals can be tightened quickly and effectively.

FROM THE TECHNICAL EDITOR'S NOTE BOOK



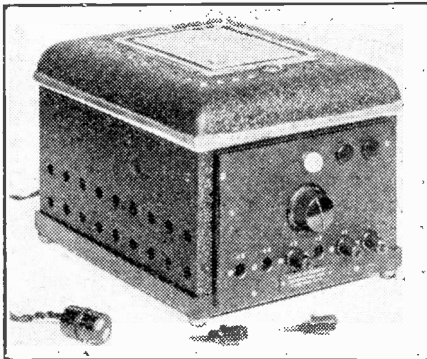
R.I.-VARLEY MAINS UNITS.

ONE thing is certain, and that it is that the R.I.-Varley H.T. mains units conform both to the safety regulations governing such devices and to the most ambitious of set users requirements. We are referring specifically to type AY7 for D.C. mains, and AY8 for A.C. mains, samples of which we were recently sent for test. The D.C. model provides four H.T. tapplings; positive 1 makes available a range of 50 to 150 volts, there being a knob on the unit for giving this adjustment. Positive 2 gives 50 volts, 3 gives 85, and 4, 180. This is when the unit is used with a 220-volt supply. The maximum total current is 100 milliamperes.

The A.C. model has five tapplings, up to 220 volts being available in the output. In this case the total current is 80 milliamperes. The A.C. model also has one variable tapping giving a range of 50 to 125 volts. Both models have renewable safety fuses.

The units are compact and they have a far more substantial appearance than most. The workmanship is of course, of usual R.I. standard, and this is tantamount to saying as good as can be. And on test both units functioned exceedingly well. The D.C. type was tried on mains of unusual roughness and the smoothing was found, even in these trying circumstances, to be ample.

The A.C. model operated equally satisfactorily.

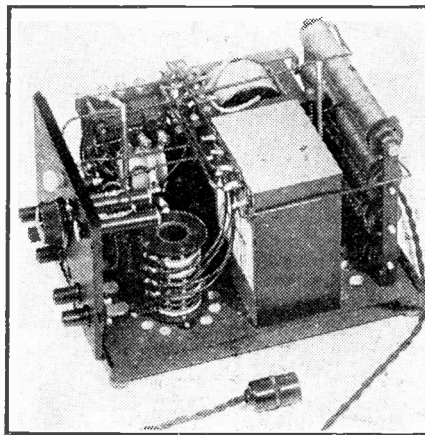


The R.I.-Varley Mains Unit for supplying H.T. from A.C. Mains.

PIONEER BATTERY SWITCH.

Practically every modern valve set employs a battery switch, and small though this item is it is an important one. For one thing it does as much work as any other component, and its potentialities as a trouble-maker are just as great. I have come across a very great number of different makes of battery switch in the course of

the years, and the surprising thing has been that by no means a vast percentage have been really good.



The A.C. Model R.I.-Varley H.T. Mains Unit, with its cover removed.

But the switch recently sent me for test by the Pioneer Manufacturing Co., of Fulwood Place, London, W.C.1, is up to standard. It seems to have a number of those points which one frequently looks for in vain, such as self-cleaning contacts, positive action, and so on. It is of the push-pull variety and designed for one-hole panel mounting. The retail price is 1s. 3d.

LASSOPHONE LOUD-SPEAKER UNIT.

Mr. Lassman recently sent us one of his Lassophone Double Reed Forked cone units for test. It is a large unit, and is contained in a well-moulded bakelite casing. On the back are two widely spaced terminals in between which is the adjusting device, this being in the form of a brightly nickelled, milled knob. Three holes in the kind of back plate enable the unit to be mounted easily.

From the front projects the stout rod for fixing to the centre of the cone. Access to the interior of the unit is easily obtained, as it is only necessary to remove one nut and the casing comes away.

Having removed this, the meaning of "double reed forked" becomes apparent. Instead of a single reed or armature, there are two reeds separated by about half an inch. The one operates right inside the gap of the magnetic circuit and the other outside the core. The construction of the unit is sound and everything is on robust lines.

We fixed it to a semi-free-edged cone mounted in the centre of a baffle board

three feet square, in accordance with the instructions accompanying the unit. The results were excellent. The speaker was found to be sensitive, and the response was bright. Additionally, there was creditable bass. We do not think that any amateur buying one of these units and fitting it up in the specified manner but would think that he was getting results out of all proportion to the cost.

A NOVEL SWITCH.

In these days of simplification of panel layout there is real room for a component of the nature of the Junit Multiple-Contact Switch produced by the Junit Manufacturing Co., Ltd. This component actually embodies in one moderately compact single-hole-panel-mounting unit a filament on-and-off and a wave-change switch. Turning the set on and off, and switching from long to short wave-lengths, can be accomplished with the one knob.

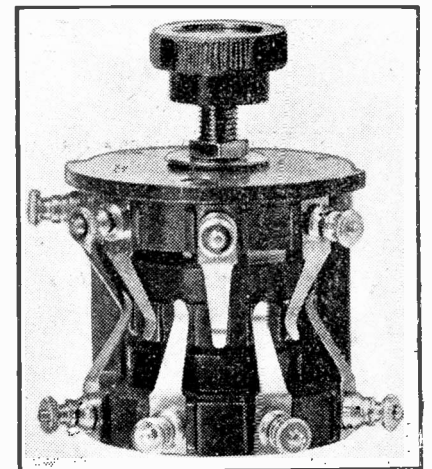
By pushing this knob in and out the set can be switched on and off. The wave-change is effected by giving the knob

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for tests. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

a half-turn when it is in either position. The pulling out and pushing in for the switching off and on processes can be carried out on either wave-range.

The switch was designed specially for use in the Mullard "Master Five" portable set, and the markings on its eight terminals correspond to those specified by the designers of the Mullard set; but the switch can, of course, be adapted to other receivers if desired.

It is a sleek, well-made article, and its multiple contacts are of a self-cleaning, positive character. There can be no confusion between the two switching operations, for the set can be switched on and off when you have switched over to either waveband, the wave change in no way affecting the filament circuit.



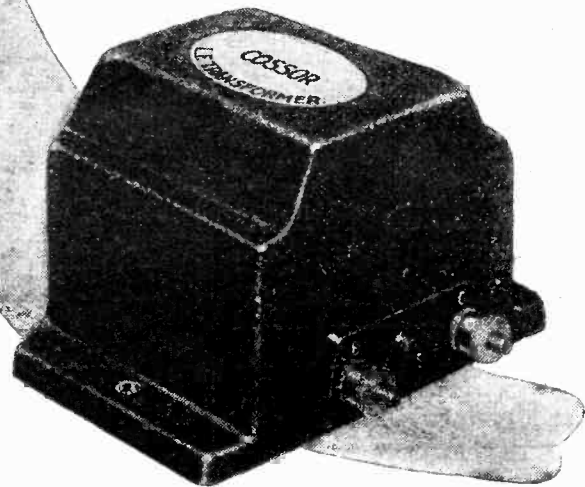
The Junit Multiple-Contact Switch.

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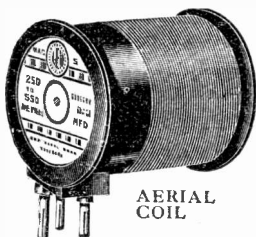
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RADIOTORIAL

An Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents Messrs. John H. Eric. Ltd., 4, Ludgate Circus, London, E.C.4. The constructional articles, which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

AN ELIMINATOR PRECAUTION.

M. R. S. (Goodmayes, Essex).—"To tell the truth, I am nervous of using the H.T. from the mains because I understand the H.T. positive is earthed, which means that in the event of a condenser breaking there might be a rather serious bust-up. Is there a really safe way of arranging the aerial-earth connections in such a case?"

One of the main safeguards is to use good quality condensers, as if this is done there is very little likelihood of a breakdown occurring here. To make it doubly sure you can adopt the following plan, which will give a very thorough insulation of the set from the mains.

First of all, use an "inductive coupling," which means that neither the aerial wire nor the earth wire need be connected to the set at all. Instead of connecting the aerial lead to the grid circuit of your first valve, connect it to a separate coil placed close up against the grid coil.

To the other end of this extra coil let the earth wire be connected, by means of which arrangement the energy collected by the aerial will be transferred from one coil to the other without aerial or earth-lead being connected to the set at all.

In addition, for safety's sake, you should use the good-quality large condenser in the earth lead as recommended for all eliminators work.

Yet another precaution can be taken consisting of a similar condenser (it need not be so large in this case, but its insulation should be good) connected in series with the new aerial coil. That is to say, connected between the aerial lead and the aerial coil, which is coupled to the first valve's grid circuit.

In this way not only is the aerial-earth circuit separated from the set itself, but it is protected both when it enters and leaves the house from any danger due to the proximity of mains.

THE REGIONAL SCHEME.

"INTERESTED" (Willenhall, Nr. Wolverhampton).—"What is meant by the regional scheme of broadcasting, and when is this going to start?"

The regional scheme of broadcasting was put forward by the B.B.C. about a couple of years ago as a suggestion for improving the broadcasting service to all British listeners.

As you know, wireless is comparatively a new thing, and so, when the first B.B.C. stations were erected, there were very few other broadcasting stations on the continent of Europe. Nowadays, as any sensitive set will tell you, there is an immense number of powerful stations on the Continent, and programmes from these stations can be heard clearly all over the country.

If the wave-length of such a broadcasting station is close enough to a wave-length of a B.B.C. station there is mutual interference between the two and the programmes are spoilt by what is called "heterodyne interference." To meet the new conditions which have arisen here and on the Continent, and to provide listeners with better value for their licence money, the B.B.C. suggested that British broadcasting should be distributed not as at present, but by a smaller number of higher powered stations.

The main principle of the scheme has been approved officially, and it was with the idea of attacking the

technical problems that the Daventry Experimental station was started. Valuable experience gained in the operation of Daventry 5 G B has enabled the B.B.C. now to go ahead with the first of the regional broadcasting stations.

The site chosen for this is, on the Brookman's Park Estate, not far from Barnet on the Great-North Road. Here the new London station, which will come into operation some time this year, is being built, and it will be the first twin-wave-length high-power station of its kind.

The station will possess two different aeriads and will simultaneously transmit two different programmes, on two different wave-lengths. Other

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise had appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

stations of the same type are being planned in different parts of the country, the idea being to cover Britain with a network of high-power stations each sending out two different programmes.

Although the work has actually gone forward to the degree indicated above, the scheme is still somewhat in the experimental stage, and latest news of the regional scheme will be given week by week in "P.W." as it becomes available, on the "Latest Broadcasting News" page.

ADDING R.C. TO THE "EMPIRE" TWO.

T. N. G. (Glamorgan).—"I made up the 'Empire' Two, which was the set described in the Christmas Number of POPULAR WIRELESS, but as I had made up my mind to have a three-valve set when I could afford it, I got a larger cabinet than was necessary and thought I would do with the two-valve at first as I wanted to get a little experience of the short waves.

(Continued on page 1070.)



*—the Speaker
that lives!*

Whatever goes into the microphone, comes through absolutely naturally on the Blue Spot 49 Loudspeaker. No matter whether it is the top note of the piccolo, the deepest thunder of the organ or the middle register of the voice, you get unalloyed tone without distortion. Reproduction is perfect—and this amazing speaker, obtainable from all leading wireless retailers, costs only **£2 2 0**

The secret of its success is the Blue Spot 66Z Driving Unit, capable of handling great volume without distortion, and pleasing results can be obtained with low H.T. values. It can be obtained for home constructors as a separate unit, price **17/6**

For those who own sets of 3 valves or more we recommend Blue Spot Speaker 59. Price £4 4 0, with 66K unit capable of handling any output. Price of unit alone, 25/-.

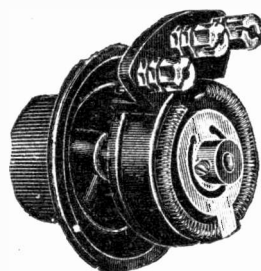
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Variable High Resistance.

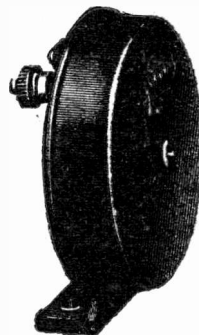
Invaluable for volume control by the high resistance potentiometer method, and for use as a stabilising resistance, variable grid leak, etc. Gives very smooth, even control.

Resistances of 50,000, 500,000 ohms, 1 and 5 megohms. Price 6/- each.

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WIRE-WOUND
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Recognised as essential for satisfactory and silent operation of resistance-capacity coupled circuits. Shielded to prevent interaction. Made with resistances of 20,000, 50,000, 80,000, 100,000, 150,000 and 250,000 ohms. Prices from 2/9 each. Holders 1/6 each.



**IGRANIC
H.F. CHOKE**

The self capacity is so low that the IGRANIC H.F. CHOKE may be used for the lowest broadcast wavelengths, whilst the high inductance makes it suitable for reception up to 3,000 metres. Easily inserted in a small space. Price only 5/-.

IGRANIC SHORT-WAVE CHOKE, for wavelengths of 10-80 metres. Price 2/-.

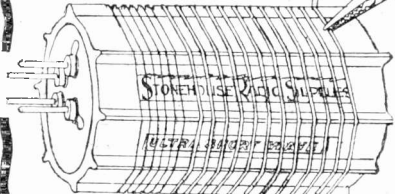
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AERIAL COIL - 7/6
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A screened-grid ultra short-wave set capable of tuning in the world's short-wave stations for 16/- (postage gd. extra) the cost of the

S.R.S. Ultra Short-Wave Coils

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Not only do you get this, but **FAILURE IS IMPOSSIBLE** as with each set of coils is given full operating instructions and valuable short-wave hints, and a special department is available to every Cossor "Melody Maker" owner, ready to answer any question or give you free advice and best service. These coils embody unique features exclusively. **The only two coils that cover the whole short-wave band. Five to over 100 metres.**

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The Firm that made ultra short-wave reception possible on the Original Cossor "Melody Maker" and now lead the way with the New.

RADIOTORIAL
QUESTIONS AND ANSWERS

(Continued from page 1068.)

I am now quite an expert with these and can get American stations with almost disheartening regularity, so I should like to try now adding another valve.

What I had in mind was a resistance stage added to the present set, and I have on hand a '01 fixed condenser mica, an anode resistance, grid leak, valve holder, etc., so if you can give me the necessary wiring in words, I think I can make a good job of it. As the set is good and strong at present, I have got a power valve for the last stage, and I suppose I shall have to increase my grid-bias battery ?

Yes, you will need higher grid bias when you get the power valve going, and we advise you to use as much H.T. as you can manage. If you look at the valve-maker's curve for the power valve, you will see the number of grid volts that are necessary for use with the high-tension voltage that you are going to employ.

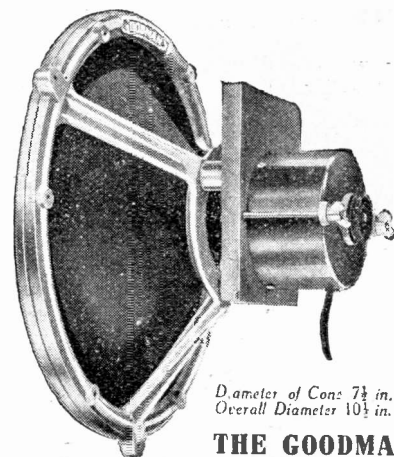
Having purchased a suitable grid-bias battery you can then connect up as follows. First of all mount the valve holder in a suitable position on the base-board, arranging the holder for the anode resistance near to it. Close to the grid of the valve holder mount the '01 mica condenser and grid leak.

You will require an extra H.T. terminal. Label this "H.T.+" and then join the anode resistance to those wires which now go to the loud speaker positive and negative terminals. (The loud speaker, of course, is disconnected from these, and two other loud-speaker terminals are provided, near to the new H.T. positive terminal.)

Having inserted the anode resistance across the points which previously went to the loud speaker, connect that end of the resistance which is now joined to the plate of V 2 to one side of the new coupling condenser '01 mfd. The other side of this condenser is joined to the grid socket on the new valve holder and also to one end of the grid leak. To the other end of the grid leak is fixed a flexible lead which plugs into the grid-bias battery at the required negative voltage.

One of the filament terminals on the new valve holder is taken to the lead on the old set which at

(Continued on page 1072.)



Diameter of Cone 7 1/2 in.
Overall Diameter 10 1/2 in.

THE GOODMAN
"SPIDER CHASSIS & CONE," 16/6

(as used in the P.W. Purity Cone—Dec. 22nd, Issue.)

Exclusive Features.

Can be used with any Unit on the market, regardless of make.

The Chassis consists of correctly designed, highly polished, sturdy aluminium castings.

The Cone is of the Goodman Seamless variety, manufactured under Letters Patent. Alternatively a cut out Cone, Leather suspensions, comprising kit recommended by P.W. (Dec. 22nd), can be supplied. By reason of the exclusive doping processes employed the Seamless Cone actually improves with age. Two minutes constructional work only, and you have a wonderfully efficient Cone assembly, ready for mounting in cabinet, or to a baffle board.

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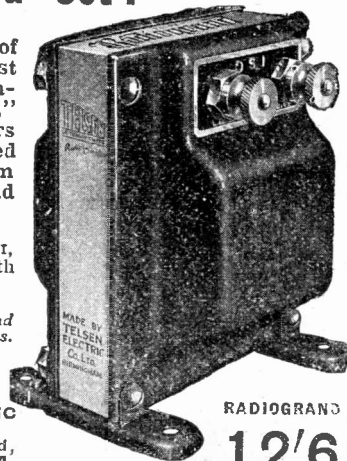
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Ratios 5-1 or 3-1, Shrouded and with Detachable Feet.

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Sold by Wireless Dealers everywhere.

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RADIOGRAND

12/6

Making a New Cabinet ?

If so, stain it with Johnson's Wood Dye and be assured of 100% perfect results. JOHNSON'S WOOD DYE is the standard for all woodwork, furniture and floors where a permanent, penetrating stain is required. It is easy to use, does not show laps or streaks, and penetrates so deeply that scratches cannot reveal the natural colour of the wood. Johnson's Wood Dye dries in four hours and brings out the beauty of the grain without raising it. Makes inexpensive soft woods look as artistic as hard woods.



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Write for FREE descriptive price list and particulars of JOHNSON'S WOOD DYE and JOHNSON'S WAX POLISH.

BUY A 9d. TRIAL SIZE
You will be pleased with results.

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MAKERS OF JOHNSON'S WAX POLISH.

High-grade QUEEN ANNE STYLE FIGURED OAK CABINET

Height 3 ft. 3 ins. - Depth 1 ft. 3 ins.
For Panels up to 21 ins. x 7 ins.
Baseboards up to 11 ins.

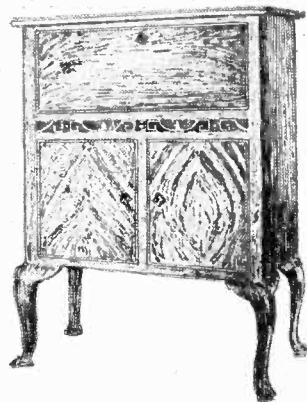
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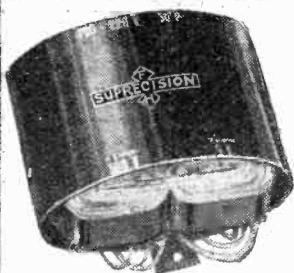


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The secret of obtaining powerful, silent, and enduring results from the H.T. or E.T. Eliminator you are about to build depends entirely upon the right selection of its component parts.

Success with SUPRECISION Power transformers and chokes is a guaranteed certainty. Specify them and you follow the lead of thousands of satisfied Customers.

How to build your own Eliminator inexpensively is explained in the new list 935. Any output obtainable from 2 volts to 500 volts.



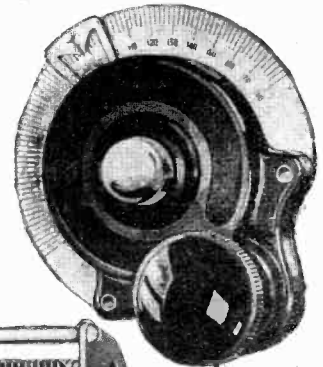
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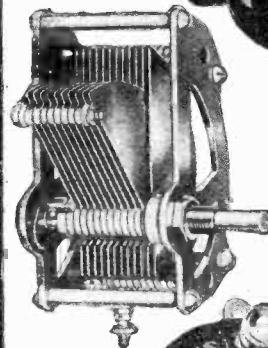
8/9, Talbot Court, Eastcheap, E.C.3.

(One minute from Monument Underground Station.)

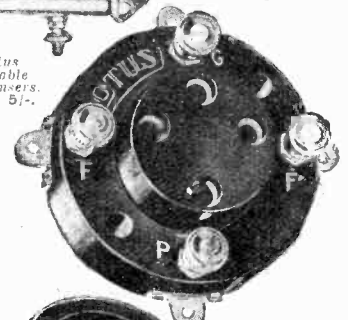
BUILD EVERY SET WITH



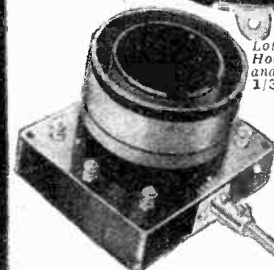
Lotus Vernier Dial, 4/9.



Lotus Variable Condensers, from 5/-.



Lotus Buoyancy Valve Holders, Miniature and Standard Types, 1/3 to 1/9.



Lotus Dual Wave Coils, now made with lid, 15/-, 18/6, 21/-.

COMPONENTS

Made by Garnett, Whiteley & Co. Ltd.,
Lotus Works, Broadgreen Road, Liverpool

Advertisement

National Physical Laboratory Test Report shows Breakdown-8,000 volts



But Belling-Lee terminals proved equal to the terrific test and refused to "short circuit." Belling-Lee bakelite insulation was responsible for this remarkable achievement. It will pay you to buy these terminals.

Type 'B', 6d. Smaller insulated model, type 'R', 3d. For instruments where insulation is not important our type 'M' terminal at 4d. is ideal. All types made in 36 different engravings.

BELLING-LEE
TERMINALS

Belling & Lee, Ltd., Queensway Works, Ponders End, Middx.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1070.)

present joins the grid-bias positive and the two valve filament sockets together, and which also goes to earth, etc. The other filament socket on the new valve holder is joined to the lead which connects L.T. positive to the remaining two filament sockets on the valve holders, etc.

Finally, join up the plate socket of the new valve holder to one of the new loud-speaker terminals (negative) and then join the positive new L.S. terminal to the new H.T. positive. This completes the wiring.

AMATEURS TRANSMITTING ON TEN METRES.

"INTERESTED" (Croydon).—"Can you tell me if any of the London and district amateurs are transmitting on ten metres?"

Many of the London amateurs have been experimenting with transmissions on this new wave-length, the most prominent among them being G 2 F N, G 2 K F, G 2 N H, G 2 O D, G 6 H P, G 6 L L, G 2 C X, G 6 Q B.

PROVIDING A CHOKE OUTPUT.

R. P. C. (Brussels).—"I have become possessed of a low-frequency choke and I should like to use this for a choke output if you can tell me the correct position for this. Am I right in thinking it is better to use a choke output than to connect the loud speaker direct in the plate of the last valve?"

Yes, we certainly recommend the adopting of choke output, provided that your choke is a fairly "hefty" one capable of carrying the plate current of the last valve without introducing too much resistance, and without saturation (20 henries is a suitable value). If it is a fairly large and heavy choke you can try it as a choke output filter in conjunction with a large fixed condenser.

This condenser should, preferably, have a capacity of several microfarads, but generally one mfd. will serve; and, at a pinch, even a 5 mfd. will give results, although the quality is not so good as with

(Continued on page 1074.)

The Easy Way TO PERFECT RADIO

In addition to their own extensive range, PETO-SCOTT offer YOU Every Known Radio Receiver or Component—all on EASY TERMS

The Peto-Scott Easy Way at last solves your Radio difficulties. Every article known in radio to-day may be obtained on Easy Terms from Peto-Scott, and all leading makes are stocked. In addition, the Easy Way also is available for all kits of parts for Home Construction of sets advertised by leading valve makers and publications, and all "Popular Wireless" sets. Here are a few examples: **COSSOR MELODY MAKER.** Send only 10/-, balance in 11 monthly instalments of 14/7. **MULLARD MASTER THREE Star.** Send only 10/-, balance in 11 monthly payments of 15/3. **LEADING MAKES' OF H.T. ELIMINATORS** from 4/7 down and balance in 11 monthly payments of 4/7. **ULTRA DOUBLE ACTION AIR COLUMN LOUD SPEAKER.** Send only 8/3, balance in 11 monthly payments of 8/3. **BRANDESET 3.** Send only 15/4, balance in 11 monthly payments of 13/4. **PHILLIPS 2-VALVE A.C. MAINS RECEIVER.** Send only 12/3, balance in 11 monthly payments of 12/3. **AMPLION LION LOUD SPEAKER.** Send only 11/-, balance in 11 monthly payments of 11/-. Mail this coupon now in 3d. stamped envelope.

To PETO-SCOTT Co., Ltd., 77, City Road, London, E.C.1
Please send me your big illustrated lists.

Name
Address P.W. 26/1

62, HIGH HOLBORN, LONDON.
4, MANCHESTER ST., LIVERPOOL.
33, WHITELOW RD., CHORLTON-CUM-HARDY, MANCHESTER.

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RADIO PRODUCTS

THE NEW BULGIN MULTI-COIL

(Patent applied for.)

The choice of critics

COVERS ALL WAVELENGTHS FROM 250 TO 550 METRES AND 1,000 TO 2,250 METRES BY OPERATING A PUSH-PULL SWITCH.

Scientifically designed in accordance with modern practice, wireless experts in all parts of the country are unanimous in praise of this New Unit. The range, selectivity and smooth control of reaction have won instant popularity.

It is centre tapped on both ranges and entirely dispenses with plug-in coils. Used with great success in all "Hartley" Circuits. One-hole fixing, and only 3 terminals to connect.

PRICE 15/6 EACH

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Phone: HOLBORN 2072.

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A Plywood Clamping Washer included with each complete set.

For Various Balanced Armature Speaker Units. The Frame is ready to take Blue Spot, Tritron, Bullphone and G.E.C. Units, &c., which are secured rigidly and DIRECT to ALUMINIUM CRADLE or CHASSIS. Setting remains constant and speaker will take full output from set without chatter.

CRADLE FRAME ONLY, ready to receive various units - 12/6

Designed to give easy access to adjusting nuts on Driving Rod of unit.

CONE KIT, comprising 1 1/2 in. Kraft Diaphragm (forming 9) in. Cone, 4 Suedlin Segments, 1 Card Ring, all cut to size ready for 2/6 mounting

INSIST ON THE GENUINE SQUIRE CONE KITS, IN LABELLED ENVELOPES

Guaranteed Moving Coil Speaker Resemblance.

The Finest Reception can be obtained from the "Titan" Three with this type of speaker.

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"GOLSTONE" MULTI-STRAND ASTRA WOUND COILS are superior to others owing to greater self-capacity. Thus ensuring: **Increased Volume, Improved Selectivity, and added range of reception.**

SHORT WAVE (250-600 m.) **10/-** per pair
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From all first-class Radio Stores—Refuse Substitutes. If any difficulty write direct.

Radio Catalogue R.119 A.P.W., sent FREE on request.

Ward & Goldstone
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DON'T BE CAUGHT—NAPPING—NOW IS THE TIME TO BUY REALLY FIRST-CLASS EUREKA TRANSFORMERS.

We have no old stocks to dispose of, every instrument is of 1929 manufacture and supplied with a "Money-Back" Guarantee if dissatisfied. Being the actual makers we are able to supply ANY model.

NOTE OUR PRICES compared with usual charges:—

	Ratio	OUR PRICE	Old Price
Concert Grand 1st Stage	(4-1)	10/6	21/-
" " 2nd "	(3-1)	9/6	21/-
Baby " 1st "	(4-5-1)	8/6	13/6
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As good as EUREKA TRANSFORMERS have been our 1929 Model is infinitely BETTER and with our REDUCED PRICES it is IMPOSSIBLE to get better VALUE FOR MONEY. REMEMBER—Out-of-date components are often VERY EXPENSIVE even as a GIFT. DON'T DELAY—Try One, or Two.

Remittances To-day—Goods Delivered To-morrow.

If you have an old EUREKA TRANSFORMER which is beyond further service, let us fit our UP-TO-DATE winding, IT WILL PAY.

Sole Manufacturers: **L. PERSON & SON,** Phone: 63, Shaftesbury St., London, N.1. Clerkenwell 7139.

SCOTT'S ALL-WAVE EBONITE TUNER

Price Now ONLY 13/6 Post Paid

"P.W." Test Report, May 12th.

"On test we found this unit covered the wave-length range claimed—i.e., 180-2,000 metres—reaction control being quite satisfactory throughout. It is nicely made, more robust than the majority, and can only be regarded as an economical proposition at 15/-."

A similar report was published by "Amateur Wireless," June 16th, and "Wireless World," Oct. 10th.



Constructional Details.

Wound with green silk wire on a polished ebonite tube; switch and variable reaction combined; nickel plated parts. Size, 4 1/2 ins. x 3 1/2 ins.

Supplied with wiring diagram, drilling template and instructions. If your dealer does not stock this Tuner, send direct to the manufacturers. Cash with order or G.O.D. All orders despatched same day as received.

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 TRADE SUPPLIED. Phone: Brixton 1504.

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No Acid to Spill

in the ENTIRELY NEW

"GEEKO"

"U" TYPE

LOW TENSION UNSPILLABLE ACCUMULATOR

with plates totally enclosed in

SOLID ELECTROLYTE

The Ideal Accumulator for PORTABLE SETS


Cat. No. 0.480
 2 volts
 20 amps. (actual)

PRICE: **25/-**

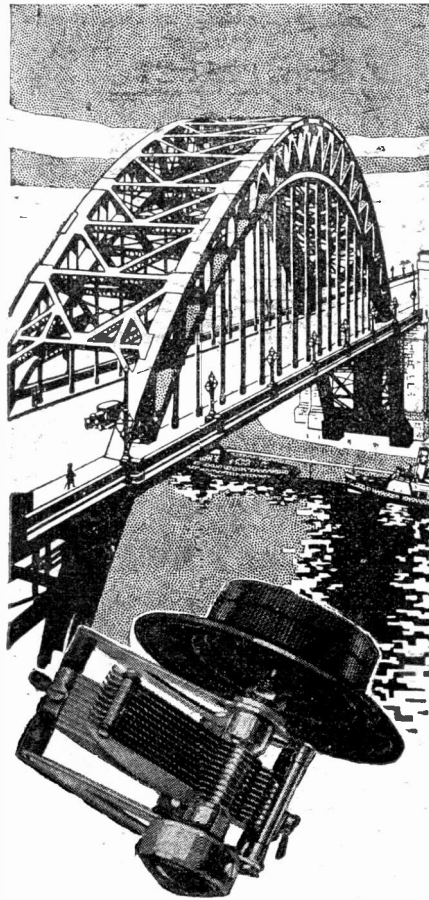
GUARANTEED FULL CAPACITY IN ANY POSITION

Sold by all Wireless dealers

MADE IN ENGLAND



Made by The General Electric Co., Ltd., Magnet House, Kingsway, London W.C.2.



ENGINEERING PRECISION.

Brestriding the Tyne like a Colossus, this inspiring new bridge leaps the great waterway in one span, a perfect example to Newcastle—and indeed the world—of the skill and precision to be found in twentieth-century engineering.

No less worthy examples of craftsmanship are to be found in the products of J.B. Infinite care and accuracy, and a flair for turning a good design into a perfect one, have raised J.B. precision instruments to an unassailable position of good repute.

The J.B. New type Slow Motion Condenser (Ratio 40-1) is really a wonderful job. The height of the Verrier Knob and Dial is less than that of last year's model, but the new arrangement provides remarkably convenient control, and is vastly improved in appearance. Completely enclosed in dustproof mechanism—a real protection from accidental damage. Tension of friction mechanism adjustable. Absolutely silent on short waves. Every possible precaution has been taken to prevent wear.

Prices : S.L.F.	Prices : LOG.
·0005 14/6	·0005 14/6
·00035 13/6	·0003 13/6
·00025 13/-	·00025 13/-
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PRECISION INSTRUMENTS

Advt. of Jackson Brothers, 72, St. Thomas' Street, London, S.E.1. Telephone: Hop. 1837.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1072.)

the larger sizes. The connections are very easily arranged.

All that is required is to connect the low-frequency choke across the terminals which at present carry the loud-speaker leads. The loud speaker leads should be disconnected and joined up to new terminals.

One of these new L.S. terminals should be joined to the L.T. negative. The remaining L.S. terminal should be joined to one side of the now fixed condenser. The other side of this new fixed condenser should be joined to the wire which now connects the plate of the last valve to the low-frequency choke.

On switching on you will find that your loud speaker is fed from the set, even although it is in series with the large fixed condenser, and the whole of the plate current of the valve is now passing through the L.F. choke. Do not forget that, owing to the removal of the plate current from its winding, the loud speaker may require readjustment when fitted to the choke circuit.

WAVE-METER WORRIES.

G. C. BLYTHE (Northumberland).—“A friend of mine sent me a home-made wave-meter for a Christmas present, but I think he has made it a bit too strong. When I switch it on, although I cannot hear it by ear, or can only just hear it when listening carefully, it gives rise to a very loud sound in the telephones and is not sharp.

“Instead of only just being able to hear it on the wave-length to which it is set, I can hear it quite strongly about a third of the way down the dial, and very, very strongly at the point where the set comes into tune. It is too strong to be of much use in searching for distant stations because it does not give an exact wave-length, but only an approximation. Is there any way of toning it down?”

Apparently the whole trouble is due to the fact that you are standing the wave-meter too close to your set. Try taking it out of doors altogether or placing it a couple of yards or so away from the aerial.

Probably you will find that, if placed thus, the reading obtained will be quite a sharp one; but, if necessary, you can alter the distance from the aerial so that the actual position of the wave-meter is convenient for use and adjustment, and it transmits at a convenient strength into your receiver. When loosely coupled in this way a buzzer wave-meter generally affords a very sharp and satisfactory indication of the wave-length to which the receiver is tuned.

THE LOW-TICKING FRENCHMAN.

A. S. (Greenwich).—“As I am learning to speak French I am interested in these transmissions, and recently I came across a new one which I should like you to identify, if you can. The wave-length is almost exactly that of Goteborg (before the Brussels alteration). After Goteborg had switched off the other night I heard this Frenchman talking, and although I could not catch the words (jamming was bad, as usual, in this part near the river here), I noticed that in the intervals between speech there was a very low ticking clock. As the strength of reception was quite good I should like to listen for this station, if I can find out who it is.”

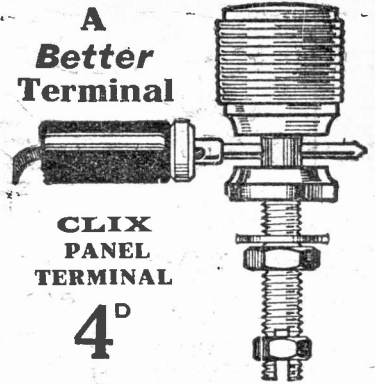
Apparently you heard the new Moroccan station, Radio-Maroc Rabat, which has recently been sending programmes in the evenings on a wave-length of

(Continued on page 1076.)

MAKE YOUR OWN HIGH-TENSION ELIMINATOR AND ALL-POWER UNIT.

RADCROIX.

Mains Unit Components.
Guaranteed output 200 volts 30 m/a.
COMPLETE KITS OF PARTS FOR:
H.T., A.O. Unit, 6 Variable Voltages £2 17 9
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Wiring Diagrams free. State A.O. or D.O.
From your dealer or direct from.
THE WHOLESALE WIRELESS COMPANY,
103, Farringdon Road, London, E.C.1.
Telephone: Clerkenwell 5312.



Better in many ways. It takes Spade, Pin or bare wire connection quickly and gives perfect contact. Has polished insulated knob with metal inserts. The non-soldering wiring device gives excellent contact and makes assembly easier. Is highly nickel-plated and improves the appearance and performance of any receiver.



PRICE 2d. EACH
Ask your dealer or write for the Clix Catalogue
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“RED DIAMOND” WALL PLUG

No. RD 29
Solid Ebonite. Highly Finished. Perfect Insulation. Two size plugs and sockets so that it is impossible to insert plugs in reverse.
2/-
Or by insured post 2/3.



Of all high-class Radio Dealers, or Sole Makers:
JEWEL PEN CO., LTD.,
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SUPPLY YOU WITH ALL COMPONENTS TO MAKE YOUR OWN SET ON **EASY TERMS**
EVERYTHING WIRELESS
COMPONENTS FOR ALL “P.W.” CIRCUITS
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COMPLETE SETS OF ANY MAKE
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BEST MONTHLY TERMS
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GOODS SENT C.O.D. BY RETURN.
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PLEASE MENTION “POPULAR WIRELESS” WHEN REPLYING TO ADVERTISEMENTS.

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CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker Guaranteed to give results equal to the most expensive Loud-Speakers yet made.

Full constructional details with each Unit.

GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement or the famous Bullphone Nightingale Loud-Speakers. Cobalt Magnet guaranteed for all time.

With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full power Loud-speaker, giving a wealth of pure, undistorted volume which must be heard to be believed.



15/-

SATISFACTION GUARANTEED or money refunded!

AS FITTED TO OUR £8 POST HORN

BUY ON EASY TERMS

5/- Secures this Speaker

The Nightingale "DE LUXE"

50/- CASH

or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell, Mahogany finished with plated arm and stand.

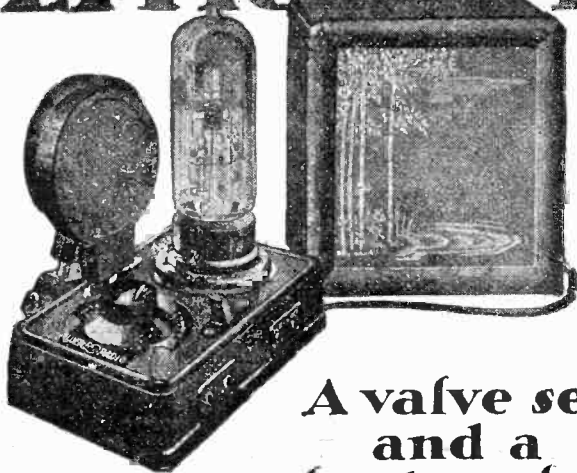
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EFFICIENCY



A valve set and a loudspeaker

The 3 in 1 Set

The PIONEER SET of CHEAPER RADIO

The famous Loewe Radio Multiple Valve used contains Three Complete Valve systems in ONE valve. and all the necessary coupling elements of a 3-valve set.

PRICE Complete with Loewe Radio Multiple Valve, type 3 N.F. Special cable with wander Plugs and Spade Terminals attached ready for connecting to H.T. and L.T.
£3 - 3 - 0
Royalty Paid
(Coils not included)

A marvel of ingenuity and efficiency, giving loud-speaker results of excellent volume and purity.

Use a LOEWE RADIO CONE SPEAKER

with your Loewe Set for retaining the full purity of reproduction and a clarity that is unexcelled. Artistic appearance. Silk front. Mahogany finish.

The finest loud-speaker value obtainable at . . . 50/-

Obtainable through all dealers. For illustrated leaflet write:-



The Loewe Radio Co., Ltd.,
4, Fountayne Road, Tottenham, London, N.15
Telephones : Tottenham 3911/3912

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1074.)

414 metres. Although situated in Africa the station announces in French and follows the usual French procedure; Morocco, of course, being under French protection.

AN ALL-WAVE H.F. UNIT.

It is regretted that owing to a shortage of space the article giving further details of the All-Wave H.F. Unit—described in last week's issue of POPULAR WIRELESS—has unavoidably been held over to make room for the important article by the Technical Editor on "Film Talks by Radio."

Constructors of the All-Wave H.F. Unit and all others interested will, however, find the article in next week's issue of "P.W."

THE SUPER SET.

S. M. G. (Northampton).—"My straight three-valve set has been such a success that this time I am going to construct a super four-valver. What I had in mind was two screened-grid high-frequency valves, detector and pentode, so can you give me a good circuit for these?"

Although we can give you a circuit of this kind, we would very much rather not do so, for when dealing with screened-grid and pentode valves the amplification obtainable is so high, and considerations of layout, circuit and H.T. values become so important that only an experienced set designer could build up such a set from a theoretical diagram with any prospect of successful reproduction.

The fact that you have had several sets up to three valves going well has probably given you sufficient skill and experience to enable you to tackle

A FREE BLUEPRINT

of an outstanding receiver

The "Titan" Three

is being presented to "P.W." readers with

NEXT WEEK'S "P.W."

a straightforward ordinary four-valver with every prospect of success. For instance, if you had a neutralised H.F., detector, and two L.F. (say, resistance-transformer coupled) stages, we should expect you to have no difficulty.

The case is entirely different when screened-grid and pentode valves are introduced. Even with a complete theoretical diagram, with all necessary H.T. values, etc., we expect you would find the greatest difficulty in getting quality reception, and your best plan is to watch POPULAR WIRELESS, "Modern Wireless," and the "Wireless Constructor" for a full description of a set which meets with your requirements as regards range and selectivity; or, if you like to give us further details of the requirements you have in mind, we will recommend a set fulfilling these.

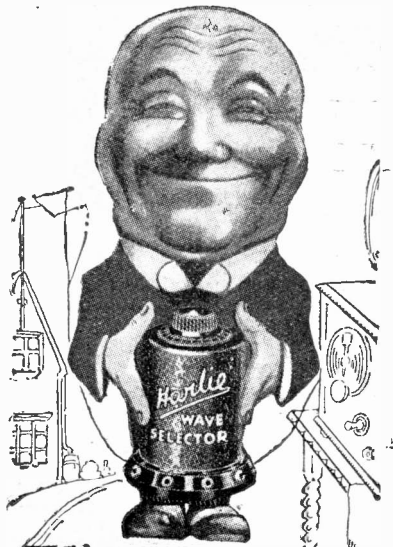
We will, of course, supply a theoretical diagram if you wish it; but, frankly, we would rather not do so, because we are certain that it would cause you more trouble than pleasure in the making.

FITTING A FUSE.

D. C. M. (Bristol).—"My chum has had the nasty experience of burning out three valves, so in order to prevent anything of the kind on my set I want to put in a fuse, and I understand that I can use a flashlamp bulb for this. Will a low-consumption flashlamp bulb be quite O.K., and if so where do I insert it?"

A low-consumption flashlamp bulb of the type you mention is quite O.K. to act as a fuse in such circumstances, on account of the fact that it will blow before enough current flows to fuse the valves if the H.T. supply is accidentally shorted across them. It is very easy to add such a fuse, the best place for it being between the H.T. negative and L.T. negative terminals.

If you examine the set you will probably find that these two are joined together by a short, straight wire, and this should be broken and the fuse inserted in series here.



**Why Worry
about buying a
new Set when
for 12/6 you can
make your present
Set as selective
as the most
modern receiver**

No matter what type of set or aerial you may have, the "HARLIE" WAVE-SELECTOR will definitely cut out the unwanted station, bring in stations—home and foreign—clearer and with greater volume, and also bring in stations hitherto unobtainable.

This ingenious device, which caused a sensation at the Manchester Exhibition, is selling phenomenally and is producing astounding results in all parts of the U.K. Numerous testimonials have been received and these can be seen on request.

4 1/2" high, 3 1/2" diameter. In finest grade black crystalline finish throughout.

NO ALTERATION TO SET—JUST PLUG AERIAL INTO SOCKET PROVIDED. FULL PARTICULARS ARE GIVEN.

£100 Guarantee.

If the "Harlie" Wave-Selector proves unsatisfactory, and is returned to us within 7 days of purchase, your money will be returned in full, providing it is purchased direct from us. A similar arrangement can be made with your dealer.

2 MODELS SUPPLIED

- (a) Normal Waveband, 200-700 metres.
 - (b) High Waveband, 700-2,000 metres.
- Please state model required when ordering.

If unobtainable, either model will be sent on receipt of 12/6 or per C.O.D. upon receipt of postcard.

"HARLIE" WAVE-SELECTOR

Dept. C,
HARLIE BROS.,
Balham Road, Lower Edmonton, N.9.

Finished in black or beautifully grained mahogany.



**neat-
accurate and
inexpensive**

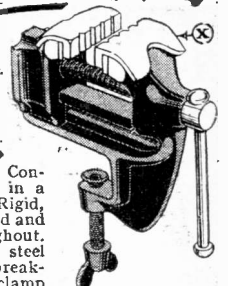
Watch for Brownie's latest triumph in artistic moulded Bakelite—"The Dominion Vernier Dial." Special non back lash slow motion drive gives very accurate tuning, while the action will fit any condenser and the new design of the dial will enhance the appearance of every set. See this latest Brownie production at your nearest radio dealer.

BROWNIE WIRELESS

"DOMINION" VERNIER DIAL
The BROWNIE WIRELESS COMPANY (G.B.) Ltd.
MORNINGTON CRESCENT, LONDON, N.W.1

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is a capital
Table Vice
WIRELESS WORK



It gives a Wireless Constructor a workshop in a moment—anywhere. Rigid, accurate, finely finished and British Made throughout. Fitted with accurate steel screw, detachable unbreakable jaws. Ample clamp clearance. Jaws: Width 2"; Opening to screw 1 1/2"; clearance to screw 1 1/2". Price 3/9 post free.

Supplied also with detachable White metal Grips, see "x," to hold rods and screws without damage. Price complete with Grips 5/- post free. Cash with Order. Money refunded if not fully satisfied.

Trade enquiries invited.
The STAR FOUNDRY Co., Ltd.,
Vice Manufacturers, BILSTON, Staffs.

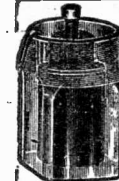
Direct from the makers. R.H.S.

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The first firm to supply Wireless parts on easy payments. Five years advertiser in "Popular Wireless." Thousands of satisfied customers. Send us a list of the parts you require, and the payments that will suit your convenience, and we will send you a definite quotation. Anything wireless. H. W. HOLMES, 29, FOLEY STREET, 'Phone Museum 1414. Gt. Portland St., W.1.

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Solve all H.T. Troubles.
SELF-CHARGING, SILENT, ECONOMICAL.
JARS (waxed) 2 1/2" x 1 1/2" sq. 1/3 doz.
ZINCS, new type 1 1/4 doz. SACS 1/2 doz.
Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d.
Sample unit, 6d. Plus booklet free.
Bargain list free.
AMPLIFIERS 30/- 2-VALVE SET 24.
P. TAYLOR, 57, Studley Road,
STOCKWELL, LONDON



Player's Please



REGD N° 154011.

N.C.C 207

THE 100% Broadcast Receiver

BUILD and OPERATE in ONE EVENING

FORMO
PATENT SCREEN & GRID
"Screened Grid"

Obtain a Broadsheet from your dealer and read why you should—
Completely Screen the Grid

EXTRACT FROM LETTER RECEIVED.

"I have recently assembled one of your Screened Grid Three Wireless Sets, and though I have been a Wireless enthusiast for many years, long before the days of the British Broadcasting Company, and have tried hundreds of different makes of Sets, I have never had such satisfactory results as I obtain from this comparatively inexpensive Set.

"I find the volume and purity remarkable. All the chief Continental Stations come in at good strength and remarkably clearly."

The above is one of many UNSOLICITED TESTIMONIALS.

Send post card for **FREE FULL-SIZE LAYOUT PLAN** and wiring instructions

THE FORMO CO.,
Crown Works, CRICKLEWOOD LANE, N.W.2

FREE ADVICE

for all our clients **BUY THE EASY WAY, a SMALL FIRST PAYMENT BRINGS PERFECT RADIO INTO YOUR HOME NOW** Established before broadcasting started in this country, we are able to give advice that is sound and of inestimable value.

- A FEW OF OUR WONDERFUL OFFERS:
- CELESTION C.10** loudspeaker, 9/9 now and 9/9 monthly.
 - BROWN MOVING COIL** loudspeaker, 15/6 now and 15/6 monthly.
 - COSSOR MELODY MAKER KIT**, complete with valves in maker's sealed carton, 13/3 monthly.
 - DUNHAM A.G. MAINS UNIT**, output 150-v. 20 m/a, £5/18/6, or 10/- now and 10/- monthly.
 - DUNHAM LONG-RANGE 3 VALVE SET**, in handsome cabinet with compartments for all batteries. **LEGAL PROOF** given that actually

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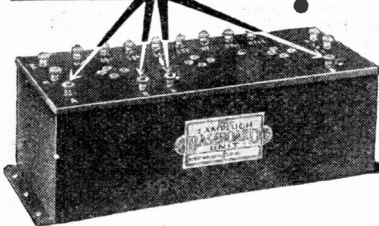
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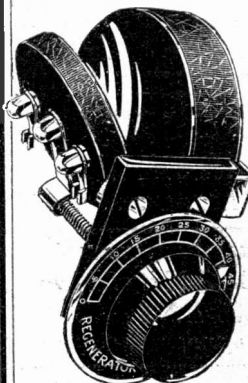
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SHORT-WAVE NOTES.

By W. L. S.

THE past week or so has seen a great improvement in the general conditions for short-wave DX reception from all parts of the world, and it is to be hoped that the abnormally long spell of really bad conditions that we have been experiencing ever since last June or July will be amply compensated for when things get into their stride again.

The outstanding feature of this particular spasm of good conditions has been the great number of signals from Asia, whence they are usually very scarce. Those interested in amateur C.W. reception will doubtless have heard by now VSICB, a British ship at Hong Kong. He comes through night after night at good strength on 41 metres or so, his best time being about 6 p.m. G.M.T.

A Peculiar Phenomenon.

Then there are the little crowd of active stations in the Philippines, another new station, PK4AZ in Sumatra (Dutch East Indies) and XW7EFF off Singapore, the latter being an American boat.

I have heard several faint broadcasting stations on the 20-metre band which I have not been able to identify, but when I get my new set with two stages of screened-grid going, I hope that I shall never have to make this confession again!

An Australian reader is interested in my remarks some time back about a friend who lights an electric lamp in another bedroom (in a remote part of the house) when he switches his 10-watt transmitter on. He asks for full details.

Well, "W. H. C." I am sorry if I misled you, but the phenomenon referred to was an entire accident! My friend was not at all pleased with himself over the business, as, if he wanted to burn the midnight oil over some transmission stunt, he suffered badly from the other phenomenon known as "domestic Q.R.M." owing to the undesirability of having one's bedroom light sending Morse at one when one wants to sleep!

Success of 5 S.W.

The only explanation I can offer is that somewhere or other in the wiring of that particular part of the house circuit was a loop that was resonating at approximately 45 metres. The same gentleman hands a nice bouquet to 5 S.W., which is, he says, a wonderful station, and better than any other S.W. station he has heard.

Another reader calls me to task about my remarks on "W2XAD" as being the correct call-sign for the well-known American. He informs me that they have been calling themselves "W2XAD" for months!

Sorry, but I so seldom listen to him for more than five minutes that I haven't heard him give his 'call-sign' at all for a very long time.

5 S.W. ought, of course, by the terms of the Washington Conference, never to allude to himself as anything but "G5SW." The "G" is part and parcel of the call-sign.



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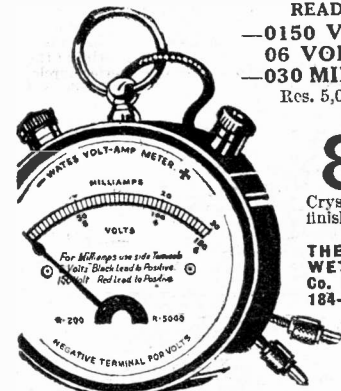
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CORRESPONDENCE.

CUTTING CONES

CRYSTAL RECEPTION—A "P.W." LOUD SPEAKER.

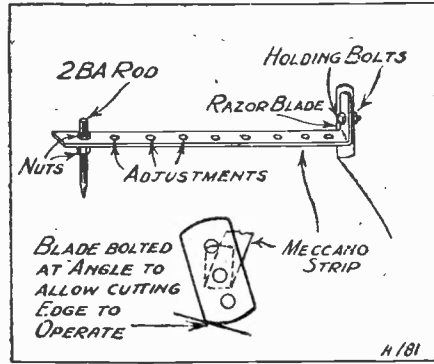
Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

CUTTING CONES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I, being a reader of your paper, have commenced to construct the Loud Speaker No. 3, the "P.W." (Chassis Model). I wish to bring before you, in the hope that you put it before your readers, an idea for cutting the cone.

Take a strip of Meccano and in one end put a piece of 2 B.A. screwed rod, pointed at one end. Fix



this by means of a nut top and bottom. Next bend the other end of strip up and fix a used razor blade, forming a cutting knife. Then adjust the gadget to what size circle you require and, while scribbing the circle, the razor will cut the paper, giving a perfect circle. Trusting you will think this idea suitable for your paper.

Yours truly, J. L. GRIFFITHS, Herne Hill, S.E.21.

CRYSTAL RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—It is an amusing fact that, almost invariably, when a reader writes to "P.W." on the above subject he preambles with information to the effect that though the owner of a multi-valve set, he occasionally "plays about" or "messes with" a crystal, to entertain the kids, or kittens, or because his grandmother is afraid of an explosion in a high-tension battery.

May I, therefore, on behalf of less ashamed, or apologetic crystal users, herald the fact that I abandoned the valve for the "humble crystal" six years ago and that "since then" I have never regretted it? I must add that this amazing act is greatly due to "P.W.," which, at the time, published a method of using two crystals as rectifiers. Unfortunately, this method was technically damned in a following issue by a destructive critic. Six years' test has, however, more than vindicated the "P.W." invention. The circuit in which the twin crystals are employed has never been published and never will—because it is too good to appear true.

"GRAND KNIGHT OF THE WHISKER."

A "P.W." LOUD SPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am a regular reader of your journal, but do not often write to praise your good work.

However, I have been following particularly your designs lately on home-made loud speakers. I have just made up No. 3 (December 15th) and am really pleased with the results obtained.

I was not able to obtain "Kraft" paper, but used "Bristol Board" instead.

First of all I tried four-sheet, but found it muffled on speech; then I tried the two-sheet and this thickness seems to be perfect for both speech and music, the quality being wonderful as used with Det., 1 R.C. and one transformer-coupled set.

I used the adjustable Blue Spot unit and a sheet of chamois leather for the suspension, the baffle board of 4mm. plywood 1 1/2 in. square, and wooden supports for the unit.

The whole instrument as made up I found to be very sensitive and more than I expected it to be, and I believe it gives louder results than an A R 19 Horn, and that is sensitive, as you know.

Thanking you for publishing such good designs. Yours faithfully, A. N. MARTIN.

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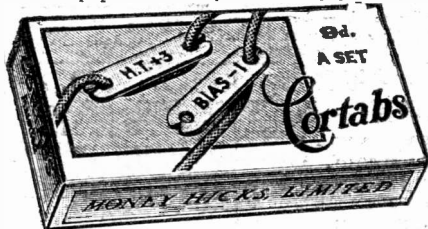


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TECHNICAL NOTES.

(Continued from page 1052.)

aspects of this subject by other contributors have been printed in this paper from time to time.

I would just like to deal in a general way with two or three of the leading points which frequently arise in letters from readers.

Amplification.

The first one, and the one which is most generally raised, relates to the amplification factor. The simplest way to understand what is meant by amplification factor is to imagine a definite change to be made in the voltage applied to the grid of the valve; if an H.T. battery is connected to the anode of the valve and a current is flowing between anode and filament, this change in the potential of the grid will naturally cause a change in the current which is flowing.

But you can look at the matter in another light and you will have no difficulty in agreeing that if the voltage of the grid had remained unchanged, the same alteration in the current flowing through the valve could have been brought about by a suitable alteration in the H.T. voltage applied to the anode.

A Simple Explanation.

Here, then, we have the simplest possible explanation of amplification factor, and we

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may say that the amplification depends upon the voltage-change of the grid and the corresponding voltage change of the anode which should have the same effect upon the current flowing through the valve, the amplification factor being the ratio of the latter to the former.

This is sometimes expressed by saying that the amplification of the valve is the number of times by which the changes of the grid voltage are magnified as voltage changes in the anode.

High Factor.

Without any further explanation than the foregoing, you would conclude at once that it was desirable to employ in all cases a valve having as high an amplification factor as possible, since it is primarily the purpose of the valve (with the exception of the detector) to amplify the signals.

This brings us to the point I referred to above, and that is the fact that the characteristics of the valve depend upon other conditions as well.

An Illustration.

If the valve is to handle fairly heavy signals the large voltage amplification may be of little use. Perhaps I could illustrate

(Continued on next page.)



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TECHNICAL NOTES.

(Continued from previous page.)

this in a very rough way (not to be taken too literally) by comparing with an induction coil which, as you know, is commonly used for producing very high potentials.

You might imagine that with electrical current delivered from the induction coil at a voltage of, say, 50,000 volts and passed to any ordinary outside circuit, a tremendous current would flow, proportional to the voltage. The fact is, however, that nothing of the kind occurs in practice, for the very simple reason that the total energy available is limited and the high voltage is only maintained so long as the external circuit has a resistance which is fairly high compared to that of the induction coil itself.

If the "load" applied to the secondary of the induction coil is too heavy, it simply means that the high voltage in question is not generated or, perhaps to express it more correctly, is immediately pulled down to a very much lower value.

Going back now to the question of amplification factor, you will see that the mere fact that the valve has a high amplification factor does not necessarily mean that it will be suitable for the amplification of any particular signals.

Impedance.

For heavy signals it is necessary to have a correspondingly heavy anode current, and this requires that the impedance of the valve shall be reasonably low. Now a low impedance usually means a fairly low amplification factor and we are driven back eventually to a compromise between a high amplification factor and a high impedance on the one hand and a low amplification factor and low impedance on the other hand. Our object must be to choose a valve which has as high an amplification factor as possible, consistent, however, with as low an impedance as can be obtained.

For resistance-capacity coupling it is particularly desirable to have high amplification and fairly low impedance, since with this method of coupling the voltage step-up which is obtained with transformer coupling is not available.

An Acid Test.

I was recently asked by a reader why rubber carrying-handles are sometimes used for accumulators rather than leather. The answer is a very simple one—that the carrying handle is almost certain to be contaminated with acid sooner or later, and in the case of a leather handle this is apt to lead to rotting, with the obvious possibility of trouble sooner or later with the accumulator being dropped upon the carpet. A rubber handle is practically proof against this kind of trouble. Usually, in order to give added strength, the so-called rubber handle consists of several layers of fabric covered in vulcanised rubber after the fashion of a motor tyre.

Personally, I think that a metal or wooden handle is, in any case, preferable to either of the above-mentioned.

Corrosion.

Corrosion of accumulator terminals, once it starts, is often very difficult to cure. If a battery is left unattended for a long period you will sometimes find that one of the

(Continued on next page.)

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TECHNICAL NOTES
(Continued from previous page.)

terminals will be completely corroded, and instead of a metal terminal you will find a nice little mound of pale green powder.

If matters have gone so far as this there is nothing but to remove the remains of the corroded terminal and to screw in or sweat in a fresh terminal. The latter, by the way, is rather a ticklish job requiring a certain amount of experience in lead soldering, and if the damage is considerable and the accumulator a valuable one, it is better to return the battery to the manufacturers for repair.

Prevention and Cure.

Prevention in this matter is very much better than cure and, in addition to keeping the exposed metal parts covered with a thin layer of vaseline, you should keep a look-out for the start of corrosion and correct it immediately by applying a little of a strong solution of washing soda or ammonia. (This may conveniently be done by means of a very small brush.)

Output Filters.

Should a choke filter be included in the output of a set? This is a question which, though often asked, depends (like so many other radio questions) largely upon circumstances. The output filter has the effect of allowing the signal impulses which corre-

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spond to the speech or music to pass to the loud speaker by way of a condenser which keeps out all else.

Now if we are using only a small power valve in the last stage it is, as a rule, fairly safe to connect this directly in circuit with the loud speaker, since the latter will generally be proof against any possible damage by the current from the small power valve.

"Super Power."

If, however, the set is one which delivers such a signal volume that the "small power" valve referred to above has to be replaced by a valve of the super-power variety, it becomes an important question whether an output filter should not be used, and this on account not only of the heavier current but also of the actual mechanical (magneto-mechanical) effects produced in the loud-speaker unit.

L.F. Oscillation.

If the heavy anode currents are passed through the low-resistance windings of a suitable filter-choke, then, as I have already mentioned, only the signal impulses reach the loud speaker.

The separation of the steady anode current from the signal impulses by means of the choke filter circuit often has the effect of stabilising a set which is otherwise liable to troublesome low-frequency oscillation.

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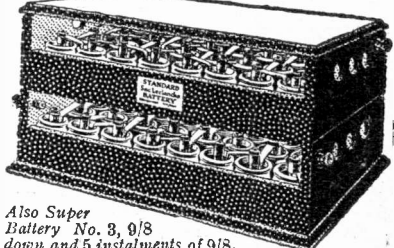
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THIS week's design is for a mains H.T. unit of a particularly well-smoothed type. It works from A.C. mains (of any voltage, provided the correct transformer is obtained) and the filtering arrangements are so thorough that the output is practically indistinguishable from that of a good

THE "P.W." "WHITE PRINTS."

A NEW SERVICE FOR OUR READERS.

White Print No. 8. :: :: An A.C. Mains H.T. Unit.

This week we publish the eighth of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the White Print filed. In due course you will thus have available an encyclopaedic collection of the best circuits used in modern radio practice. A "White Print" will be published on the last page every week in "P.W." until further notice.—THE EDITOR.

and wander leads with battery plugs are provided for the necessary control. Other makes may be found to have small terminals or tags, and for these tappings clips will be desirable.

The unit is provided with four output terminals, of which one is the negative and three are positives. One of the latter (H.T. +3) is a fixed

new battery. The circuit is practically a standard arrangement so far as the rectifying portion is concerned. A power transformer of the usual type is required, having two secondary windings, both centre tapped. One of these is a low-tension winding which lights the filament of the special rectifier valve, the actual voltage output required depending upon the particular type of valve used.

For example, for the Marconi or Osram U.5 rectifier a winding of a 5 to 6-volt rating is required, to supply about 1½ amps. The other main class of rectifier is the 4-volt one, examples being the Mullard D.U.2 and the Cosmos S.P.42 U., and here you want a winding supplying a current of about 2 amps. at 4 volts (Cosmos) or 1 amp. at 4 volts (Mullard). Whatever make or type of valve you choose note that it must be of the full-wave variety.

The high voltage secondary supplies the actual H.T. current, and the voltage here fixes the maximum output voltage of the completed unit. This, of course, depends on your own particular requirements, and requires a little consideration before you order your transformer.

Choosing Your Transformer.

For general purposes with ordinary valves an output voltage (maximum) of 140 to 160 volts is ample, and to get this you want a transformer with a high-tension secondary giving 150 volts on either side of the centre tap. This is usually described as a "150-0-150" volt winding. For larger power work, where your last valve will stand a high voltage a transformer rated at 250-0-250 volts for the H.T. winding should be chosen. In any case, be careful to specify the voltage and frequency of your mains when ordering.

Just a word of explanation of this part of the circuit diagram. You will see that the rectifier valve has two plates, and in the middle a dotted line to represent the filament, with a connection to the low voltage winding on the transformer from each end. The two plates are wired to the extreme ends of the high voltage winding.

The actual connections of the valve base are these: the filament is wired to the usual filament pins, while the two plates are connected to the plate and grid pins. The centre tap on the L.T. winding of the transformer forms the positive

voltage terminal giving the full maximum voltage of the unit, and is intended for supplying the L.F. valve or valves.

The other two terminals (H.T. +1 and H.T. +2) are variable as to voltage in steps. You will note that each is wired inside the unit to a flex lead carrying a wander plug, and by placing these plugs in suitable sockets on the potential divider you can get the desired voltage regulation. For example, if the maximum voltage of your unit is about 200-220 volts the plug for the H.F. valve should be put in a socket near the middle of the divider, and will then give the necessary 100-120 volts for this stage. The one for the detector should go in a socket somewhere between this point, and the negative end (nearest to H.T. -) the exact best point being determined in the usual way (smoothest reaction).

Leads are taken from these two points to the smoothing filter circuit, which you will see is an unusually thorough one. It consists of two smoothing chokes in series and several large capacity reservoir condensers. By the way, don't make the mistake of using ordinary low-voltage Mansbridge condensers here. They must be of the high-voltage type, with a rated working voltage of at least 250 volts.

After leaving the filter circuit the rectified and smoothed current, which is now practically pure D.C., is applied across the

COMPONENTS.

- 1 Panel, 8 in. × 7 in. × 3/16 in. or 1/4 in.
- 1 Cabinet, with baseboard 14 in. deep.
- 1 Power transformer rated to suit your mains (A.C.) and with centre-tapped H.T. and L.T. windings (see text).
- 1 Valve socket.
- 2 L.F. smoothing chokes of good make.
- 4 2-mfd. reservoir condensers, minimum rating 250 working volts.
- 1 8-mfd. ditto.
- 1 Potential divider (see text).
- 4 Insulated terminals.
- 2 Battery plugs, wire, flex and adapter for connection to mains, screws, etc.

ends of a device known as a "potential divider." This is simply a large and robust tapped resistance of a special type made for eliminator work which is connected up potentiometer fashion, with its two ends right across the circuit. Intermediate voltages can thus be tapped off it at various points as desired for the different valves in the set.

A suitable resistance for this component is 15,000 to 25,000 ohms, and quite a number of different makes are available. In the one illustrated a row of sockets along the top represents the various voltage tappings,

Preventing Motor-Boating.

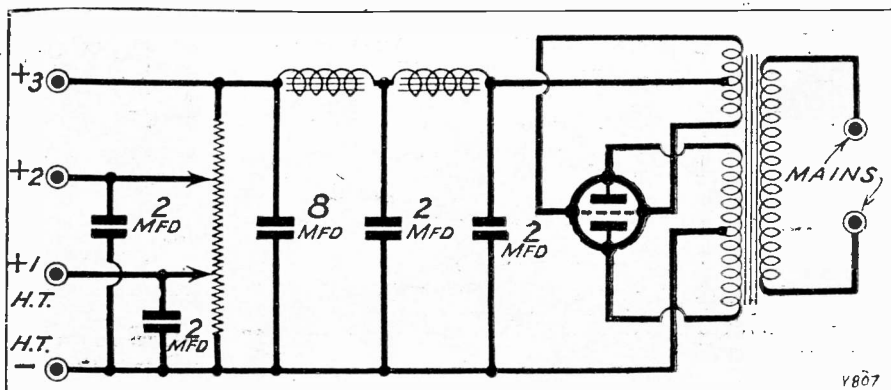
Across each of these variable voltage terminals an additional 2 mfd. condenser is shunted to H.T. -, and these are most important, since their function is to prevent motor-boating and other back-coupling troubles.

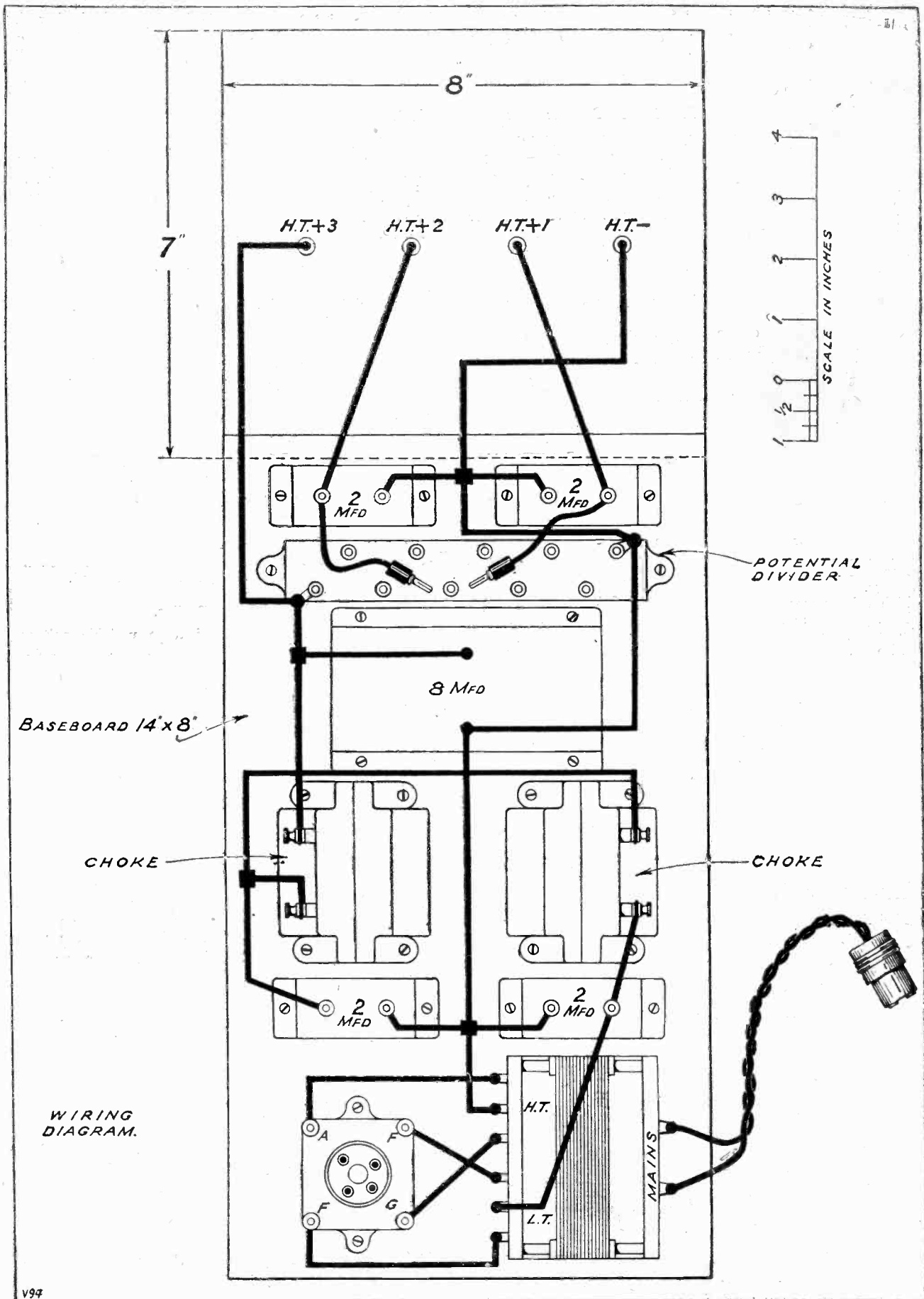
The constructional work is extremely simple, and only one point need be mentioned: on no account forget that it is important to use well-insulated material for the wiring. Stiff wire and Systoflex sleeving make a good safe job and is advised.

Now for some miscellaneous "safety" hints. First of all, about the connection to the mains. This will be in the form of a flex lead bearing an adapter or plug, and you should take care to avoid leaving any "whiskers" at either end which might stray across and produce a short by touching.

Next, be very careful never on any account to do anything inside the unit while the mains are switched on. Always switch off first, and so make sure that you cannot receive a shock. This is most important, since there are very high voltages across various points inside any A.C. type of unit.

Always be careful to switch off at the mains before doing anything whatever inside the set. Fairly high voltages are to be found at various points here also, especially if the L.T. happens to be turned off. Quite nasty shocks can be received if you forget this. The power available is considerably greater than when average sized batteries are used.





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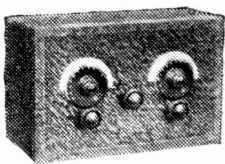
Met-Vick All-Electric Valves will improve a set out of all recognition.

With these wonderful valves and All-Electric operation the H.T. never fades away, the L.T. is always just right.

Met-Vick All-Electric Valves are without doubt the most supremely successful valves obtainable.



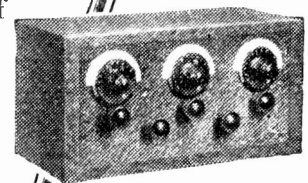
The model "B" Eliminator connected to a wall plug or lamp socket provides heater current for the All-Electric Valves, five tapings for the H.T. supply up to 180 volts 20 milliamps, and automatically regulated grid bias taps for the last stage. Price complete with Met-Vick Rectifying Valve for A.C. £8. For D.C. £7 2 6.



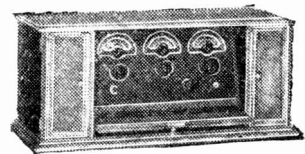
The Met-Vick 3 Valve All-Electric Mains Operated Set for Local, Daventry & many Continental Stations. The extremely high quality reproduction is a special feature. It is very suitable for new Regional Scheme. Price complete with Valves, coils and Royalties, A.C. £12 17 0. D.C. £13 8 0.



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The Met-Vick 4 Valve All-Electric is called the "All Necessary Performance" set, one H.F. stage, low loss coils and condensers, loose coupled Tuned aerial, it gets anywhere and everywhere at Loud Speaker strength. Price, complete with Valves, coils and Royalties, A.C. £17 14 6. D.C. £18 7 6.



Met-Vick 5 Valve All-Electric. More powerful, of course, than the Met-Vick 4. In beautiful cabinet with cupboards for L.T. and large size H.T. Eliminators, 220 volts 35 milliamps. For A.C. or D.C. supply, price complete with all accessories, except Loud Speaker, and including Royalties. In Oak, £47 9 0. In Mahogany, £50 19 0.

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MET-VICK All-Electric Valves A.C.G for all but last stage 15/-—A.C./R last stage (power)—17/6.
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