THE FAN'S SHORT-WAVE ONE


# Amateur Wireless And Electrics

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## The "PICK-UP" THREE-FOUR


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# Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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## *An Interesting Set—Worth Tuning For—The "Pirate" War—"Fishy" Radio Stories—"His Master's Voice"—The Regional Scheme and Selectivity*

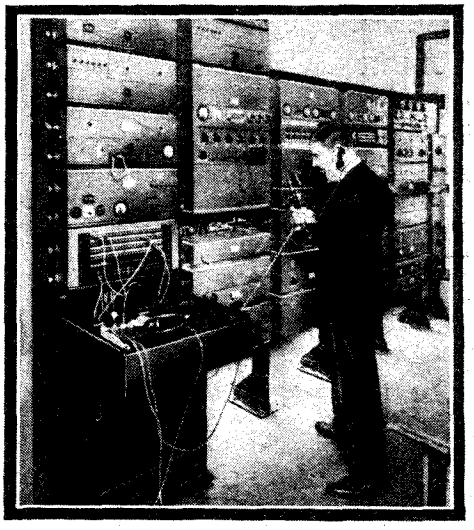
***An Interesting Set***—The purpose of the "Pick-up" Three-Four (see page 14) is suggested in its name: not only does it "pick-up" wireless programmes from the local station, but it can be used with a pick-up for the reproduction of gramophone records, with great volume and purity. A novel method of L.F. inter-valve coupling which has become very popular in America is introduced to our readers in this set.

***Worth Tuning For***—"Something in the Air" is the title of an "atmospheric disturbance" to be set up for the benefit of 5GB listeners on July 11. It is the work of Harold Simpson, the author of the *Nine o'clock Revue*, *From Dover Street to Dixi*, and other similar entertainments which have scored a success in the past. The music is by Stanley Holt, who will personally conduct the B.B.C. Dance Orchestra and the chorus.

***A Reminiscence***—When H.M.S. *York* is launched on July 17, from Palmer's Yard at Jarrow-on-Tyne, the christening will be performed by the Duchess of York. The ceremony will be described in a broadcast from the Newcastle station by Commander Q. H. Paterson. One of the famous exploits of this naval officer during the war consisted of descending to the sea-floor in a diving suit where, at the risk of being blown to atoms, he removed the detonators from mines with which a sunken German submarine was loaded.

***Progress and——?***—Now that we have practically abolished our radio censor, France has decided to institute one. In the future all speeches to be broadcast in France must be submitted to the authorities. Political speeches are completely barred.

***The "Pirate" War***—A sharp skirmish is now taking place in Russia, we hear, between the authorities and "pirate" listeners. To "exterminate" the "pirate," laws have been passed providing penalties up to three years' imprisonment. A young man was recently sentenced to three months, his youth being considered as an extenuating circumstance.



**When the first beam stations were opened, Senatore Marconi said that wherever a short-wave beam service was conducted a telephone service could also be established. The final tests are now being carried out at the Marconi beam station at Bridgwater with apparatus which enables this to be done. Recently a party of experts at Bridgwater listened to perfectly clear dance music which was being received from Montreal at the same time as and with the same apparatus as the two morse services from Montreal. The Marconi-Mathieu Multiplex, as it is called, enables as many as four "transmissions" to be made over the one beam system. Our photograph shows Mr. Mathieu at the apparatus.**

***"Fishy" Radio Stories***—Our American Correspondent writes: Radio stories took the place of "fish stories" when 400 members of the American Radio League opened their third annual convention at the Pennsylvania State College recently. In the liars' contest, a feature of the convention, the amateurs related odd experiences which they had met with. A silver cup was offered for "the best true story."

***"His Master's Voice!"***—The following is a true story: A German doctor who had found and adopted a stray dog, was listening on his loud-speaker to a talk given from the Hilversum station by a German professor. The dog pricked up its ears, wagged its tail, and barked with joy at the loud-speaker. The doctor communicated with the professor, with the result that it was found that the professor was the dog's original owner.

***For the U.S.A. President***—Mr. Coolidge, president of the United States, is spending his summer vacation at a small town named Brule in Wisconsin. So that he may enjoy the evening broadcasts the Federal Radio Commission is temporarily increasing the power of station WEBC at Superior, from 250 to 1,000 watts.

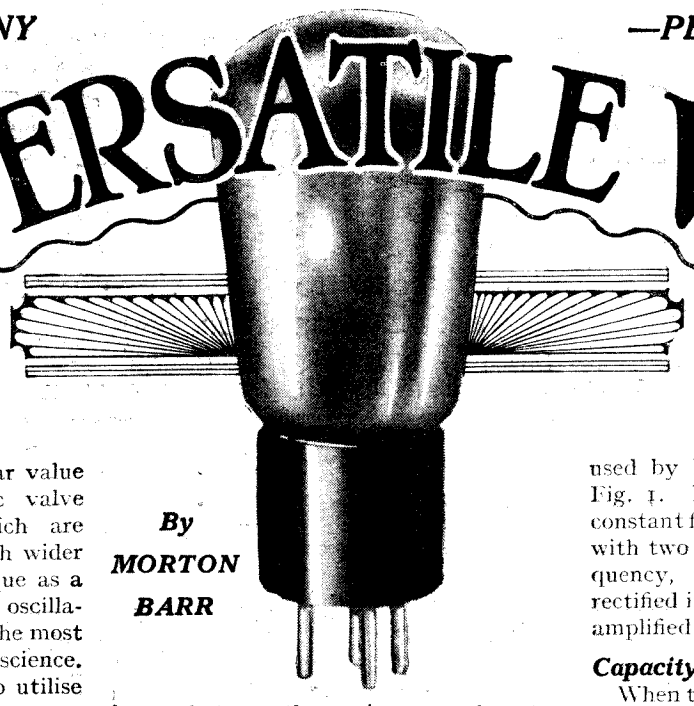
***The Regional Scheme and Selectivity***—It is the habit of the AMATEUR WIRELESS Technical Staff to look well ahead, to study not only technical developments, but also changes in the requirements of the listener. The "Explorer Four," to be fully described next week, has been designed with an eye on the situation which will be brought about with the advent of the new twin-wavelength regional stations in some months' time. There can be no doubt that the not very selective receiver generally in use to-day will be made practically helpless by the crush of high-power transmissions. A new standard of selectivity will be required. You will find food for thought in the "Explorer Four."

## PRINCIPAL CONTENTS

THE VALVE HAS MANY OTHER USES THAN THOSE—

# THE VERSATILE VALVE

—PERTAINING TO WIRELESS, SOME OF WHICH ARE DETAILED HERE



By MORTON BARR

QUITE apart from its particular value in wireless, the thermionic valve possesses certain properties which are capable of being used over a much wider field. In the first place it is unique as a generator of sustained electrical oscillations, and in the second place it is the most sensitive relay at present known to science.

Inventors have not been slow to utilise these properties in various ingenious ways. For instance, not long ago a young Russian inventor, Professor Theremin, entertained the public with an apparatus which was described as "a magic box for producing music from the ether." Outwardly his apparatus consisted of a small cabinet, not unlike the ordinary sloping-front wireless receiver, fitted with a projecting control rod or "aerial" on one side and a small loop "aerial" on the other.

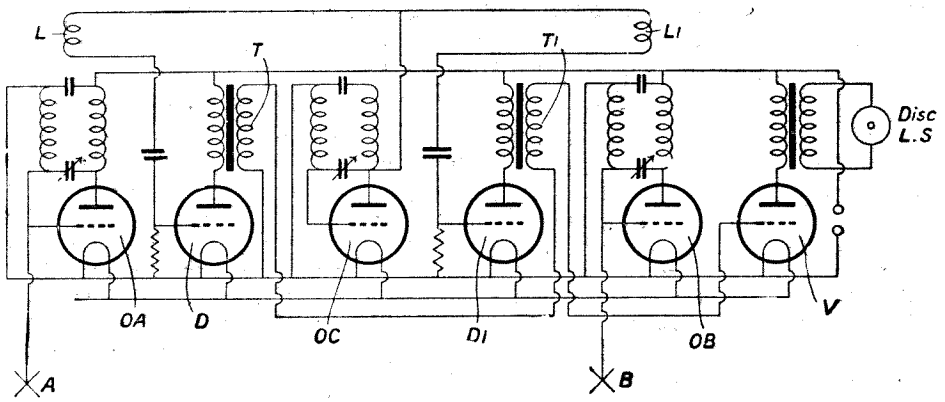



**Fig. 1. A Musical Valve Circuit**

### Ethereal Music

By waving his right hand to and fro in the vicinity of the rod, the Professor produced notes of varying pitch, whilst by a similar movement of his left hand relatively to the small loop, he regulated the volume of the music.

Actually the music consists of a modified heterodyne "howl" or audible beat note produced by the interaction between two high-frequency valve oscillators.

The effect is familiar to every broadcast listener, and is due to the combination of waves from a self-oscillating wireless set with the carrier wave from a distant station. Sometimes it is heard on a non-oscillating receiver owing to the overlap or interference between the carrier-waves from two distant stations transmitting on approximately the same wavelength.

When both the high-frequency oscillations are maintained perfectly steady the beat note will be of constant pitch. But if one or other of the interacting frequencies is varied, for instance by detuning the circuits of the receiving set (in the first instance mentioned above) then the pitch of the resulting beat note moves up or down the tonic scale.

### Tone Control

The beat note resulting from the interaction of two pure or sinusoidal high-frequency oscillations, would have practically no musical quality or timbre. But by combining frequencies containing a high proportion of harmonics, it is possible to produce rich notes resembling those of the 'cello, flute, or practically any other known instrument.

Harmonics are introduced by loading the grid with an initial bias such that the oscillating valve works over the knee or bend of the characteristic curve instead of being confined to the straight-line portion.

A circuit arrangement similar to that used by Professor Theremin is shown in Fig. 1. It comprises an oscillator OC of constant frequency, working in combination with two oscillators OA, OB of varying frequency, the resulting beat notes being rectified in separate detectors D and DI and amplified at V.

### Capacity Effect

When the hand of the operator is brought near, say, the control rod A, the capacity of the tuned circuit associated with the oscillator OA is varied, and the frequency generated by that valve alters accordingly. Meanwhile, oscillations of constant frequency generated by the valve OC are present in the coil L.

The varying oscillations from valve OA are also transferred to the coil L, and the mixture is applied to the grid of the rectifying valve D, which detects the resulting beat note and feeds it to the transformer T.

A similar action takes place between the varying oscillations emitted by the valve OB, under the influence of the capacity control B. These are mixed with the constant-frequency oscillations fed to the coil LI, and the resulting beat note is detected by the rectifier DI, and fed to the transformer TI.

The secondary windings of the two transformers T, TI are both connected in series with the grid of the amplifier V, which feeds the loud-speaker incorporated in the "magic box." In the arrangement as shown, the melody or sequence of notes would be controlled by bringing both hands alternately near the "capacity" controls A and B.

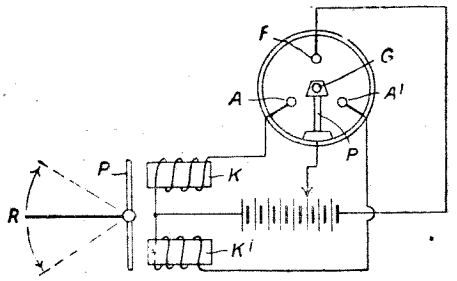
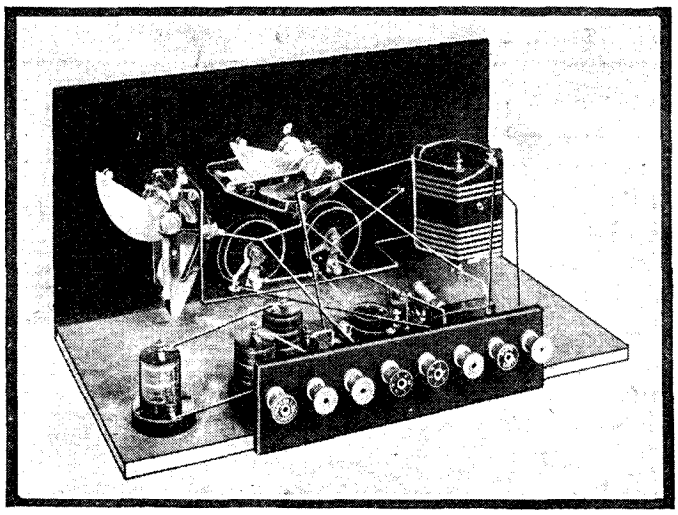


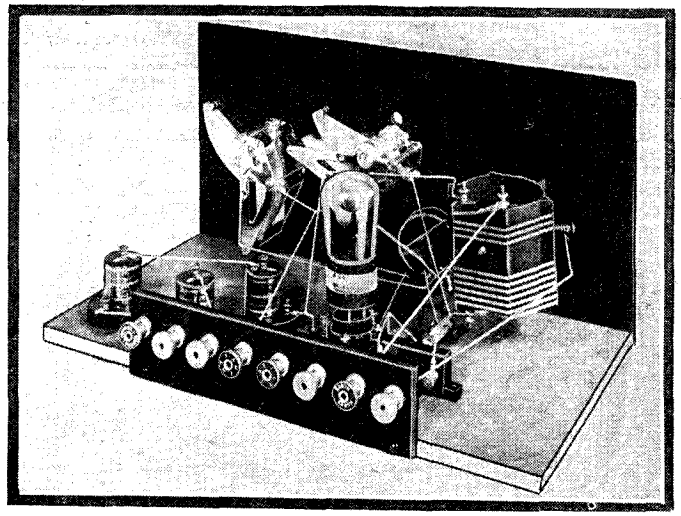

**Fig. 2. Automatic Steering by Swinging-grid Valve**

### Volume Control

To provide volume regulation, the

(Continued on page 28)





# The FAN'S SHORT-WAVE ONE

## *Designed on the Very Latest Lines for Head-phone Reception of the World's Short-wave Transmissions*

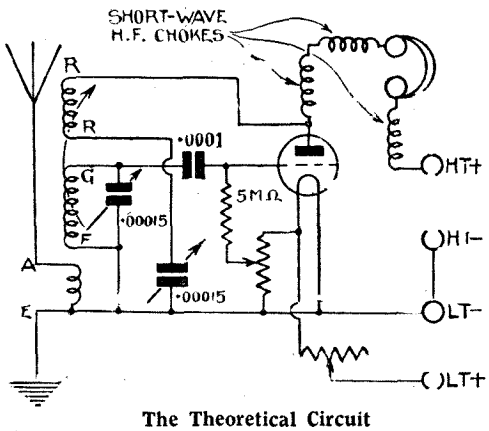
SOME readers may find it hard to believe that the simple-looking one-valve receiver illustrated on this page has brought in American broadcasting at good telephone strength. That it has, however, is perfectly true, and is but one example of what can be expected from this amazing little set, especially designed by the AMATEUR WIRELESS Technical Staff for the reception of short-wave signals on any wavelengths between 18 and 60 metres.

Great care has been taken to select components most suited to short-wave work and these have been arranged in the most efficient way on the panel and baseboard. It cannot be over emphasised that on the short-waves every possible precaution must be taken against high-frequency losses—otherwise very disappointing results will accrue.

### *Circuit*

As far as the circuit is concerned, there is no point in deviating from the main essentials of the standard Reinartz-reaction detector arrangement. It will be seen, however, that we have added to the standard circuit in a way which we consider definitely enhances the possibilities of the hook-up.

There are three separate coils: the aperiodic or untuned aerial coil, the grid-tuning coil and the reaction coil. On short waves it is essential to dissociate the aerial damping from the tuning circuit, otherwise, even with a large reaction coil, it will be quite impossible to get the set to oscillate. By connecting the aerial and earth to a small untuned




**The Theoretical Circuit**

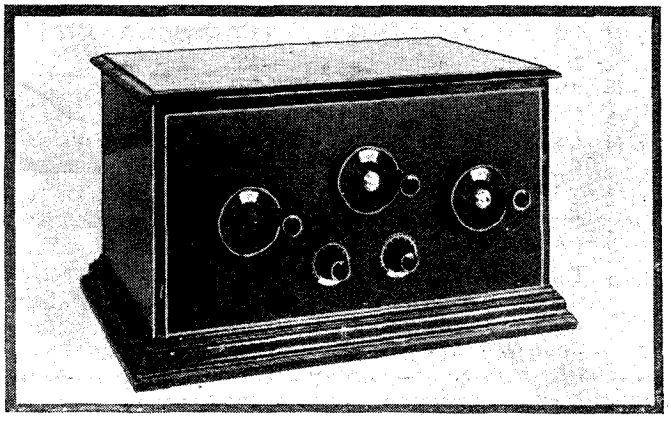
winding and coupling this to the grid-tuning coil (corresponding to the ordinary tuned aerial coil in a broadcast receiver) we are able to oscillate quite freely over the whole available wavelength range.

Fixed or variably coupled to the grid-tuning coil is the reaction coil connected in series with a variable reaction condenser across the anode and filament of the valve.

Both tuning and reaction condensers must have a low maximum and minimum capacity—in this set they are both .00015-microfarad maximum—so that a small movement of the vanes only causes a small variation in wavelength. The tuning and reaction are both very finely controllable on this set due entirely to the fact that both condensers are small and are fitted with slow-motion dials.

Quite a small value of inductance in the anode circuit will choke back the high-frequency component of the rectified current through the reaction system. A short-wave choke need not have more than 70 turns. Do not use an ordinary long-wave choke because on the very short waves the self-capacity of the big choke will be quite sufficient to by-pass the high-frequency current.

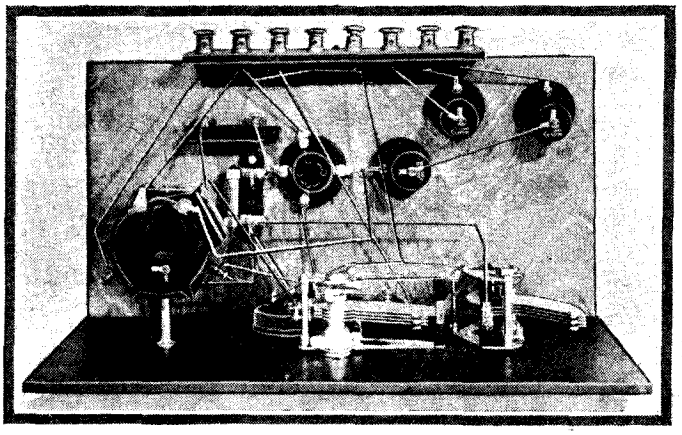
The secret of successful short-wave reception lies in the ability of the operator to get just below the oscillation point and a great factor in this respect is the grid leak, which may cause such "ploppy" reaction as to render it impossible to coax the reaction to the desired point. That is why the "free" end of the 5-megohm grid leak is taken to the



**The Complete Fan's Short-wave One**

# "THE FAN'S SHORT-WAVE ONE" (*Continued*)

slider of a potentiometer, the winding of which is shunted across the low-tension battery. By means of this control the

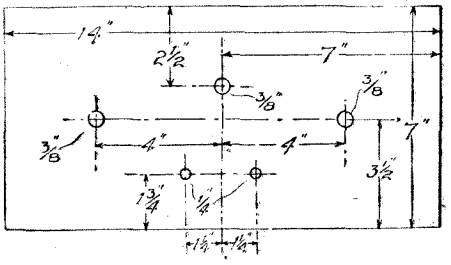


**Wiring is quite simple**

potential on the grid, as applied through the grid leak from the accumulator, can be adjusted to a value that will provide the smooth reaction essential to success.

The grid condenser has a value of .0001-microfarad which, with a 5-megohm grid leak, provides the most sensitive combination for short-wave work.

The only other control is a rheostat




**Details of Panel**

wired in the positive low-tension lead. It is not suggested, or advised, that this be used as a "control" but as an adjuster of working conditions. A slight decrease of the rheostat and of the high-tension supply, which should not exceed 60 volts, may make all the difference to the smoothness of working.

Anyone who has listened with headphones to short-wave stations must have experienced the annoyance caused by "head-capacity." The set is adjusted, the operator leans back to enjoy the fruits of his labours and then—the set either bursts into oscillation or the station disappears! This phenomenon is due to the fact that some high-frequency energy is flowing through the leads and earpieces and is setting up capacity effects. The trouble can be wholly cured by inserting two small high-frequency chokes in the phone leads as indicated.

## Construction

To make up a one-valve short-wave receiver such as we are discussing, the reader will require the following components. Those mentioned first are the ones actually used; the others are suitable alternatives.

## Components

Ebonite or bakelite panel, 14 in. by 7 in. by ¼ in. and terminal strip, 8 in. by 2 in., by ¼ in. (Ebonart, Becol, Raymond, Pertinax).

Baseboard, 14 in. by 7 in. by ⅜ in. (Carfington).

Eight terminals marked Aerial, Earth, L.T.+, L.T.−, H.T.−, H.T.+, Phones +, Phones − (Belling-Lee, Eelex, Igranic).

Three short-wave chokes (Wearite, Bulgin).

Valve holder (Ashley, Benjamin, Wearite).

.0001-microfarad fixed condenser (Lissen, Dubilier, Mullard, C.D.M.).

5-megohm grid leak and holder (Lissen, Dubilier, Mullard, C.D.M.).

Two .00015-microfarad variable condensers (Jackson, Burndept, Polar).

7-ohm rheostat (Lissen, G.E.C., Igranic).

400-ohm potentiometer (Lissen, G.E.C., Igranic).

Low-wave tuner (Wearite).

Three slow-motion dials (R.I. and Varley).

As will be seen from the specifications, the three short-wave coils are embodied in a special low-wave tuner, made by Wright and Weaire, Ltd. This instrument is of a simple and robust construction and is arranged for one-hole fixing. It comprises a 7-turn grid coil, coupled at a fixed distance to a 4-turn aperiodic aerial coil, the reaction coil being an internal rotating one. The advantage of this method of construction is that the reaction application can be very finely adjusted by two means—the reaction condenser and reaction-coil coupling. The turns of the grid and aperiodic coil consist of flat copper ribbon wound on the ribbed ebonite former.

The panel is drilled to accommodate the tuner on the left, the tuning condenser at the centre and the reaction condenser on the right. Below these three controls are the potentiometer on the left and rheostat on the right, making five panel controls in all. The tuner is mounted longitudinally with the grid winding at the bottom.

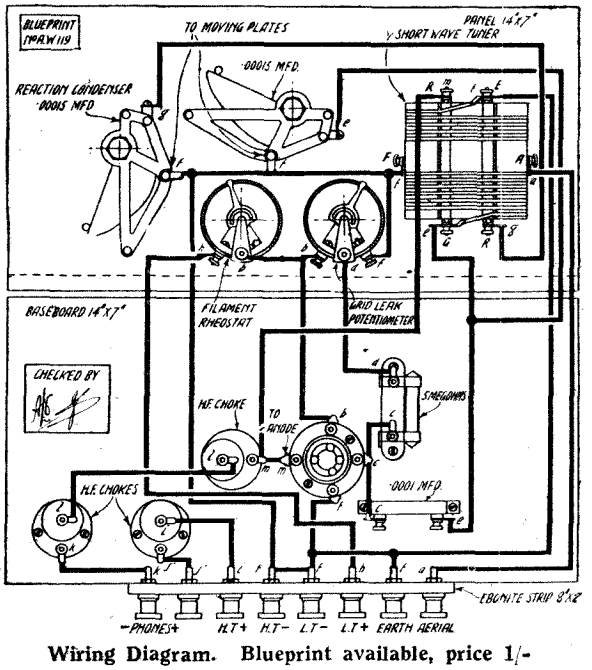
The valve holder, grid leak and condenser and three high-frequency chokes are mounted on the baseboard as shown by the reduced reproduction of the full-size 1s. blueprint (obtainable from Blueprint Dept.). The aerial, earth, phones, and battery terminals are mounted on a strip of ebonite screwed to the back of the baseboard.

In wiring together the components, the constructor will find the blueprint of great assistance, since it clearly indicates the point-to-point connections. Use bare wire and take the shortest possible path between components. Covered wires straggling about will definitely lower the efficiency of the receiver.

## Operating Hints

Operating this receiver is not quite the simple process it appears to be. When sitting down to tune in, just make sure your body is as far away from the lead-in as possible and "keep your distance" from the receiver. If the set is placed some distance from the edge of the table, the hands can be stretched towards the controls, the elbows resting on the table and the body well clear. All this is important as will soon be apparent to the operator!

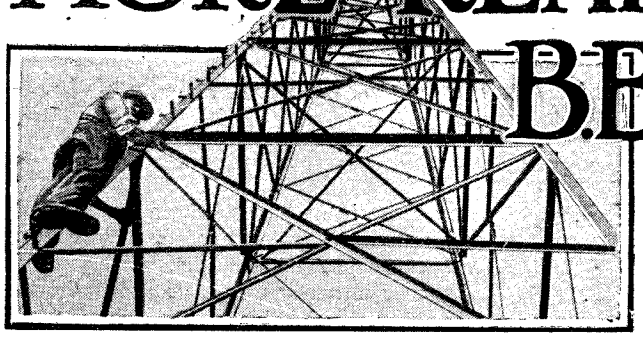
It is difficult to help the constructor very materially as regards operation, but one point can be emphasised. Turn the dials




**Wiring Diagram. Blueprint available, price 1/-**

as slowly as possible. Otherwise literally dozens of stations will be missed. To receive telephony, turn the reaction condenser until a faint "plop" indicates oscillation. Only just oscillate, and then turn the tuning condenser slowly remember, until a squeak is heard. Stop oscillating, but only just. Readjust the tuning until the speech or music is heard as loudly as possible and then "edge up" to oscillation again, at the same time retuning a little for every readjustment of reaction.

# MORE REMINISCENCES of a B.B.C. ENGINEER



by BAYNHAM HONRI

1924 WAS the year of birth of a mistaken policy on the part of the B.B.C. So far as the engineering side was concerned, it was almost wholly devoted to the equipment and erection of low-power relay stations in about a dozen large towns and cities, most of which (so far as the transmitters are concerned) will be scrapped very shortly. The B.B.C. cannot be blamed for the original erection of small relay stations; they seemed to "happen" just naturally. The broadcasting service in many large towns was very inadequate at the time and there was no 5XX to comfort the disgruntled listeners in these towns. Not that the relay stations comforted these disgruntled listeners to any great extent; they immediately complained that it was impossible to cut the local relay station out!

In January, 1924, Captain West, of the B.B.C., went to Sheffield to investigate thoroughly the alleged "blind-spottedness" of this city to its local station (at the time), Manchester. He found that Sheffield wasn't so much a blind spot as it was a veritable hot-bed of oscillation, though this was not the report published at the time!

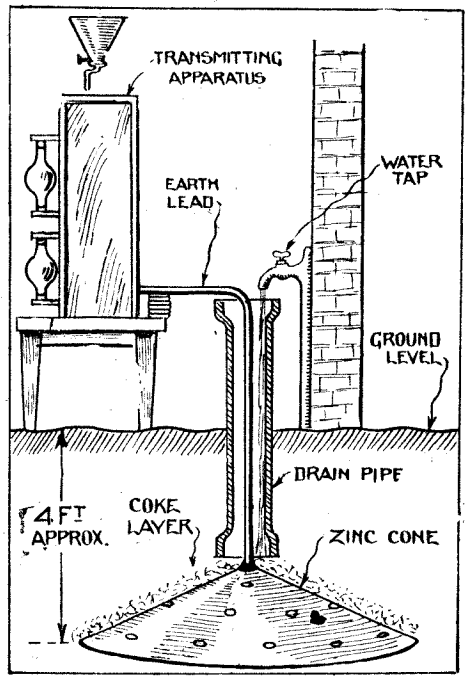
It was decided that the best way to overcome this oscillation was to provide a stronger local signal with a small broadcast transmitter which would relay the Manchester programmes by wireless link. A receiving station was erected just outside Sheffield which was connected by land-line to a low-power (100 watts.) transmitter in the centre of the city. The sites of the first experimental Sheffield transmitters moved about quite a lot, from the University buildings to the house of local amateur transmitter and finally to an old grinding mill.

### *The B.B.C. Gets the Bird!*

The Sheffield-ian was quite a normal sort of person until wireless, listening-in, or the B.B.C were mentioned! Then he became pink at the gills! The first experiments of the B.B.C. may have been a little trying; the idea was to find out how little power need be used to serve the town adequately. Unfortunately, the Sheffield newspapers did not enter into the experimental spirit of the undertaking and blasted the efforts of the B.B.C. with destructive criticism. The B.B.C. engineers were so wilted by the lash of Sheffield tongues that they had to recuperate by the sea, at Plymouth. The Sheffield transmitter was more or less put on a maintenance basis, with instructions to the engineer-in-charge to do no "fiddling" with the transmitter, and experiments were continued at Plymouth.

### *Plymouth Ho!*

One of the first "jobs" I undertook on joining the newly-formed B.B.C. Development Department was the erection of the Plymouth relay station. The site chosen for the transmitter was in a disused sugar refinery, this building having the highest




**An Earth tried at the Liverpool Station**

chimney stacks near the centre of the town. An aerial was suspended from one of the chimneys, earth plates buried and a small counterpoise erected. Subsequently the counterpoise was abandoned and a piece of "flat top" was added to the aerial, the free end being suspended from a second chimney.

Everything was ready for going ahead and the transmitter was sent down from London. But when it arrived it was almost smashed into a thousand pieces! Worse still, Captain Eckersley was coming down next day to superintend the first tests from the station! All that night, Mr. Nicholson (the engineer-in-charge, Plymouth) and myself slaved away at that wretched transmitter, and by the time our chief arrived, a perfectly new transmitter was assembled and in working order. It was fortunate that the valves had been sent separately and had arrived safely, so the first tests were carried out from 5PY according to plan, the first words from the station being spoken (via a solid-back microphone) by Captain Eckersley. The first song to be inflicted on Plymouth listeners was perpetrated by myself: it was that fine old sentimental ballad, "An Old Bass Bottle"! This was especially appreciated by many Devonport listeners!

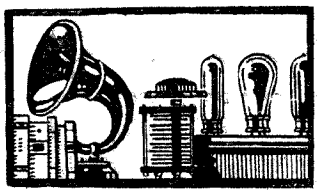
### *When Business was Pleasure*

Many experiments were carried out at Plymouth during about two months of testing before the station was officially opened. Experimental work was usually carried out in the daytime and regular transmissions (relays of 2LO) were broadcast from 7 o'clock every evening. A day in the life of a development engineer was very varied and interesting in those days.

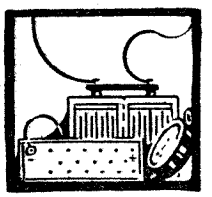
At about half-past nine or ten he would drift along to the temporary studio and offices and attend to correspondence, etc. Experimental work commenced at about eleven and continued until five o'clock in the afternoon. After a hurried cup of tea, the transmitter would be switched on for a more or less regular item, the Children's Hour. Along to the studio he would go, to become a temporary Uncle Adam or Old Father Time. Then a brief interval until the evening transmission commenced, and home to bed at midnight. A busy, yet thoroughly enjoyable day! I, for one, was quite sorry when Plymouth was officially opened and the experimental work ceased.

Since those early days, however, quite a lot of experimental work has been carried out at Plymouth. The nice, clean town, the nearness of the studio to the transmitter, the Hoe, and the welcome smile of Mr. G. E. Prance, a local amateur transmitter who also presided over the Palace of Varieties, have been attractions difficult to resist. Until 5GB was erected, practically all transmitter experiments, data on transmitting valves, try-outs of new gear, etc.,

(*Continued on page 20*)



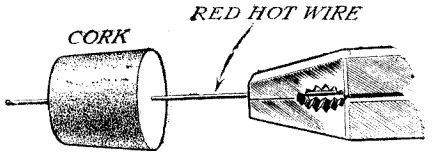
# PRACTICAL ODDS & ENDS



## An Accumulator Stopper

WHEN the accumulator stopper is lost a quite serviceable substitute can be made from a cork.

To prevent any action of the acid on the




**Making an Accumulator Stopper**

cork it is advisable to first soak it thoroughly in melted wax.

The vent should not be made by drilling with a bit; in this case the "homely" red-hot-needle method is the best to employ.

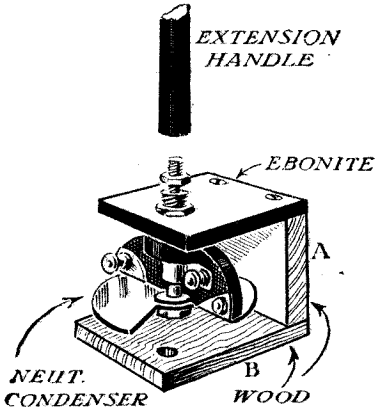
C. A. W.

## Mounting Panel Components on Baseboard

WHEN about to reconstruct an out-of-date receiver in which some of the components, now usually mounted on the baseboard, are mounted on the panel, the following suggestion will be found very useful.

The method used is indicated in the sketch given below, which shows clearly how a neutralising condenser can be adapted for modern requirements.

The small piece of wood marked A may be about ¾ inch thick, and the base piece, B, about ¼ inch thick. The two pieces should be nailed and glued together. A couple of holes should be drilled in the piece B, for screwing it to the baseboard.



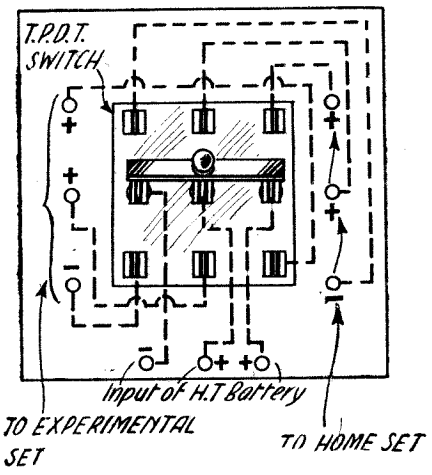

**How to Adapt a Panel-mounting Neutralising Condenser for Baseboard**

Filament rheostats can be mounted in a similar manner, as, indeed, can almost any gadget which has provision for one-hole fixing. C. A.

## A Battery-switching Idea

THE listener who uses two receivers will find the following suggestion, for enabling both sets to be run off the same H.T. battery without the trouble of disconnecting and reconnecting the leads, of considerable interest.

The change-over is effected by means of switching. A three-pole double-throw switch is the essential component, and is wired up to nine terminals spaced on a suitable piece of ebonite as shown in the drawing given below.




**A Very Useful Battery-switching Idea**

If a three-pole switch is not available, three single-pole double switches can, of course, be utilised. A. T. C. F.

## Earthing to Water Pipe

A SIMPLE "earth" to the nearest water tap or pipe is still used by many amateurs.

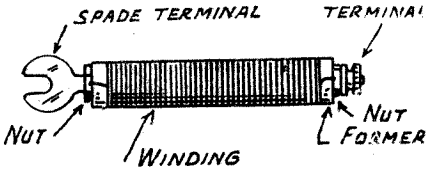
The main weakness is at the earth clip on the pipe, for the surfaces of the lead pipe and of the brass clip soon become corroded with the damp, and bad contact results.

It is a good plan, having cleaned the pipe and the earth clip, to replace the connection and then coat the clip liberally with paint or enamel. L. F.

## A Useful Resistor

RESISTORS are not now much used in receivers, but it is handy to have one by for use in such a case as where, say, a six-volt accumulator is being used to supply filament current to two or four volt valves.

When this is the case the resistor should be connected to the accumulator, thus despensing with the necessity of incorporating it in the receiver itself. Only one resistor, of course, is required; a resistor especially suitable for using in this manner is easily made, as shown in the drawing. The former is of ebonite rod




**A Handy Resistor**

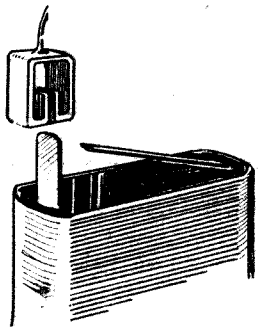
tapped at each end to receive a spade terminal and an ordinary terminal, as shown. The resistance wire, for which Eureka enamelled should be used, is wound around the former, the ends of the winding being connected beneath the nuts provided at each end, when the enamel insulation has been scraped off.

A suitable gauge of wire to suit all purposes is No. 30 S.W.G., which carries a safe current of .59 ampere and has an ohmic resistance of 5.5 ohms per yard of wire used. To find what resistance is necessary, subtract the voltage of the valves used from the voltage of the accumulator and divide the result by the total amperage of the valves used. The length of wire required can easily be worked out. F. B.

## A Useful Tapping Clip

THERE are a number of useful tapping clips on the market, and many readers do not find it difficult to devise one when required urgently.

The one shown in the drawing given below is very easily made and has been



**An Easily-made Tapping Device**

found by the writer to have the special advantage that it makes a particularly good, rigid contact.

It can be made up out of any piece of strip metal, such as the tag of an old battery or a blade from an old knife switch.

H. H.

# On Your Wavelength!

### Radio Economics

ON the average, wireless sets and components cost about fifty per cent. more in this country than they do in the United States. It is not that the British manufacturers make any more profit than the Americans—they don't make as much—but it is because mass production methods cannot properly be taken up here. The conservatism of the average Englishman is responsible for the keeping in action of many a radio set which should long ago have been cast into the junk bin or put under a glass case in a museum. And even if this conservatism does not have its way in the matter of replacement of obsolete gear, another rather important factor—a question of economics—retards progress. In the States the demand for radio sets is most irregular, alternating from "no sales" to a feverish rush of business, the latter taking place usually in the autumn.

### Mass Production

There are thousands and thousands of people in the States who have Rolls-Royce incomes, and many more thousands who have Rolls-Royce ideas but push-bike incomes. All of these people change their "radios" each year, just as they do their cars, the "push-bike" people making good use of the highly developed deferred-payment systems. The demand for new complete sets is so great during a certain period of the year that the manufacturer who sells a set which catches the popular fancy is bound to make a complete "clean-up." The unfortunate rival who is not quite so successful probably finds a couple of hundred thousand sets on his hands and bankruptcy waiting round the corner. The radio business in America is fine—for the "consumer" and for the leading radio engineers. The various manufacturers compete for the services of the best wireless engineers and salaries reach colossal heights.

### Salaries

Talking about the salaries of radio engineers, I had a letter the other day from a friend, an ex-B.B.C. engineer, who is now managing a broadcasting station attached to a certain American "departmental store." He appears to be having the time of his life. With about the same responsibilities as he had with the B.B.C., where he was in charge of a station, he now draws more than four times as much "filthy lucre" in the way of salary. The standard of technical ability of broadcasting engineers in the States is very low, he says, and an engineer who knows his job well reaps a rich reward. The B.B.C. should take notice of this or they may find some of their best engineers looking elsewhere for jobs. Incidently, manufacturers and foreign broadcasting companies should make a note. It is cheaper to pay a ready-trained engineer good money than it is to find "new" people for the highly skilled job of running a broadcasting station efficiently.

### Boom Tones

With the increase in popularity of moving-coil loud-speakers, there has been a tendency to neglect the reproduction of the higher audible frequencies in the effort to obtain an adequate reproduction of the bass. First of all, the moving coil and cone must be right. I have heard several home constructed moving-coil loud-speakers lately which have given anything but natural results. In every case the fault was the complete absence of "top," lack of musical harmonics and speech sibilants. In one case the fault was in the matching of the output loud-speaker transformer to the moving coil, the transformer having the wrong output impedance. In the other cases the design of the diaphragm was wrong, one being too large and another too heavy.

### A Hint

By the way, if your set has an output choke, don't scrap it when you put a step-down transformer into the output circuit for feeding your moving-coil loud-speaker. The output transformer will give a much better performance if the heavy anode current for the last L.F. stage is not passed through its windings. Therefore, connect the primary of the loud-speaker step-down transformer in place of the old loud-speaker, keeping the output choke in circuit.

### What Should We Call Them?

It would appear desirable to devise some standard nomenclature for the tetrodes which are now becoming so popular. These are variously referred to as "shield grid," "shielded grid," "screened grid," "shielded plate," and "screened plate," and numerous other variants.

None of these really seems to meet the case, for it is a little difficult to say whether one is screening the grid from the plate or the plate from the grid. The question was discussed recently in the course of a paper on Four Electrode Valves, read by J. T. Warner before the Institute of Radio Engineers (Procs. I.R.E., April, 1928). In this paper he refers to the various names and his remarks, slightly paraphrased, are as follows:

"These terms are obviously not all synonymous, although they all have some technical justification. In general, they do not indicate directly that the screening or shielding is accomplished by use of a fourth electrode. Also there is some question as to whether the grid or the plate is screened, since the screen is interposed between the two. 'Screen grid' and 'shield grid' refer directly to the fourth electrode, which is the distinguishing feature of the valve. Of these two, the name 'screen grid' has the advantage of implying the form of structure of the fourth electrode, while 'shield grid' gives the idea of a solid metal plate such as is commonly used for shielding of circuits and, in fact, such as is often used around the outside of the valve itself. 'Screen grid' is also in keeping with the idea of allowing the electrons to pass, without tending to obstruct the electro-static field and, furthermore, it can, without confusion or misunderstanding, be conveniently abbreviated by speaking of 'screen voltage' or 'screen currents,' if desired."

This certainly appears to sum up the situation accurately, and it would seem desirable to concentrate on some definite form of nomenclature. It will be interesting to have readers' comments on the matter, but for the meantime we propose to adopt the term "screen grid" in referring to the particular type of four-electrode valve concerned.

### Neither Four-electrode nor Tetrode

The use of the terms "four-electrode" valve or "tetrode" are not satisfactory, because there are two types of four-electrode valve. The first of these is the screen-grid valve, and the second is the "space-charge grid" type of valve. In this latter type, it is the outer grid which is used as the control grid, while the inner grid is connected to a small positive potential and serves to nullify the space-charge effect. This is the negative electro-static field set up by the electrons themselves as they just leave the filament. The electro-static field set up tends to repel further electrons from being emitted, and in order to overcome this it is necessary to use a fairly high value of high-tension voltage in order that the control grid may exercise proper control over the current flow.

The interposition of the grid between the normal grid and the filament, this being connected at a small positive potential, serves to increase the emission by overcoming the space-charge effect, so that the valve can be operated and the current controlled satisfactorily at a much lower value of high-tension voltage.

The operation of this type of valve is clearly essentially different from the screen-grid type, and therefore the term "four electrode" is quite inadequate, since it does not differentiate between the two.

# On Your Wavelength! (continued)

### Another Score

If you want information on any wireless topic, ask readers of AMATEUR WIRELESS. That, at least, has been my happy experience. Recently I wrote a paragraph dealing with the short-wave relays of the American WABC. This morning's post brings me letters from two readers, one hailing from South Bermondsey and the other from Bexley Heath, both of whom report excellent reception of the 58.5-metre transmission. One of them reports fair headphone strength on a 0-V-1 receiver, whilst the second states that this is generally a good signal with a 0-V-2 set. One very interesting point has been cleared up by these two readers. For months past 2XE's wavelength has been given in certain lists as 64 metres. A communication to one of them from the station itself shows that the correct figure is approximately 58.5.

### Interference

One correspondent reports that he notices much less atmospheric interference on this wavelength than on the rather higher one used by KDKA. The short waves are kittle-kattle. One may find static very bad on a certain patch, whilst wavelengths, just above or just below are comparatively free from interference. The results obtained by one reader are remarkable, for the apparatus that he used for short-wave work is a broadcast receiver with the plug-in coils and a small neutralising condenser in series with the aerial. Despite the fact that he is not too well situated for wireless reception, he has logged 2LO, 2XAF, 2XAD, 8XK, KDKA, 5SW, PCJJ, and a good many others.

### A Harmonic Problem

Another reader sets me a pretty little problem. Here it is. In the early hours of the morning during November last, he used to receive on a little over 66 metres a pretty good signal. The call-sign was difficult to pick up, as call-signs so often are; but, being a sticker, he persisted for a whole fortnight until he got it. To his surprise, it turned out to be WBZ, who was not shown as possessing a short-wave transmitter. He wrote to the Westinghouse people who run WBZ and WBZA, receiving from them an interesting and, at the same time, a very puzzling reply. They stated that, though they have no short-wave transmitter, they had had letters from listeners in various parts of the United States who reported having heard their stations on a wavelength in the neighbourhood of 60 metres. "I presume," writes Mr. D. A. Myer, the engineer-in-chief, "that we have a very strong harmonic around the 60-metre band."

### A Possible Explanation

Is it possible that at a range of over 3,000 miles the fifth harmonic of a U.S.A. medium-wave broadcasting station could be heard in this country? Harmonics play queer pranks, it is true, and one does occasionally come across an amazingly strong one on the short-wave band. Still, I hardly think that what my correspondent heard could possibly have been the fifth harmonic of WBZ. My own explanation of the occurrence is that he probably picked up KDKA or 2XE, and that one of those stations was indulging in S.B. work and was sending out a portion of WBZ's programme.

### An Ingenious Tip

Yet another reader has taken pity on my plight through the microphonic tendencies of dull-emitter valves when used as short-wave rectifiers. He sends me a highly ingenious tip which he has himself put into practice. I record it, with my best thanks to him, for the benefit of other sufferers. To cure ponginess you go to the nearest chemist and buy a rubber sponge. With a pair of big scissors you chop off a suitable chunk, and in this you dig out a hollow, producing a kind of rubber bird's nest. The excavation should be of such a size that it just fits comfortably over the bulb of the valve. The next process is to glue the sponge to the baseboard of the set in place of the existing valve holder. To each of the valve pins solder a length of rather fine enamelled wire and make each of these connections into a spiral by rolling the wire tightly round a pencil. Insert the valve into the hollow prepared for it, connect up the wires to the appropriate terminals, and there you are.

### Indispensable

The recent rescue of General Nobile from an ice-floe near the Pole, and the happy termination of what might have been a very ugly business aboard the *Jervas Bey*, went to prove how absolutely indispensable wireless has become in our life nowadays. When you think that it is just over a quarter of a century since the first paid radiogram was sent, you will realise how rapidly wireless has attained its present wonderful position. But a few years ago a ship at sea was completely out of touch with the rest of the world, except when she spoke to another vessel or came within signalling distance of land. To-day, crew and passengers know that if any emergency arises wireless enables aid to be summoned at once.

### Loud-speakers for Soft Speakers

The Editor as a parent, and your THERMION as an old boy were present the other day at a public school speech day when the prizes were given away by a very eminent personage who has always something to say that is well worth hearing though he is rather handicapped by a weak delivery. In the ordinary way, much of his witty speech would have been lost to those sitting towards the back of the hall. The school wireless society, however, rose to the occasion, installing upon the platform a microphone and an amplifier, and half-way down the hall a big loud-speaker.

When the switch was turned over it was apparent at once that the arrangements had been most skilfully carried out. From my place near the back of the hall I could see the speaker's lips moving, but could hear hardly anything of his first sentence, for the loud-speaker had not then got properly into its stride. In a moment though, the right signal strength was found and the whole of the rest of the speech came through to perfection, with no distortion whatever, and was just the volume needed to make every word audible in all parts of the hall.

### The Lausanne Conference

I am informed that as a result of the conference held at Lausanne by the Council of the Union Internationale de Radiophonie, the following new members have been admitted to the Broadcasters' Union: Radio Stanica, Zagreb (Jugo-Slavia); The British East African Broadcasting Company, Nairobi, and the Societé Roumaine de Radiophonie of Bucharest.

The question of station calls appears to have been discussed at the sittings, but the Council merely recommended that the names of the broadcasting stations should be stated as clearly as possible.

Following the decisions taken at Washington in respect to the wavelengths of the stations to operate in the 1340—1875-metre band, a formula was adopted by the Council by which the area and population, as well as the priority and power of the transmitters owned by seven nations, were taken into consideration. In all there were fifteen applications, but wavelengths were only allotted to Great Britain, France, Germany, Russia, Sweden, Poland, and Holland.

### New Long-wave Arrangements

For the present, the distribution stands as under, subject to official authority being obtained by the individual governments:

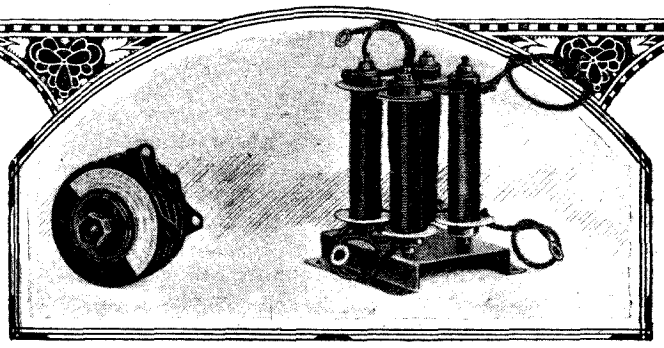
Huizen 1,852 m.; Radio Paris, 1,752 m.; Koenigswusterhausen, 1,649 m.; Daventry 1,561 m.; Moscow, 1,483 m.; Warsaw, 1,414 m.; and Motala, 1,352 m.

There is a possibility that agreement may be arrived at with Russia to concede the wavelength of 1,483 metres to the Finnish high-power station at Lahti. To those applicants to whom long waves cannot be allotted, an effort will be made to compensate them in the short-wave (broadcasting) band. No decision has been taken with regard to the date on which these alterations are to be carried into effect, but a further discussion will take place in Brussels at the end of this month.

THERMION.

# Using the All-metal Rectifier

*The Second of a Series of Articles by Our Technical Editor describing the New All-metal Rectifier which—*



*—provides a New Means of Eliminating the High-tension Battery and of Charging the Accumulator.*

**Left : the Trickle Charging Unit with an output of ½ amp. at 6 volts. Right: the H.T. Unit with an output of 100 m.a. at 200 volts**

TWO weeks ago I described the general principle of the Westinghouse metal rectifier, showing how a contact between a particular oxide of copper and copper formed an excellent rectifier and that rectifiers to suit various current and voltage demands could be built up by the use of a suitable number of rectifier elements.

### *Bridge Rectification*

It will be of interest, therefore, to describe how this is done in practice and to indicate the formation of the different types of unit available at present for the constructor. In the first place, the system of rectification adopted—namely bridge rectification—should be considered. All the units are built up on this system, which has several advantages, but is not usually practicable with valve rectifiers as will be seen.

The action of a bridge rectifier is shown in FIG. 1. Four rectifiers are arranged on the sides of a square and forming a bridge arrangement. The alternating voltage is applied across the points A B, while the D.C. output is taken from the points C D. Let as assume that at any instant, the point A is positive and the point B negative. Current will then flow through the rectifier between A and C in this direction, this being indicated by the arrow-head. Current cannot flow along the paths A D or B C because the particular rectifiers in these arms conduct only in the reverse direction.

The current, therefore, flows through the external D.C. circuit, through the load—whatever it happens to be—and back again to the point D. Here there are two possible circuits, only one of which is open, namely that from D to B because although the rectifier in the arm D A is in the right direction, the current would be travelling against the voltage, i.e., to a point of higher potential, which is impossible. The current thus returns to the point B and back to the transformer.

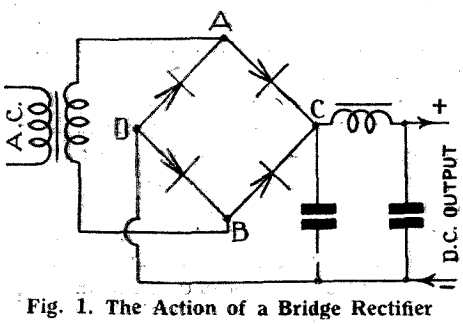



**Fig. 1. The Action of a Bridge Rectifier**

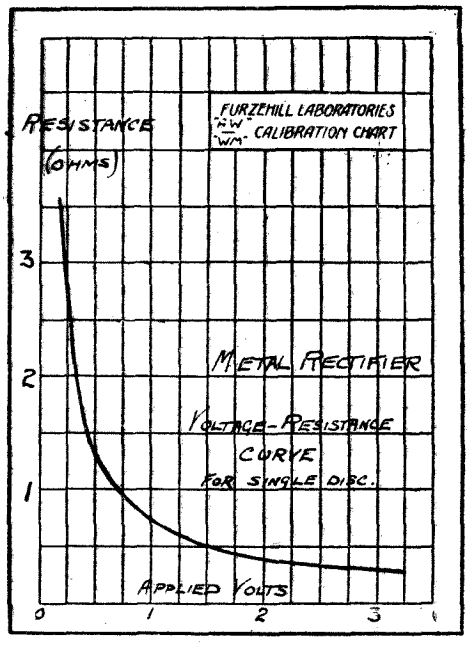



**Fig. 3. The Voltage-resistance Curve of a Single Disc**

During the next half-cycle the point B is positive and A is negative. The cycle therefore will be reversed. Current will now flow from B to C through the rectifier which formerly was not used, out through the external circuit and back again via the rectifier to A. Thus, in both cases, the current in the external circuit always flows from C to D despite the reversal of the voltage applied across the points A and B.

The particular feature of this arrangement is that the voltage developed across the points C D is the same as that across A B, neglecting any drop in the rectifiers. This is a distinct advantage for the voltage need only be of the same order as that actually required to be delivered as direct current. With the normal rectifying arrangement, if double-wave rectificaton is employed, a transformer of double the voltage has to be used, with centre tapping in accordance with well-known practice.

Bridge rectification is not practicable with rectifier valves owing to the fact that it is necessary to heat the filament. Fig. 2 shows a bridge circuit arranged with ordinary valves, and it will readily be seen that this involves no fewer than three separate filament windings. This is because the filaments of three of the valves have all to be at different potentials and, therefore, must be insulated from each other.

Two principal sizes of rectifier discs are made. One of these is about ¾ in. in diameter and is capable of passing a current of 100 milliamps without overheating. The other size is a much larger disc 1½ in. in diameter. This larger size is also assembled with a cooling fin having an outside diameter of 3 in. which serves to conduct the heat away from the rectifier itself and to radiate it into the atmosphere. These large units will carry currents up to .5 ampere.

Rectifier units are made up by building up banks of these individual units so that they will handle the necessary voltage. For example, the 6-volt type consists of a bridge formation, each arm of the bridge containing two rectifier units in series. This is normally used with 8 to 9 volts A.C. applied so that the peak value of the alternating voltage applied across the A.C. input will be about 12½ volts, assuming a sine wave. There is a back E.M.F. of 6 volts from the battery leaving 6½ volts

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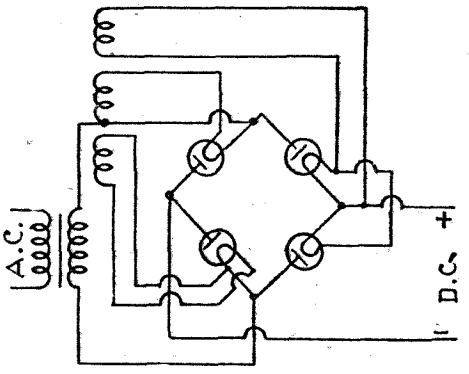
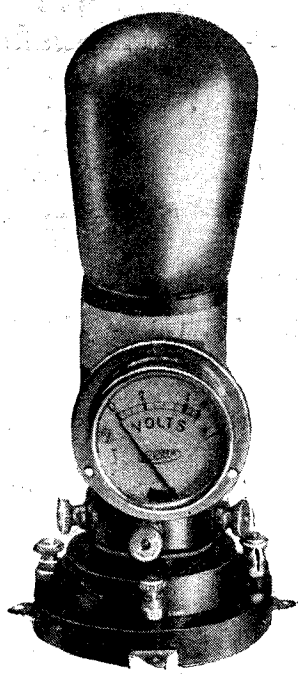



**Fig. 2. A Bridge Rectifier using Valves**

# A VALVE VOLTAGE TESTER

## By H. J. BARTON CHAPPLE



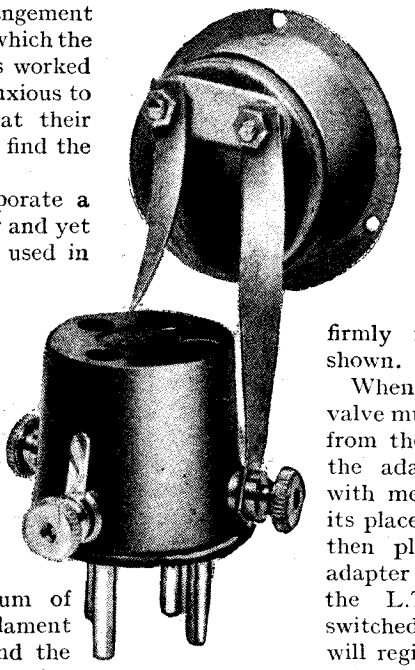
The Tester in Use

FROM time to time all users of wireless sets are reminded that it is essential to ensure that valves are worked at their correct or rated filament voltage. A failure to observe this warning will result in a considerably shortened life of the valves should over-running take place, although there may be a temptation in this direction when the signals just fall short of anticipated volume. It is a mistaken policy, however, to attempt to over-run the valves, or for that matter to unduly "force" any of the voltage variables, and for this reason it is very advisable to have some means available, whereby proper voltage regulation can be guaranteed. A voltmeter can be fitted into the receiver panel and, by means of switches, readings taken of the various voltages it is desired to measure. Another plan, of course, is to have a portable pattern voltmeter, with leads and testing handles, to enable contact to be made at the different points, readings noted and the desired adjustments executed.

### *Meeting a Need*

Cases arise, however, where either of these suggestions are inconvenient, and where it is only desired to regulate valve filament voltage an elaborate arrangement is frequently unnecessary. A plan which the writer adopted quite recently has worked excellently and readers who are anxious to have some visual indication that their valves are not being over-run will find the scheme worthy of trial.

The idea is to actually incorporate a voltmeter in with the valve-holder and yet allow the piece of apparatus to be used in any valve-holder position while the valve filament itself is operative. The simplest and most effective way of doing this is to obtain a Lissen valve-adapter and a small Bulgin voltmeter, 0—6 volts range. By referring to the two accompanying photographs the arrangement is practically self-explanatory. The meter is supported vertically by two brass strips which also form the medium of connecting links between the filament terminals of the valve adapter and the terminals of the meter. The strips should be 2¼ in. long, ¼ in. wide and 1/16 in. thick, and a small hole must be drilled at each end to allow the terminal screws to pass through. Pass one end of each strip over the valve adapter filament terminals and hold both rigidly at an inclination of about sixty degrees by means of the terminal nuts. Now twist each strip through ninety degrees and slightly bend up the free ends so that the holes pass over the meter terminal screws. Screw home these nuts and the meter will be held quite firmly in the manner shown.


The Back of the Tester

When in use, the valve must be removed from the valve holder, the adapter complete with meter inserted in its place and the valve then placed into the adapter sockets. When the L.T. supply is switched on, the meter will register the actual voltage at the filament.

## "USING THE ALL-METAL RECTIFIER" (*Continued from preceding page*)

applied across the rectifier. This voltage is developed across two opposite arms of the bridge in series, so that there are altogether four rectifiers in circuit, each one of which thus has a little more than 1½ volts developed across it.

At this point the rectifier resistance is of the order of ½ an ohm so that there is very little voltage developed on the rectifier itself. The actual rectifier resistance at various voltages is shown in Fig. 3. The 1 amp. L.T. unit consists of two ½-amp. units in parallel.

The high-tension rectifier is built up of a much larger number of the smaller type of disc capable of handling up to 100 milliamps effective current. A suitable number of discs is employed so that the voltage per disc is again between 1 and 2 volts when the actual effective resistance is only ½ an ohm per disc. As there are 50 discs in each arm of the bridge, we have a total resistance of 100 × 0.5 = 50 ohms, only for the rectifier, which is particularly low and involves very little voltage drop.

It should be particularly observed that the current output quoted relates to the total current flowing through the rectifier and not merely to the D.C. output alone. In the case of the low-tension rectifier, the circuits normally employed impose little extra load on the rectifier other than the pure D.C., but with a high-tension rectifier this is not the case. Consider again the circuit shown in Fig. 1. Here we have a rectifier unit applying current to an eliminator through the usual filter circuit. A reservoir condenser is followed by a filter choke and smoothing condenser, the D.C. load being applied across the terminals.

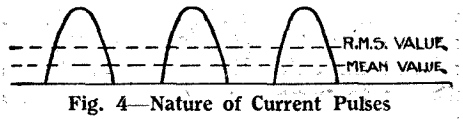


Fig. 4—Nature of Current Pulses

Now the current actually applied by the rectifier to the reservoir condenser is in the form of a series of pulses being somewhat of the nature indicated in Fig. 4. The actual D.C. output is equal to the mean of this fluctuating current as indicated by the dotted line. The heating effect of such a current, however, is not proportional to the mean value. Heating depends upon the square of the current and the R.M.S. or root-mean-square value (which is a value giving the equivalent heating current of any fluctuating current) is in this instance greater than the mean.

Thus, if we were to measure output from a rectifier with an ordinary D.C. meter, we should only obtain the mean value, whereas if we put in a meter depending for its action upon the heating effect of the current or depending in some other way upon a square law, we should obtain quite different results. It is this latter current which is the effective output from the rectifier because as we have already seen, such output is limited by the heating effect.

We must not, therefore, take from these rectifiers a current, whether steady or fluctuating, which will have an equivalent effect greater than the passage of a steady current of 100 milliamperes. As has been pointed out, this matter is relatively unimportant on the low-tension unit, but is appreciable in the case of the high-tension unit.

# WITHOUT FEAR OR FAVOUR


## *A Weekly Programme Criticism by Sydney A. Moseley*

WE had another magnificent broadcast from Covent Garden. *Madame Butterfly* is, of course, one of the most popular of Puccini's operas. It possesses one of the few stories which is widely known, and the airs are whistled by street urchins.

We heard some truly first-rate singing, and once more let us offer our thanks to all concerned.

◆ ◆ ◆

The Kit-Cat dance music sounded all the same to me, and the names were equally stupid. One dance was called "How long has this been going on?" Well, it seemed to me a long time.

◆ ◆ ◆

For heaven's sake, let the announcer who pronounces the foreign names so "posh" come down to plain, understandable English. It is one thing to give a *correct* rendering of these names, but quite another to be pedantic about it. Mr. Raditch, the politician who was shot, sounded like—well, I can't spell it. This craze for *comme il faut* announcing is going a bit too far.

◆ ◆ ◆

It was quite a good idea, the Musical Curiosities, with Victor Hely-Hutchinson at the piano and the Wireless Orchestra conducted by John Ansell. "The Funeral March of a Marionette" (Gounod), "Toy Symphony" (Laubach), "Kaliedoscope" (Goossens), and "March of the Kitchen Utensils" (Vaughan Williams) were some of the quaint items.

The musical "Robots," by that young B.B.C. composer above mentioned, was quite expressive of that bizarre play.

◆ ◆ ◆

A recital with Isolde Menges (the violinist) and Harold Samuels (pianoforte). This would crowd the Queen's Hall!

◆ ◆ ◆

I tried hard to take down in shorthand the latest limericks sent in by listeners in the André Charlot competitions. The condition was that five lines were to begin with A, S, C, O, T. The first one was:—

"A postman who went to the races
Said: 'Horses I'll back, not places.'
Crawled away home at last,
Oxford bags at half-mast,
The bookie had both trousers and braces."

Or something like that. That was the best of the bunch, although, judging from the explosion of laughter as the gentleman chosen to read the effort tried to get them over, you would have thought something really funny was coming. This clue failed, for even the claque didn't laugh. Try to take them down next time and read them in cold blood. That's the acid test—or, rather, the blood test.

◆ ◆ ◆

I don't know why, but somehow the organ recitals seem to be coming over better. I liked, for instance, Rheinberger's organ sonatas as played by Leonard Warner from St. Botolph's, Bishopsgate. Unless I mistake not, we don't get so much of this stuff from the cinemas as of yore. You remember a correspondent wrote a complaint to me on the poor sort of music we got from that quarter. Probably the programmes department took the hint.

◆ ◆ ◆

Suggested by a heathenish correspondent: "Why not transfer the 10.15 early morning *short* religious service to Sunday evening?" Does he mean "transfer" or "substitute"?

◆ ◆ ◆

What *is* there in the song about "the man coming along and taking my hand. . . . Maybe, Monday, Tuesday . . ."?

Here is Nora Blaney, described as "The versatile actress, singer, composer, and pianist," giving us one more version of it. Well, I wish we could get a little more versatility in these sob-songs. As a composer, Miss Blaney ought to be able to do better herself.

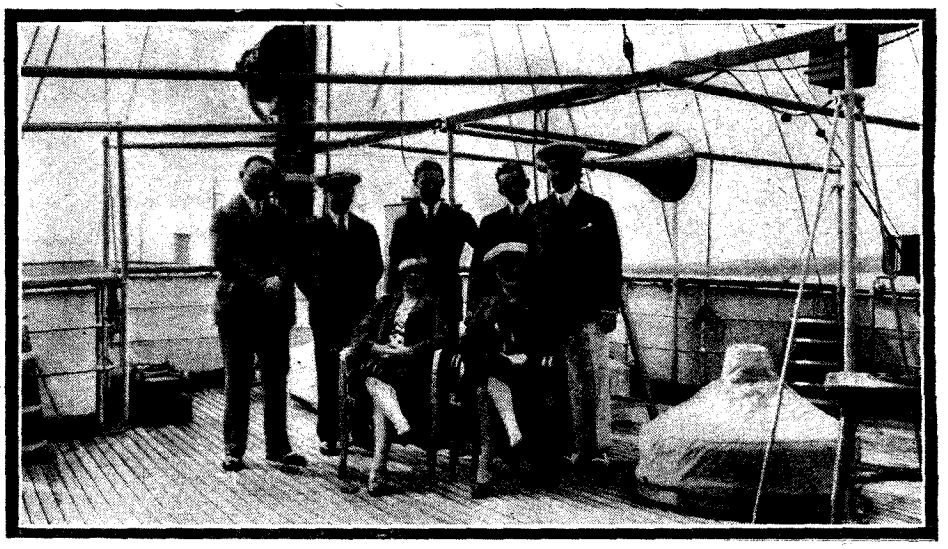
Her next item about the working girl's love song was better.

◆ ◆ ◆

One more Covent Garden success was *Cavalliera Rusticana*. (Here, I admit, I find I have been mis-pronouncing the name of this popular opera for years. What about you?). But I do wish some of these mechanical geniuses would invent a set that refused to receive and give out morse. I am not sure, but wasn't it Sir Oliver Lodge who was stated to have "something up his sleeve" in this connection? But, as I say, the opera, even with its morse and upstage fade-outs, was entirely delightful. But that screaming at the *finale* sounded like Hoxton on a Bank Holiday night.

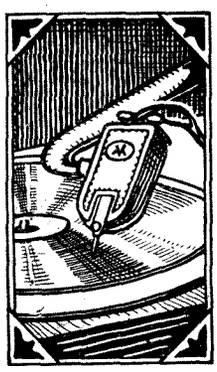
◆ ◆ ◆

If television actually comes, an interesting point which affects us is this: Up to now we have had competent artistes, some of whom probably have no "presence." They make first-class wireless artistes, but would hardly go down in the face of an audience. How is this going to affect matters if we can *see* as well as hear them?



**SENATORE MARCONI'S NEW EXPERIMENTS**

*Senatore Marconi has been conducting a number of beam wireless experiments on his yacht "Elettra"—The photograph shows (left to right) Mr. W. A. Winterbottom (Traffic Manager of the Radio Corporation of New York), Mr. David Sarnoff (Gen. Manager of the Radio Corporation of New York), The Chief Officer of the "Elettra," Mr. Frank K. Stanton of New York, Senatore Marconi, Mrs. Sarnoff and Mrs. Marconi.*



THE reproduction by electrical means of electrically-recorded gramophone records is a comparatively recently-developed "side-line" of wireless that must surely interest all wireless amateurs possessing any sort of gramophone. With a first-class receiver and loud-speaker even the most decrepit gramophone can be converted into a reproducing instrument as good, if not better, than the most expensive models. For in working a gramophone by wireless the only part of the gramophone that is involved is the turntable and tone arm, and all that is required is a spring motor in good working order and a tone arm adapted for the fitting of an electro-magnetic pick-up in place of the sound box.

### *Gramo-radio Advantages*

The chief advantages of the "wireless gramophone" are: (1) increased purity of reproduction, due to even amplification of all frequencies and elimination of needle scratch, and (2) greater volume, easily controllable. But these advantages are only obtained provided the amplifier and loud-speaker are of extremely good design. There are at the present time probably far more really bad wireless sets than gramophones and unless the reader knows that his wireless reproduction is, or can be made better than his gramophone reproduction, he had better leave his gramophone as it is.

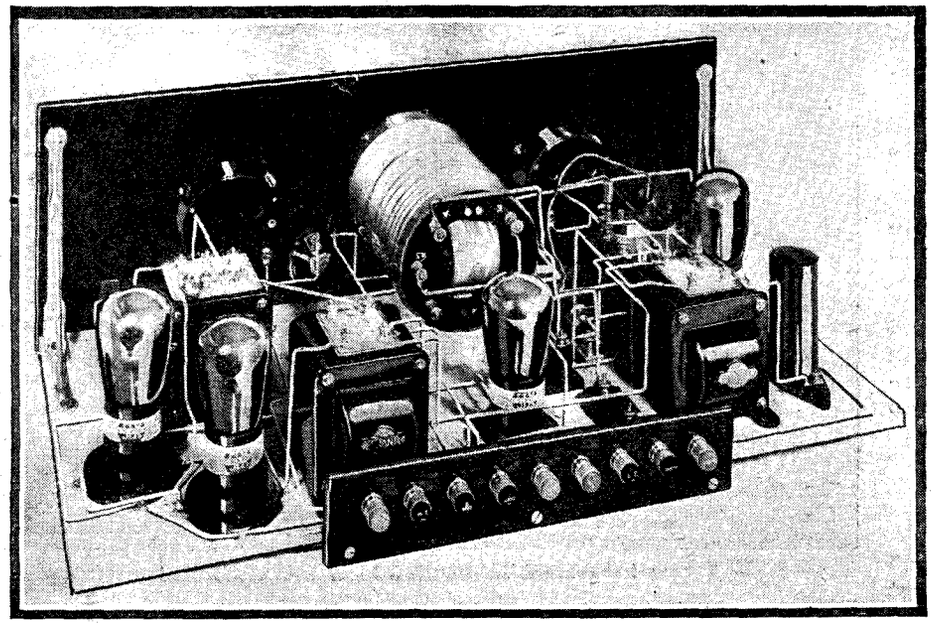
Those who are on the look-out for a really powerful and pure wireless receiver suitable for gramophone reproduction, should carefully consider building "The 'Pick-up' Three-four," because it has been specially designed for gramo-radio reception.

Used with a moving-coil loud-speaker, the instrument illustrated in these pages will provide a continuous supply of entertainment either from the nearest broadcasting station or from gramophone records. When the wireless programme does not appeal, simply plug in the gramophone pick-up and hear the record of the moment! It's a great idea, to be sure, and one that is going to "catch on" this autumn. Meanwhile, the reader will want to know something about the method we have adopted in designing this gramo-radio, and there is no better way of grasping the main essentials than by studying the circuit diagram.

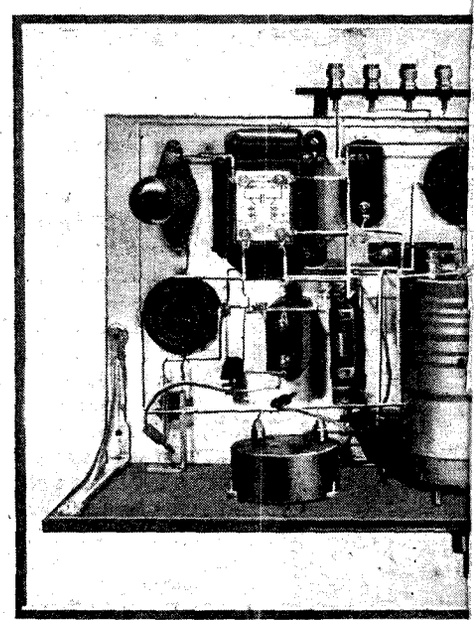

### *Circuit Considerations*

It should be obvious that although the sequence of valves is quite a common one—detector followed by two low-frequency amplifying valves — the method of coupling them together is somewhat unusual. It might be expected that for greatest purity we should have used resistance-capacity coupling. We are quite well aware that R.C. coupling gives purity —but does it give power as well? Only when a very high anode potential in the neighbourhood of two or three hundred volts is available.

A rival "purity" coupling which has come into considerable prominence in America is the dual-impedance coupler. As its name implies, the device consists of two impedances, one is connected in the anode circuit and the other acts as an impedance grid leak. As in R.C. coupling, the dual-impedance couplers embody a



This picture shows the Set ready for Testing



A plan View sh

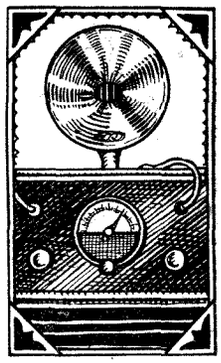
# K-UP" REE-FOUR

***A Gramo-Radio of Great Volume and Quality; Switch over from Wireless to Gramophone merely by Plugging in***

coupling condenser—in fact the connections of both sytems are similar, the impedances being substituted for the resistances.

One obvious advantage of an impedance over a resistance in the anode circuit is the lower voltage drop across it, meaning that a larger proportion of the applied H.T. will actually reach the anode with an impedance-coupler than with an R.C. coupler. Hence for a given power, the dual-impedance system of coupling can be worked with a lower H.T. than the R.C. system. The great question is, of course, whether the impedance couplers give as pure reproduction as R.C. couplers. The Igranic Company, who have produced a set of units for dual-impedance coupling, contend that this system is superior to R.C. coupling, for the following reasons:

Voltages developed across the anode impedance are transformed through the coupling condenser and divide across the coupling condenser and grid impedance. At high frequencies most of the voltage is developed across the grid impedance, but as the frequency is reduced and the reactance of the condenser increases, a smaller proportion of the voltage is developed across the impedance. Uneven amplification would therefore be expected but, actually, the amplification curve is kept substantially level, because advantage is taken of the fact that the condenser and impedance form a resonant circuit which is tuned to the low-frequencies, so that when the resistance of the condenser becomes effective it actually helps to amplify the low notes. With R.C. coupling there is no resonant circuit because a resistance is used instead of an impedance in the grid circuit and the effect of the condenser at low-frequencies is, therefore, to reduce the amplification of low notes. In practice the claims made for dual-impedance coupling appear to be substantiated, for in our receiver the Igranic units work extremely well with quite a moderate high-tension supply.

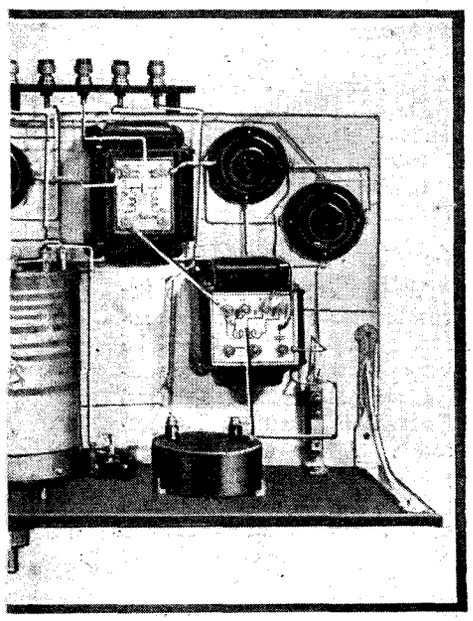


### *Switching*

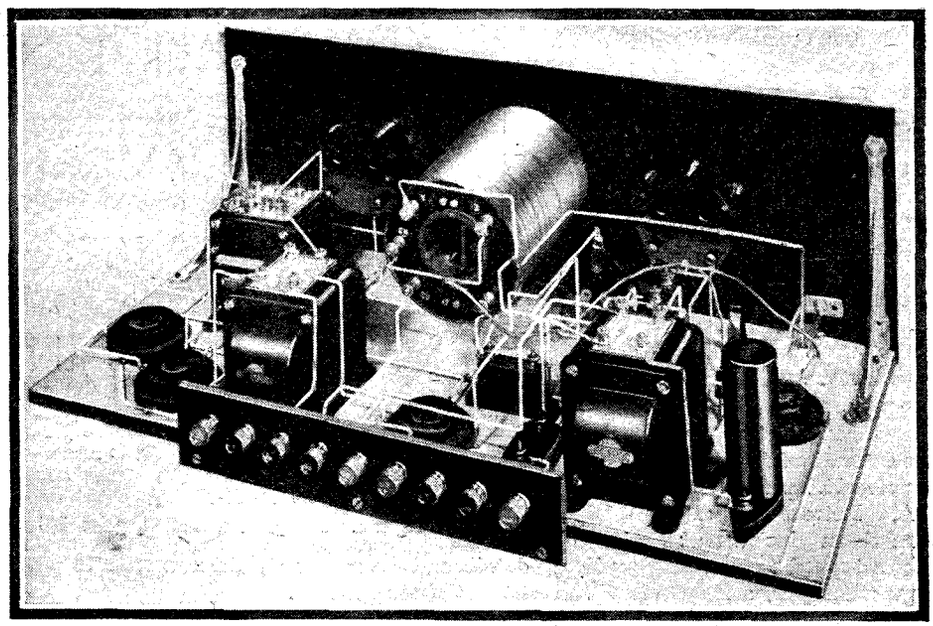
There are several important points about the circuit requiring comment and of which it will be as well to dispose now. The four valves comprise a detector working on the anode-bend principle and two low-frequency valves coupled by dual-impedance units, the last stage including two paralleled power valves. Two main requirements had to be satisfied—(1) a simple switching for the alternative use of gramophone or wireless, and (2) a suitable control of volume. A simple closed-circuit jack is wired in the grid circuit of the detector valve, so that when the pick-up plug is inserted it is shunted across grid and filament; at the same time the grid end of the tuner is automatically disconnected.

The high-resistance winding of a potentiometer volume control is shunted across the grid impedance of the first amplifying valve and the slider taken to the grid. In this way a most effective control of the output is achieved, without introducing distortion when on partial load.

There are several refinements introduced into this rather "de-luxe" receiver, some of which can be omitted. For example, a milliammeter reading 0-50 m.a. is wired in the anode circuits of the last two valves and a voltmeter reading 0-7·5 volts



owing the Wiring



The finished Receiver without the Valves

# "THE 'PICK-UP' THREE-FOUR" *(Continued)*

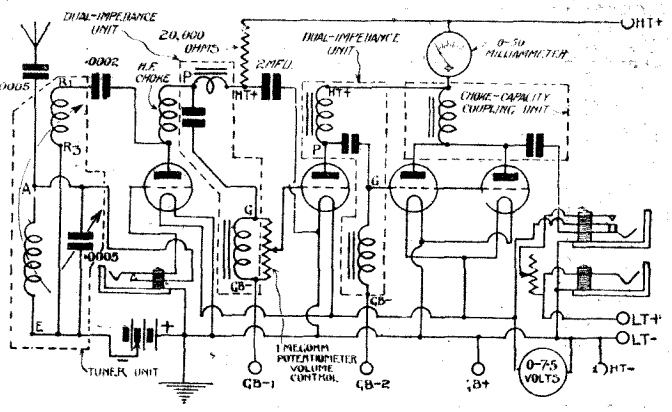
is shunted across the filaments. These instruments give a visual indication of what is happening; the milliammeter shows up any serious distortion by a violent "kick" of the needle, whilst the voltmeter shows whether the accumulator is "well up" or running down. Useful as they undoubtedly are, these instruments are not essential to the working of the receiver and if the constructor wishes to economise they can be omitted—and perhaps added later when funds permit.

Then there is a single-circuit jack shunted across the L.T. terminals, for which some constructors will have no use, since its object is simply to provide a convenient means of charging the accumulator without unhooking the leads. The charger leads should be connected to a plug and the latter inserted in the jack after the set has been switched off. Owners of trickle chargers will no doubt appreciate this refinement.

A third jack is used as a combined filament on-off switch and loud-speaker connector. When the L.S. plug is inserted in this jack it is connected in series with one side of a filter condenser and low-tension minus. (This condenser, with a low-frequency choke, is contained in an Igranic output unit.) At the same time two other contacts are constrained to meet and so the filament circuit is completed. A master rheostat is wired between one of these contacts and low-tension plus, thus providing a double control for the filament-current supply.

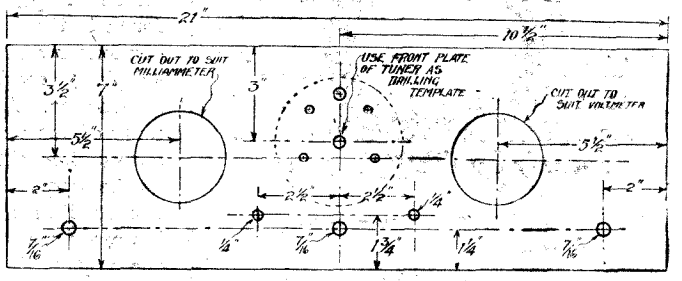
The aerial and reaction circuits were determined for us by our choice of an R.I. and Varley, Model A, Retroactive all-wave tuner—an instrument comprising a tapped coil covering medium and long wavelengths, a .0005-microfarad variable condenser and a variably-coupled reaction coil. On the control panel of the tuner are three knobs, one for wavelength selection, another for tuning and a third for reaction. We were averse to going back to the old-fashioned method of "swinging-coil" reaction—and found that the principle of the familiar Reinartz system could be adopted by making the usual fixed reaction coil variable and the usual variable reaction condenser fixed. Although the control is therefore a reversal of practice the result is a very smooth reaction application.

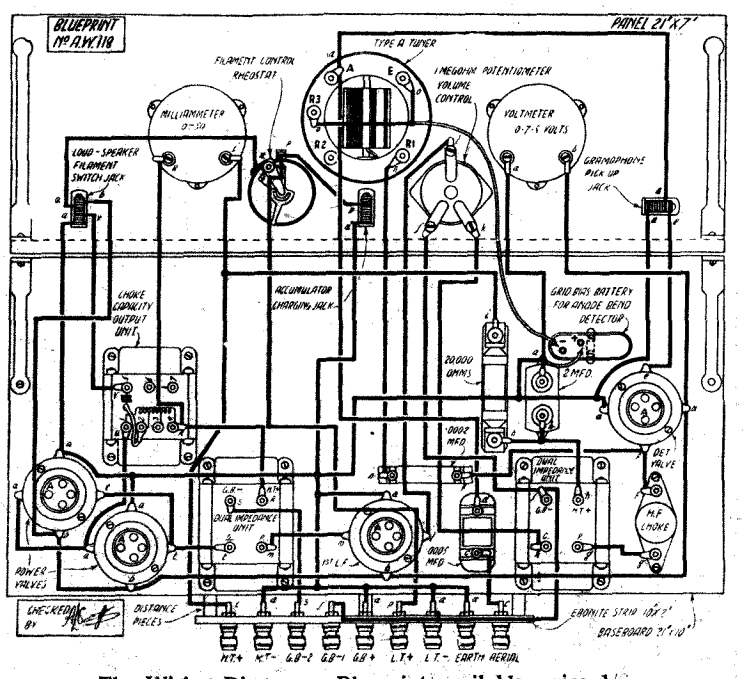
To overcome any tendency on the part of the amplifiers to "motor-boat" or otherwise misbehave themselves a resistance-capacity filter consisting of a 20,000-ohm resistance and 2-microfarad condenser is wired in the anode circuit of the first low-frequency valve. There is one H.T.+ terminal and two G.B.— terminals. A .0005-microfarad fixed condenser is connected in series with the aerial and the tuner. That is all there is to say about the circuit details and the reader should now refer to the list of components.




**Left: The Circuit Diagram**

**Right: Details of Panel**




**The Wiring Diagram. Blueprint available, price 1/6**

## Components

Ebonite or bakelite panel, 21 in. by 7 in. by ¼ in., and terminal strip, 10 in. by 2 in. by ¼ in. (Raymond, Ebonart, Becol, Pertinax).

Baseboard, 21 in. by 10 in. by ⅜ in. (Carrington).

Two panel brackets (Camco, Bulgin).

Type "A" tuner (R.I. & Varley).

Voltmeter for panel mounting, 0-7.5 volts (Ferranti, Sifam, Heaybeard).

Milliammeter for panel mounting 0-50 m.a. (Ferranti, Sifam, Heaybeard).

7-ohm rheostat (Lissen, G.E.C., Igranic)

Volume control (Igranic).

Three jacks: one single open circuit, one single closed circuit, and one three-spring automatic (Igranic, Bowyer-Lowe, Formo).

Two dual-impedance coupling units (Igranic).

Output unit (Igranic).

Four valve holders (Lotus, Wearite, Ashley, Benjamin).

High-frequency choke (Lissen, R.I. and Varley, Igranic, Wearite).

.0005-microfarad and .0002-microfarad fixed condensers (Dubilier, Lissen, C.D.M., Graham-Farish).

2-microfarad fixed condenser (Dubilier, T.C.C., Lissen).

20,000-ohm resistance and holder (Dubilier, R.I. & Varley, Graham-Farish).

4½-volt G.B. battery (Lissen, Ever-Ready).

Nine terminals marked Aerial, Earth, L.T.—, L.T.+, G.B.+, G.B.—1, G.B.—2, H.T.—, H.T.+ (Belling-Lee, Eastick, Igranic).

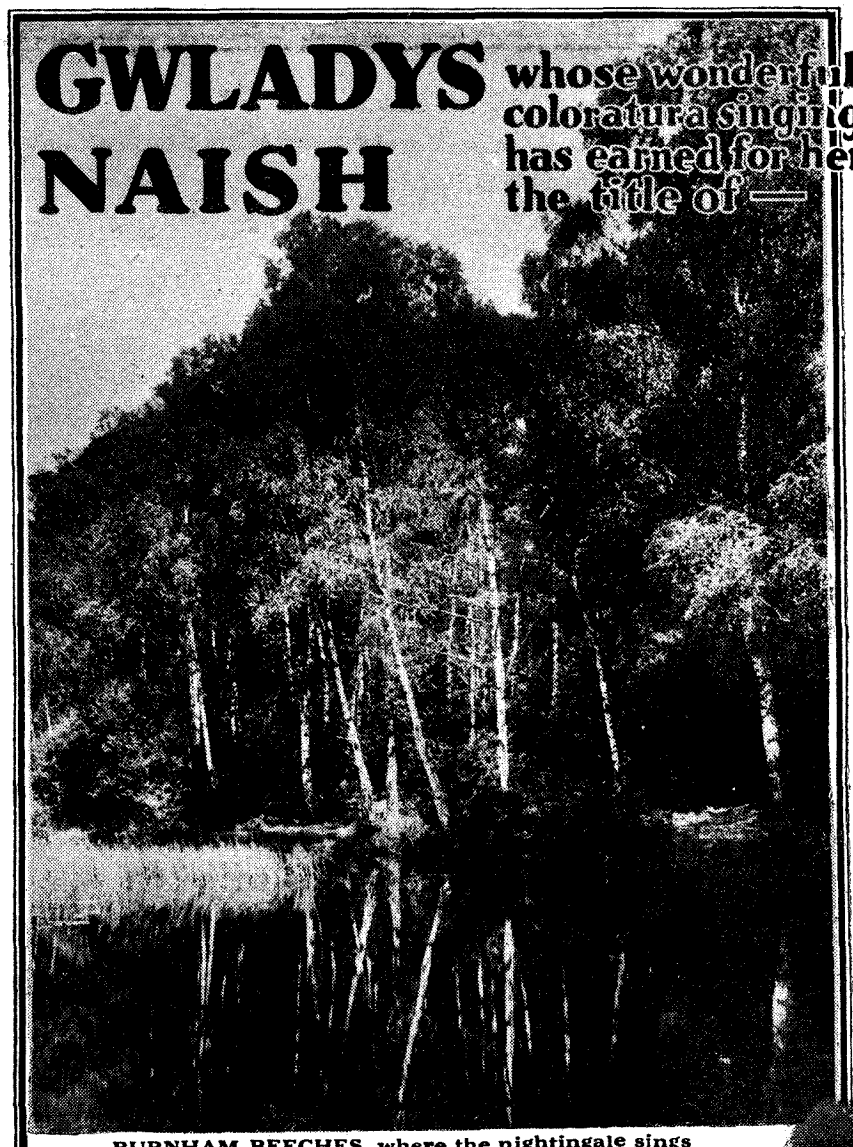
Cabinet to take panel and baseboard (Carrington).

## Construction

With these components the constructor can start the assembly, a process that will be very much simplified if a full-size 1s. 6d. blueprint is obtained from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4. Besides giving all the dimensions, this blueprint constitutes a complete guide to the layout of both panel and baseboard components; it also indicates the point-to-point wiring between each component. With the blueprint in front of him the constructor can hardly go far

*(Concluded on page 26)*

# GWLADYS NAISH whose wonderful coloratura singing has earned for her the title of — "The WELSH NIGHTINGALE"



BURNHAM BEECHES, where the nightingale sings

Nightingales in the wood and the greater nightingale in the studio. Here is song that will impel you to listen if you are using the pure power of a Lissen Battery for your H.T. For this battery produces perfectly pure D.C. current by means of a new process and a new chemical combination which is known only to Lissen. It will keep the wonderful voice of Miss Gwladys Naish so liquid, so clear, that you will hear a perfect rendering of coloratura singing.

You can get no better power for radio than the Lissen New Process Battery. It lasts longer. It is smooth flowing. It is noiseless, steady and sustained. There is no ripple in it anywhere—there is no hum. You will never go back to any other form of current for radio once you have used the Lissen Battery.

If you would like to hear what perfect coloratura singing is like, make a special point of having a Lissen New Process Battery in your set in time to hear Miss Gwladys Naish broadcasting.

You can get it at one of 10,000 radio dealers. Be sure you ask for it in a way that shows plainly you intend to take no other—delightful radio reproduction will be your reward.


*Photo by CLAUDE HARRIS*

**60 volts**
(reads 66)
**7/11**

| | | |
|---|---|---|
| 100 volts | (reads 108) | 12/11 |
| 60 „ | Super Power | 13/6 |
| 9 „ | Grid Bias | 1/6 |
| 4½ „ | Pocket Battery | 5d. |

(or 4/6 a dozen).
MADE IN ENGLAND.

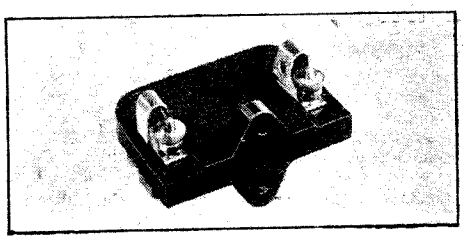
**LISSEN LTD., 16/20 Friars Lane, Richmond, Surrey.**
*Managing Director: Thomas N. Cole*

# "A.W." TESTS OF APPARATUS

*Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.*

### Stewart R.C. Coupler

WE recently examined and tested a Stewart R.C. coupler having a number of novel features. The unit consists essentially of a fixed condenser having



Stewart R.C. Coupler

a rated capacity of approximately .002 microfarad; this is housed in a black insulated moulding, on each side of which a set of resistance clips is fitted. Two lugs forming part of the moulding serve for fixing the component to the baseboard.

Each resistance clip consists of a piece of springy metal, the ends of which are drilled and bent over in order to increase resilience and power of holding the resistance securely. Any standard type of tubular resistance could be inserted in the clip and was then held particularly firm without risk of coming adrift after prolonged vibration, such as might occur with a portable receiver.

The inter-coupling capacity, as tested in our laboratories proved to be .0013 microfarad, whilst the insulation resistance was infinity. This is a neat and compact unit and should appeal to readers. J. Stewart, Ltd., of 24 Hatton Garden, E.C.2, are the manufacturers.

### Tunewell Six-pin Coil Base

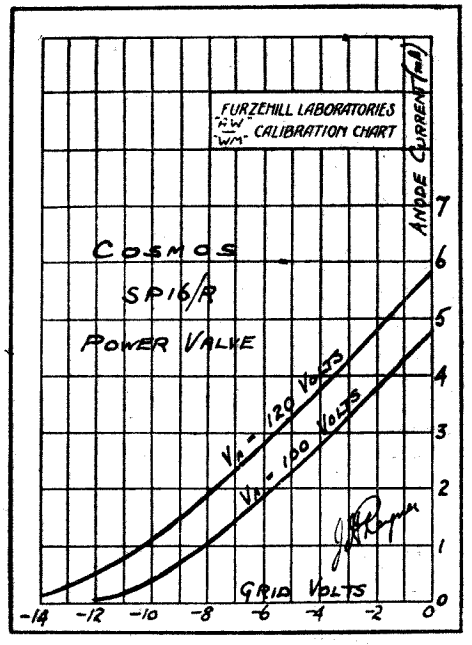
SIX-PIN coils are in constant demand since they are adaptable to all types of tuning circuit. We recently gave a report in these columns of a Tunewell six-pin coil: we have now examined and tested a standard six-pin base of the same make. The necessary sockets and terminals of this component are mounted on an elliptical black insulated moulding. Connections from the sockets to the terminals are made on the under side of the base.

The three terminals are placed on either side of the component and are marked in the conventional manner. By making the base elliptical in shape, the overall dimensions of the component have been decreased, which in these days of compact receivers is most desirable.

Altogether, the workmanship and finish of this component are satisfactory whilst the spacing of the sockets allows the average six-pin coil to be inserted and removed without difficulty and at the same time providing good electrical contact. The component can be recommended.

### Cosmos SP16 Valves

THE demand made on H.T. and L.T. batteries even with the present-day low-consumption valve, is quite high enough, the problem being particularly important in the case of portable receivers where weight must be cut down. It is not surprising, therefore, that valve manufacturers are doing their utmost to manufacture economical valves without reducing their efficiency. Cosmos valves made by Metro-Vick Supplies, Ltd., of 155 Charing Cross Road, W.C.3, are well known for




Characteristic Curves of the Cosmos SP16/R Valve

their good performance and sound construction, and the fact that the makers have produced a new low-consumption series is interesting.

These new valves are known as the SP16 type. The first of these, the SP16B, is a high-resistance valve, rated at 70,000 ohms. with a correspondingly high amplification factor, and is therefore particularly suitable for use with resistance-coupled amplifiers. It may also be used in tuned-anode high-frequency amplifiers. We found this valve rather better on test than the rated figures indicated.

The best of the series is the SP16G. This is a low-frequency valve of undoubted merit. It has a rated resistance of 17,000 ohms and an amplification factor of 16. As a detector or a first stage low-frequency amplifier, followed by transformer or choke-coupling, it should operate effectively, while it is also suitable for H.F. transformer coupled circuits.

The last of the series is the SP16R, a power valve, designed for use in the final stage of a low-frequency amplifier. A characteristic curve taken with this valve at two anode potentials is given. It will be seen that the valve is capable of handling a grid swing of 7 volts with 120 volts H.T. without distortion. The valve has a rated amplification factor of 6.5.

Below we show the figures obtained from tests carried out in our laboratories.

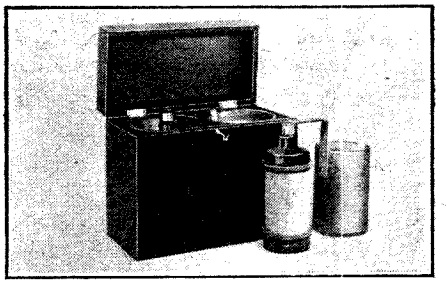
The tests were taken with 110 volts on the anode.

| Type | Resistance | Amplification factor |
|---|---|---|
| SP16B | 47,000 | 33·7 |
| SP16G | 21,000 | 17 |
| SP16R | 13,000 | 6 |

### L.T. Wet Battery

THE Wet H.T. Battery Co., of 184-188 Shaftesbury Avenue, have had considerable experience with Leclanché cells, particularly of the small unit for H.T. work. The makers have recently placed on the market a large-capacity cell for low-tension use. The advantages of such a cell are obvious: in the first place, it does not require recharging and, secondly, it should have a long life without need for much attention.

We recently subjected one of these cells to a practical, although rather severe test. The cell was discharged at a mean rate of ¾ amp. for twelve hours. The voltage, which was originally 1.3 fell to 0.9 volt; but, on leaving the cell idle for a few hours, rose to 1.1 volts and remained at this value. Subsequently, discharges of 0.5 amp. were taken for periods varying from four to eight hours, a rest of about ten hours being allowed in between each discharge. During



Wet H.T. Battery Co.'s Wet L.T. Battery

this time the voltage did not fall below 0.9 and did not rise above 1.1 volt.

Since the variation in voltage is small when the cell has settled down, it should be particularly useful for L.T. work.

# IN THE TWILIGHT

Music has great charm in that most fascinating period of the day—'twixt sunset and dusk. To enjoy it wherever you may be—in the house or garden; on the tennis court or river, or by the countryside—in fact, anywhere, at any time; for dancing or just for the entertainment provided by good music perfectly produced, take the line of least resistance and invest in one of the new Lissen products, the

## LISSENOLA
REG. TRADE MARK
## GRAMOPHONE

### THE PERFECT PLAYING PORTABLE

Here is a portable gramophone, with a fine sound box, a robust silent-running motor, fitted with speed regulator and cam brake, and which has a horn longer than in any other instrument up to double the price. Its reproduction of bass notes is a revelation. The case is covered in artistic black figured leatherette. The cover carries eight 10 in. and the machine will play up to 12 in. records.

Every gramophone tested before despatch, is compact, handsomely finished, light and easy to carry—the ideal companion for the picnic and the holiday. Provides a full volume of dance music at any time, anywhere. Buy a "LISSENOLA" to-day, and add to the enjoyment of your holiday or week-end.

If unable to obtain prompt delivery from your dealer, order at once direct from Lissen's, but give your dealer's name and address, and state Model required. Cash with order, or will be delivered by return, C.O.D.

**MODEL NO. 1**
(as illustrated)
**£2-2-0**

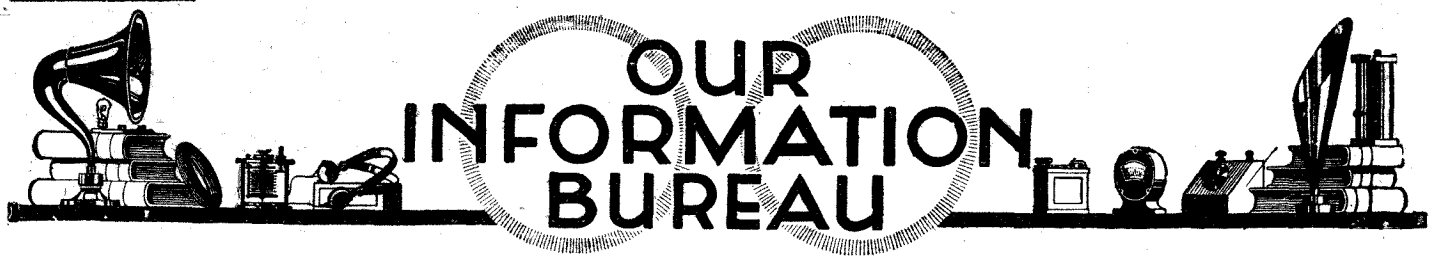
**MODEL NO. 4**
with special horn, sound box and long-running motor
**£3-7-6**

### 7 DAYS APPROVAL

If you are not entirely satisfied with the "LISSENOLA" after trial, return to Factory within seven days and money will be gladly refunded in full.

## LISSEN LIMITED, LISSENIUM WORKS,
## FRIARS LANE - RICHMOND - SURREY.

*(Managing Director: Thos. N. Cole.)* *Telephone: Hounslow 2361 (Private Branch Exchange).*




RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

**Reducing Condenser Capacity.**

**Q.**—*I have a .0005-microfarad variable condenser and wish to reduce the maximum capacity to a value suitable for tuning on the short waves. What capacity fixed condenser should I connect in series with the condenser to do this?—J. T. (Leith).*

**A.**—If you connect a fixed condenser of .0005-microfarad capacity in series with your present variable condenser the total capacity in circuit will be ·00025-microfarad. This value will be quite suitable for tuning on the short waves, that is, round about 100 metres.—L. C.

**Metal for Screens.**

**Q.**—*Can any particular metal be preferred for screening a receiver from parasitic pick-up? I notice that aluminium is largely used, while copper is also often advised, but I cannot call to mind ever having seen brass specified, and am wondering if there is any definite reason for this.—G. F. (London).*

**A.**—Copper is by far the best material for screening purposes, but aluminium is quite good and has the advantage of retaining its bright appearance for a longer period than does copper. Brass is hardly ever specified for the simple reason that it more often than not contains impurities, which may cause undesirable losses.—A. L.

**Summer-time Reception.**

**Q.**—*Must one expect poorer reception during the summer time? I ask this because I wish to take steps to retain my present satisfactory results if it is at all possible.—G. D. (Somerset).*

**A.**—The state of the atmosphere governs reception to a considerable degree, and it is a fact that wireless reception falls off during the summer. The dry state of the ground, which is used for earthing purposes, also may be the cause of some inefficiency. Should you experience a falling off in signal strength from any of your favourite stations you are advised to pay particular attention to the various factors within your scope that govern reception. In this way only the unavoidable falling off in reception can be combated. The best plan is, of course, to add an H.F. valve to your receiver.—C. L.

## *When Asking Technical Queries*

***PLEASE write briefly and to the point***

**A Fee of One Shilling** (postal order for preference) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

**Rough** sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

**Reaction-condenser Capacity.**

**Q.**—*Why is it that in some sets a .0003-microfarad condenser is used for reaction purposes while in others, apparently using the same circuit, a .0001-microfarad condenser is specified?—S. F. (Rugby).*

**A.**—The value for the reaction condenser is determined by the number of turns of the reaction coil, and also, to some extent, by the aerial-earth system. When a large number of turns are contained in the reaction coil a small reaction condenser is best and vice versa. Where an inefficient aerial-earth system is employed, a more powerful application of reaction is needed, often making it necessary to increase either the size of the reaction coil or the capacity of the reaction condenser, or both, before good results can be obtained.—F. D.

# "More Reminiscences of a B.B.C. Engineer" (*Continued from page 7*)

were carried out at Plymouth—as being typical of relay station conditions. As a matter of fact, it was also the nearest relay station to London.

The first experiments which the B.B.C. made with "wired wireless" were carried out on the London-Plymouth line early in 1924. As you may know, "wired wireless" is a method of sending speech and music over a land-line in which the signal is transmitted in radio frequency, on a very high wavelength. This is rectified and amplified at the receiving end, the resulting sound being (or should be) free from "cross-talk," hum and distortion. Not until quite recently have all these three objects been attained at the same time. I remember that on the occasion of the first "wired wireless" experiments at Plymouth, much interference was picked up from high-power, high-wavelength wireless-telegraph stations.

### *Edinburgh Rock!*

When Plymouth was officially opened, on March 28, 1924, it was decided that relay stations would be erected in various towns and cities at the rate of one a month. The next relay station on the programme was Edinburgh, where the only available site presented many great difficulties. The transmitter hut was situated in a yard in the very centre of the University buildings. Apart from the unpleasant fact that it was literally surrounded by dissecting rooms and mortuaries, the aerial was very badly screened and the "earth" was rock!

There was very little time for "playing about" with advanced theories. It being vacation time, it was difficult to obtain permission to carry out any extensions such as fixing up a network counterpoise, and the nearest water-pipe was tried out as an earth. With full power on the transmitter, radiation was practically nil! A little detective work, a spot of diplomacy and a few telegrams secured the necessary permission and a counterpoise was erected as near the ground as possible, radiating in all directions, around the hut to the buildings which formed the four sides of the yard.

### *An Efficient "Earth"*

The erection of the remainder of the relay stations was fairly straightforward. The Liverpool transmitter was erected in a cement works with the aerial across a main road to the very high chimney of a burglar-proof safe works. At this station the first of a particular type of "earth" was tried out and proved to be very successful. A number of large sheets of zinc were soldered together to form one large earthplate, the shape of the plate being practically a circle, the outer edges of the circle being slightly lower than the centre (thus forming a kind of squashed-out cone).

The earth lead (of very heavy copper tape) was taken from the centre of this cone up a drain-pipe to the transmitter. Several holes were perforated in the zinc, to allow water to drain through. A thin layer of coke was put on the earth-plate before the soil was thrown back, and the depth of the plate was about four feet below the surface of the ground. An increase of radiation of about 20 per cent. was obtained during dry weather by simply pouring a few pailfuls of water down the drain-pipe on to the earth-plate! On a smaller scale, such an earth would be excellent for ordinary receiving sets. Where it is not possible to bury wires and earth plates underneath the aerial, the squashed-cone "damp" earthplate is certainly the most efficient.

(*To be continued*)

Readers will be interested to know that when the Derby result was picked up on a five-valve "McMichael portable receiver," on the Flying Scotsman, "Six-sixty" valves were in use.

The receiver which enabled General Nobile of the *Italia* to keep in touch with the world was a British-made Burndept (Mark IV) short-waver.

# See this new L.F. Coupling in the "Gramo-Radio" Set

The Igranic Dual Impedance Coupling Unit is the latest and most perfect low frequency coupling produced. Used in a *three* stage amplifier it gives a practically straight curve between 30 and 10,000 cycles—the whole audible range. Nothing could be nearer perfection than this.

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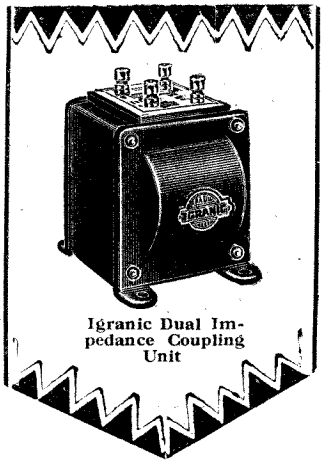

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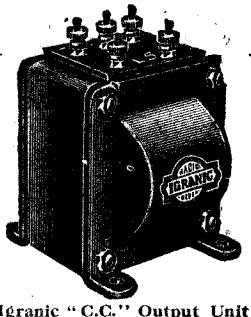
*Particulars of the principle of this new coupling will gladly be sent on request for List No. D.94. Ask for a free copy of "Selected Circuits" by H. J. Barton Chapple, B.Sc., at the same time.*

## Other Igranic Components used in the "Gramo-Radio"



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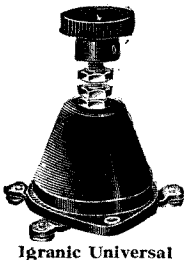

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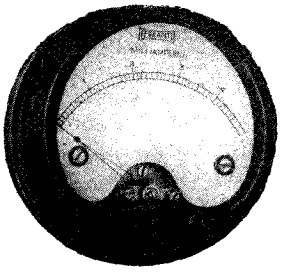
# RADIO METERS



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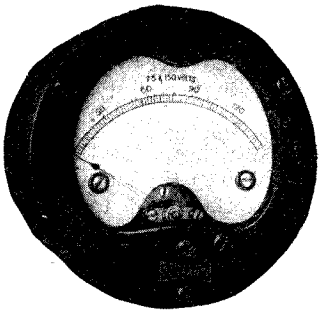

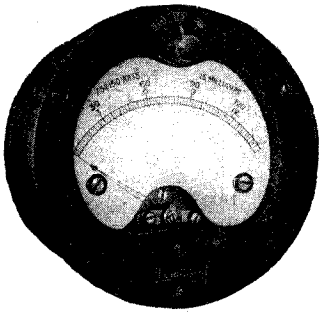

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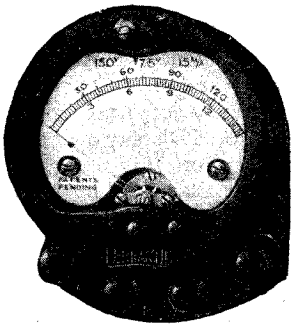

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# RADIOGRAMS

ON July 9, Gene Gerrard, well known to West End audiences for his successes in *Katja the Dancer* and *The Desert Song*, will broadcast from 2LO with Rudy Starita, the "star" xylophonist. In the same variety programme will be found Helen Gilliland, who is now appearing in *Lady Mary* at Daly's Theatre.

July 14, France's National Fête day celebrates the storming of the Bastille; it is to be commemorated in London by a special programme entitled *Vive La France*, in which French artistes will take part.

The winning band of the 1928 police championship ("A" division) is to provide the orchestral concert to be broadcast from the London studio on July 21.

*Hal the Highwayman*, an eighteenth-century play of the road, with an unexpected climax, will form the main feature of the evening entertainment to be offered to listeners by 5GB, on July 6.

Imito, an Australian artiste who does not limit his imitations to bird-calls, but also illustrates dog fights and political meetings, will take part in the variety hour down for transmission by Cardiff on July 17.

On July 14, Mabel Constanduros, the creator of *Mrs Buggins*, will visit the Newcastle station to broadcast two numbers of her repertoire.

A well-known Spanish composer, poet, and critic, Senor Pedro Merales, has been invited to the Savoy Hill studio to conduct a programme of music of his country on July 20. The soloists will be Brosa and Gertrude Johnson.

Provincial listeners who missed the broadcast of the Hendon Air Pageant will have an opportunity of hearing the biggest Royal Air Force Display ever given outside London when, on July 6, stunts are to be performed at Blackpool by the light aeroplane clubs in co-operation with the Royal Aero Club. This event will be broadcast from the Manchester station from 2.50 to 5.0 p.m.

In view of the impatience displayed by the inhabitants of Turin (Italy) at the delay in the introduction of a broadcasting service in their city, the authorities have erected a provisional transmitter which is to start testing within the next few days. The wavelength will be 315.8 metres and the power about 500 watts. It has adopted the call letters 1TO.

For the purpose of effecting alterations to its plant, the Basle broadcasting station will close down from July 22 to August 5 inclusive.

The Hilversum broadcasting station closes down nightly for five minutes at 8.40 p.m. B.S.T. during which period a weather forecast is transmitted on a wavelength of 1,100 metres by the De Bilt Meteorological Institute.

*Radio Maroc*, the Rabat broadcasting station, which transmits wireless programmes daily on a wavelength of 416 metres, possesses an aerial power of some 2 kilowatts, and on favourable nights can be distinctly heard even in the northern districts of France. To feed the transmitter two studios have been erected, one at Rabat and the other at Casablanca, with cable connections to several theatres, cabarets, and dancing halls in both cities.

8GF, the small broadcasting transmitter owned and operated by the Radio Club du Bas Rhin in Strasbourg (France), now limits its broadcasts to two hours on Tuesdays and Thursdays in each week, namely, from 9 to 11 p.m. The wavelength is 268 metres.

Experiments in short-wave wireless telephony transmissions are being carried out by the French Ministry of Posts and Telegraphs, through the Ste Assise (Bordeaux) station; reports received confirm that signals have been well received in both French Cochin-China, and Tokyo (Japan).

The Roumanian Broadcasting Company proposes to erect at Bucharest a 12 kilowatt type 1928 Marconi telephony transmitter to be officially opened on January 1, 1929. In the course of the year, this station will be equipped with more powerful plant, and the original transmitter transferred to Jassy as a relay. The wavelength allocated to Bucharest is 236.2 metres.


The new 2.4-kilowatt station installed at Haniska (Enyicke) in the neighbourhood of Kosice (Czecho-Slovakia) has started its first tests on a wavelength of 263.1 metres. Favourable reports have been received from Hungary, Roumania, Germany, and England.

It is reported from Germany that the Oslo Broadcasting Company has placed an order with the Telefunken Co., of Berlin, for the supply of a 50-kilowatt high-power transmitter to be erected in the neighbourhood of the Norwegian capital.

The "Mail Bag's Fifteen Minutes" from WLW, Cincinnati, crowds interesting and humorous entertainment into a short period. "Kicks," complaints and hints, that are received in that station's mail are read before the mike once a week. This is a suggestion for the B.B.C.

Emil Velazco, organist at WOR—Newark, is improving his programmes by hearing himself as others hear him. While broadcasting he listens himself with a pair of earphones.

According to M. Edouard Belin, pioneer in the invention of the transmission of pictures by telegraph, China, which is so backward in taking to radio, has adopted a telegraphic picture service between Peking and Mukden.

South America has taken to radio intensely. Brazil has twenty broadcasting stations, five of which are in Sao Paolo. About 150,000 listeners are registered in that republic. In Argentine there are six stations; in Chile, six; in Peru, one; and Venezuela, one; Bolivia, five.

New Zealand expects to double its amount of licensed listeners this month over the amount registered last year. Already they have 40,000 such listeners, compared with the 21,000 licences in June, 1927.

In accordance with the rulings of the International Radio Convention, Canadian amateurs have now received their new licences. They will be identified by the letters VE before the conventional amateur call. There are five amateur districts in Canada. In addition special amateur licences start with a VE9, while clubs start with VE10 and training schools with VE6.

The new 5-kilowatt station planned for KNX, Los Angeles, will cover five acres of ground. It will be remote-controlled from the studio situated in Hollywood, and will be equipped with all the latest radio improvements.

A fire-call system using automatic wireless transmitters is now in use in Texas, in America.

# LETTERS TO THE EDITOR

*The Editor does not necessarily agree with the views expressed by correspondents.*

### Push-pull Amplification and Royalties

SIR,—The employment of push-pull amplification in broadcast receivers is patented by the Standard Telephones and Cables, Co., Ltd. We are pleased to advise you and your readers that we have made arrangements with that company to incorporate in the price of the transformers the necessary licence for the use of the push-pull system in broadcast receivers.

In order to encourage the continued use of push-pull amplification, we have made only a small increase in the price in order to cover the licence royalty payable.

FERRANTI LTD. (Hollinwood).

### The "Best-yet" Crystal Set

SIR,—I have tried out the "Best-yet" crystal set as described in your valued paper (June 23) and the results have been excellent.

At one mile from 5NO I tuned in that station on the loud-speaker at sufficient strength to listen quite clearly to the transmission, and when the local station closed down on Friday evening at 11 o'clock, I received Daventry senior at very good headphone strength, and as it was just dusk I feel sure that I could do much better during the dark winter nights.

I thought it may interest you to know that I have since slightly altered the set, and have converted it into a combination crystal detector and wave-trap set, and it is very efficient in cutting out the local station.

To use the wave-trap I take a connection from the earth terminal to set and by disconnecting the phones from the terminals this automatically cuts out the crystal circuit. I have also incorporated a switch to cut out the wave-trap when listening to the local programme.

B. (Newcastle-on-Tyne).

### Gaspipe Earths

SIR,—Referring to A. C. C.'s letter, my experience is the same.

In my workroom I have leads to a main water pipe and also one to a pipe fed from a cistern and using a crystal set on 2LO I cannot really say either is better than the other.

In the room where I keep my sets, I tried leads to a pipe from a cistern, a copper plate 2 by 1 feet, buried about 2 feet, but in gravelly soil, and the gas pipe—a brass pipe going from the iron elbow to the fire.

The copper plate is the worst earth and the gas pipe immensely superior to the water pipe. S. M. (London, W.C.).

### On the Short Waves

SIR,—I have just been listening to the transmission from 3LO Melbourne, on 32 metres. What prompts me to write to you is the fact that when working on the short-waves (15-100 m.), the microphonic noises of which THERMION has more than once complained, never trouble me. I can actually tap my detector valve and barely produce a "ping"; this while the set is in its most sensitive condition!

I use "W.B." anti-microphonic valve-holders, but perhaps the main reason for my immunity from extraneous noises is the valves I use. These are of the 2-volt .1-ampere class, and are made by Mullards. I find that the Mullard PM1 (H.F.) makes a very useful short-wave detector, it oscillates down to twelve metres.

P. J. (Streatham).

### "The Home and Abroad Two"

SIR,—I agree with your correspondents *re* the "Home and Abroad Two" as a station-getter.

Here, about one mile from the local station, with a water-tap earth and an aerial about two feet above the chimney top, on a fair night, I receive 5GB and a couple of Continental stations without the aid of a trap. When the local station shuts down, stations too numerous to mention, on both long and short waves, can be brought in. J. (Dublin).

# BLUEPRINTS

Full-size blueprints are available of the following sets. Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of all these sets can be obtained at 1s. 3d. and 4d. respectively, post free.

*All Post Free*

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| "Best-yet" Set | AW 114 |
| Half-hour set | WM28 |

## ONE-VALVE SETS (1s. each)

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|---|---|
| Loud-speaker Special | AW 78 |
| Ultra-sensitive Hartley One | AW103 |
| Fan's Short-wave One | AW 119 |
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| Britain's Favourite (*7d. with copy "A.W."*—D, Trans) | AW 72 |
| Ultra-selective Hartley (D, Trans) | AW 90 |
| Oceanic Short-wave (D, Trans) | AW 91 |
| "Q"-2 (D, Trans) | AW 99 |
| Long distance Two (HF, D) | AW110 |
| Three-waveband Two (D, Trans) | AW112 |
| Two-programme (D, Trans) | WM56 |
| "Q"-coil (D, Trans) | WM62 |
| Crusader (D, Trans) | WM69 |
| Flat Dweller's (HF, D) | WM76 |

## THREE-VALVE SETS (1s. each)

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| Ether Searcher (D, RC, Trans) | AW 52 |
| Britain's Favourite (*7d. with copy "A.W."*—D, RC, Trans) | AW 74 |
| "Q"-coil 3 (D, RC, Trans) | AW 84 |
| Clarion (D, 2 Trans) | AW 88 |
| Miniature Hartley Three (D, 2RC) | AW101 |
| Summer-time D.X. Three (HF, D, Trans) | AW106 |
| Three-valve Mains set (HF, D, Trans) | AW109 |
| Screened-grid (HF, D, RC) | WM21 |
| Screened-grid Short-wave (HF, D, Trans) | WM51 |
| Everyday (D, 2 Trans) | WM52 |
| Music Charmer (D, RC, Trans) | WM60 |
| Britannia (D, RC, Trans) | WM67 |
| Home and Garden Three (D, 2 RC) | WM78 |

## FOUR-VALVE SETS (1s. 6d. each)

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| "Q"-4 (HF, D, RC) | AW 98 |
| Near and Far Three-Four (HF, D, RC, Trans) | AW 113 |
| "Pick-up" Three-four (D, 2 Dual Amp.) | AW 118 |
| Revelation (HF, D, RC, Trans) | WM24 |
| Station-finder (HF, D, 2 RC) | WM68 |
| "Q"-coil 4 (HF, D, Trans, RC) | WM71 |
| Gramo-Radio 4 (D, RC, 2 Trans, Push-pulled) | WM70 |
| Screened-grid 4 (HF, D, 2 RC) | WM77 |
| All-from-the-Mains Four (HF, D, 2 LF) | WM86 |

## FIVE-VALVE SETS (1s. 6d. each)

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| Exhibition (2 HF, D, RC, Trans) | WM33 |
| Phoenix (2 HF, D, 2 LF) | WM42 |
| 1928 Five (2 HF, D, 2 Trans) | WM46 |
| All-the-world Five (2 HF, D, 2 RC) | WM63 |
| Cataract 5 (HF, D, RC, Push-pull) | WM79 |

## SIX-VALVE SETS (1s. 6d. each)

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|---|---|
| Short-wave Super-6 (Super-het, Trans) | AW 67 |
| Adaptor for above (See Misc. List) | AW67a |
| Nomad (2 HF, D, RC, Push-pull Trans) | WM31 |

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| Utility (RC, Trans) | AW 68 |
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| Hook-on Short-waver | AW104 |
| Purity Amplifier | AW108 |
| Add-on Distance-getter | AW 117 |
| Range Extender (HF Unit) | WM38 |
| True-tone (3 valves) | WM47 |
| Gramo-radio Amplifier (2v) | WM72 |

## MISCELLANEOUS (1s. each)

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| Rectifying Unit | AW 63 |
| Adaptor for Short-wave Super-6 (6d.) | AW67a |
| H.T. from A.C. Mains | AW 73 |
| "A.W." Moving-coil Loud-speaker | AW 97 |
| H.T. Eliminator for A.C. (200 v. output) | AW102 |
| Hook-on Short-waver (Amplifier) | AW104 |
| Moving-coil Output Unit | AW 115 |
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| Daventry Portable (D, Trans) | AW105 | 1/– |
| Daventry Loud-speaker Portable 5 (2 HF, D, RC, Trans) | AW107 | 1/6 |
| Daventry Portable (D, Trans) | AW105 | 1/– |
| Town and Country (HF, D, RC, Trans) | AW111 | 1/6 |
| House and Garden (screened-grid HF, D, RC, Trans.) | AW116 | 1/6 |
| Sunshine 5 (2 HF, D, 2 Trans) | WM74 | 1/6 |
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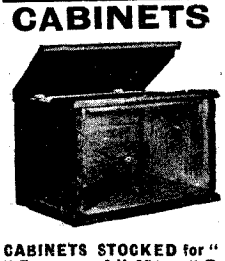

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| 18x7 | 21/- | 21x7 | 22/6 |

**Oak (3 qualities).**

| | | | |
|---|---|---|---|
| 12x8 ... | 9/11 | 11/9 | 13/6 |
| 14x7 ... | 12/11 | 13/11 | 16/6 |
| 16x8 ... | 12/11 | 15/6 | 17/11 |
| 18x7 ... | 15/- | 18/6 | 21/- |
| 21x7 ... | 15/- | 18/- | 21/- |

Carriage and Packing 2/6 extra. Extra Irish Free State and Abroad.

**CABINETS STOCKED for "Britain's Favourite 3," 16/11; "Everyman 4," 35/-; "Radiano 3," 12/11,** and all well-known circuits.

**SPECIAL CABINETS FOR COSSOR AND MULLARD. Handsome design, compartment underneath for batteries (fall front), elegant mahogany polished, many testimonials, 42/-.** Carriage 2/- (extra Irish Free State and abroad).

## MUSIC CHARMER KIT (W.M.)

**SEE FREE GIFT AT BOTTOM**

**'0005 Raymond Condenser (AS USED IN SET), 1/6; 7 ohm. Panel Rheostat; '0001 Reaction Ormond 4/-; Single Coil Holder, 8d.; '0003 Fixed 2-meg. Leak and Series Clip, 3/-; 3 Anti-Microphonic Valve Holders 5/3; R.C.C. Unit, 7/-; L.F. Transformer (Igranic), 16/-; H.F. Choke (Burne-Jones), 7/6.**

**Nett Total 52/11**

**FREE WITH ABOVE**

**Terminal Strip, 7 Marked Terminals, Ebonite Tube, Wander Plugs, Spade Tags, Rubber Flex and Pointer, and Panel, 16 by 8. Carriage 1/-.**

## BRITAIN'S "FAVOURITE 2"

**Ebonite Panel, 14 x 7 in., .0005 Ormond S.L.F. and S.M. Dial, Igranic 6 ohms, Lissen 2-way, 2 Lotus Valve-holders, .0003 and series clip, 2 meg. Leak, B.T.H. or R.I. and Varley L.F. Transformer, .0005 Fixed, Strip 4 x 2, 8 marked Terminals, G.B. Clips, 2 Wander Plugs, Square Wire.**

**THE ABOVE LOT nett cash, post free 45/-**

**With Lissen or Telsen Ace L.F. 37/6**

**SPECIAL QUOTATIONS FOR SETS OF COMPONENTS FOR ADVERTISED CIRCUITS**

**Kindly make out list with goods required and makers' names to save delay. We hold large stocks of components, etc. COMPONENTS STOCKED FOR:—Radiano 3, Toreador, Music Charmer, Raleigh 5, Nelson de Luxe, Mikado, Britain's 2 and 3, Ediswan 3. FULL LISTS FREE.**

**Please State Actual Requirements for Quotation.**

## MULLARD MASTER THREE

**No solder—only 20 wires to connect. (All ready for use.)**

**Kit of Parts as specified (details last week's issue, or send card), and 3 MULLARD P.M. Valves (state voltage.)**

**C.O.D. U.K. £6 : 17 : 6 Carriage 2/6 U.K.**

**FREE WITH ABOVE KIT** EXTRA QUALITY ALUMINIUM PANEL, 18 x 7. (Drilled, surface sperially Frosted). 9-volt Grid Bias, 100-volt H.T. (good make), OR you can have Oak Cabinet, 18 x 7 hinged lid, American type, instead of H.T. Battery.

## LISSEN

Valve-holders, 1/-; Fixed Con., 1-, 1/6; Leaks, 1/-; Switches, 1/6, 2/6; Latest 2-way Cam Vernier, 4/6; Rheostats, 2/6; B.B., 1/6; Lissenola, 13/6; L.F. Transformers, 8/6; 100-v. H.T., 12/11; 60-v. H.T., 7/11; Coils, 60X, 6/4; 250X, 9/9; 60-v. H.T., 7/11; 100-v., 12/11; Super 60-v., 13/6; Grid Bias, 1/6; 4·5, **5d.**

ALWAYS IN STOCK

## LEWCOS

**"MASTER 3" COILS 10/- each. Wave Trap, 13/6. CT COILS (can be used without C.T.), 3/6 and 5/3. Split Primary H.F.T., 10/-.**

**ALL PARTS STOCKED**

**THE NEW No. 3**

## ORMOND S.L.F. CONDENSER

.00025, **5/6**; .00035, **5/9**; .0005, **6/-**. With 4-in. Dial. With Friction 55-1 4-in. Dial, **6/-** each extra.

**ORMOND Square Law Low-Loss.** .0005, **9/6**; .0003, **8/6** (1/6 each less no vernier); **Friction Geared,** .0005, **15/-**; .0003, **14/6**; .00025, **13/6. Straight Line Frequency Friction Geared,** .0005, **20/-**; .00035, **19/6**; S.L.F. .0005, **12/-**; .00035, **11/-.**

## ORMOND "DID" FRICTION DIAL, 5/-

**Amplion Vivavox Gramophone Pick-up,** with volume control plug, adaptor, and leads, **50/-.**

**Amplion A.C. 13,** cone unit assembly, **50/-.**

**Browns, B.T.H., Sterling,** and all best makes of headphones.

**Bulgin Short-Wave Chokes,** 8-80 metres, **3/-.** Post 6d.

**Bowyer-Lowe Aluminium Screening Box,** with screws and base, **6/-.** Post 6d.

**Bowyer-Lowe "Elfin"** .00015, **6/-.** Supplied with pointer, knob, and template.

**Climax Autobat Transformer, 35/-**; Heavy Mains Choke **21/-**; Pot Divider, **5/-**; Special Choke, H.T., **10/6**; H.F. Choke, **8/6.**

**Colvern Set of four S.W. Coils,** 10-130 metres, with base, **35/-.**

**Colvern Formers, 4/-**; Bases **1/6**; Featherweight, **4/6**; SPIFFT Long or Short-wave, **9/6**; Mullard Master 3 coils, **7/6** and **8/6.**

**Climax H.T. Unit.** 100 to 240 volts, 10 tappings, **34/-.**

**Ebonite cut while you wait at ½d. square inch, also ¼ in. at ¼d.** Only the best supplied. No cheap rubbish.

**Ekko H.T. Units,** all voltages.

**Ferranti Trickle Chargers 55/-.**

**Ferranti AF5, 30/-; AF3, 25/-; AF4, 17/6.** Output push pull, meters and chokes stocked.

**Formo 1928 Log, 5/-** (.00035 and .0005). Post 6d.

**Gambrell Neutrovernia, 5/6.** .0001 Midget Bulgin, **5/6**; .0001 Ormond Reaction (for P or B.B.), **4/-.**

**HYDRA CONDENSERS**

Tested on 500 volts D.C. (working voltage 240 d.c.). **1 mfd., 2/6; 2 mfd., 3/6; 4 mfd., 5/3.**

**Igranic L.F. Choke,** Type G. **27/6**; Smoothing Choke **25/-**; Indigraph Dial, **7/6**; Universal High Resistance **5/6**; Pacent Jacks, from **2/-.** Ask for List No. J.546.

**KEYSTONE (PETO-SCOTT) Midget .0001 Condenser, 5/6 Neutralising, 5/-; Six-pin Base, 2/9; Standard Wave Trap, 15/-.**

**Lissen Electrical Pick-up** The finest at the price. Without adaptor, **15/-.** With adaptor, **16/6.**

**Lissen New Model Headphones,** at an incredible price for the quality, **8/6.** Post **3d.**

**Lotus 2-way Coil Stand,** panel mounting, **7/-.**

**For B.B.** (Long handle), **8/-.**

**Lotus Jack Switches,** stocked from 2/-, Plugs, **1/6.**

**Mullard Permacore L.F. Transformers.** Special Winding, **25/-.**

**Marconi HL 210 Valves, 10/6. Marconi or Cossor Screened Valves, 22/6** each.

**"Q" Coils (Lewcos),** Aerial **15/-**; H.F. Transformer, **21/-**

**R.C.C. Units,** various, Lissen **4/-**; Cosmos, **8/6** (with V.H.) **10/6**); Magnum, **6/7**; Carborundum, **8/6**; Marconi "A," **7/3,** and "B," **8/6**; Dubilier, **7/-.**

**R.I.-Varley Super-Power Resistances,** for Battery Eliminators, various from 500 at 50 m/a to 3,000 at 20 m/a ohms. Each, **12/9.**

## BLUE SPOT 25/- CONE UNIT

**Valves,** all latest stocked. D., L.F., H.F., P., **10/6** and **12/6** each; D.U.10, **15/-**; Mullard, Ediswan, Marconi, Osram, Six-Sixty.

**CONE SPEAKER CABINETS** take 12 in. cone (will take Blue Spot unit) handsome design, all enclosed, **16/11.** Post, 1s.

## EDISWAN NEW THREESOME

Three Coupling Units, Tubular Fixed Condenser, Multiflex Cable and Plug, .0003 Variable with S.M. Dial, 2-way Geared Coil Holder, Connecting Wire, Red and Black Flex.

The lot post free, **42/-** net. Panel and Baseboard Free.

# "THE 'PICK-UP' THREE-FOUR" (Continued from page 16)

wrong when following our instructions.

First let us briefly sketch the general layout and design of the receiver. There is the inevitable ebonite panel screwed at right angles to the baseboard, with a terminal strip at the back as usual. The R. I. and Varley tuner occupies a central position on the panel, and extends to over half-way to the back of the baseboard. On either side of the control plate of the tuner is fitted the voltmeter and ammeter, left and right respectively. If these are omitted the layout is still symmetrical, so that the constructor can first try out the receiver without the meters if desired. The jacks are equally spaced along the bottom of the panel, on the left is the gramophone pick-up jack, in the centre, just below the tuner, is the trickle charger jack (omitted if not required) and on the right is the combined loud-speaker and filament jack. The two remaining panel components are the volume control, between the voltmeter and tuner and the filament rheostat, between the tuner and milliammeter.

From the back of panel view as shown by the blueprint, the baseboard is roughly divided into two halves by the tuner. On the left of the tuner are mounted the second impedance coupler, output unit and two parallel valve holders. On the right of the tuner are mounted the first impedance-coupler, the high-frequency choke, the detector valve holder, grid-bias battery for anode bend, motor-boat eliminator (2-micro farad condenser and 20,000-ohm resistance) and aerial series fixed condenser. The two remaining baseboard components—the fixed reaction condenser and first low-frequency valve holder—are placed approximately between the back of the tuner and the terminal strip, which carries the battery, aerial and earth terminals and is fixed in a central position at the back.

The three jacks, rheostat, and volume control are all one-hole-fixed and are, therefore, quite easy to mount. The two meters involve some extra work, however, for two large circular holes must be cut in the panel to fit them in position. A fretsaw can be used or alternatively a large number of ¼-inch holes can be drilled inside the scribed periphery and the waste ebonite then knocked away.

The baseboard components are mounted in the usual way with fairly narrow-gauge ½-inch or ¾-inch woodscrews. The anode-bend grid-bias battery can be held in position either by means of metal clips or more simply by gluing the bottom of the battery to the baseboard. The terminal strip is "held off" from the baseboard by two insulating collars. If desired a slightly wider baseboard can be used, although there is a distinct advantage in the strip-mounting method adopted, since the distance of the strip from the panel can be adjusted to suit different cabinet widths.

## Wiring

Wiring is carried out with Glazite and in a receiver of this description it will pay the constructor to follow the blueprint very implicitly. Note that each wire is lettered to indicate the sequence of wiring. Thus all points marked *a* should be wired together with as few wires as possible, then all those marked *b* should be connected together, and so on through the alphabet. As soon as the wiring is completed the receiver can be given a preliminary test. The great advantage of the R.I. and Varley tuner will now be apparent, for there is no question of finding suitable reaction and tuning coils as both of these are incorporated in the tuner for all wavelengths between 250 and 2,000 metres.

The correct choice of valves is of great importance if really good results are to be obtained. For the detector a medium-impedance high-frequency valve is required, a low-frequency valve for the first amplifying stage and two power or super-power valves for the paralleled stage. The accompanying table of 6-volt valves gives a number of recommended combinations. It is no use trying to get good reproduction with a meagre H.T. supply—it cannot be done. If dry batteries are used see that they are capable of delivering an adequate current output at not less than 120 volts. The "Super H.T. Eliminator" described in the May 12 issue of AMATEUR WIRELESS, works excellently with this receiver.

If the meters have been incorporated, the operator has an accurate and visible check on the working of the receiver, for as the rheostat is turned on the voltmeter needle should swing over to exactly two, four, or six volts according to the accumulator used, and with the loud-speaker plug inserted in the jack on the right the needle of the milliammeter should swing over to 20 or 30 milliamps, according to the valves and batteries used. The centre jack is only of assistance where the constructor charges his own accumulator. After making sure the battery circuits are correctly functioning the local station can be tuned in as a test by setting the wavelength switch at "C" or "D" and then rotating the condenser dial and reaction knob.

**Six-volt Valves for "The 'Pick-up' Three-Four"**

| *Make* | *Detector* | *1st L.F.* | *2nd & 3rd L.F.* |
|---|---|---|---|
| Cosmos | DE50 | SP50R | SP50R |
| Cossor | 610HF | 610LF | Stentor 6 |
| Ediswan | ES5HF | ES5LF | PV610 |
| Marconi | DEL610 | DEL610 | DE5A |
| Mullard | PM5X | PM6 | PM256 |
| Osram | DEL610 | DEL610 | DE5A |
| Six-Sixty | SS6075HF | SS610P | SS625P |

After exhausting the many possibilities of the wireless side of the receiver—such as tuning in 5GB on stud "D" of the tuner and 5XX on "G" or "H," the gramophone can be brought into action by connecting a pick-up in place of the sound box and inserting a plug carrying the pick-up leads into the jack on the left. Really wonderful reproduction of gramophone records is obtained with this receiver.

# BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths).

| Metres | Kilocycles | Station and Call Sign | Power Kw. |
|---|---|---|---|
| **GREAT BRITAIN** | | | |
| 24 | 12,500 | Chelmsford (5SW) | 20.0 |
| 252.1 | 1,190 | *Bradford (2LS) | 0.2 |
| 272.7 | 1,100 | *Sheffield (6FL) | 0.2 |
| 275.2 | 1,090 | *Nottingham (5NG) | 0.2 |
| 277.8 | 1,080 | *Leeds (2LS) | 0.2 |
| 288.5 | 1,040 | *Edinburgh (2EH) | 0.2 |
| 294.1 | 1,020 | *Stoke-on-Trent (5ST) | 0.2 |
| 294.1 | 1,020 | *Swansea (5SX) | 0.2 |
| 294.1 | 1,020 | *Dundee (2DE) | 0.2 |
| 294.1 | 1,020 | *Hull (6KH) | 0.2 |
| 297 | 1,010 | *Liverpool (6LV) | 0.2 |
| 306.1 | 980 | Belfast (2BE) | 1.5 |
| 312.5 | 960 | Newcastle (5NO) | 1.5 |
| 326.1 | 920 | *Bournemouth (6BM) | 1.5 |
| 353 | 850 | Cardiff (5WA) | 1.5 |
| 361.4 | 830 | London (2LO) | 3.0 |
| 384.6 | 780 | Manchester (2ZY) | 1.0 |
| 400 | 750 | *Plymouth (5PY) | 0.2 |
| 405.4 | 740 | Glasgow (5SC) | 1.2 |
| 491.8 | 610 | Daventry EX (5GB) | 24.0 |
| 500 | 600 | Aberdeen (2BD) | 1.5 |
| 1,604 | 187 | **Daventry (5XX) | 25.0 |
| *Relay stations. **Relays 2LO. | | | |
| **AUSTRIA** | | | |
| 254.2 | 1,180 | Linz | 0.5 |
| 272.7 | 1,100 | Klagenfurt | 1.5 |
| 277.8 | 1,080 | Salzburg (under const.) | 0.5 |
| 294.1 | 1,020 | Innsbruck | 0.5 |
| 355 | 845 | Graz | 0.5 |
| 517.2 | 580 | Vienna (Wien) | 15.0 |
| 577 | 520 | Vienna | 0.75 |
| **BELGIUM** | | | |
| 220 | 1,360 | Chatelineau | 0.25 |
| 230 | 1,304 | Schaerbeek | 0.5 |
| 275 | 1,090 | Ghent | 0.5 |
| 291 | 1,030 | Liége | 0.25 |
| 508.5 | 590 | Brussels (Radio-Belgique) | 1.5 |
| **CZECHO-SLOVAKIA** | | | |
| 263.1 | 1,140 | Kosice | 2.4 |
| 300 | 1,000 | Bratislava | 0.5 |
| 348.9 | 860 | Prague (Praha) | 5.0 |
| 441.2 | 680 | Brunn (Brno) | 2.4 |
| **DENMARK** | | | |
| 337 | 890 | Copenhagen (Kjobenhavn) | 2.0 |
| 972 | 308 | Soro | 2.5 |
| 1,153.8 | 260 | Kalundborg | 7.0 |
| **ESTHONIA** | | | |
| 408 | 735 | Reval (Tallinn) | 2.2 |
| **FINLAND** | | | |
| 375.9 | 798 | Helsingfors (Helsinki) | 1.8 |
| 1,522.8 | 197 | Lahti | .25 |
| **FRANCE** | | | |
| 40.2 | 7,463 | Lyon (PTT) | 10.0 |
| 37 | 8,108 | Vitus (Paris) | 2.0 |
| 61.5 | 4,878 | Radio LL (Paris) | 1.0 |
| 158 | 1,899 | Beziers | 0.6 |
| 198 | 1,515 | Biarritz | 0.25 |
| 210 | 1,428 | Chambery | 0.5 |
| 230 | 1,304 | Ste Etienne | 0.25 |
| 238.1 | 1,260 | Bordeaux (Radio Sud-Ouest) | 2.0 |
| 240 | 1,245 | Nimes | 0.5 |
| 246 | 1,220 | Juan-les-Pins | 0.7 |
| 252.1 | 1,190 | Montpellier | 0.5 |
| 259 | 1,160 | Toulouse-Pyrenées (PTT) | 0.5 |
| 267 | 1,123 | Lille (PTT) | 0.7 |
| 268 | 1,118 | Strasbourg | 0.3 |
| 273 | 1,098 | Limoges (PTT) | 0.5 |
| 279 | 1,072 | Bordeaux | 0.5 |
| 291 | 1,030 | Radio Lyon | 1.5 |
| 293 | 1,022 | Rennes | 0.5 |
| 302 | 993 | Radio Vitus (Paris) | 1.0 |
| 304 | 986 | Algiers (PTT) | 2.0 |
| 310 | 966 | Agen | 0.3 |
| 315.7 | 947 | Marseilles | 0.5 |
| 340.9 | 880 | Le Petit Parisien, Paris | 0.5 |
| 370 | 811 | Radio LL, Paris | 1.0 |
| 389.6 | 770 | Toulouse (Radio) | 25.0 |
| 400 | 750 | Mont de Marsan | 0.3 |
| 415 | 722 | Grenoble (PTT) | 1.5 |
| 416 | 721 | Rabat (Radio Maroc) | 2.0 |
| 447 | 671 | Paris (Ecole Sup., PTT) | 3.0 |
| 477.5 | 628 | Lyons (PTT) | 1.0 |
| 1,040 | — | Strasbourg (testing) | 1.0 |
| 1,765 | 170 | Radio Paris | 8.0 |
| 1,850 | 162 | Radio Carthage (Tunis) | 2 |
| 2,650 | 113 | Eiffel Tower (FL) | 8.0 |
| **GERMANY** | | | |
| 37.65 | 7,968 | Doeberitz (AFK) | 5.0 |
| 45.3 | 6,602 | | |
| 67.65 | 4,434 | | |
| 51 | 5,882 | Bergedorf (AFL) | 3.0 |
| 236.2 | 1,270 | Stettin | 0.75 |
| 241.9 | 1,240 | Nurnberg | 3.0 |
| 250 | 1,200 | Muenster | 1.5 |
| 252.1 | 1,190 | Cassel | 0.7 |
| 256 | 1,172 | Kiel | 0.7 |
| 272.7 | 1,100 | Danzig | 0.75 |
| 272.7 | 1,100 | Bremen | 0.75 |
| 275.2 | 1,190 | Dresden | 0.75 |
| 277.8 | 1,080 | Kaiserslautern | 0.5 |
| 283 | 1,060 | Cologne | 4.0 |
| 297.9 | 1,007 | Hanover | 0.7 |
| 303.6 | 988 | Koenigsberg | 4.0 |
| 322.6 | 930 | Breslau | 4.0 |
| 329.5 | 910 | Gleiwitz | 10.0 |
| 366.3 | 819 | Leipzig | 4.0 |
| 380 | 789 | Stuttgart | 4.0 |
| 396 | 757 | Hamburg | 4.0 |
| 401 | 748 | Aachen | 0.75 |
| 428.6 | 700 | Frankfurt-Main | 4.0 |
| 470.9 | 637 | Langenberg | 25.0 |
| 484.6 | 619 | Berlin | 4.0 |
| 535.7 | 560 | Munich | 4.0 |
| 566 | 530 | Augsburg | 0.5 |
| 574.7 | 522 | Freiburg | 0.75 |
| 1,250 | 240 | Zeesen | 25.0 |
| 1,829 | 164 | Norddeich | 10.0 |
| 2,525 | 119 | Berlin (News) | 8.0 |
| 2,900 | 103 | ,, ,, | 8.0 |
| 4,000 | 70 | ,, ,, | 8.0 |
| **HOLLAND** | | | |
| 18.75 | — | Kootwijk (PCLL) (Wed. 13.40 B.S.T.) | 30.0 |
| 31.4 | — | Hilversum (PCJJ) | 25.0 |
| 341.6 | 878 | Huizen (until 5.40 p.m.) | 4 |
| 1,069 | 280 | Hilversum (ANRO) | 5.0 |
| 1,870 | 160 | Huizen (after 5.40 p.m. and on Sundays) | 4 |
| 1,950 | 154 | Scheveningen-haven | 5.0 |
| **HUNGARY** | | | |
| 557.1 | 538 | Budapest | 15.0 |
| **ICELAND** | | | |
| 333.3 | 900 | Reykjavik | 1.0 |
| **IRISH FREE STATE** | | | |
| 319.1 | 940 | Dublin (2RN) | 1.5 |
| 400 | 750 | Cork (5CK) | 1.5 |
| **ITALY** | | | |
| 315.8 | 946 | Turin (testing) | 0.5 |
| 333.3 | 900 | Naples (Napoli) | 1.5 |
| 450 | 666 | Rome (Roma) | 3.0 |
| 549.3 | 540 | Milan | 7.0 |
| **JUGO-SLAVIA** | | | |
| 309 | 970 | Zagreb (Agram) | 1.25 |
| 460 | 652 | Belgrade | .25 |
| 566 | 530 | Laibach | 10.0 |
| **LITHUANIA** | | | |
| 2,000 | 150 | Kovno | 15.0 |
| **LUXEMBURG** | | | |
| 217.4 | 1,380 | Luxemburg | 0.25 |
| **NORWAY** | | | |
| 370.4 | 810 | Bergen | 1.0 |
| 412 | 728 | Notodden | 0.7 |
| 434.8 | 690 | Fredriksstad | 1.1 |
| 448 | 670 | Rjukan | 1.5 |
| 461.5 | 650 | Oslo | 1.5 |
| 504 | 594 | Porsgrund | 1.0 |
| 555.8 | 540 | Hamar | 0.7 |
| **POLAND** | | | |
| 270.3 | 1,110 | Lemberg (under construction) | 10.0 |
| 343 | 874 | Posen (Poznan) | 1.5 |
| 422 | 711 | Kattowitz | 10.0 |
| 435 | 689 | Wilno | 1.5 |
| 566 | 530 | Cracow | 1.5 |
| 1,111 | 270 | Warsaw (Varschava) | 10.0 |
| **ROUMANIA** | | | |
| 236.2 | 1,270 | Bucharest (under construction) | 12 |
| 1,800 | 187.4 | Bucharest | 0.3 |
| **RUSSIA** | | | |
| 995.5 | 301 | Leningrad | 10.0 |
| 1,450 | 209 | Moscow (Moskva) | 30.0 |
| 1,700 | 176 | Kharkov | 15.0 |
| **SPAIN** | | | |
| 309 | 970 | Oviedo (EAJ19) | 0.1 |
| 327 | 917 | Almeria (EAJ18) | 1.0 |
| 335 | 895 | San Sebastian (EAJ8) | 0.5 |
| 335 | 895 | Cartagena (EAJ16) | 0.5 |
| 344.8 | 870.7 | Barcelona (EAJ1) | 1.5 |
| 374 | 804 | Madrid (EAJ7) | 1.5 |
| 400 | 750 | Cadiz (EAJ3) | 0.5 |
| 405 | 741 | Salamanca (EAJ22) | 0.55 |
| 434.8 | 690 | Seville (EAJ5) | 1.0 |
| 434.8 | 690 | Bilbao (EAJ9) | 0.5 |
| 462 | 649 | Barcelona (EAJ13) | 2.0 |
| **SWEDEN** | | | |
| 260.9 | 1,150 | Malmo | 1.0 |
| 357 | 840 | Falun | 0.5 |
| 416.7 | 720 | Goteborg | 1.0 |
| 453.8 | 661 | Stockholm | 1.5 |
| 545.6 | 550 | Sundsvall | 1.0 |
| 720 | 416 | Ostersund | 2.0 |
| 1,190 | 252 | Boden | 2.0 |
| 1,380 | 217 | Motala | 30.0 |
| **SWITZERLAND** | | | |
| 411 | 730 | Berne | 1.5 |
| 588 | 510 | Zurich | 0.6 |
| 680 | 441 | Lausanne | 0.6 |
| 760 | 395 | Geneva | 0.5 |
| 1,000 | 300 | Basle | 0.25 |
| **TURKEY** | | | |
| 1,193 | 252 | Stamboul | 5.0 |
| 1,804 | 165 | Angora | 7.0 |

## CHIEF EVENTS OF THE WEEK

**LONDON AND DAVENTRY (5XX)**

July 8 A concert by the London Chamber Orchestra.
,, 11 *The Daughter of the Regiment*, a comic opera in two acts by Donizetti.
,, 13 *On with the Show of* 1928.
,, 14 French programme.

**DAVENTRY EXP. (5GB)**

July 9 *The Daughter of the Regiment.*
,, 10 A symphony concert from Manchester.
,, 12 The "P.P. and P." Concert Party.
,, 13 *Carmen* (Act II), from the Scala Theatre.

**CARDIFF**

July 9 Love scenes (Scenes VIII and IX) from *Kit Marlowe*, an opera in one act by Herbert Bedford.
,, 14 *Recalled to Life*, from a *Tale of Two Cities*, played by the Station Radio Players.

**MANCHESTER**

July 9 Musical comedies—past and present.

**NEWCASTLE**

July 10 *Glimpses of the Past*

**GLASGOW**

July 12 *Stars*, a one-act play by Guy Rawlence.

**BELFAST**

July 13 *The Ballie's Nominee*, a Scots comedy in one act.

## *TRADE NOTES*

WE have been informed that through increase of business the Wet H.T. Battery Co. have removed to new head offices, showrooms, and works at 184-186 Shaftesbury Avenue, W.C.1, and have changed the style of the firm to the Standard Wet Battery Co.

The Mullard Company has opened a new depot at Newcastle-on-Tyne. The address, to which all future communications should be sent, is as follows: The Mullard Wireless Service Co., Ltd., 16 Clayton Street West, Newcastle-on-Tyne.

## "THE VERSATILE VALVE"

(*Continued from page 4*)

capacity B is again used to control the tuning of the plate circuit of the valve O B, but a shunt lead is taken from that circuit and diverts a variable voltage on to the grids of the amplifier, so that the output from the latter rises or falls in accordance with the movement of the operator's hand.

### *Burglar and Fire Alarms*

Exactly the same kind of detuning effect has been used in connection with an oscillating valve to provide an automatic burglar alarm, or to give warning of the approach of any unauthorised person, say, to the strong room of a bank.

Here the *modus operandi* is to adjust the back-coupling between the grid and plate circuits to a point where the valve is triggered, or set just on the threshold of self-oscillation, In this condition the system is highly sensitive and the approach of any trespasser near to a door or window that is guarded by a winding or coil, forming part of the plate or grid circuits, is sufficient to throw the valve into sustained oscillation.

The resulting change in the value of the plate current when this occurs is then utilised to close the contacts of a local circuit, which rings an alarm bell.

A somewhat similar arrangement has also been used to detect the presence of stolen metal articles hidden about the person of a workman. Each worker on leaving the factory passes through an exit door surrounded by a coil of wire connected to a triggered valve. The pilfered metal alters the inductance of the coil and so gives rise to an audible note in a pair of phones worn by the doorkeeper.

If a light-sensitive cell, or a thermostat, is included in one of the valve circuits, the same arrangement can be used to operate an automatic alarm in the case of an outbreak of fire.

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