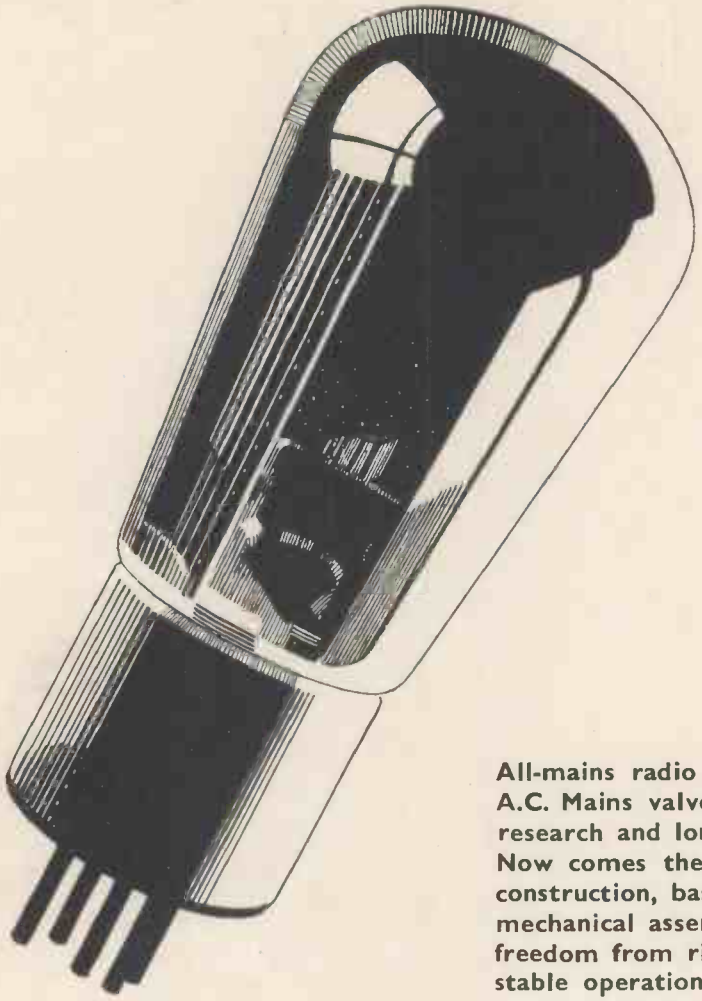
RADIO FOR THE MILLION

1932

3d.

VOL. 6. No. 3. APRIL 1932

MULLARD A.C. MAINS VALVES



All-mains radio is more efficient than ever because 1932 Mullard A.C. Mains valves incorporate the cumulative results of ceaseless research and long experience.

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Type S.4V*, S.4VA and S.4VB Screened Grid H.F. Amplifiers	Reduced Price	19/-
Types 904V and 354V* Detectors	Reduced Price	13/6
Type 104V Small Output Valve	Reduced Price	15/-
Type A.C. 044 Large Output Valve	Reduced Price	17/6
Type Pen. 4V* Output Pentode	Reduced Price	20/-

* Specified for the Super V.3.

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Arks.

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RADIO FOR THE MILLION

THE RADIO OWNERS' MAGAZINE

VOL. 6
No. 3

APRIL 1932

PRICE
3d.

TRAVELLING AROUND . . .

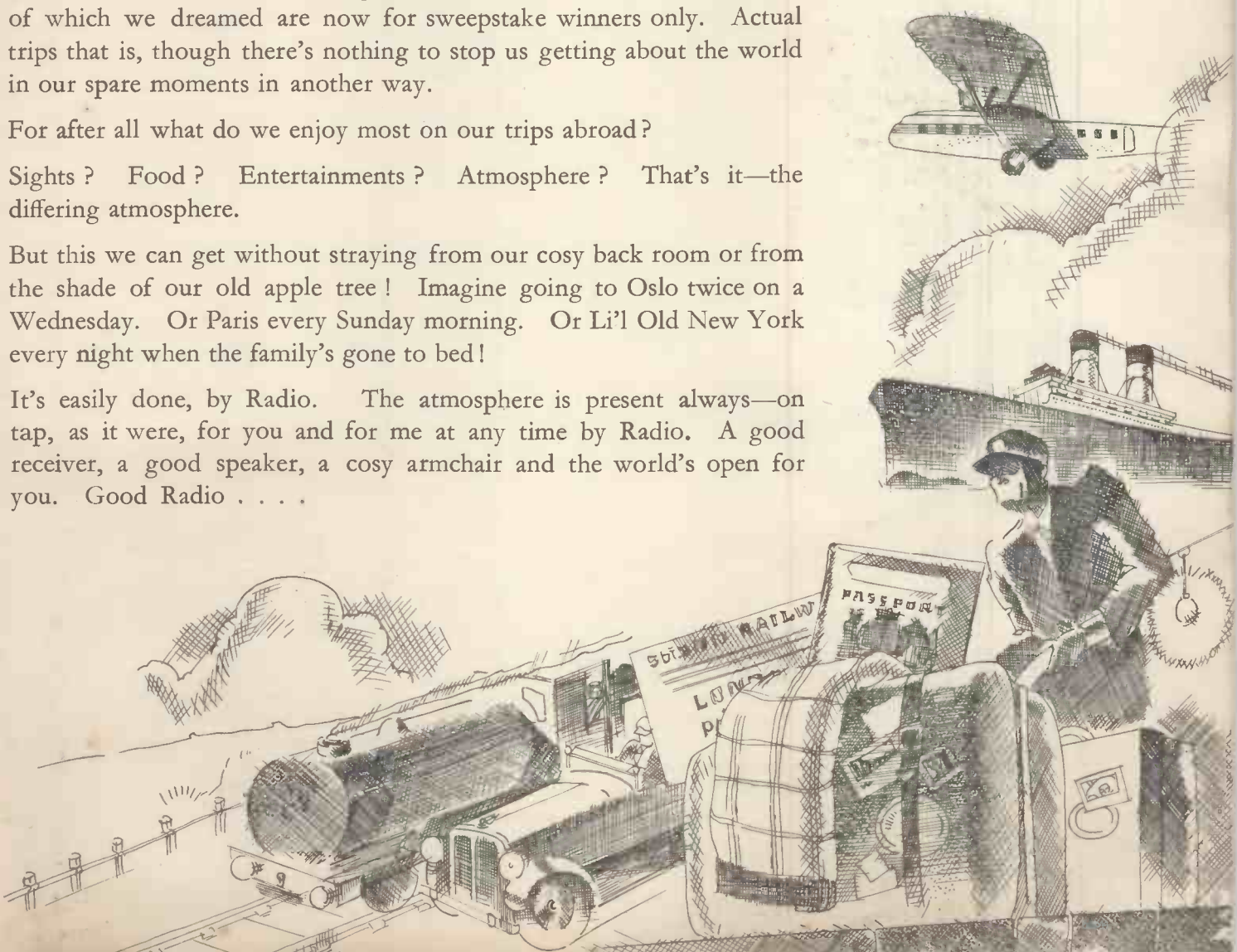
Barriers are up ! Tariff barriers, Fall of the pound barriers, Off the gold standard barriers—hedging in the countries. Those trips abroad of which we dreamed are now for sweepstake winners only. Actual trips that is, though there's nothing to stop us getting about the world in our spare moments in another way.

For after all what do we enjoy most on our trips abroad ?

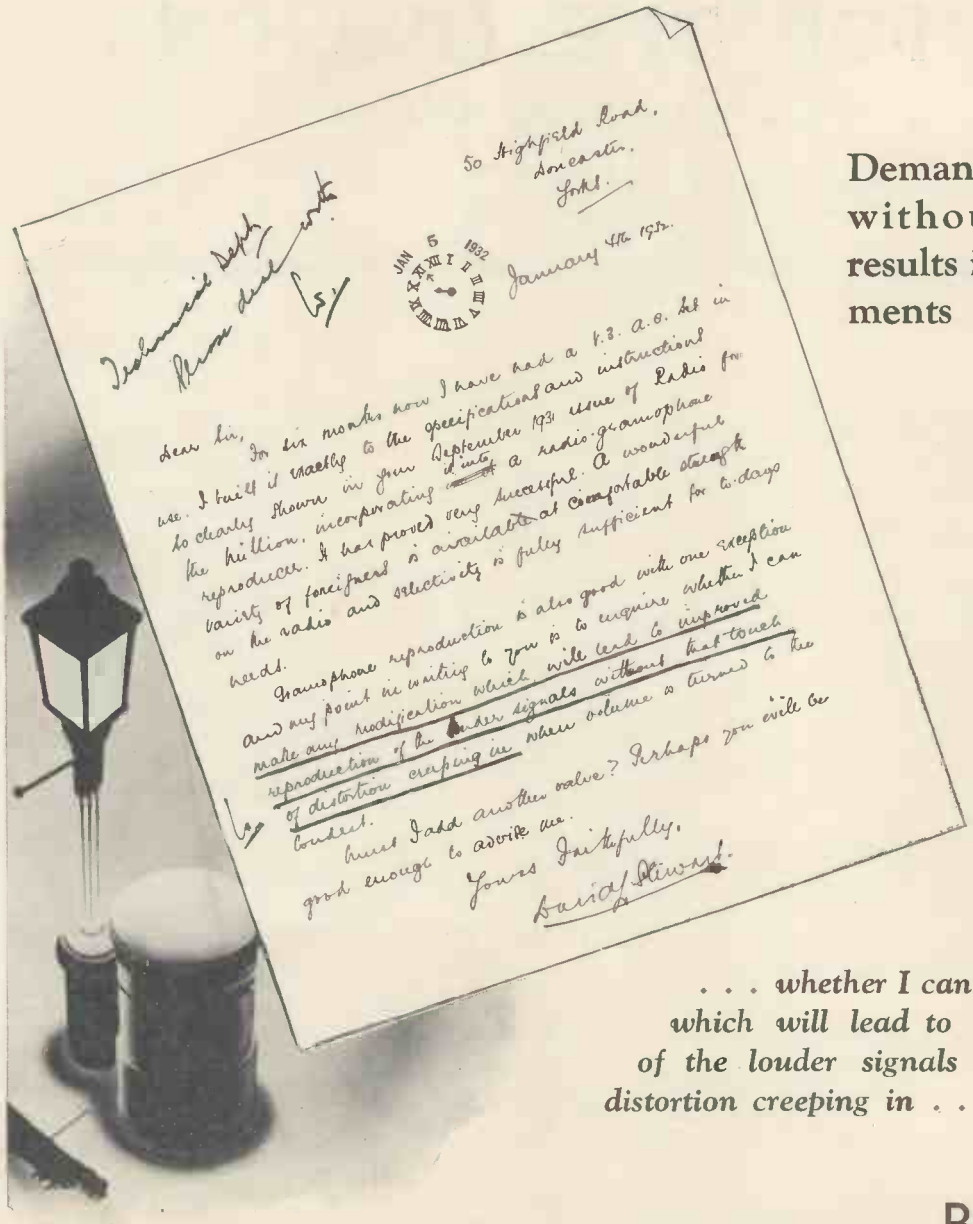
Sights ? Food ? Entertainments ? Atmosphere ? That's it—the differing atmosphere.

But this we can get without straying from our cosy back room or from the shade of our old apple tree ! Imagine going to Oslo twice on a Wednesday. Or Paris every Sunday morning. Or Li'l Old New York every night when the family's gone to bed !

It's easily done, by Radio. The atmosphere is present always—on tap, as it were, for you and for me at any time by Radio. A good receiver, a good speaker, a cosy armchair and the world's open for you. Good Radio . . . .



A Reader's Letter to the Editor Leads to Super Set Design



Demand for Volume without distortion results in vast improvements in set design.

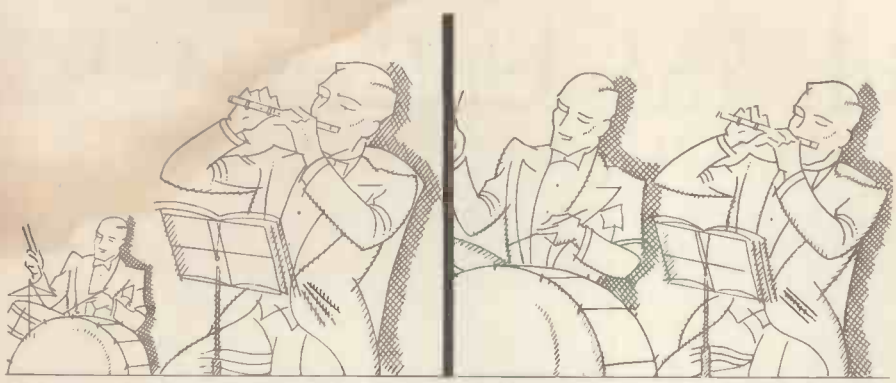
. . . whether I can make any modification which will lead to improved reproduction of the louder signals without that touch of distortion creeping in . . .

THIS LETTER was just one of the hundreds received by the Editor every month. A simple request for a solution to an apparently simple problem—yet it has led to reproduction nearer to the truth perhaps than has ever been obtained before.

On the face of it, it was a simple problem, yet the more we tried to help, the more we realised the importance to radio and gramophone listeners generally of the improvements we could offer.

For it has to be realised that, above all, quality is the key test to a radio receiver to-day. And although we cannot hope to arrive at an absolute duplicate of the original in our reproduction we can reproduce with such a fine degree of quality that the listening ear is sufficiently deceived to be satisfied.

BUT SUCH A CONDITION is not easily obtained from a receiver which has been built to a price-limit, and it is therefore necessary to effect some modification in order to arrive at this high standard of quality. We do not wish it to be assumed that the average radio receiver is of poor reproductive quality. That would be far from the truth. For the work which the normal user expects from his radio the average receiver, the R. for M.V.3 for example,



The man with the big drum has the same right to be heard as the man with the piccolo. It's all a question of matching stage by stage.

gives him, for the price, particularly good quality plus all the other essential results,—sensitivity, selectivity, low current consumption and so on.

But for the user, like our correspondent, who puts most value on the quality of reproduction at big volume, then some modifications are necessary, and particularly is this true when the gramophone is allied with the radio.

THIS then is where our correspondent's query begins to lead us to a super set design. For adding another valve will *not* solve his difficulty, neither will replacing his output valve by a "fatter" one do so necessarily.

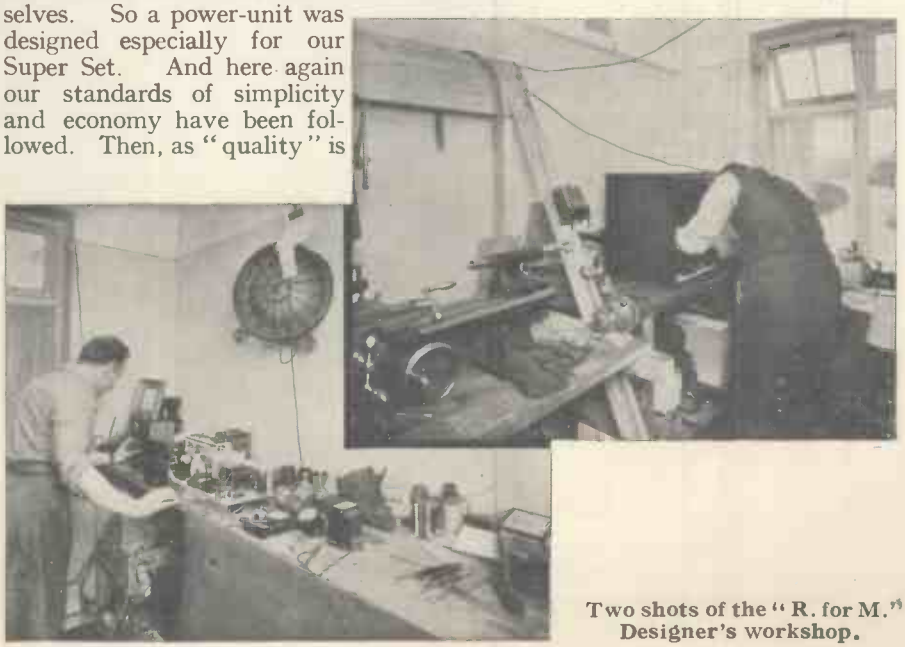
So when his letter was received we went into the question thoroughly and with enthusiasm. For we at once realised that he must voice the requests for purity of thousands of our readers. And as a result we have produced the "Super V.3." How we have done it, the stage by stage improvements which we have incorporated, we must leave unexplained until the next chapter. But any listener with an ear for music, any listener who appreciates the quality of the entertainment he gets from his loudspeaker will be as enthusiastic over the wonderful improvements which have resulted from our correspondent's question and our resulting efforts as we are of the future popularity of this latest child of ours—the Set with the Golden Voice.

DESIGNING a quality circuit is no easy matter, particularly when the circuit must be suitable for home construction, must be economical within reason. It was a high standard to work to. But the results have fully justified the task. The quality of the "Super V.3" is magnificent and yet no other feature of the set has been sacrificed. Selectivity is there, sensitivity is there. Foreign travel by radio is more comfortable on this Super Set than ever before. Yet its keynote is quality—truth. "Stage-matching" is the secret. Every stage has been studied with a view to quality. Every improvement in the output stage has called for an improvement in the detector stage. Every modification of the detector stage has demanded a modification of the L.F. stage.

SO HAS the circuit itself been brought to a high degree of perfection. But it was not enough to concentrate only upon the circuit. Power was required—sufficient power to enable the valves we had chosen to perform their duties well within themselves. So a power-unit was designed especially for our Super Set. And here again our standards of simplicity and economy have been followed. Then, as "quality" is our watch-word, careful choice of the right speaker must be made. It must be of a type that will be faithful to the lower frequencies which have been so carefully studied in our set design. It must have a strong voice without becoming unpleasant in our dining rooms or parlours. It must not boom—it must, in fact, give tone for tone a quality rendering of the quality signals our Super Set passes to it. Our choice fell on a moving coil speaker—for here are all the qualities we demand at a reasonable price.

This is the combination which has arisen in our workshop as a result of our reader's letter. Set, speaker and power-unit working together to give us a higher standard of quality reproduction than has ever been reached before. Without each part the rest will suffer, for quality depends almost as much on power and reproduction as it does on the set itself.

So has the highest standard of quality been realised. The Set with the Golden Voice is ready. Compare this example of "Stage-matched" circuit with any other reproducer. Listen to its top notes. Hear every murmur at the other end of the harmonic scale. Feel the vibrations of the big drums. Turn it up full. Fill the room with magnificent, terrific volume. Music—as near truth as never before. Judge it for yourself—the Set with the Golden Voice.



Two shots of the "R. for M." Designer's workshop.

The Set with the Golden Voice

HOWEVER perfect the programme, however selective the receiver, a big proportion of the music which your loudspeaker should pass on to you is lost! That is the position with the average receiver. Why should you be robbed of any part of the musical structure built up for you by the genius of the composer? Why lose what may be the very soul of the harmony? Do not blame your speaker. The fault does not necessarily lie there. It may be that your circuit is not "matched"—not capable of picking up the whole or of handling it when it is picked up. Particularly is this true of radio-gramophone reproduction. The very finest artists in the world are recorded for you. Perfectly recorded—every harmonic of their voices or their instruments faithfully copied. Yet you may lose some of it. Or you may distort it in an effort to get volume. This should not be so. Radio reproduction has advanced sufficiently to-day for such a problem to be solved.

It has been solved. Without loss of any of the other qualities necessary to a good radio receiver, reproduction has been brought to as near truth as is possible. A properly "stage-matched" circuit is the solution. And the design of the "Super V.3" is "matched" stage by stage—setting new standards of quality radio.

WHAT IS the first step in this "stage-matching" of a radio circuit? On what precisely does quality depend? One of our correspondents—his letter is reproduced on page 2—asks if to get more undistorted volume he should add another valve. The same question is asked almost every day, evidence that the business of obtaining volume is not understood.

Adding another valve will only increase magnification which will probably give an opposite result to the one desired. For greater magnification, while perhaps desirable when listening to distant stations, is certainly not

A Receiver designed for Quality

"Perfect quality of reproduction is largely a matter of 'matching' a receiver stage by stage and providing an adequate power supply," says our designer.

"The SUPER V.3."

wanted when the local station is being received. What really is wanted is the means of using the magnification which our set is already giving us.

It is quite possible, with three valves, to reproduce the signals of a powerful station 25 miles away at sufficient volume for a large hall holding hundreds of people, and to reproduce those signals at volume equal to their original rendering. Why is this? The reason is not because the three valves used magnify the signals to any greater extent than the valves you use, but because they are capable of handling very great signals. Actually, large power valves usually have smaller amplification factors and amplify to a smaller degree than the valves generally in use. And so, if the best possible quality is to be obtained, large power valves capable of handling great signals must be incorporated into our Super Set, and high voltages and high power must be used.

There is an old adage which says that you "cannot get more out of anything than you put in." This is as true for radio as for most other things; unless you put power in you will never get good quality signals. If the necessary power is to be provided from batteries then the cost is going to be very high, but with the A.C. mains available the requisite increase in power will cost at most only a few pence a week. The apparatus required by these large power valves is very little more expensive than a standard three valve A.C. receiver, and yet the tremendously improved results repay this slightly increased expenditure a hundredfold. Compare the prices of the "R. for M. V.3" A.C. model on the market now with those of our new "Super V.3" incorporating a large power valve. In the former case the model itself costs £6 12s. 6d. and the power unit £4 7s. 6d. making a total of £11 0s. 0d. The "Super V.3" model costs £6 15s. 9d., its power unit £4 7s. 6d. making a total of £11 3s. 3d.—an increase of only 3s. 3d. Yet this slight difference in cost will enable you to get a performance in a higher standard altogether.

THE REAL questions are, therefore, why does not mere amplification give greater volume, and why do we have to provide a larger power supply when we want big volume?

The answers to these are not easy to give without delving rather deeply into the characteristics of thermionic valves, but it can be said that a given

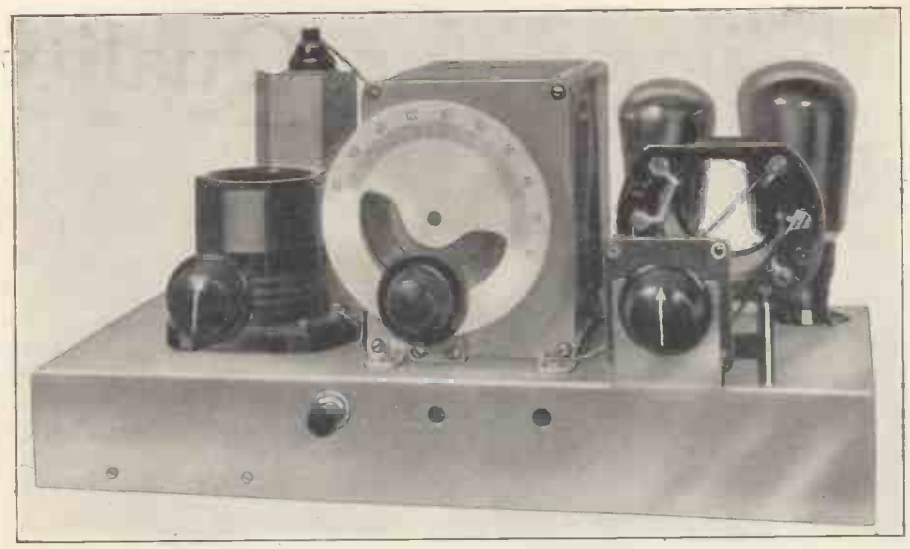


Fig. 1.—The completed chassis of the Super V.3—a clean, workmanlike job.

valve will amplify a signal of, say, 6 volts and produce corresponding changes of anode current in the speaker winding which is, of course, included in the anode circuit.

But if a signal of 12 volts is applied to the grid of this valve the change of anode current is not proportional and, as we say, we "go off the straight part of the curve." The anode current which has to operate our speaker no longer faithfully reproduces the changes of voltage applied to the grid of the valve. To reproduce the 12-volt signal we need a valve with a longer straight characteristic, which means a valve with a greater anode current—in short, we must use more power.

Again, the same valve which will handle the signal we want without distortion at its full rated voltage of, say, 200, will not handle the same signal if this voltage is reduced. When the voltage is reduced we reduce the anode current and shorten the straight part of the characteristic. So that, for adequate reproduction of our signal we need a valve rated to handle the power we want, and a current supply adequate to work that valve at its maximum efficiency.

FOR OUR Super Set then, we must choose a valve with a power output sufficient for our needs, but not unnecessarily large for the job the receiver will have to do. Let us look at the undistorted A.C. output of a few typical specimens.

The first, the P.M.2 A which is the standard output valve for the "R. for M. V.3" battery receiver, has an output of 200 milliwatts. The P.M. 22 pentode, the valve recommended when a H.T. unit is available, has an output of 400 milliwatts, or just twice as much. Then the output valve supplied with the "V.3" A.C. model, the P.M. 24, has an output of 500 milliwatts, just 2½ times the output of the P.M. 2 A.

The PEN. 4.V, when used with the "V.3." A.C. standard kit is given an anode voltage of only 150 volts—the maximum power available from the standard power unit—and under those conditions its power output is about the same as of the P.M. 24. But with its maximum rated power of 200–250 volts the PEN. 4.V. gives *2,000 milliwatts undistorted output;* an output sufficient for loud volume in a large room without any trace of overloading, an output ten times as big as our first example.

There you have the answer to the whole question of the connection between power, amplification and volume. Our last example gives us an output which is something to conjure with, something big to work on, something to give pleasure to the listener who enjoys the full round

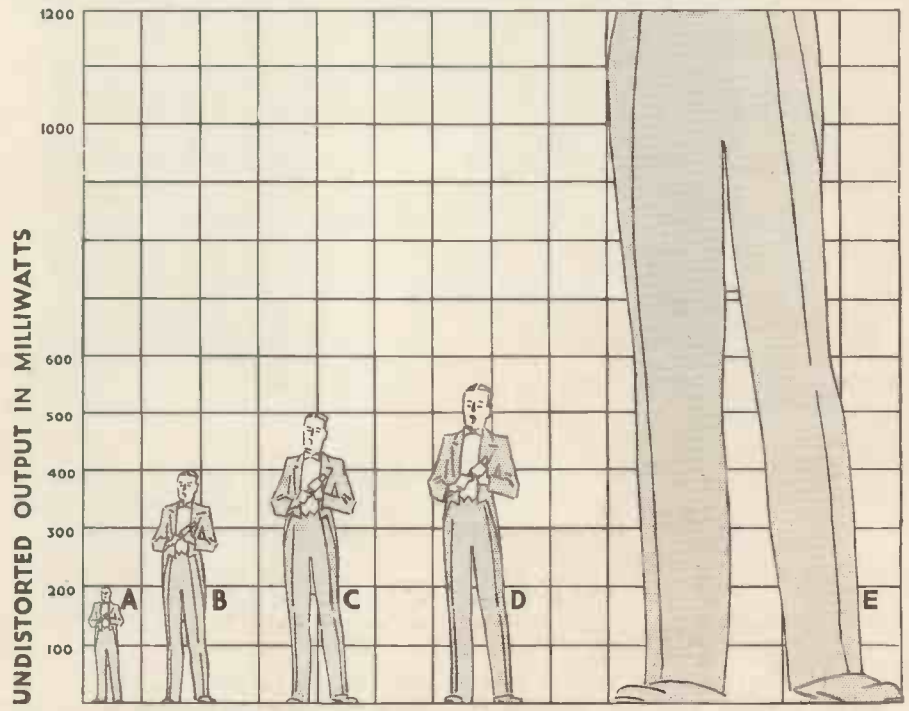


Fig. 2.—This represents a comparison of undistorted outputs of various standard types of valves under normal conditions.

"A" is the P.M.2A—a 2-volt battery operated power valve.

"B" is the P.M.22—a 2-volt pentode output valve.

"C" is the P.M.24—a 4-volt pentode output valve.

"D" is the PEN.4V—an A.C. pentode—with 150 volts the maximum obtainable from the average Power Unit.

"E" is the PEN.4V—when given its maximum rated anode voltage of 200-250. Its undistorted output is so large—2,000 Milliwatts—that it has had to go out of the picture. This is how it is being used in the Super V.3.

clear tone of a valve working well within its full capabilities and yet reproducing the programme at something like its full intensity.

HAVING ARRANGED our output stage to handle more volume without distortion, we must study the preceding stages of our Super Set to find if any improvements can be incorporated. For defects here, which would pass unnoticed when the set is used at low intensity, will become most noticeable now that we can increase our volume.

In order to make the detector function in a manner which will result in our getting reproduction nearer to the true, it is desirable to increase the anode voltage of this valve. But such increased voltage will result in increased anode current; an increase which will make the current in the primary of the L.F. transformer exceed the rated limit. This will lead to the introduction of harmonic distortion and loss of the lower frequencies, a state of affairs not to be tolerated in a receiver designed for perfect quality.

So a further modification must be adopted to overcome this defect, and "shunt feed" is introduced. This arrangement consists of a resistance through which the anode current is fed, and a by-pass condenser which carries the signal from the anode to the primary of the transformer. The transformer is called upon only to handle the signal and the problems

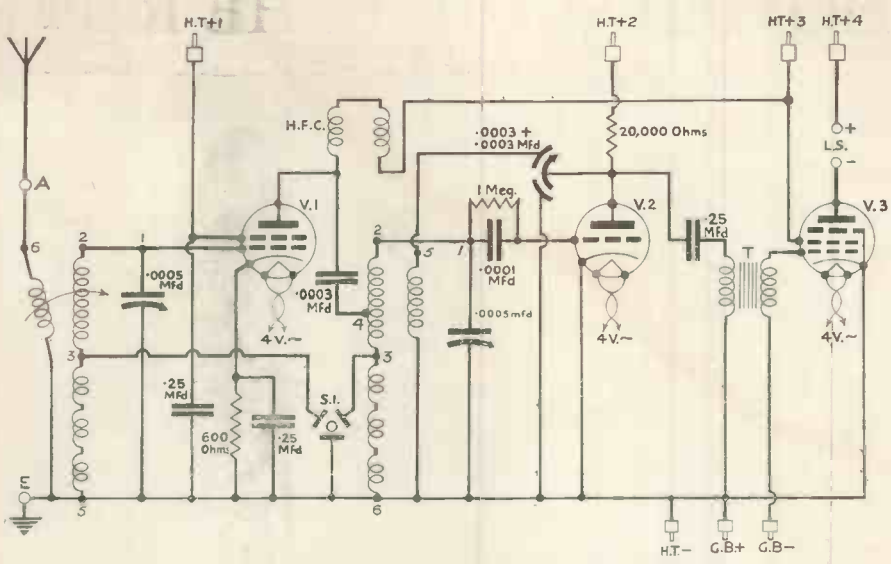


Fig. 3.—Theoretical Circuit of the Super V.3.

arising out of the D.C. component are eliminated. This arrangement has an additional advantage in that different capacities of shunt condensers can be used to modify the characteristics of the transformer coupling, to give a rising characteristic in the lower frequencies. This is important when it is realised that the small cabinets favoured by the public are inclined to cause a loss of the lower frequencies, and this can now be compensated, with the result that the whole apparatus—set, speaker and cabinet—can be arranged to give an output, uniform to the ear, of from 32 cycles up to 2,000 cycles with a gentle fall above this.

As a matter of interest we have tested the radio gramophone described later in this issue with constant frequency records, and it showed an appreciable response down to 16 cycles, the very lowest frequency audible as a musical note. The response above 64 cycles was perfectly level up to 2,000 cycles and above that fell gently to 4,000 cycles over which the response rapidly falls off.

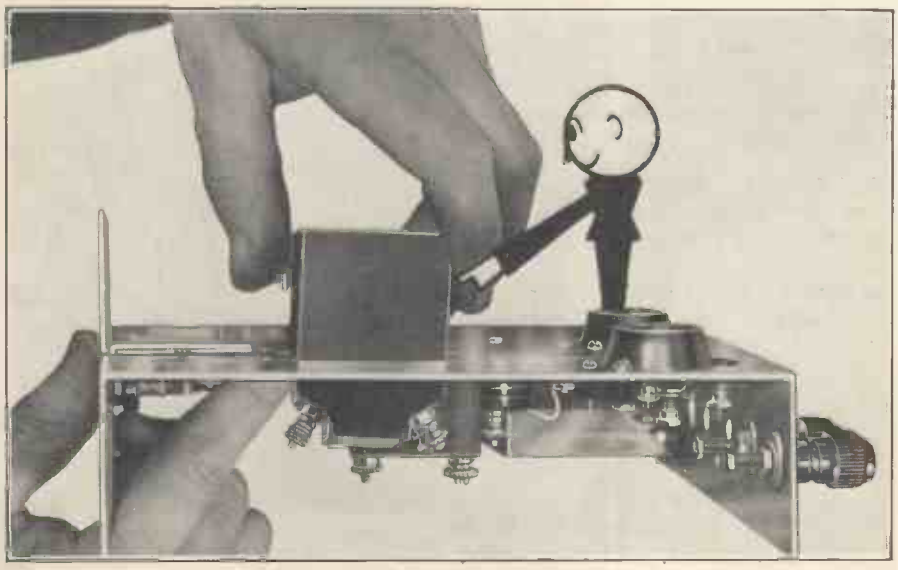


Fig. 4.—In an early step in the construction of the Super V.3 the transformer is dropped through the slot in the chassis as shown here.

THAT IS the circuit, but the circuit alone is not enough. The Power Supply must be given the same careful consideration—it is an essential part of our Super Set. It must provide a high voltage supply to our output pentode, it must provide the correct potentials for the preceding stage and it must supply the field current for our loudspeaker. So for our Super Set we must design a Super Power Supply unit—a unit worthy of the set.

And finally we must choose a quality speaker for our Super Set—a speaker capable of giving rich full voice to the pure signals fed to it. It must be of the moving coil type for no other type of speaker can reproduce so wide a range of frequencies as the moving coil.

So we have our Super V.3—the set with the Golden Voice. Perfect Circuit, Perfect Power, Perfect Speaker—these three make QUALITY.

HOW TO BUILD THE R for M "SUPER V.3."

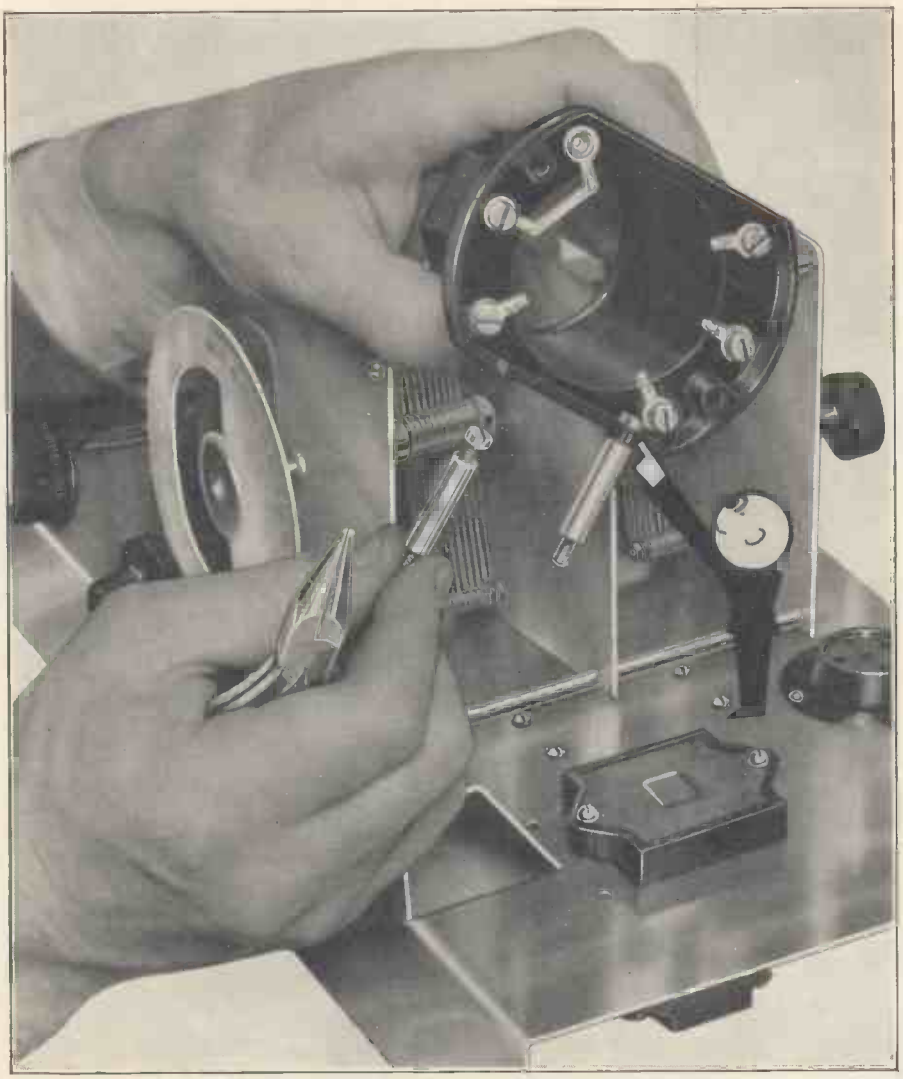


Fig. 5.—Fixing Coil H.2 should present no difficulties if this illustration is studied. The screwed ends of the pillars go through holes in the chassis and are secured underneath by nuts.

TO BUILD the "Super V.3" receiver you need to possess a small screwdriver and a small pair of pliers, nothing more. All the parts are fixed to the metal chassis with screws and nuts, and no holes have to be made.

For the sake of uniformity and to keep the appearance of the set at its best all screws, except condenser fixing screw Sc.2, should be inserted from the top of the chassis, and the nuts fitted from below.

Step 1.

Lay the components out and, turning the chassis on to its back edge, fix the transformer, the H.F. choke and the fixed condensers. The positioning of all the components is made perfectly clear by reference to the Blue Print and to the photographs reproduced here. Leave the switch for the moment. The grid leak forms part of the wiring and this will be fixed later as the wiring is completed.

The condenser C.8 and the resistance R.2 can be left for the moment and be fitted after part of the wiring is complete.

Step 2.

Next fit the terminals to the back edge of the chassis. Note here that Aerial, L.S. + and L.S. — terminals have insulating washers which are fixed inside the chassis, but the earth terminal has a metal washer so that the metal spindle makes contact with the metal chassis. Do not mix these washers or the set will not work.

Step 3.

THE NEXT STEP is to fit the coils and condenser assembly to the top of the chassis. The coil which contains the rotor must be fixed first; this fits in position H.1 on the chassis. The other coil is supported on two pillars, and this should be fitted next. Pass the screws through the slots in the coils into the pillars, and then secure the pillars to the chassis. Do not omit to fit the earthing screw which connects terminal 5 of coil H.1 to the chassis. Now fit the condenser assembly, inserting screw Sc.2 from the under side.

Step 4.

NEXT TURN your attention to the front edge of the panel and fix the black switch (the wave change switch) in the left-hand hole. The fixing nut of this switch must make a definite electrical connection with the chassis. The right-hand hole is for a gramophone pick-up switch if you wish to use the set as a radio gramophone amplifier. Instructions for connecting this are given later in this issue.

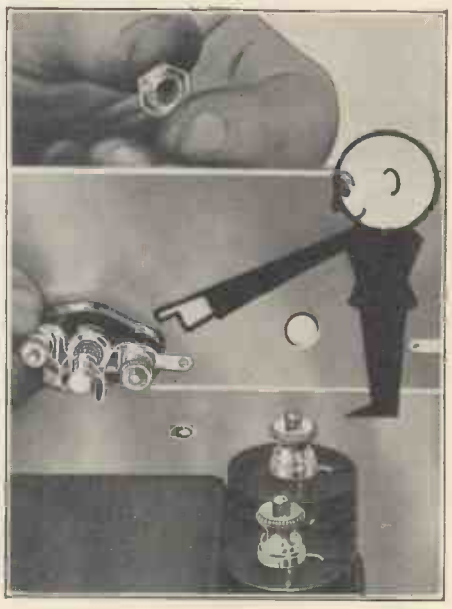


Fig. 6.—In fixing the switches the metal washers may be omitted. Screw the nuts tightly on to the fixing bushes, so that they make proper electrical contact with the chassis.

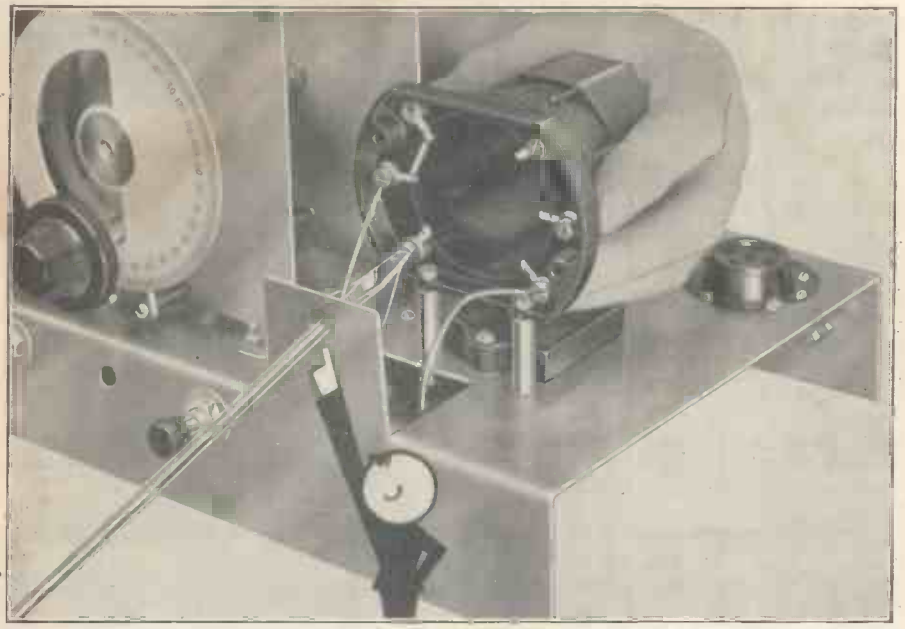


Fig. 7.—Wiring to coil H.2 will be simplified if the reaction condenser is left until wire No. 23 is in position. Note the suggested position of the screwdriver during this operation.

The only remaining component to fit before starting to wire is the paper condenser C.6.

Step 5—Wiring.

THE WIRING may now be commenced. Start with the receiver upside down, resting on the top of the condenser assembly. Use the blueprint and the point to point wiring instructions printed by the side of it. The wiring is very simple, and as the majority of the wires are very short, 20 S.W.G. tinned copper wire is used, since this is easy to bend and handle. The sleeving is easily slid over the wire, and forms a perfect insulating covering, which, unlike coated connecting wires, does not crack and become bared on the corners.

Note by the way that the terminal nuts for the valve holders are included in the package containing the switches.

Step 6.

THE WIRING should proceed up to wire 14 when the condenser C.8 should be fitted. The condenser is secured by one of its lugs to the further choke terminal and one of the nuts from the coil pillars is used to secure it. The lug holding the end of wire No. 14 and battery lead H.T. + 3 secure on the terminal. When wire 16 is fitted fix one end of resistance R.2 at the same time. The remaining end of the resistance is then fixed by one of the spare nuts and bolts included in the kit to the horizontal hole in the nearer side of the T.C.C. condenser C.8.

If any other condenser than the T.C.C. is used this ear will be missing so be sure you have the right one.

Now get on to wire No. 23 when the reaction condenser must be fitted. Note that this component is fitted with the terminals towards the bottom of the receiver. One of the aluminium packing washers may be discarded, the other should be placed on the fixing bush under the nut. When fitting this, do not bend the metal support backwards, or the condenser spindle will not project sufficiently far through the cabinet for the knob to fit securely. The remaining wiring can then be done.

WHEN THE WIRES to the condenser assembly are fitted, the covers must be removed to allow access to the terminals. This is done by pulling the lugs on each side, springing the lower part away, and then lifting. The wires to the condenser terminals pass between the lower bar of the condenser and the chassis. If this is not done it will be impossible to get the covers back into place.

When cutting off the wire for these two connections allow an adequate length. If cut on the short side you may strain the condenser frame when screwing down the screws, and this may result in the set not working at the first attempt. The whole of the wiring can be completed in an hour or two and the set made ready for use, so do not hurry, you will be finished in good time.

When fixing the power leads pass all the leads under the fixed wiring so that the flex leads are held close to the metal chassis. This will make the wiring neater and more easy to check.

When the wiring has been completed check each step in the point to point wiring instructions so that you are assured that every wire has been fitted and fitted to the correct terminal. Certain now that every part is in order the set may be connected up ready for the test.

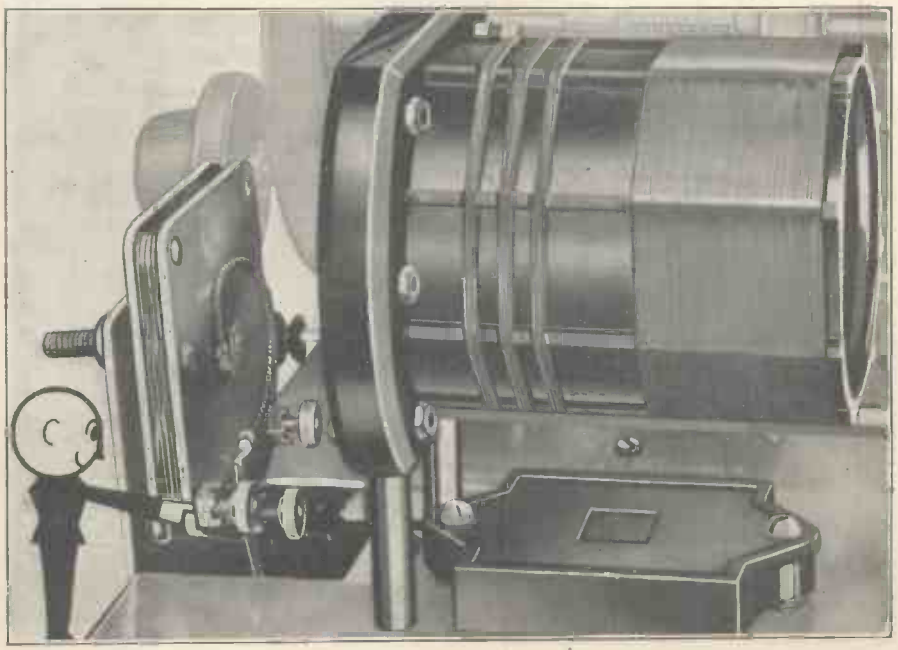


Fig. 8.—Mount the reaction condenser with its terminals nearest the bottom of the chassis.

Step 7—The Valves.

THE SPECIFIED Mullard Valves should now be fitted

The "Super V.3" has been designed to work with valves with certain characteristics in each stage. These characteristics are represented only in the Mullard Valves specified.

Any deviation from this specification will at once result in the marring of the performance of the Receiver. The correct valves are supplied in your kit, but remember when the time comes for replacements that it is of the utmost importance that the specified Mullard types be used.

INSERT the valves, the S.4V into valve holder V.1, the 354V into valve holder V.2, and the Pen.4V into valve holder V.3. Then connect up the power unit.

OPERATING THE "SUPER V.3."

LOOKING AT the panel of the receiver you will see three controls in line, and below these a black knob switch. This switch operates long and medium waves. When the switch is pulled out the receiver is set for medium waves, and when the switch is pushed in the receiver is set for long waves.

To make a first test pull the switch; this will make the set operate on the medium wave or normal broadcast band.

Then turn the left-hand control knob and observe that it moves the rotor in coil H.1. This controls volume and selectivity. When the rotor is at right angles to the chassis minimum volume and maximum selectivity are obtained, so that, depending on the distance of the station, one can vary the volume and selectivity to suit the aerial and position of the receiver. Set this control a few degrees from the right angle position and turn the centre dial until a station is heard; you can then re-adjust the selectivity control to suit.

THE RIGHT HAND control is for reaction and on the more distant stations this enables a very great increase of volume to be obtained.

When searching for distant stations the reaction control should be held by the right hand and the receiver kept as near as possible to the oscillating point while the left hand turns the tuning control.

The small trimmer knob in the centre of the tuning control only needs occasional adjustment, and is for the purpose of accurately matching the tuned circuits. It is made to operate from the panel so that on the most distant stations you may get the very last ounce that is possible from the receiver.

By the way, the vizor, which is included with the J.B. Condenser in the kit, should be fitted as shown in the illustration, fig. 23, page 27.

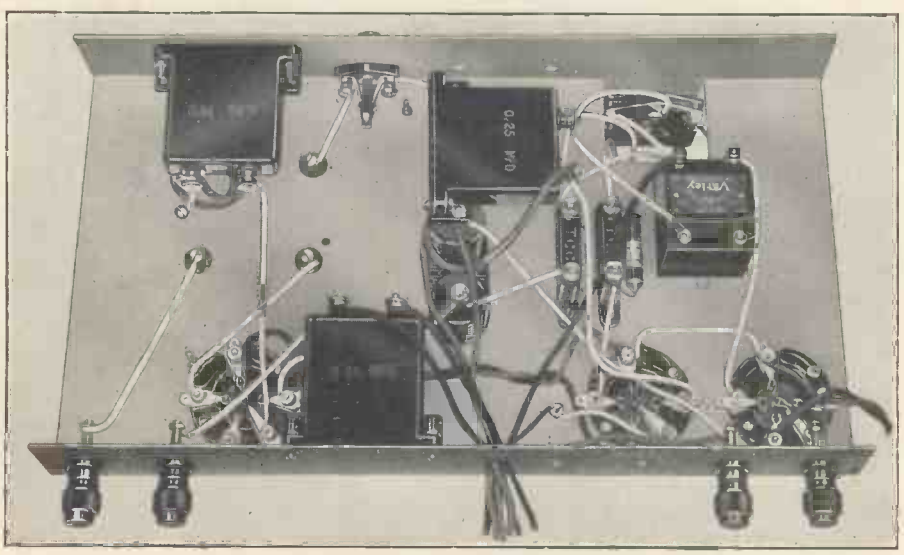


Fig. 10.—The underside of the completed Super V.3.

Fig. 9.—Making any necessary adjustment to the fixed trimmer in condenser C.2. is fully described and this illustration shows the action.

Adjusting Fixed Trimmer.

NORMALLY the fixed trimmer in condenser C.2 should be set with the vanes wide apart.

It may, however, be found that the small trimmer knob does not seem to match the circuits accurately, in which case it will be necessary to adjust the fixed trimmer on condenser C.2.

To do this, turn the small trimmer knob clockwise for about three quarters of its travel, and tune in a weak station on the medium wave band, preferably below 60 degrees on the scale. Then with a screwdriver carefully adjust the fixed trimmer on condenser C.2 as shown in illustration 9, at the same time slowly rocking

the main tuning knob. When the volume is at a maximum the circuits are accurately tuned and the adjustment is completed.

In the "Super V.3" reaction control is by means of a differential condenser which, in conjunction with a carefully chosen reaction winding on the coil, provides a very satisfactory system. Should, therefore, the reaction control happen to be a little fierce, a check of the disposition of the wiring should also be made to see that all wires are kept properly spaced and as short as possible. Note in this connection that wire No. 27 should follow the path indicated on the blueprint; it should not be allowed to pass under the condenser C.1, for, if it does, feed back may occur and make the set unstable.

IF WHEN the set has been connected up it fails to work, do not presume that it is some fault in the parts; it is a 100 to 1 chance against this being the case. Just look the set over again and it is highly probable that some little part has not been wired correctly, or that a wire has not been covered properly and so is shorting.

Fixing a Gramophone Pick-up.

PROVISION has been made for fixing a gramophone pick-up to the "Super V.3." It will be necessary for you to obtain two Belling Lee terminals marked "Pick-up," and one Junit coloured knob push-pull switch. The washers are the same as those on the loud speaker terminals of your set, and you will find you have two spare ones left in the packet from your kit, which should be used for insulating these pick-up terminals. It is essential to obtain the correct switch; the one specified has the spindle tip insulated from the fixing bush.

Fit the terminals in the two holes which are to be found in the back of the chassis. Then fit the switch in the right-hand hole in the front of the chassis. Two additional wires are necessary, one from the right-hand terminal of the switch to left-hand terminal (3) of V.2 and the other from left-hand terminal of the switch to one of the terminals marked "Pick-up."

Now fit a length of flex to the other terminal "Pick-up" and connect it to socket 1½ of the grid bias battery.

WHEN LISTENING to radio the right hand switch must be pushed in, but when you wish to listen to gramophone reproduction the switch must be pulled out. This arrangement is the most satisfactory because you can build the set into a radio gramophone, and not be obliged to connect and disconnect wires when you wish to change from gramophone to radio.

The specified pick-up incorporates a volume control and details of this apparatus will be found in the article dealing with the Tablegram V.3.

When a pick-up without an incorporated volume control is used however, a volume control is essential, otherwise the most distressing distortion will take place owing to overloading. A convenient type is the Igranic Megostat (50,000 ohms) and this may be mounted on the motor board of the gramophone. It should be inserted in the lead from the pick-up to the pick-up terminals on the set as follows:—Break the flexible and fix the two wires from the pick-up itself on to the two outer terminals (red and blue) on the control. Connect the flex from the pick-up terminals on the set to the inner (plain) and one of the outer terminals (blue) on the megostat.

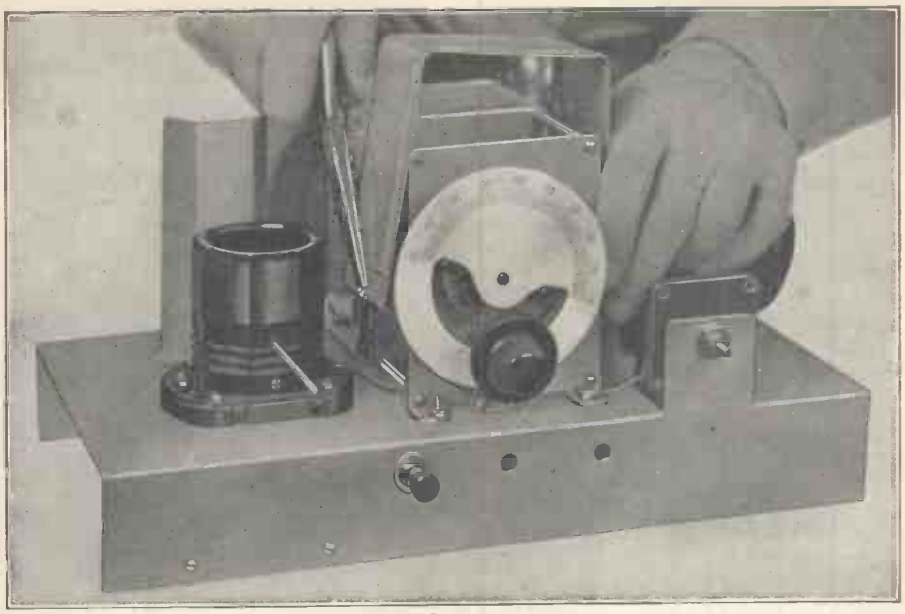


Fig. 11.—The condenser covers clip to the frame of the condensers. Spring them apart and lift them for removal.

BUILDING THE "SUPER V.3" POWER UNIT.

WE NOW REACH the second stage in the construction of our Super Set; and it is necessary for us to assemble the Power Supply Unit which has been specially designed for the "Super V.3."

This Power Unit is an essential part of the equipment, and no other Power Unit will operate the set satisfactorily. It has to supply the high voltage to the output pentode, the correct potentials for the preceding stages and, in addition, supply the field current for the moving coil speaker.

In construction the Unit is perfectly straightforward. Being designed only to work the "Super V.3" the resistances incorporated in it are of fixed values and consequently there are no after adjustments to be made. The importance of this lies in the fact that the home constructor, having no accurate and expensive instruments, would find it practically impossible to adjust variable resistances to give the exact voltages demanded by the valves. His only available method would be to try various adjustments until one is found at which the set sounds all right. But this rough and ready way is of no use for our Super Set. Our voltages must be adjusted critically, the different voltages have to be correctly related, and so fixed resistances are incorporated to obviate any question of adjusting by chance.

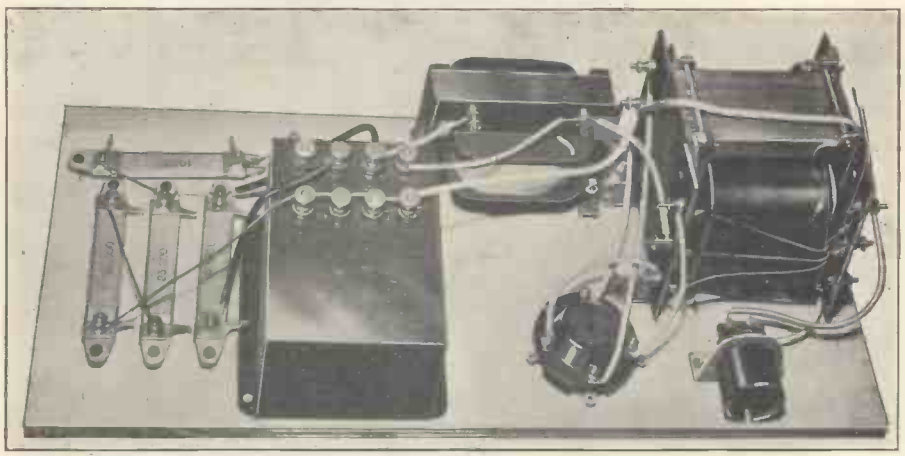


Fig. 12.—The " Super V.3 " Power Unit completely assembled and wired.

THE " SUPER V.3. " Power Unit components are available in Kits, packed and marketed by a reputable power unit manufacturer, and can be obtained from any good radio dealer.

The Unit gives an output of 250 volts at 60 milliamperes approximately, and this output is divided between the speaker field winding and the H.T. Supply for the Set.

Another point worthy of note is that the speaker field and the H.T. supply are in parallel instead of in series as in previous supply units. There is an obvious reason for this. With 100 volt speaker, and our output valve taking 250 volts H.T., it would have been necessary to design a unit to give 350 volts output if these were to be in series. Such a high voltage might have deterred some of our readers from building the set and so we have adopted the parallel method using a 250 volt speaker. This method has a further advantage in that low voltage type condensers and rectifying valve can be used and our standard of economy so maintained.

The First Step.

THE FIRST STEP in the building of the Unit is to lay out the components in the positions shown on the plan on page 13. In the case of the Unit, careful positioning is not so essential as in the case of a receiver, and therefore a blue print has not been made. The position indicated for each component should be followed as closely as possible however, and in the case of the safety mains socket an exact position must be found in order that the plug will register with the hole cut for it in the cabinet. When mounting the socket arrange that the right-hand fixing screw is exactly 2 inches from the right-hand edge of the base-board; this will then ensure correct registering with the plug which later on is to be fitted through the back of the cabinet.

Wire and sleeving for all connections is provided in the Kit. *Be very careful to cover every wire with insulated sleeving*; a " short " on certain leads will result in an expensive burn-out.

Follow the point to point wiring instructions shown on page 13 and make a careful check of each wire before connecting the unit to the set.

Now connect the set to the unit according to the instructions on page 13.

IMPORTANT.

DO NOT ATTEMPT to use this unit unless the speaker field winding is connected. The reduction in load will cause the voltage to rise to an excessive figure and may damage the valves and the condenser block. If for any reason it is necessary to test or use the unit without the speaker, a resistance of 7,500 ohms must be connected between the terminals marked " Field." This resistance should be rated to carry 35 milliamperes; it will then take the place of the field winding and the voltages will be correct.

HUM.

IF THE MAINS transformer be reversed, or the unit placed in a different position in relation to the set hum may be caused—check these two points in the case of hum. A bad earth always increases residual hum.

Another hum trouble which sometimes arises we will call, for the want of a better term " tunable hum." This trouble manifests itself when tuning to a station or in some cases certain stations only; a loud hum is heard which is tuned out as the station is tuned out. This trouble can be cured by the insertion of a ·01 mfd. condenser between one mains lead and H.T.—.

The condenser is of a special type, tested to 1,000 volts, and it is essential that a reliable make be used for, if it breaks down, one lead of the mains will connect to earth and damage to the house installation may be caused. The condenser recommended is T.C.C. make, capacity ·01 mica dialectric, tested to 1,000 volts D.C.

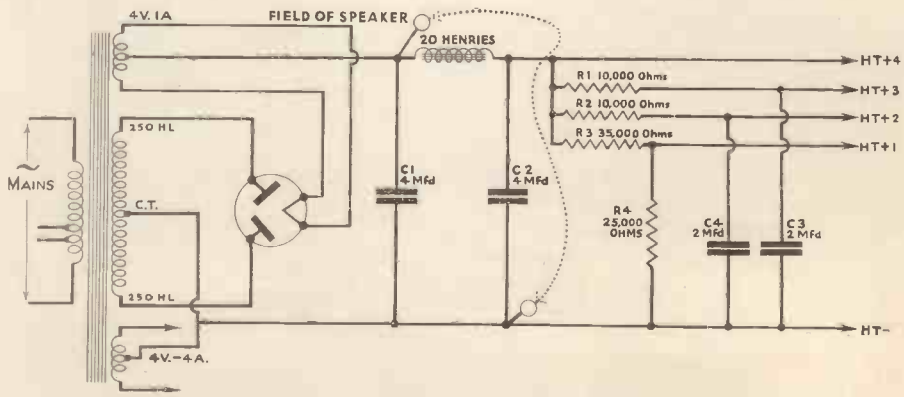
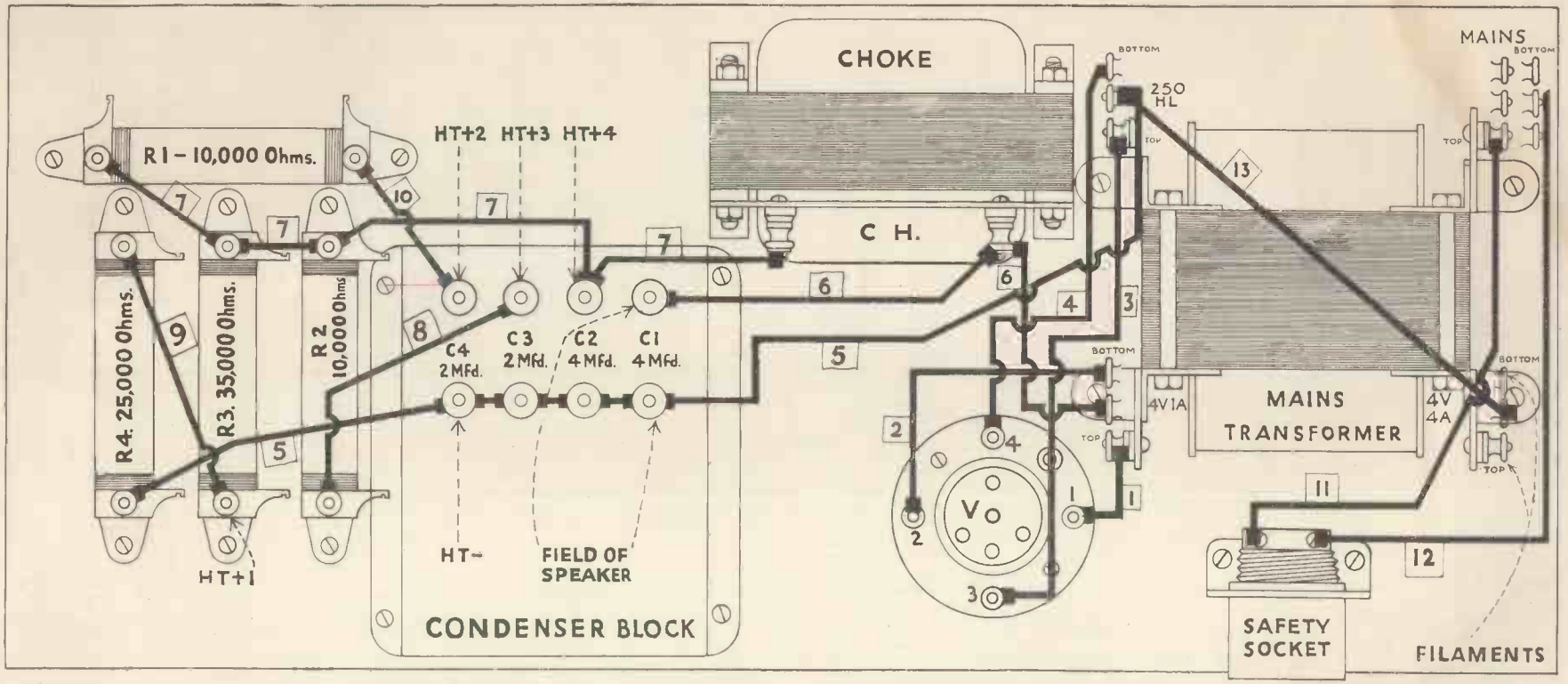


Fig. 13.—The theoretical circuit of the " Super V.3 " Power Unit.

Fig. 14. PLAN OF ASSEMBLY OF "R. for M." "SUPER V.3" POWER UNIT.



POINT TO POINT WIRING INSTRUCTIONS.

(All wires to be covered with sleeving).

Wire No.

1 Connect top terminal "4V1A" on mains transformer to terminal 1 on valve holder V.

2 Connect bottom terminal "4V1A" on mains transformer to terminal 2 on valve holder V.

3 Connect top terminal "250HL" on mains transformer to terminal 3 on valve holder V.

4 Connect bottom terminal "250 HL" on mains transformer to terminal 4 on valve holder V.

5 Connect middle terminal "250 HL" on mains transformer to each of nearer terminals C1, C2, C3 and C4, on condenser block, and finally to nearer terminal on resistance R.4.

6 Connect middle terminal "4V1A" on mains transformer to right-hand terminal of choke CH, and then to further terminal C.1 on condenser block.

7 Connect left-hand terminal of choke CH. to further terminal C.2 on condenser block, then to further terminals on R.2 and R.3 and left-hand terminal of resistance R.1.

8 Connect further terminal C.3 on condenser block to nearer terminal of resistance R.2.

9 Connect nearer terminal on resistance R.3 to further terminal of resistance R.4.

10 Connect further terminal C.4 on condenser block to right-hand terminal of resistance R.1.

11 Connect left-hand terminal of mains safety socket to terminal "O" on mains transformer.

12 Connect right-hand terminal of mains safety socket to the terminal on the transformer corresponding to the voltage of your mains supply.

13 Connect middle terminal "HL" on mains transformer to middle terminal "4v4A" on mains transformer.

POWER CONNECTIONS FROM UNIT TO SET.

FILAMENTS	To terminals "4v4A" on mains transformer.
H.T. –	To one of nearer terminals on condenser block, C.4.
H.T. + 1	To nearer terminal on resistance R.3.
H.T. + 2	To further terminal (C.4) on condenser block.
H.T. + 3	To further terminal (C.3) on condenser block.
H.T. + 4	To further terminal (C.2) on condenser block.
FIELD OF SPEAKER...	To nearer and further terminals (C.1) on condenser block.
MAINS CONNECTION TO TRANSFORMER.	Connect one terminal of safety socket to terminal "O" on transformer. Connect the other terminal to the terminal on the transformer corresponding to the voltage of the supply mains.
G.B. + ...	Insert in zero (+) socket of G.B. Battery.
G.B. –.	Insert in –10½ volt socket of G.B. Battery.
G.B. (Pick-up) ...	Insert in socket–1½ of G.B. Battery.

Essential Components for the "R. for M." Super V.3.

	£ s. d.
1 V.3 metal chassis ready drilled, with three five pin valve holders, screen, fixing screws and nuts ... (Junit)	
1 Switch, type B (black knob) (Junit)	
1 Condenser Assembly, Cat. No. 2010 ... (Jackson Bros.)	
1 Pair of V.3 A.C. Coils (with supports) ... (Colvern)	
1 Grid Leak, 1 megohm, with wire ends ... ... (Pye)	
1 Differential Reaction Condenser, type 926 ... (Pye)	
4 Terminals, type "B," Aerial, Earth, L.S.+, L.S.— (Belling-Lee)	
1 Packet of Insulating and metal washers for terminals (Belling-Lee)	
2 ·25 mfd. Paper Condensers (T.C.C.)	
1 ·0003 mfd. Mica Condenser (T.C.C.)	
1 ·0001 mfd. Mica Condenser (T.C.C.)	
1 600 ohm Spaghetti Resistance (Varley)	
1 Niclet Transformer D.P. 22 (Varley)	
1 Bijou H.F. Choke (Climax)	
2 Wander Plugs (1 red and 1 black) ... ... (Lissenin)	
1 Coil of 20 S.W.G. tinned copper Wire	
3 Yards sleeving to take 20-gauge wire	
5 Yards heavy flexible	
1 S.4.V. Valve (V.1) (Mullard)	
1 354.V. Valve (V.2) (Mullard)	
1 Pen 4.V. Valve (V.3) (Mullard) Above supplied in sealed carton by United Radio Manufacturers Ltd. (63, Lincoln's Inn Fields, London, W.C.2)	6 12 6
1 20,000 ohms Spaghetti Resistance ... ... (Varley)	1 0
1 ·25 mfd. Paper Condenser, type 50 ... (T.C.C.)	2 3
1 Magnavox Speaker, type R.M.P. 7,500 ohms model (Magnavox (Gt. Britain) Ltd., 89, Kingsway, London, W.C.2) ...	1 17 6
1 "R. for M." Midget Cabinet drilled for "Super V.3" (Camco) ... ... [Stool, if required, 30/- extra].	2 8 0
1 16½-volt G.B. Battery, type G.3 (Siemens)	2 6

IMPORTANT.

The standard turntable is suitable for 50 cycle mains only, but is available in two models, for 200/250 volts and for 100/130 volts.

The Power Unit is suitable for 200/250 v. 40/100 cycles. A Unit is also available for 100/130 v. 40/100 cycles.

Essential Components for the Super V.3. Power Unit.

	£ s. d.
1 Mains Transformer (Junit)	
1 20 Henries Choke (Junit)	
1 12 mfd. Block Condenser, R.M. 12 ... (T.C.C.)	
1 25,000 ohms Strip Resistance (Colvern)	
1 35,000 ohms Strip Resistance (Colvern)	
2 10,000 ohms Strip Resistances Colvern	
1 Safety Mains Plug and Socket, P.18 R.M. ... (Bulgin)	
1 Lo-los valve holder (Junit)	
20 S.W.G. tinned copper wire, sleeving, etc. ... ... Above supplied in sealed carton by the Junit Mfg. Co., Ltd. (2, Ravenscourt Square, W.6).	3 15 0
1 D.W.2 Rectifier Valve (Mullard)	12 6

Additional Components required when using "Pick-Up."

	£ s. d.
1 Pick-up Model 40 with volume control (Harlie Brothers [Edmonton] Ltd., Balham Rd., N.9)	1 7 6
1 Simpson Electric 12" Turntable (Simpsons Electricals Ltd., 11, Jewry Street, E.C.2) *When ordering, state voltage.*	1 19 6
2 Terminals, type "B," "pick-up" (Belling-Lee) @ 6d.	1 0
1 Type "C" Switch (Junit)	1 0

Brixton Road,
S.W. 9.

Dear Sirs,

At the time of writing I feel I ought to congratulate you on your achievement on construction of the "R. for M." V.3 A.C. Model, which works a Baker's Selhurst Moving Coil Loud Speaker, a really wonderful combination.

I am not exaggerating when I say the above combination of set and speaker gives better reception than in the B.B.C. studio itself. I was amazed when I first switched on and I have not heard another set to equal it for purity and volume.

E. S.

TEST REPORT R.V.3. 10/10/1931.

St. Andrew's Road,
Walthamstow, E.17.

Aerial 25 ft., old iron pipe for earth. Both London stations working, time 9.35 p.m., 47 stations received on loud speaker full strength, many others at good 'phone strength. Customer more than satisfied.

(Signed) W. T. C.——
R.S.G.B.

TEST REPORT R.V.3 9/11/31.

Hove Avenue,
Walthamstow, E.17.

Four strands of wire tangled up in downstairs room as aerial, earth off dirty gas pipe (doubt if connected to earth) (unused).

36 stations at extra loud strength on speaker, equal to London. Time 9.15 p.m., both London stations working not a trace of interference.

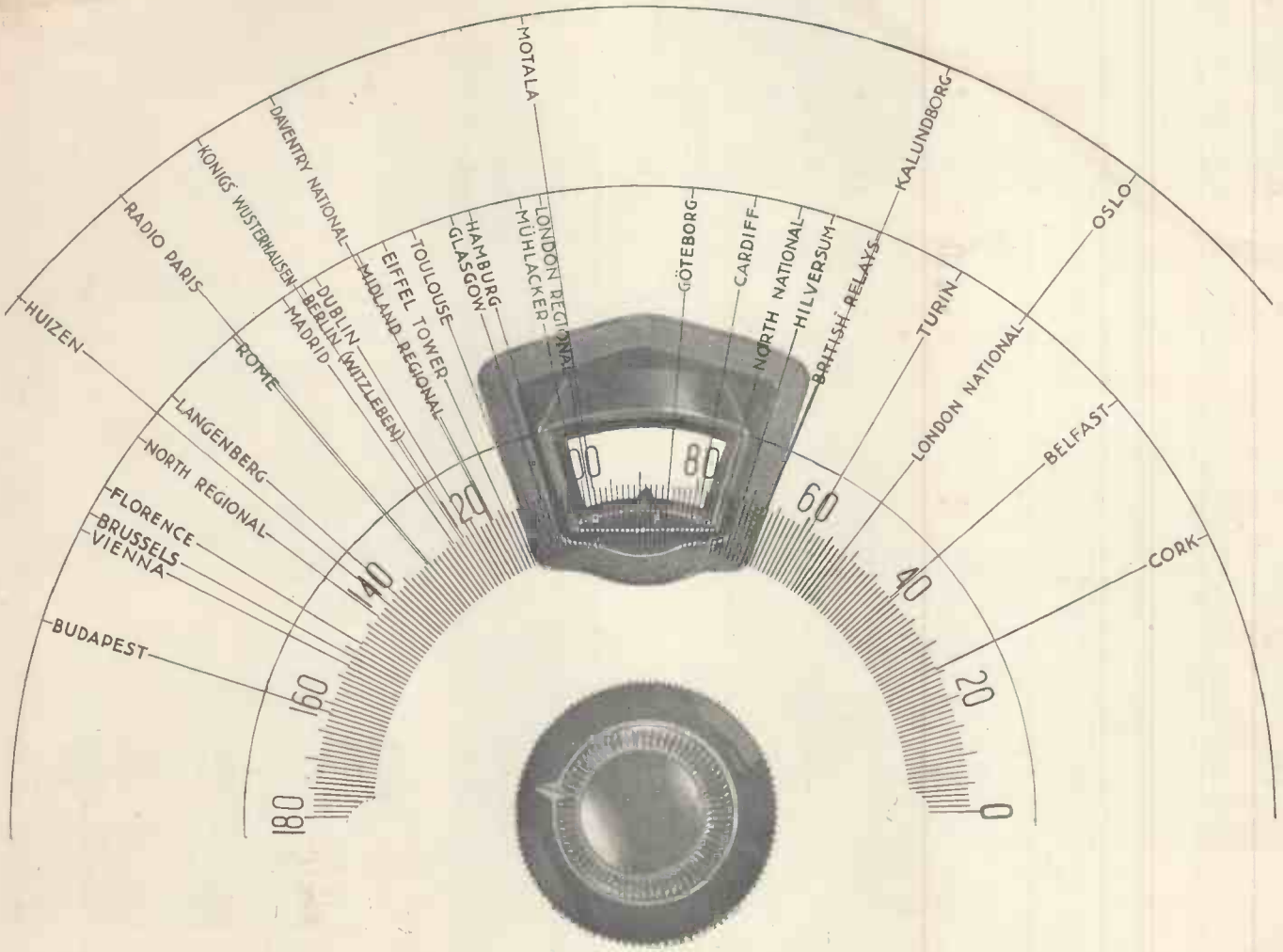
Customer's remarks. Can we tone set down, far too loud for them.

Recommended to another friend for R. for M. V.3 and got the order. Report on this receiver to follow.

(Signed) W. T. C.—— R.S.G.B.

The "R. for M." Midget Cabinet for the Super V.3 mounted on its stool.

HOW THE STATIONS WILL COME IN ON YOUR SUPER V.3. DIAL.



Calibration Chart for "R. for M." Super V.3.

Medium Wave Band.	Dial Readings.	Medium Wave Band.	Dial Readings.	Medium Wave Band.	Dial Readings.
200	5	380	109	560	165
210	14	390	113	570	167
220	23	400	117	580	169
230	31	410	120	590	171
240	39	420	123	600	173
250	45	430	127		
260	51	440	130		
270	57	450	133		
280	63	460	137	Long Wave Band.	Dial Readings.
290	69	470	140		
300	74	480	143	1071	52
310	79	490	145	1153	67
320	84	500	148	1350	97
330	89	510	151	1411	102
340	93	520	154	1554	117
350	97	530	156	1635	123
360	101	540	159	1725	130
370	105	550	162	1875	140

Are you a Radio-Star Fan?

Here are a few of the best known broadcasting personalities whose voices you constantly hear. Can you recognise them?

1. Henry Hall and the B.B.C. Dance Band.
2. Christopher Stone.
3. Stainless Stephen.
4. Jack Hulbert.
5. Mabel Constanduros.
6. Alexander and Mose.
7. Leonard Henry.
8. Elsie and Doris Waters.
9. Olive Groves.
10. M. Stephan.
11. Sir Walford Davies.
12. Clapham and Dwyer.

STOP THAT WHISTLE!

HAVE YOU NOTICED when listening to certain stations that the programme is accompanied by a high-pitched insistent whistle? A most annoying noise at any time, this whistle, and with the rapid distribution of new stations and the increase of power of existing ones, an annoyance which is likely to grow.

WHAT IS THE CAUSE OF IT? It is a characteristic whistle set up when the transmission of two stations overlap. *It has nothing to do with pentode valves.* The idea that the heterodyne whistle is in any way due to the use of pentodes is a fallacy. It is true that the ability of the pentodes to handle the upper frequencies may cause an existing whistle to appear stronger, but the whistle is there and will be reproduced by any set together with the high frequencies of the programme being received. For this reason certain set manufacturers fit what they call a "Tone-corrector" for use with pentode valves. In American sets this is often variable but in British sets it is more often a non-adjustable component fitted into the set.

SO IF YOUR favourite station's programme is interfered with by a heterodyne whistle here is a simple and inexpensive corrector which can be fitted into any set. It has a variable control, which will allow you to adjust it just sufficiently to deal with the heterodyne without cutting off the higher notes. It has the further distinct advantage over the fixed type in that, on stations which are not troubled with the whistle, the control need not be brought into use and there is no possibility of losing the top notes.

Only two components are required, a 50,000 ohms variable resistance and a ·01 mfd. condenser. These components are connected as shown in the circuit diagram reproduced here.

CONNECT one terminal of the ·01 mfd. Condenser to anode terminal (terminal 4) of the valve-holder V.3. Connect the other terminal of the condenser to one of the outer terminals of the resistance—which can be a Colvern 50,000 ohms Potentiometer. The middle terminal on this resistance is connected to the chassis (Earth).

A convenient way of assembling the control is to cut in the side of the cabinet a hole sufficiently big to take the bush of the variable resistance. The condenser is then screwed to the inside of the cabinet and the three wires which complete the circuit fitted.

The control is then easily operated from outside the cabinet, but the symmetrical appearance of the front panel of the set is not upset.

This little device, connected in this way, will be found to reduce the "scratch" experienced with some types of pick-ups in gramophone record reproducing and, for this purpose alone, it is well worth including in your radio-gramophone.

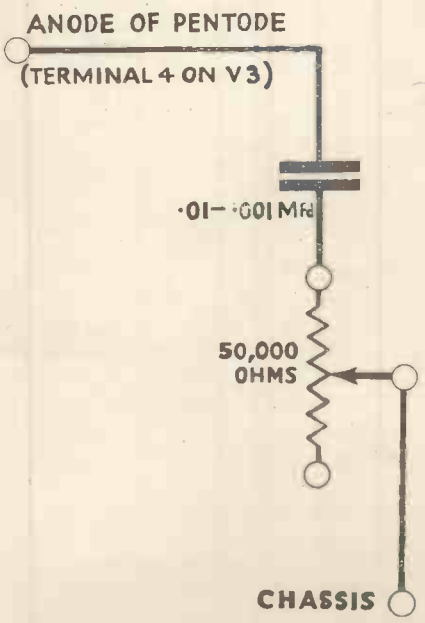
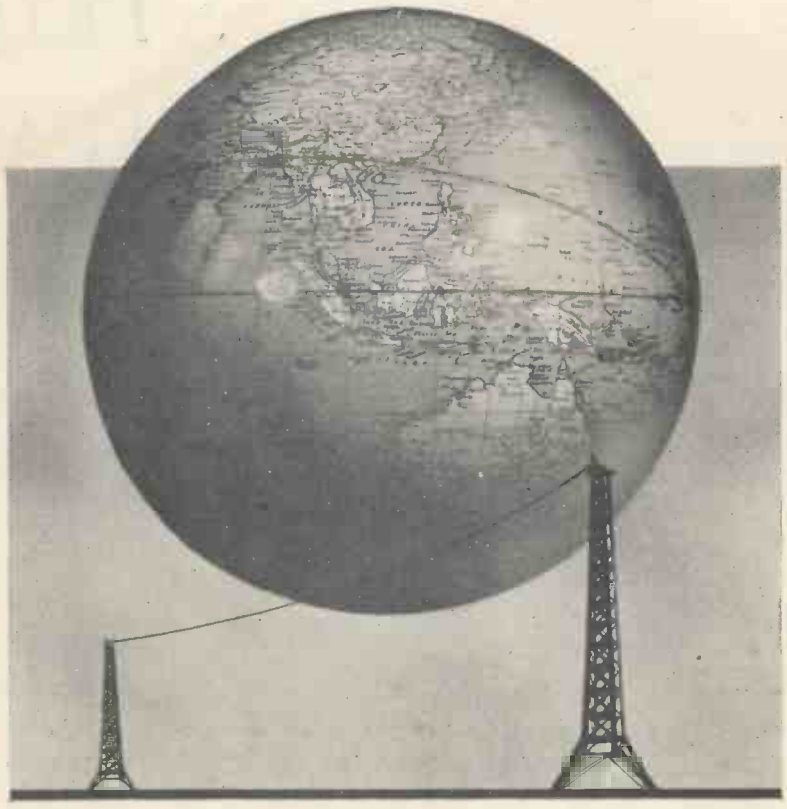


Fig. 15.—The circuit of the filter.

The Whole WORLD at your Finger-Tips



Adapt your Receiver for Short-Wave work by this simple link-up Circuit

SOME OF the most interesting radio programmes broadcast during every year are quite unobtainable on the average receiver. Stations in the remotest parts of the world are sending out entertainments of a kind and a variety which would add a thousand-fold to the interest value of radio, if they could be heard. Yet the nature of their wavelength makes it impossible for the ordinary receiver to tune in to them and so a tremendous variety of entertainment is lost. We have all heard of Short Wave Stations and Short Wave Receivers; we may have considered using them from time to time, but the question of cost or the necessary duplication of receiving apparatus has forced us to go without. America, Australia and half a dozen romantic countries have tempted us with their programmes but we have let them go.

OF SUCH interest is this short wave work that "Radio for the Million" has studied the question of designing a simple and inexpensive circuit, not additional to the ordinary receiver, but that can be joined to it and brought into use with it when short wave work is required. The Short Wave Superhet Adaptor is the result.

The Adaptor is not a complete receiver in itself. It is joined to an existing V.3—or, in fact, to any standard receiver with a similar circuit—and the combination thus becomes a five valve short wave receiver. When short waves are not required it can be cut out and the V.3 used for reception of the medium and long wave-band stations in the ordinary way.

The Choice of Super Het.

OUR SHORT WAVE ADAPTOR could have followed two different designs—the super-heterodyne or the straight detector. The latter type has been used before with moderate success, but it has never been able to compete with the standard of a receiver designed for short wave work only. Consisting, as it does, of a reacting detector valve which is linked to the low frequency stage of the normal receiver, it cuts out the H.F. stage of the normal receiver and thus loses the H.F. magnification of signals necessary to bring them up to loudspeaker strength.

Fig. 16.—The complete S.W. Superhet Adaptor.

The superhet type of adaptor, however, works in an entirely different way, utilising the High Frequency stage of the receiver as well. The signal is received by the detector stage of the Adaptor, the frequency changed and passed to the H.F. stage of the standard receiver where it is magnified 40 to 80 times according to the efficiency of the receiver in use. It is again rectified by the detector valve of the standard set, finally amplified by the low frequency stage so that a much more powerful signal is finally obtained.

One Dial Operation only.

THERE ARE additional advantages of the superhet type of adaptor. With careful design it can be made to operate by the manipulation of one dial only. The stations can be brought in clearly and easily without squealing or hair-splitting adjustments. Extreme care has had to be taken in the design, however, for, with frequency changing apparatus such as this, the highest degree of efficiency must be obtained if it is to operate satisfactorily. In the "V.3" Adaptor a screened-grid detector has been used and a separate oscillator provided, for it was found that a combined detector-oscillator valve arrangement gave continual trouble ; it proved difficult to maintain oscillation, and it was found that a valve which could be made to oscillate at the high frequencies available was not at all suitable for detecting weak signals.

Therefore, in spite of the temptation to be economical and utilise one valve, these facts made the use of a separate oscillator imperative, for otherwise the results would be erratic and the signals, when received, poorer than they should be.

The detector valve, freed from its obligations as an oscillator, can now be chosen for its suitability as a detector without reference to any other consideration. For this purpose we have chosen a screened grid valve which is admirably suitable for first detector in a super-heterodyne, because, as no reaction can be used on it, low inter-electrode capacity is of first importance. In triodes, high magnification is usually accompanied by high capacity and "Miller effect" on the preceding circuit, but with the screened grid valve, which is not called upon to change the signal to low frequency but only to an intermediate frequency, its high impedance does not entail frequency distortion.

THESE ARE some of the considerations which have influenced the "R. for M." Superhet. S.W. Adaptor, and now let us consider the apparatus in detail.

The panel is of metal and the baseboard is metal-faced plyboard, an arrangement which keeps hand-capacity effects down to a minimum. On the baseboard are mounted the necessary components, chief of which is the coil. For this we have chosen a six-pin plug-in type with three interchangeable coils giving us a wave range of from 15 to 70 metres approximately which represents the full band over which useful stations can be received.

On the panel is mounted the tuning condenser, which is of the wide spaced short wave type with a capacity of ·00015 mfd. Next to this is mounted the oscillator condenser, a control which very rarely requires adjustment.

To operate the "R. for M." S.W. Adaptor it is only necessary to connect its output terminal to the grid end of the aerial coil, *i.e.*, to terminal 2 of the coil H.1 in the V.3 set and the earth terminal of the Adaptor to the earth terminal of the V.3 set. Your aerial is joined to the aerial terminal of the Adaptor and a complete 5-valve short wave super-heterodyne is at your disposal—as efficient a short wave receiver as it is possible to devise.

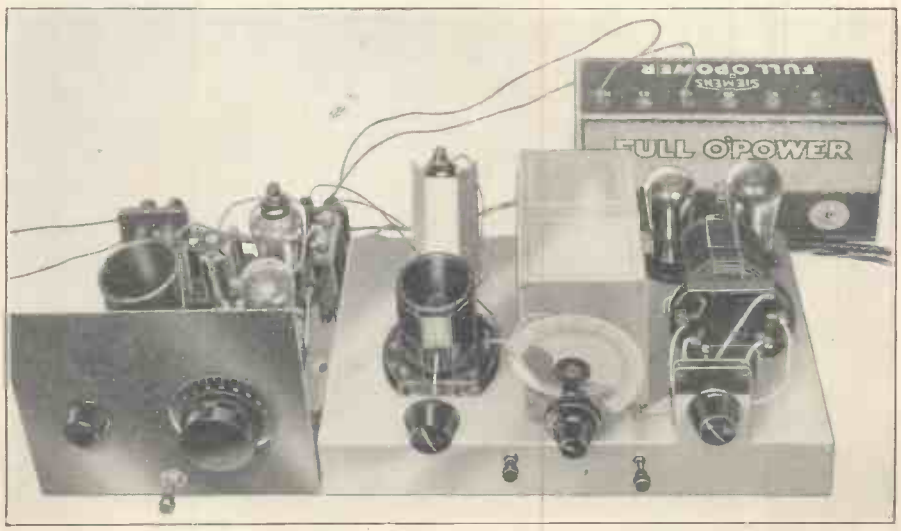


Fig. 17.—The S.W. Adaptor connected to the "R. for M." V.3.

HOW TO BUILD THE S.W. SUPER-HET ADAPTOR.

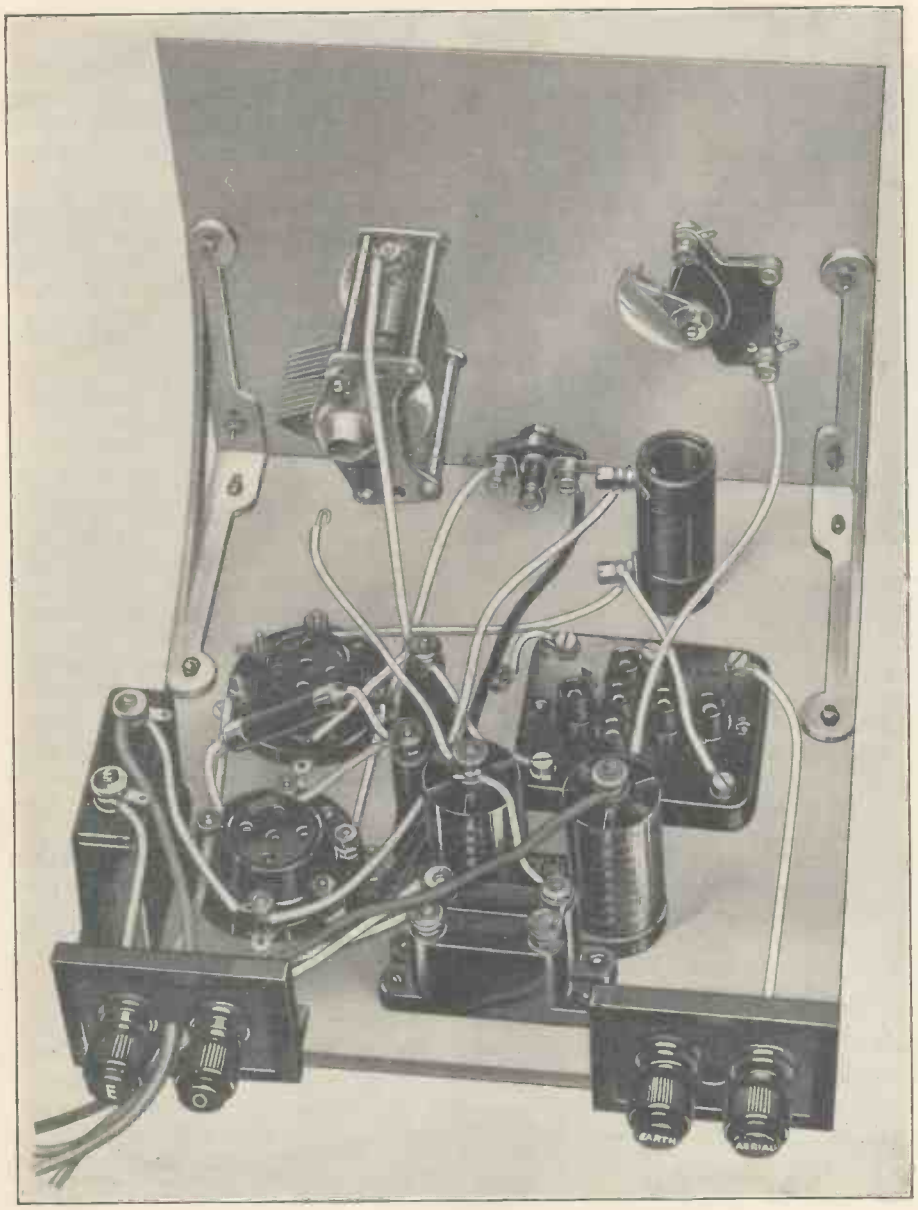


Fig. 18.—The S.W. Adaptor when assembled and wired.

WE MUST start with a word of advice and warning about the choice of components. When building short wave circuits it is essential that the electrical characteristics of the original design should be complied with exactly. Without laboratory tests it is impossible to discover whether two components, alike in appearance and rating, are in fact electrical duplicates of each other. Without this means of determining electrical differences, the only course to follow is *to use the components specified for the original design.* The wrong choice of a small item such as the switch can cause infinite trouble, for even this component is chosen specially because of certain characteristics. *So follow the designers' specification of components.*

The Start.

START BY laying out the components on the baseboard, first having applied the blueprint to the baseboard and pierced the fixing screw holes through the metal. Here is a hint about piercing the baseboard. The aluminium face is quite soft and easy to pierce with a sharp bradawl. See that the bradawl goes right through the metal, otherwise there may be difficulty in getting the screws to enter. Use iron screws rather than brass, for brass screws have a habit of twisting in half unless given the very lightest handling. If any difficulty is experienced in screwing the components down a little oil on the screw will help it through the metal.

Fix all the components to the baseboard, then fix the panel and the condensers to the panel.

The Wiring.

WE ARE NOW ready for the wiring—a perfectly straightforward job when the point-to-point wiring instructions are followed. Keep all the wires away from each other and away from the metal base. Try to make the wires follow the same path that they do in the blueprint, for, with short wave work, long straggling wires can cause mystifying troubles.

Wire No. 13 which connects the left-hand terminal of H.F. Choke H.F.C.2, to the anode of the screened grid valve should be of 18 gauge tinned copper wire ; do not use flex, for short wave work demands rigid wiring. When the wiring is finished check it over carefully—if you have been hurrying make the connection which, in your hurry, you have probably left out ! Tick each connection against the blue print ; then you will be certain. When you are quite satisfied that your wiring is complete, the apparatus can be connected up and prepared for a test.

How to connect the Adaptor.

ALL THE LEADS of the V.3 set are left as for ordinary reception, except the aerial and earth which are transferred to the Aerial and Earth terminals on the Adaptor (T.S.1). Stand the S.W. Adaptor to the left of the set and connect a wire from the earth terminal of the Adaptor to the earth terminal of the set.

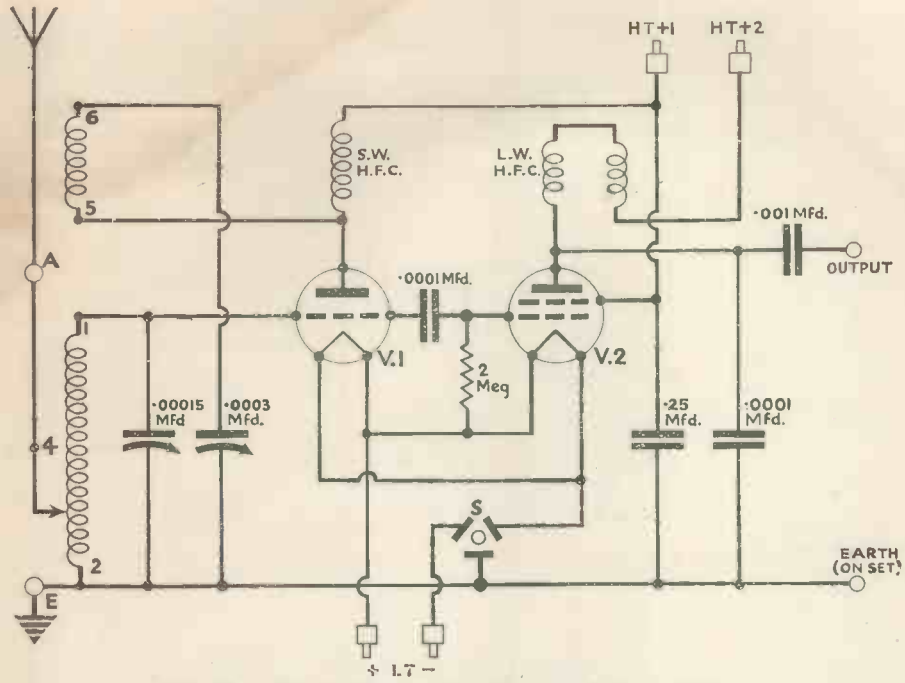


Fig. 19.—The theoretical circuit of the S.W. Adaptor.

Now connect the output terminal of the Adaptor to terminal 2 of Coil H.1 in the set.

Then connect the batteries to the Adaptor. The L.T. leads go to the accumulator that feeds the set, lead H.T.1 goes to 70 volts H.T. and lead H.T.2 to 100-150 volts H.T. If the same H.T. battery that feeds your set is used to feed the Adaptor it should be in good condition; a running down H.T. will lead to trouble. It is a good plan to use a separate H.T. battery for the Adaptor if this can be managed, and it may be noted that when the Adaptor has its own battery supply it will operate quite satisfactorily with a Mains operated set.

How to Operate.

SWITCH THE V.3 SET to long waves, turn its tuning dial to about 120 degrees, and advance its reaction close to the oscillation point.

Plug into the coil base in the Adaptor the coil marked No. 3—this is the easiest coil to use. Connect the aerial wire, by means of the clip, to a tapping about three turns up the coil. This question of the correct tapping is most important; tappings are employed because aerials vary to such an extent that it is impossible to give a fixed winding. If a tapping too high up the coil is chosen the oscillator valve will not function, while if a too low one is used the signals will not be strong.

Now turn the oscillator condenser (C.2) in a clockwise direction. When it reaches the point where the rushing noise which usually denotes a set is sensitive can be heard you will know that the oscillator is working. Turn the condenser well past this point and then leave that control and concentrate on tuning.

Slowly turn the tuning condenser (C.1) of the Adaptor by means of the slow motion control, and go carefully over the course of the dial. Tuning is incredibly sharp and unless it is done very slowly and carefully the stations will be missed.

As soon as a station is found—either speech or Morse—readjust the trimmer and reaction on the V.3 set so that the set is operating at its maximum efficiency. The set can then be left for it will not need further adjustment.

Now experiment with the tappings on the aerial coil by moving the aerial clip a turn up and a turn down. If it is found that the signal is stronger when

Fig. 20.—Showing the aerial wire connected, by its clip, to a tapping on the aerial coil.

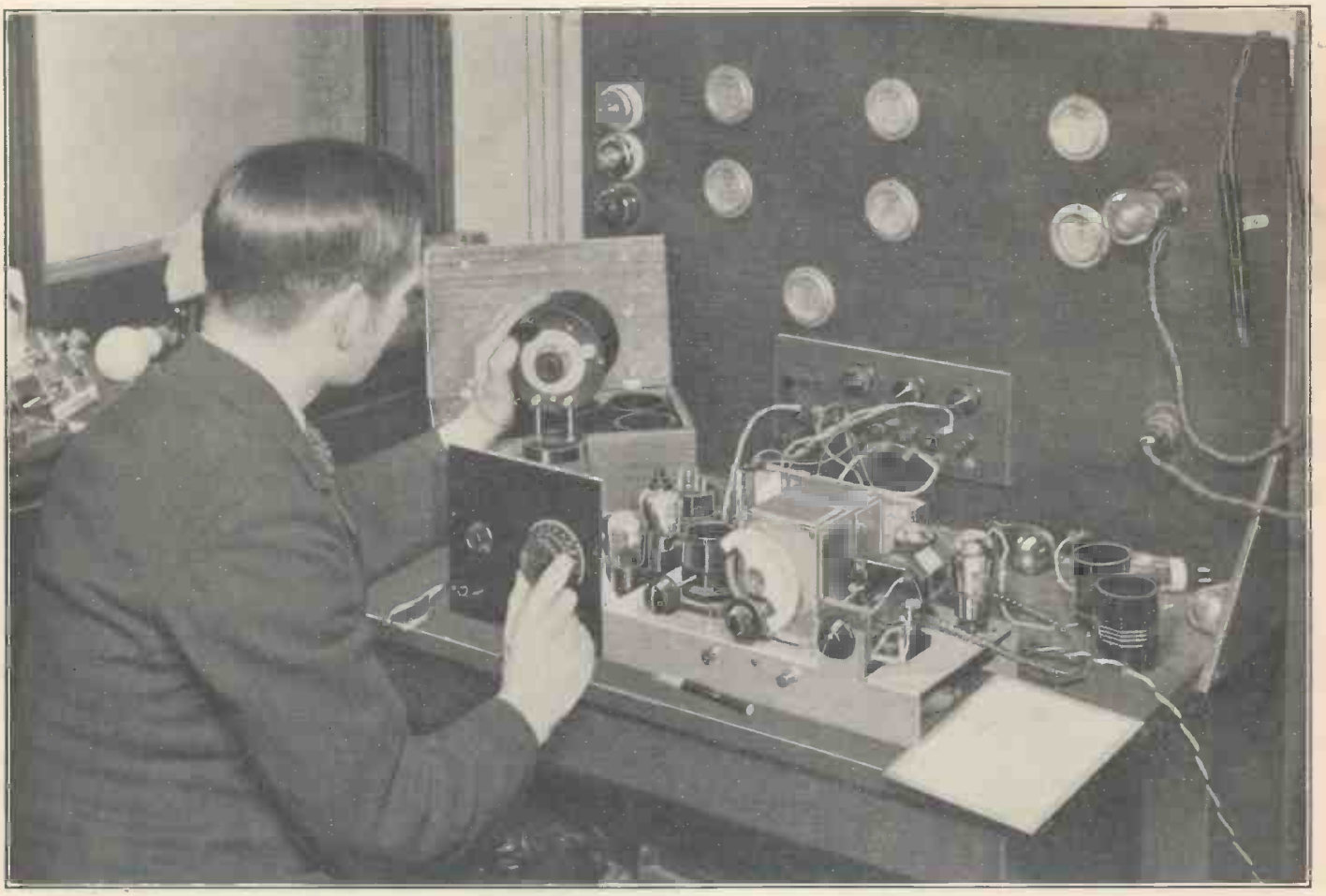


Fig. 21.—Testing and calibrating the "R. for M." S.W. Adaptor.

a higher tapping is used continue with that connection. It should be remembered, however, that when each change is made both the tuning and the oscillation condensers may need adjusting.

Now explore the whole scale of the condenser with this coil. Get the "feel" of the receiver before turning to Coil No. 2.

No. 2 coil has fewer turns than No. 3 and finding the right position for tapping in the aerial will make a lot of difference to its successful use. Start by clipping the aerial on to a tapping about two turns up and work from there. On this coil tuning will be even sharper, and quite considerable practice will be necessary before stations will be found with any degree of certainty. Having found the tapping on the coil to suit your aerial, and having experimented sufficiently with tuning to get the feel of the receiver with No. 2 coil, change to No. 1 coil.

With coil No. 1 start with the tapping about three-quarters of a turn up and adjust an eighth of a turn at a time until the right position for the aerial is found. Tuning will be most critical with this coil; a fraction of a degree will tune the station in or out.

There are dozens of important broadcast programmes and, of course, hundreds of amateur transmitters working on these low wavebands, and the fascination of picking them up and the novelty of their diversified programmes will give hours of enjoyment. Particularly is this so on the "R. for M." Superhet. S.W. Adaptor, which gives results that would be impossible on ordinary apparatus.

A Hint on Suitable Aerials—

SHORT WAVE RECEPTION differs largely from the more general broadcast reception and an aerial which is most efficient for the latter may not be so for short wave work. The high, long aerial may perhaps damp the short wave set so that it will not oscillate. On the other hand the indoor aerial fitted round walls also often proves unsatisfactory.

Quite an efficient and, incidentally, cheap aerial for short wave work can be fixed up, however, if a length of 18 S.W.G. copper wire is stretched from one corner of a room to the opposite corner diagonally. The wire should be kept away from the walls by insulators. This arrangement is often much more effective on short waves than an elaborate outdoor aerial and is well worth fitting if there are any doubts as to the suitability of the existing one.

—And on the Earth.

A POOR or long earth, because it causes hand capacity effects, is also to be particularly guarded against in short wave work. Noises, growls and troubles generally can be traced to a poor earth. So see that your earth connection is well made and that the lead is reasonably short—the shorter the better.

Essential Components for the "R. for M." Short Wave Super Het. Adaptor.

	£	s.	d.
1 Set of Colvern Parts for "R. for M" Short Wave Super Het. Adaptor, comprising: Metal Panel, drilled. "Venesta" Baseboard. 6-pin coil base. 3 Coils, type S.W.S.H. (Colvern)	18	6	
1 ·00015 mfd. Short Wave "Polar" Condenser Type "C" (Wingrove & Rogers)	9	0	
1 ·0003 mfd. "Compax" Reaction Condenser (Wingrove & Rogers)	2	6	
1 S.W. H.F. Choke (Igranic)	2	0	
1 Standard Binocular H.F. Choke (Climax)	6	6	
2 Lo-los Valve Holders (Junit) @ 10d. ea.	1	8	
1 Type "B" (Black Knob) Switch... ... (Junit)	1	0	
2 Terminal Mounts (Junit) @ 8d. ea.	1	4	
1 Pair "Magnum" Panel Brackets (Burne-Jones)	2	0	
1 2-meg. Grid Leak ... (Pye)	1	0	
2 ·0001 mfd. Condenser, mica, type 34 (T.C.C.) @ 1/6 ea.	3	0	
1 ·001 mfd. Condenser, mica, type 34 ... (T.C.C.)	1	10	
1 ·25 mfd. Condenser, paper, type 50 ... (T.C.C.)	2	3	
4 Terminals type B — Aerial, Earth, Earth, Output (Belling-Lee) @ 6d. ea.	2	0	
20-gauge tinned copper wire, sleeving, small crocodile clip for aerial tap, screws, etc. (say)	1	0	
Suitable Cabinet, oak (Camco)	10	6	

Specified Valves.

V.1. P.M. 2DX (Mullard) ...	7	0	
V.2. P.M. 12 (Mullard)	16	6	

Short-Wave Stations

All times are G.M.T.

M.	Kc/s	
62.	4800	—Long Island, W2XV. FRI., 11 p.m.
58	5172	—Prague. TUES. and FRI., 7.30—9.30 p.m.
50.26	5969	—Station du Vatican (Italy) HVJ. 10 kW. Daily 8.0—8.15 p.m.
50	6000	—Moscow (Relays Moscow T.U.).
49.96	6005	—Drummondville, Quebec, 4 kW.
49.83	6020	—Chicago (Ill.) W9XF, 5 kW.
49.5	6060	—Cincinnati, W8XAL, 10 kW.
49.5	6060	—Nairobi (Kenya), 7LO.
49.4	6072	—Johannesburg (S. Africa). Daily 3.30—8.30 p.m.
49.34	6080	—Chicago (Ill.) W9XAA, 0.5 kW.
49.18	6100	—Bound Brook (N.J.) W3XAL, 12 kW.
48.86	6140	—Pittsburgh East (W8XK). Relays KDKA.
48.8	6147	—Winnipeg (Canada) VE9CL, 2 kW.
46.69	6425	—Bound Brook (N.J.) W3XL.
45.38	6611	—Moscow, REN (Russia).
42.9	6991	—Lisbon, CT 1AA, 2 kW. FRI., 10 p.m.
41.7	7195	—Singapore VS1AB, SUN. & WED.
34.68	8650	—Long Island W2XV. FRI. 11 p.m.
33	9090	—Radio LL (France), 0.5 kW.
32.26	9300	—Rabat (Radio Maroc), 6 kW. SUN.
31.86	9416	—Bandoeng (PLE) 80 kW.
31.55	9510	—Melbourne (Australia) VK3ME.
31.51	9520	—Skamlebæk (Denmark) OXY, 0.5 kW.
31.48	9530	—Schenectady, N.Y. (W2XAF), 10 kW. Relays WGY. Weekdays 10.30 p.m.—4 a.m. SAT. and SUN., 9 p.m.—4 a.m.
31.38	9560	—Zeesen (Germany), 8 kW.
31.35	9570	—Springfield (Mass.) W1XAZ.
31.3	9582	—Philadelphia (Pa.) W3XAU, 0.5 kW.
31.28	9590	—Melbourne (Australia) VK3ME, 20 kW. WED. and SAT., 10—11.30 a.m.
31.28	9590	—Sydney (Australia) VK2ME, 20 kW. SUN., 6—8 a.m. and 2.30—4.30 p.m.
28.98	10,350	—Buenos Aires LSX, 20 kW.
25.63	11,705	—Radio-Colonial (Paris). Daily 9 p.m.
25.53	11,750	—Chelmsford (G5SW), 12 kW. 12.30—1.30 p.m. & 6.45 p.m.—12 midnight. News Bulletins at 12.30 p.m. (SAT., 12.45) 6.15 p.m., and 12 midnight.
25.46	11,777	—Saigon (French Indo-China) F3ICD.
25.4	11,810	—Rome (Italy) 2RO, 9 kW.
25,25	11,880	—Pittsburgh East (W8XK). 5 p.m.
25.2	11,905	—Radio-Colonial (Paris), 4.30—7.30 p.m.
23.8	12,605	—Rabat 6 kW. SUN. 11.30 a.m.
19.84	15,123	—Station du Vatican (Italy) HVJ. 10 kW. Daily 11—11.20 a.m.
19.68	15,234	—Radio-Colonial (Paris). Daily 1—4 p.m.
19.56	15,340	—Schenectady (W2XAD), 20 kW. Weekdays, 6—8 p.m. SAT. and SUN., 6—9 p.m.
15.93	18,830	—Bandoeng (PLE) 80 kW. TUES. 1.40—3.40 p.m.

"R for M" Super Het S.W. Adaptor Calibration

No. 1 Coil (14 to 23 metres).

DIAL READING.	WAVELENGTH.
30	14.8 m.
40	15.6
50	16.6
60	17.8
70	19.0
80	20.2
90	21.4
100	22.6

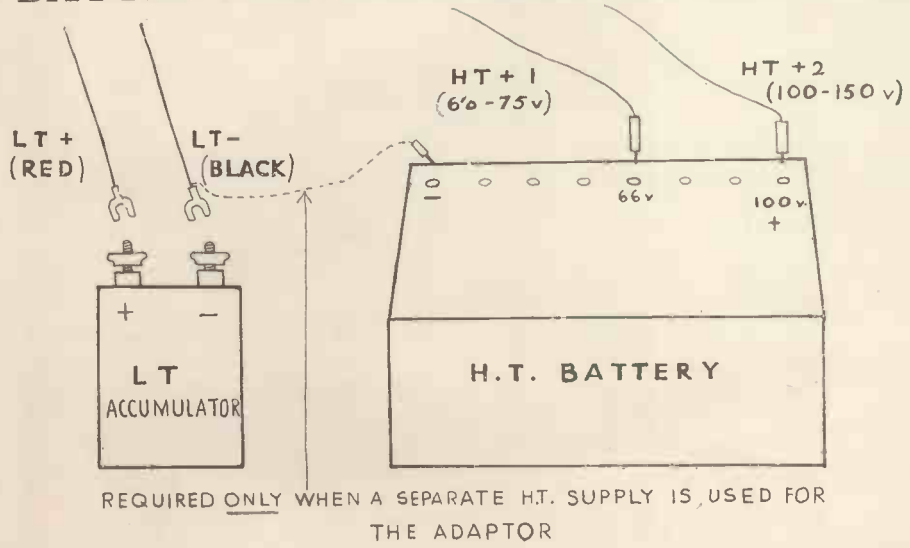
No. 2 Coil (24 to 42 metres).

DIAL READING.	WAVELENGTH
0	24.4 m.
10	24.6
20	25.2
30	26.5
40	28.5
50	30.5
60	32.5
70	35.0
80	37.5
90	40.0
100	42.5

No. 3 Coil (37 to 76 metres).

DIAL READING.	WAVELENGTH.
0	37.0 m.
10	37.6
20	40.0
30	45.2
40	49.5
50	54.0
60	58.2
70	62.6
80	67.0
90	71.6
100	76.2

BATTERY CONNECTIONS TO THE "R FOR M" S.W. ADAPTOR



LT + - - { To + terminal on Accumulator.

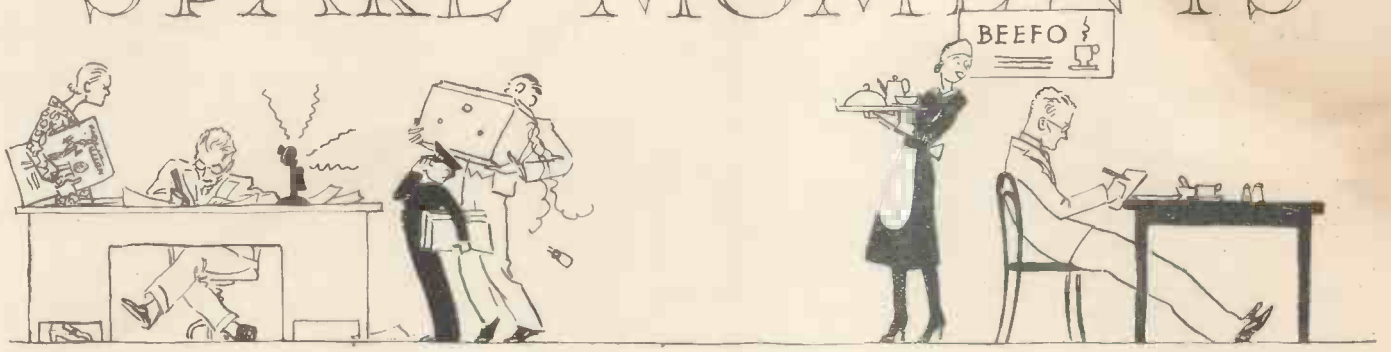
LT — - - { To — terminal on Accumulator.

HT + 1 - { To 60—75v. socket in H.T. Battery.

HT + 2 - { To 100—150 v. socket on H.T. Battery.

If a separate H.T. battery be used connect negative socket (—) of this battery to L.T. —

SPARE MOMENTS



I HAVE just been listening to as pleasant an hour of vaudeville from the London National as I've heard for some time. Vaudeville seems a new term for that very enjoyable type of entertainment which used to be called Variety—a much better word in my opinion. To-night we have had an extraordinary variety—ranging from nigger backchat through farmyard impressions to whistled opera!

I admit I'm a bit of a low-brow and that these turns amuse me no end. When it comes to choosing a programme I'd much sooner have an hour's variety than listen to all the symphonies, speeches, readings or debates that are offered. And I should be surprised if I'm not voicing the preference of the larger proportion of listeners.

That perhaps is why I laughed so immoderately at some jokes which, though I have heard some of them before, tickled me to death.

* * *

THERE was one, for example, which was told so well to-night. About the new-wealthy Hebrew who decided there was no school good enough for his son. So he approached a certain Bishop X and asked him to act as private tutor for young Abe. "Bishop" he said, "I vant you to privately tutor my son Abe. I vant you to educate him for me—make him a gentleman like you vas." "Well, Mr. Levi," said the Bishop, eyeing his prospective pupil's father, "If I try to make your son a gentleman I must make one stipulation. That you do not communicate with or visit your son for a period of at least twelve months." So it was arranged, and at the end of twelve months Mr. Levi called on the Bishop to see his son.

"Vell, vell Bishop, how is my Abe? Have you succeeded in making him a gentleman?" he asked.

"Oi, Oi," said the Bishop, "Vat a boy he is now, your Abe, vat a boy!"

HERE IS a letter which we have received. No further comment is, I think, needed.

Stirling Road,
Dumbarton, Scotland.

Please accept my most hearty congratulations for the V.3, as yet it is the "R. for M." crowning achievement. No doubt you will have received thousands of letters such as this by this time. You and your staff most assuredly deserve them all and more. I have built most of the "R. for M." circuits published during the last three years, including the V.3, both for battery and A.C. operation.

Now that you have practically perfected the S.G.–D.–Pent circuit I am very anxious to know what will be next. Might I dare to make a suggestion? The "R. for M." Super-het. Now that the super-het has returned to favour I am anxiously waiting on your version of it; there are other circuits which may be good, but I can only feel confident of an "R. for M." circuit. Please make this an early step on your triumphal march to Perfect Radio.

G. B.

* * *

DO YOU listen to the sponsored programmes available from the Continent and, lately, from Ireland! By sponsored, I mean, of course, run by advertisers for the purposes of publicity. Most of the large gramophone record manufacturers run such programmes, mainly from France—and some very bright entertainments are available during these "sponsored" hours.

I see that a well-known Sunday newspaper is now featuring complete time tables of these sponsored programmes from over the water. Complete lists of items are given and they make interesting reading.

Adelphi Street,
Glasgow, C.5.

Having had your V.3 battery radio set for 2 months now, I am more than pleased with the results I have obtained. I have only a short aerial about 45 ft. I am hardly one mile from the Glasgow station and I have obtained every British station and most of the foreign ones that are in the list of the "R. for M." Magazine. To be correct, 8 on the long waves and 45 medium, 4 unidentified at present. The stations under 3 kil. are faint.

I am using a Mullard power valve. Do you think a Pentode valve would bring them up to loud speaker strength.

I would be very pleased to see an article in your next edition about short waves in connection with this set.

J. G.

THERE has always been an air of mystery hovering around the announcers at our various broadcasting stations. We never know who they are, or how they get appointed. I wonder if they must undergo tests as severe as those inflicted on their colleagues in American Stations. This is an American test.

"A résumé of a few of the programmes of the New York Philharmonic Society's broadcasts gives a fair idea of the genre of the announcer's work during a symphonic hour.

His musical terminology must be facile, for, although he may have prepared his continuity for the Handel Concerto Grosso, he may be asked to announce, at a moment's notice, the programme notes for the largo, adagio, and finale of Haydn's Symphony in B flat major.

The following week his linguistic savoir faire may again be put to the test when he announces the 'cello virtuoso, Gregor Piatigorsky.

Continuing in the Slavic vein his tongue may trip over the announcement of Prokofiev's suite from the 'Prodigal Son,' or he may meet his Waterloo with the pronunciation of the three Czech Titans' names, Antonin Dvorak, Drdla, or perhaps even Friedrich Smetana.

Again, the Trauermarsch and the scherzo of Mahler's Fifth Symphony together with Krenek's suite from the music to Goethe's 'Triumph der Empfindsamkeit,' will give him an opportunity to display his knowledge of German.

Of course, even the commonest of terms might sometimes prove a stumbling block—Cavalleria Rusticana, badinage, Kamennoi Ostrov, a Bach fugue, Puccini, Paderewski, Wieniawski, Tradier, Ase's Tod and Peer Gynt."

Willowcourt Avenue,
Kenton,
Harrow, Midd.

Dear Sirs,

I have just constructed your V.3 A.C. receiver from "Radio for the Million" September issue, and I wish to congratulate you on this splendid set.

The results I have obtained already have been beyond all expectations.

Using only an indoor aerial at my home at Kenton, I seem to get any station on the ether, at any time of the day, AT FULL LOUD SPEAKER STRENGTH *and the reproduction leaves none to be desired.*

Another great point about this set is that while the components specified are of the best possible make, the price is far below any other A.C. V.3 and the performance I am sure is far superior to many.

Wishing you many a success with your new receivers.

R. P.

HERE is the photograph of the youngest RADIO FOR THE MILLION "fan." He is John Francis, aged 6 months. He autographed it "Expectation." I can promise him that his expectations are sure to be fully realised since he had based his radio experience on so sure a foundation.

Millbank,
S.W.1.

Dear Sirs,

Having just purchased and installed the new V.3 kit set, I feel I must write and place on record the remarkable results from this receiver under really appalling radio reception conditions.

I reside in a flat high up so that the earth wire reaches the absolute reverse to text book rules of 60 ft. before it enters the ground; the aerial is slung outside the window and in places touches the brickwork of the building. In spite of these drawbacks stations are received at almost every other degree of the dial. This must surely mean operating the set under conditions never anticipated even by the designer. Coupled to the bad earth and aerial system there are several other receivers working on the same waterpipe to which my set is attached, but even this does not upset its performance in any way.

Many wild claims are made in regard to wireless sets these days, but you are to be congratulated on putting before the public a receiver capable of operating in actual performance up to the standard advertised.

I always thought my Master Three was "the goods" and whilst I loathe to part with it, the new V.3 is surely the last word in up-to-date design and performance.

S. J. P.

Radio for the Million's Youngest Fan—Aged 6 months.

HOW TO CONSTRUCT AN INEXPENSIVE RADIO-GRAMOPHONE —

— TO GIVE YOU DOUBLE ENTERTAINMENT AT HIGHEST QUALITY.

Home Entertainment Programme.

Cavalcade Suite ...	Noel Coward and New Mayfair Orchestra.	Record.
The Railway Guard ...	Will Fyffe	Record.
Celeste Aïda	Caruso	Record.
Selected	Henry Hall & B.B.C. Band.	Radio.
Selected	Stainless Stephen ...	Radio.
Trees	Layton & Johnson ...	Record.
Gipsy and the Bird ...	Galli-Curci	Record.
Barber of Seville—Overture.	Philharmonic Symphony Orchestra of New York.	Record.
Selected	Clapham & Dwyer ...	Radio.
Parlez moi d'amour...	Georges Seversky ...	Record.
Valse Impromptu ...	Ania Dorfman ...	Record.
Because I Love You	Gracie Fields ...	Record.
Tango (from the Continent)	... ...	Radio.
Seekin'	Paul Robeson ...	Record.
Scene Shifters' Lament	Alfred Lester ...	Record.
Selected	Henry Hall & B.B.C. Band.	Radio.

THE pick of the recordings of all the very finest artistes in the world as well as continuous programmes of entertainment from every European country—these are yours when you combine radio and the gramophone. Take this specimen Home Entertainment Programme—picked at random without reference to tastes or suitability—and imagine enjoying one like it every day and at almost every hour of the day. Entertainment of the very highest order, on tap, as it were, to while away every dull moment, or to amuse your family and your friends at a cost which, over a year, would take you to theatres or music halls not once a week.

That is the opportunity which is yours to-day. Gramophone recording has been brought to a very high degree of perfection; radio now has a 100 per cent. entertainment value; electrical reproduction is practically identical with the original; and all these are combined into one machine—a machine which can be built and operated by the man who has no more knowledge of electrical engineering than is necessary to handle a screwdriver!

YEARS ago the gramophone was an instrument usually connected with scratchy records, noisy reproduction and much winding of handle. Records were brittle and expensive, and, moreover, often a travesty of the original. To-day all that is changed. A record costs 2s. 6d.

on the average ;—records of good reproductive capacity, the work of tip-top artistes, can be obtained for as little as 1s.—scratch and noise has been reduced to a minimum by electrical recording, and, above all, electrical reproduction has ensured that every tone value of the original is reproduced to a very high degree of quality. Gramophone motors, too, are driven electrically. On the radio side as much, even more, progress has been made over the last 5—10 years. It is unnecessary to go over the tremendous improvements embodied in a modern set to readers of this magazine. A set like the one described earlier in this issue enables the radio-listener to tour Europe, listening to the majority of existing stations with pleasure and in comfort. Combine these two modern instruments into a compact whole. Operate them direct from the electric light mains. Utilise the most modern, the nearest perfect of loud-speakers. And there you have the very essence of perfect home entertainment, with a wealth of gramophone records and a variety of Broadcast programmes from which to cull your enjoyment.

Fig. 22.—The "Tablegram V.3" in the Lock Cabinet.

Such an interest in this dual entertaining instrument is there, that, with as perfect a "quality" set as the Super V.3 to work upon, this volume would be incomplete without constructional details of a radio - gramophone. So every opportunity has been taken to design such an instrument, utilising all that is best in components to make it as perfect as possible and yet to keep its cost within an economical margin. Firstly, then, we have the radio receiver. This is the Super V.3 — this year's "Radio for the Million" "Set with the Golden Voice"—with appropriate Mains Power Unit for operation direct from the mains. Its constructional features and instructions are given, detail by detail, in an earlier part of this book. The gramophone motor is of the synchronous type—electrically operated from 50 cycle A.C. mains. The pick-up is the finest type available. The moving coil speaker handles every note, every tone of the music offered to it with marvellous fidelity. The whole combination is totally enclosed in a handsome cabinet, designed specially for the job and offered at a price which represents remarkable value.

This then is the instrument, which we will call the "Tablegram V.3," which will tempt the music lover in spite of Budget disappointments—tempt him, and then regale him with a wealth of perfect music such as he has never heard before.

HOW TO BUILD THE "TABLEGRAM V.3."

As we have said the radio receiver incorporated in the Tablegram V.3 is the Super V.3, and it is constructed point by point in accordance with the instructions given elsewhere in this book. The essential power unit is also built up as described, and these two, together with the speaker, the pick-up and the gramophone motor are now ready to fix into the special cabinet designed for them.

The first step is to fix the escutcheon, or window through which the tuning dial of the set is perceived, into the cabinet, for the speaker fits in such a way that its lower edge touches the top of the escutcheon.

Fitting the Speaker.

With this done, the speaker must be fitted, and it is important to note that, the dimensions of the cabinet having been reduced to a minimum,

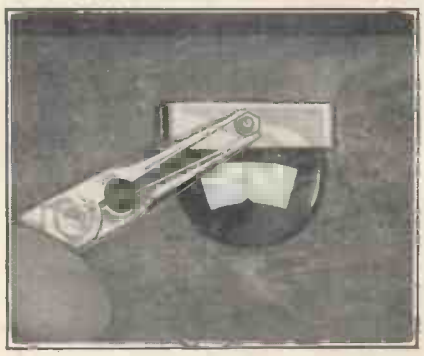


Fig. 23.—Fitting the vizor.

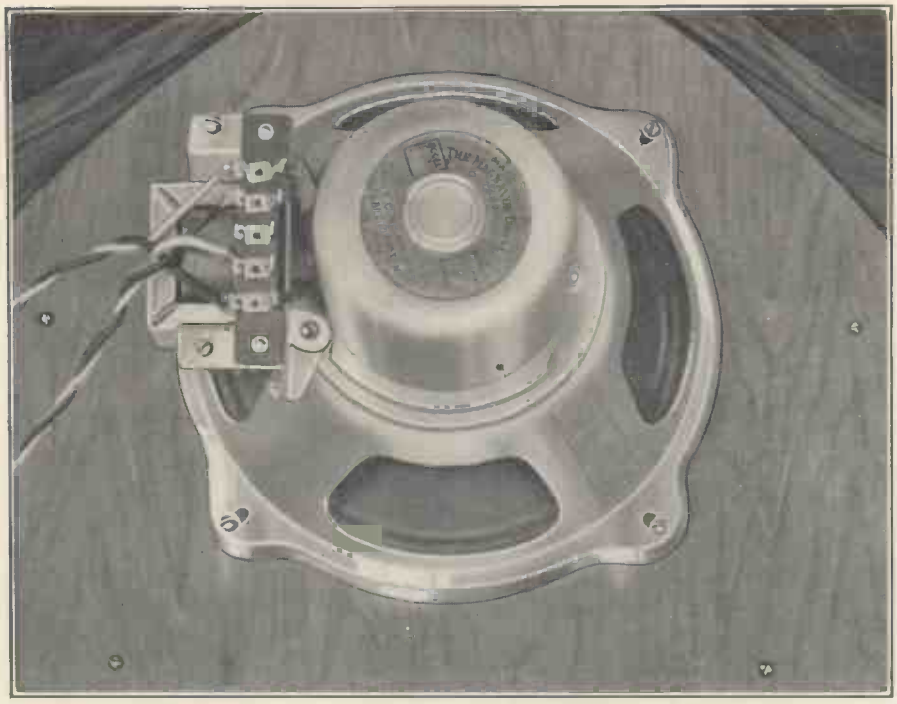


Fig. 24.—The back of the "Magnavox" Speaker, showing the leads. The outer pair take the field supply; the inner are connected to speaker terminals on the set.

The speaker connections must now be made. On the speaker transformer will be found five tags. The outer two of these are for the field winding connections and to these outer tags the ends of a piece of twin flex must be fixed. The wires can be twisted round the lips of the tags and, if you can use a soldering iron, a spot of solder put on to each to hold them.

The other ends of the flex are secured to the two terminals of C.1. of the power unit—these connections are clearly shown on the illustration of the power unit on page 13. The inner two tags on the speaker transformer—the ones for the speech winding connections—are now connected by another piece of twin flex to the loudspeaker terminals on the set. Polarity is of no importance so that it does not matter which lead goes to which terminal. The middle tag is left blank.

THIS completes the connections as far as the set is concerned; only the care must be exercised to give the speaker its correct position or it may be difficult to fit the motor board. The speaker is fixed with four screws in such a position that, viewed from the back, its transformer points towards the left side of the cabinet. The illustration on this page shows this position clearly. Do not use screws longer than $\frac{3}{4}$ inch or they may penetrate the front panel of the cabinet and spoil its appearance. The next step is to fix the receiver into the cabinet and fix the knobs on to their various spindles. This is easy to do and needs no further description. The power unit will now slide into its position behind the set, where it must be screwed down to stop it moving when the mains plug is inserted and so causing difficulty. Screw two screws through the back edge of its baseboard into the bottom of the cabinet.

Connecting Up.

A START can now be made with the wiring, the first step being to connect the power leads from the set to the unit, and the grid bias leads from the set to the G.B. battery. Fuller instructions for these connections are given on page 13.

Fig. 25.—The turntable and pick-up on the "Tablegram V.3."

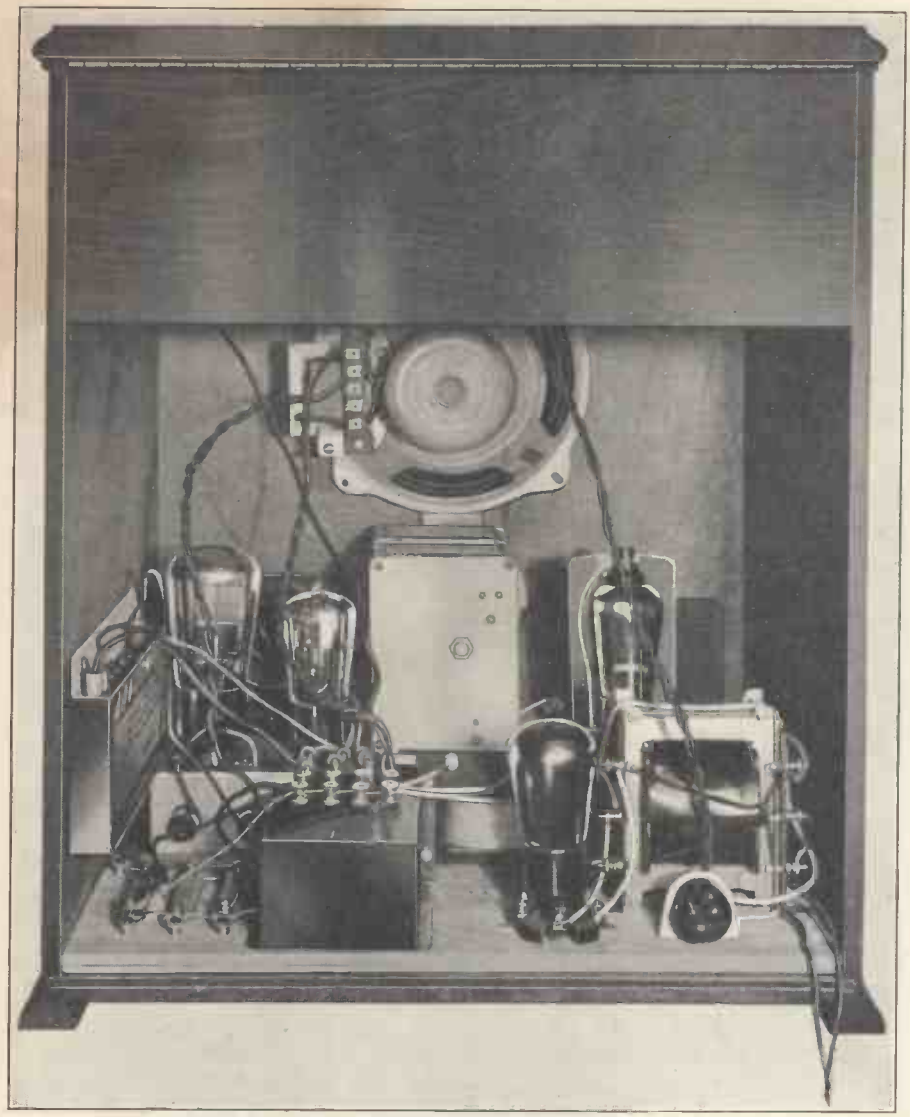


Fig. 26.—The interior of the Tablegram V.3.

gramophone circuits remain to be made.

Before the motor board is fitted into the cabinet the motor should be fixed. This is very easily done; the large knurled nut is removed from the thread on the end of the spindle, the spindle inserted in the hole in the motor board and secured by the replacing of the knurled nut.

If the motor arrives with the mains lead disconnected it must, of course, be fitted now. A $\frac{3}{8}$ inch hole for the lead is ready drilled in the motor board and the lead should be pulled through it. This lead is fitted with a bayonet adaptor which must be removed for use later for the complete receiver.

The stage is now reached when the pick-up must be fitted to the motor board, and care must be exercised here to ensure that the tracking of the pick-up is properly accomplished. With the pick-up is supplied a paper template carrying its own instructions for use. This template will enable you to fix the pick-up in its correct position in relation to the motor spindle. Be particular about this position, for incorrect tracking will result in excessive wear of the records. In the motor board a hole is ready drilled for the pick-up leads to pass through. So that when the pick-up and motor have been assembled their leads are beneath the motor board ready for connection.

Slide the motor board back into the cabinet, fix it with screws supplied for this purpose, and complete the wiring as follows. Connect the motor leads to the terminals of the power socket on the baseboard of the unit and the pick-up leads to the pick-up terminals of the set.

THE BACK of the cabinet must now be fitted so that the loose half of the safety plug is positioned. This plug has a large metal washer which must be screwed to the back of the cabinet so that, if the back is removed, the mains are automatically disconnected. This precaution complies with the regulations of the supply companies.

To position the washer, fix it to the loose plug and push the plug through the hole in the back of the cabinet into its fixed socket. The washer should now be screwed to the back of the cabinet.

Your radio gramophone is now complete. Aerial, earth and the mains leads can be connected and the instrument is ready to work.

Operation.

THE OPERATION of the set is dealt with fully on page 10 and no further comment is needed here. This applies also to the change-over from Radio to Gramophone. One instruction is necessary, however, and it concerns the synchronous motor. This type of motor, when used on a 50 cycle mains supply, runs at the correct speed irrespective of load or voltage variations. To start it just

Fig. 27.—Fit the ebonite knob first, and then screw the lock-nut against it.

Fig. 28.—The Tablegram V.3 in a Camco Cabinet.

spin the turntable with the finger and it will fall into step and continue to run at the correct speed. To stop it merely stop the turntable and the motor will remain stationary until the turntable is spun again.

The volume control relative to the gramophone is located in the base of the pick-up arm.

Cabinet Resonances.

IF THE SWITCHES are fitted with their washers and nuts in front of the Cabinet, a course you may have adopted to secure the chassis or to cover up the switch holes, it may happen that, if the nuts are screwed excessively tight, vibration of the cabinet may be communicated to the valves of the set. In such a case a loud howl is set up, and particularly may this be so with big volume.

Should this happen, first examine the switches and slacken them if necessary. Strips of felt can be placed between the chassis and the cabinet further to reduce the possibility of this resonance affecting the performance of the set.

An Alternative Pick-up.

THE SPECIFIED PICK-UP has a volume control incorporated in its carrier. This control actually consists of a variable resistance shunted across the pick-up winding and such an arrangement works very satisfactorily at ordinary intensities. At low intensities, however, there is a risk that the higher audio-frequencies will be cut off, in other words a certain amount of crispness in reproduction may be lost. For those who wish to retain a fairly uniform frequency response, even at very low volume, an alternative but slightly more expensive arrangement of pick-up in conjunction with a potentiometer type of volume control may be used. A suitable pick-up is the A.E.D. (Bowyer Lowe, price £1 5s. 0d.). Connections and instructions for fixing the volume control will be found on page 11.

Mains Supply.

REMEMBER when ordering the Power Unit that the standard kit of parts is suitable only for 200/250 volts 40/100 cycles supply. If your supply is not within these limits a special unit will be needed. The electric gramophone turntable is made for operation on 200/250 volts 50 cycles supply. For 100/130 volts 50 cycles supply a special model is available. These standard turntables cannot be operated on any other than 50 cycles supply, being designed to operate on this frequency at the standard record speed of 78 r.p.m.

Needles for the Pick-up.

LOUD TONE steel needles, of reputable make, will give the best results with the pick-up specified. Long needles are not recommended, as should the record be uneven there may be a tendency for the top of the pick-up to strike the top of the cabinet, resulting in damage to the record.

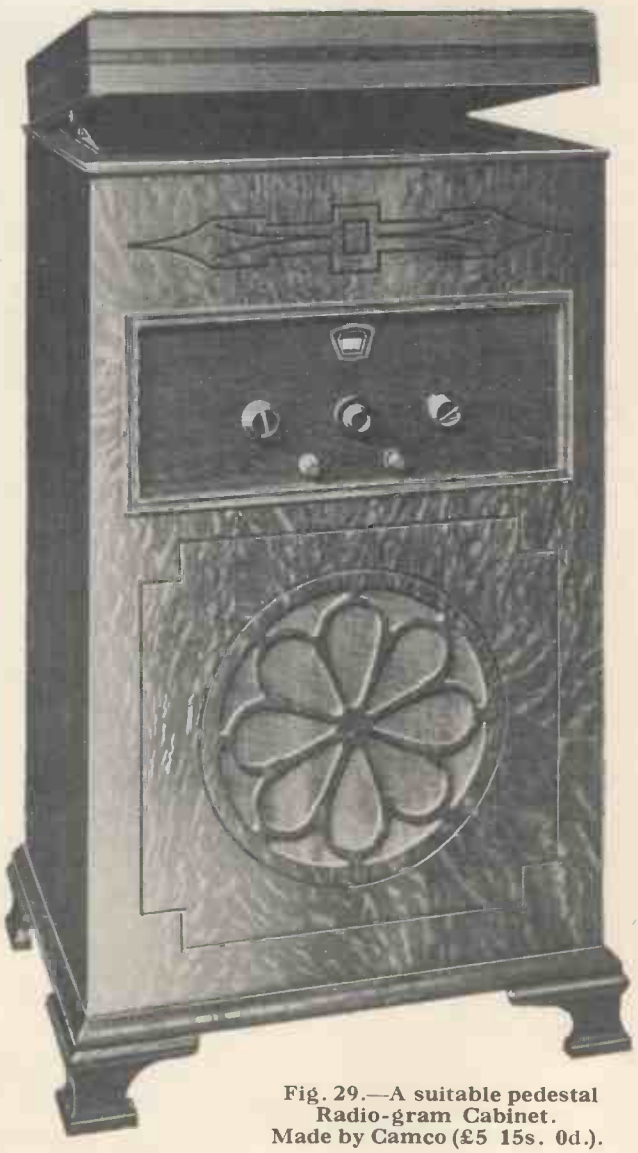
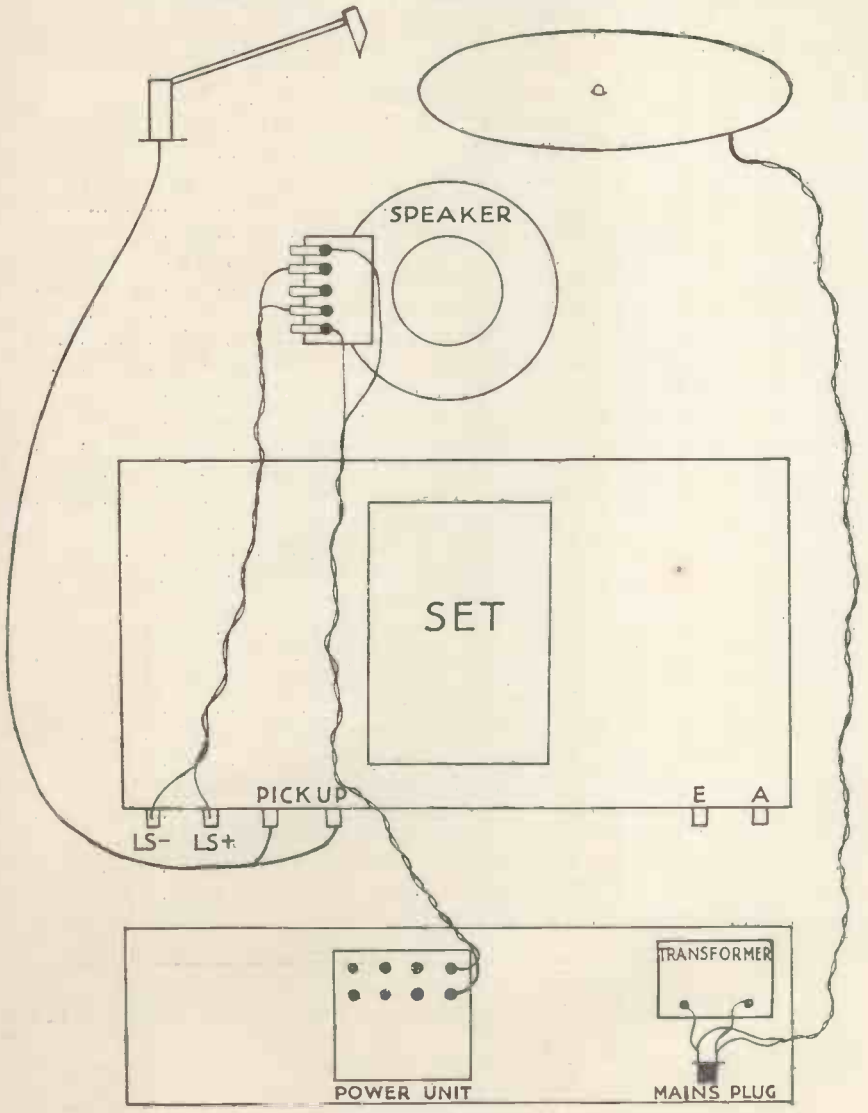


Fig. 29.—A suitable pedestal Radio-gram Cabinet. Made by Camco (£5 15s. 0d.).

Essential Components for "R. for M." Tablegram V.3.

	£ s. d.
1 V.3 A.C. Kit with S4V, 354V and PEN. 4V valves. Supplied in sealed carton by United Radio Manufacturers Ltd., 63, Lincoln's Inn Fields, London, W.C.2 ...	6 12 6
1 20,000 ohms Spaghetti Resistance (Varley)	1 0
1 ·25 mfd. Paper Condenser type 50 (T.C.C.)	2 3
1 Kit of parts for Super V.3 Power Unit (Standard Unit suitable 200/250 Volts 40/100 cycles) ... (Junit)	3 15 0
1 D.W.2 Rectifier Valve (Mullard)	12 6
1 Magnavox Speaker, type RMP 7,500 ohms model (Magnavox (Gt. Britain) Ltd., 89, Kingsway, London, W.C.2)	1 17 6
1 Pick-up, Model 40, with volume control (Harlie Brothers (Edmonton) Ltd., Balham Road, N.9) ...	1 7 6
1 Simpson Electric Turntable (Simpsons Electrical Ltd., 11, Jewry St., E.C.2) (when ordering, specify voltage) ...	1 19 6
2 terminals type B. "Pickup" at 6d. ... (Belling Lee)	1 0
1 Type C Switch (Junit)	1 0
1 16½v G.B. Battery type G.3 (Siemens)	2 6
1 Radio-Gram Cabinet drilled for Super V.3 (Camco) £2 15s. od. or (W.T. Lock)	2 10 0

Tablegram V.3 Connection Chart.



Portal Road,
Glasgow, W.3.

Dear Sirs,

Let me at the outset congratulate you on the production of your "R. for M." V.3. Having constructed several sets of varied types I at length struck upon your circuit and have never at any time been so captivated especially by the selectivity obtained in the swamp area of Glasgow.

So great has been the success of this that I have just finished a second model for a friend.

Here I have struck against a difficulty. Despite my friend's assurance that his current was A.C. I have discovered, after completing the instrument, that his current is actually D.C. Now, I installed the Midget A.C. Unit so that the conversion of this to D.C. won't be so difficult. I intend to rearrange the set as in the battery model and use valves P.M. 12, P.M. 1 H.L. and P.M. 22. Would you kindly corroborate these types.

My sole difficulty is with the speaker. I included a Magnavox R.M.P. 2,500 ohms in my A.C. model, I find that in the D.C. model an R.M.P. 7,500 ohms is specified. Would it be possible by adding a resistance or by any other method to make the 2,500 suitable for my D.C. arrangement. I am loth to purchase a new speaker when I have such on hand.

Your reply to these queries will be very much appreciated.

C. H.

[*The valves our correspondent proposes to use are quite in order. He can easily get over his difficulty in connection with the speaker by fitting a 2,500 ohms resistance in series with the speaker field and the D.C. mains. This resistance should be capable of carrying 50 or 60 milliamperes without overheating.*—ED.]

* * *

Bethnal Green,
E.2.

I have recently built the "R. for M." V.3 A.C. set and find that it certainly lives up to your claims for its remarkable performance.

In fact, those of my friends who have heard it are so delighted that I have received several orders to build its replica.

D. G.

THE STATIONS OF EUROPE

THIS LIST WAS CORRECT AT THE TIME OF GOING TO PRESS

LONG WAVES.

M.	Station.	Dial Readings
1875	Huizen (Holland), 8·5 kW.	
1796	Lahti (Finland) (relays Helsinki), 54 kW.	
1725	Radio Paris (CFR), 75 kW.	
1635	Königs Wusterhausen (Zeesen) (Germany), 60 kW. Relays Berlin.	
1554·4	Daventry National Station (Gt. Britain), 30 kW.	
1445·7	Eiffel Tower (FLE), 13 kW.	
1411	Warsaw No. 1 (Poland), 120 kW.	
1348	Motala (Sweden) (relays Stockholm), 30 kW.	
1304	Moscow (Trades Union), 100 kW.	
1153	Kalundborg (Denmark) (relays Copenhagen), 7·5 kW.	
1083	Oslo (Norway), 60 kW.	

MEDIUM WAVES.

M.	Station.	Dial Readings
550	Budapest (Hungary), 18·5 kW.	
542	Sundsvall (Sweden), 10 kW.	
533	Munich (Germany), 1·5 kW.	
517	Vienna (Rosenhügel) (Austria), 15 kW.	
509	Brussels No. 1 (Belgium), 15 kW.	
501	Florence (Italy), 20 kW.	
488·6	Prague (Czechoslovakia), 120 kW.	
480	North Regional (Manchester), 50 kW.	
473	Langenberg (Germany), 60 kW.	
466	Lyons (La Doua), France, 1·5 kW. (relays PTT).	
459	Beromünster (Switzerland), 60 kW.	
441	Rome (1RO) (Italy), 50 kW.	
436	Stockholm (Sweden), 55 kW.	
430·4	Belgrade (Yugoslavia), 2·5 kW.	
424	Madrid (Union Radio) (EAJ7) (Spain), 2 kW.	
418	Berlin (Witzleben), 1·5 kW.	
413	Dublin (2RN) (Ireland), 1·2 kW.	
408	Katowice (Poland), 16 kW.	
403	Sottens (Switzerland), 25 kW.	
398·9	Midland Regional Station (Gt. Britain), 25 kW.	
394	Bucharest (Rumania), 12 kW.	
390	Frankfurt (Germany), 1·5 kW.	
385	Toulouse (Radio) (France), 8 kW.	
381	Lwów (Poland), 16 kW.	
376·4	Glasgow (5SC), 1 kW.	
372	Hamburg (Germany), 1·5 kW.	
370·4	Radio LL (France), ·5 kW.	
363·4	Algiers (N. Africa), 13 kW.	
360	Mühlacker (Germany), 60 kW.	
356·3	London Regional, 50 kW.	
352	Graz (Austria) (usually relays Vienna), 7 kW	
349	Barcelona (Radio Barcelona) (EAJ1) (Spain), 8 kW.	

MEDIUM WAVES—*continued.*

M.	Station.	Dial Readings
345	Strasbourg-Brumath (France), 11·5 kW.	
342	Brno (Czechoslovakia), 35 kW.	
338·2	Brussels No. 2 (Belgium), ·15 kW. (Flemish programme).	
331·5	Milan (Italy), 7 kW.	
325	Breslau (Germany), 1·5 kW.	
322	Götenborg (Sweden), (relays Stockholm), 10 kW.	
315	Marseilles (PTT) (France), 1·6 kW.	
309·9	Cardiff (5 WA), 1 kW.	
304	Bordeaux-Lafayette (PTT) (France), 13 kW.	
301·5	North National (Manchester), 50 kW.	
296·1	Hilversum (Holland), 11 kW.	
288·5	Aberdeen (2BD), 1 kW. Bournemouth (6BM), 1 kW. Dundee (2 DE), 0·12 kW. Edinburgh (2EH), 0·3 kW. Newcastle (5NO), 1 kW. Plymouth (5PY), 0·12 kW. Swansea (5SX), 0·12 kW.	
281	Copenhagen (Denmark), 0·75 kW.	
279	Bratislava (Czechoslovakia), 14 kW.	
276·5	Heilsberg (Germany), 60 kW. Relays Königsberg.	
273·7	Turin (Italy), 7 kW.	
265·4	Lille (PTT) (France), 1·3 kW.	
263·8	Moravská-Ostrava (Czechoslovakia), 11 kW.	
261·6	London National, 50 kW.	
259	Leipzig (Germany), 2 kW.	
257	Hörby (Sweden) (relays Stockholm), 10 kW.	
253	Gleiwitz (Germany) (relays Breslau), 5 kW.	
247·7	Trieste (Italy), 10 kW.	
244·1	Basle (Switzerland), 0·5 kW.	
242	Belfast (2BE) (Ireland), 1 kW.	
239	Nürnberg (Germany) (relays Munich), 2 kW.	
237·2	Bordeaux Sud-Ouest (France), 3 kW. Radio-Nîmes (France), 1 kW.	
235·5	Kristianssand (Norway), 0·5 kW.	
232·2	Kiel (Germany) (relays Hamburg), 0·25 kW. Norrköping (Sweden), 0·25 kW.	
231	Hälsingborg (Sweden), 0·2 kW. Malmö (Sweden) (relays Stockholm), 1·25 kW.	
224·4	Cork (6CK) (Ireland), 1 kW.	
219·9	Fécamp (Radio Normandie) (France), 10 kW.	
217	Königsberg (Germany), 0·5 kW.	
214·2	Warsaw, No. 2 (Poland), 1·9 kW. Experim'l.	
207	Boras (Sweden), 0·12 kW.	
204	Gävle (Sweden) (relays Stockholm), 0·2 kW.	
203	Kristinehamn (Sweden), 0·25 kW.	
202	Jönköping (Sweden), 0·25 kW. (relays Stockholm)	

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Type D.W.3.	Output 120mA at 350 volts. Reduced Price	.. 15/-
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P.M. 1HL	2.0	0.1	150	14,000	28	2.0
P.M. 2A	2.0	0.2	150	3,600	12.5	3.5
P.M. 202	2.0	0.2	150	2,000	7	3.5
P.M. 22	2.0	0.3	150	—	—	1.3

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