The Wireless Constructor

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RADIO CONSULTANT-IN-CHIEF CAPT. P. P. ECKERSLEY M.I.E.E.

Vol. XI. FEBRUARY, 1931. No. 52.

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LISTEN TO SHORT WAVERS ON YOUR SET!

WITH THE

"KELSEY" ADAPTOR

Full Details Inside

Also in this Issue

THE A.C. "PARATUNE"

BY VICTOR KING

In your own interests . .

compare these figures with those of any other all-mains operated valves

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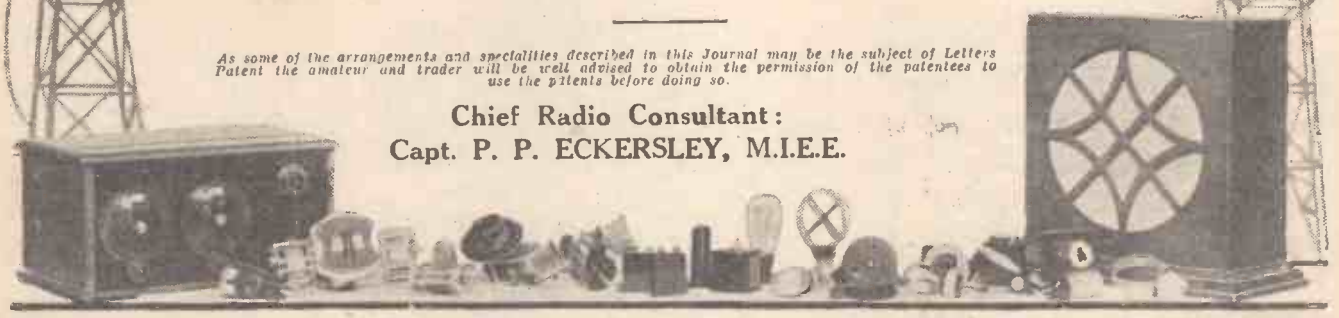

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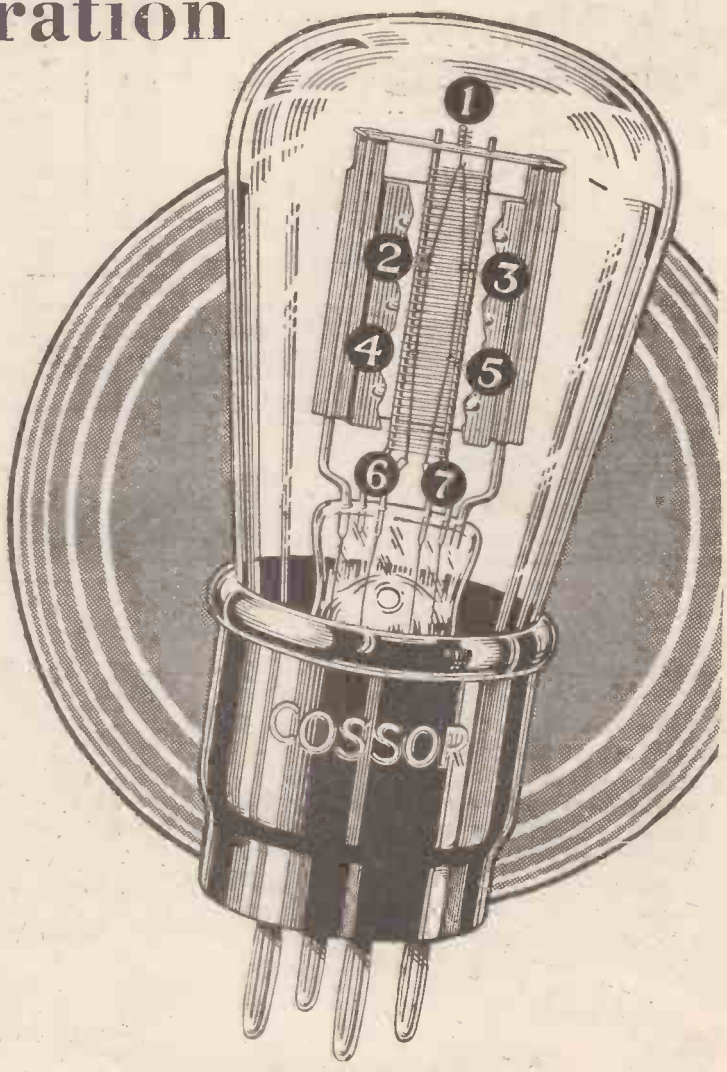
—the primary cause of microphonic noises

The cause of microphonic noises in a Receiving Set is generally to be found in a faulty Detector Valve. Usually it is due to filament vibration. The new Cossor Detector Valve (210 Det.) has been specially designed to overcome this fault. Filament vibration is rendered impossible by a new method of seven point suspension. The diagram shows the four insulated hooks which secure the filament in position and damp out any tendency to vibration. The use of this "steep slope" Cossor Detector Valve not only eliminates microphonic noises, but ensures great volume with exceptional purity of tone.



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The WIRELESS CONSTRUCTOR

Published by the Amalgamated Press, Ltd., Fleetway House, Farringdon Street, London, E.C.4.

THE EDITOR'S CHAT

The aim of the "Wireless Constructor" is to present receiver designs that are different, and whether expert set builder or tyro you will find much of interest and value in the fare we offer this month.

"THERE are large numbers of regular readers of the WIRELESS CONSTRUCTOR who take the paper for its general interest, although they themselves have not yet taken any practical steps to make home-construction a hobby."

"A Complete Hobby"

Thus the opening paragraph in my editorial for last month's issue. I repeat that paragraph, because the first two or three batches of letters I received after the January issue had been on sale for a few days contained several letters from readers who quite frankly admitted that reading about "how to make your own set" gave them a great deal of pleasure.

Although they had never tried their hands at building sets—one correspondent candidly called himself a "butter finger!"—they all agreed that studying the design of a WIRELESS CONSTRUCTOR set, tracing out the circuit (perhaps in the gleeful hope of spotting an error!), was in itself a complete hobby.

"Real Breakaway"

Now that is true enough. Radio can be a hobby in more than one way: you may get the most fun out of it by building every "star" design published—the next week pulling the set to bits and starting a new one.

Or you may go to the opposite extreme and never actually build a set, yet still get a great deal of pleasure and profit out of a study of the set designs published in the various radio publications.

One correspondent, who seems to have made a pretty thorough study of WIRELESS CONSTRUCTOR receivers, writes to say: "All WIRELESS CONSTRUCTOR sets constitute a real breakaway from conventional design, both as regards constructional form and circuits used."

That is a very acceptable compliment. Certainly it is our aim to avoid monotony of design, layout, etc., yet at the same time keeping in mind that utility and efficiency are very important factors—not forgetting the economics of the hobby!

You have probably noticed that WIRELESS CONSTRUCTOR sets are not mere assemblies of components; the set *builder* has ample chances to exercise his skill. And the novice is not forgotten.

For example, the experienced constructor has something to bite on in this month's issue—the A.C. "Paratune."

This is an *all*-mains receiver. Batteries are conspicuous by their absence. This is *not* a set for the novice; nevertheless, a study of the design and a close perusal of the text will teach him a lot. The set is really worth a careful study.

For the Beginner

For the absolute beginner I have chosen the "Easy-Stage" Three, which will, I think, exactly meet his requirements.

This is a special three-valver, described in easy stages—in short, in a way which, as far as is humanly possible, guards him against disastrous mistakes. I strongly recommend it to the man who has an itch to try his prentice hand at the construction of a really sound, efficient and economical three-valver.

THE MIGHTY MASTS OF MOORSIDE

This is a view of the three 500-ft. masts of the new North Regional Station at Moorside Edge, near Huddersfield, Yorks. Look out for the tests from this—Britain's latest twin broadcaster. (Wave-lengths, 479 and 301 metres.)

MORE ABOUT THE "PYLON" THREE

Telling you how to operate this efficient and extremely novel receiver, and giving dimensions from which the battery box can be made. Full constructional details of the set were given in our last month's issue.

THOSE of you who have built, or who are building, the "Pylon" receiver—full details of which were published in the last issue of the WIRELESS CONSTRUCTOR—will no doubt be interested to learn all about the special battery box designed to go with the outfit.

But before dealing with the battery container—the construction of which is really very simple—there are one or two points to mention regarding the operation and adjustment of the actual receiver portion, which had to be left unsaid last month on account of the rather detailed constructional description rendered necessary by the unconventional system of assembly.

The Valves to Use

As was mentioned at the end of the last article, the "Pylon" receiver is quite suitable for use with two-, four-, or six-volt valves, and therefore it does not matter very much which you choose. But whatever you do, be careful to put the valves in their correct positions.

The first valve, which is the detector, should be of the H.F. or special detector type, while for V_2 an ordinary L.F. type valve will answer the purpose. For the third valve (the one nearest the filter output choke) use a small power valve.

When everything is connected up you can switch the set on. For a preliminary test the aerial and earth leads should be joined temporarily to the wires which will ultimately be joined to the aerial and earth terminals.

Selectivity Adjustment

With the "station-change" switch pulled out, slowly adjust the compression condenser nearest the "panel" until you hear signals from one or other of the local transmitters. It does not very much matter to which station you adjust this first compression condenser, so long as when you push the "station-change" switch in you adjust the second condenser to the other station.

If you find it impossible to receive either of the two stations without interference from the other, then you must try varying the positions of the two aerial coupling coils in relation to the coils against which they are fixed. It is very unlikely that you will find it necessary to reduce the sizes of these two small coils in order to obtain complete separation, and it should be possible to obtain sufficient selectivity merely by altering the positions.

Increasing Strength

If, on the other hand, you find signals are inclined to be weak, then there is no objection to increasing the turn numbers provided you are still able to obtain complete separation of the two programmes.

When the preliminary adjustments have been made the cabinet can be completed by the addition of the two remaining sides, and with these secured all that remains to be done is the fixing of the wires inside the set to the aerial and earth terminals.

With the receiver portion completed and adjusted so that it is quite ready for use, we can next turn our attention to the construction of the battery box.

First a few words with regard to the materials required.

The lid on to which the "Pylon" cabinet is screwed is made from $\frac{3}{8}$-in. plywood, and measures 14 in. by 10 in. You would be wise to use only ply-wood for this purpose, because with ordinary types of wood a piece sufficiently large and only $\frac{3}{8}$ in. thick might tend to warp rather badly unless special precautions are taken to keep it flat.

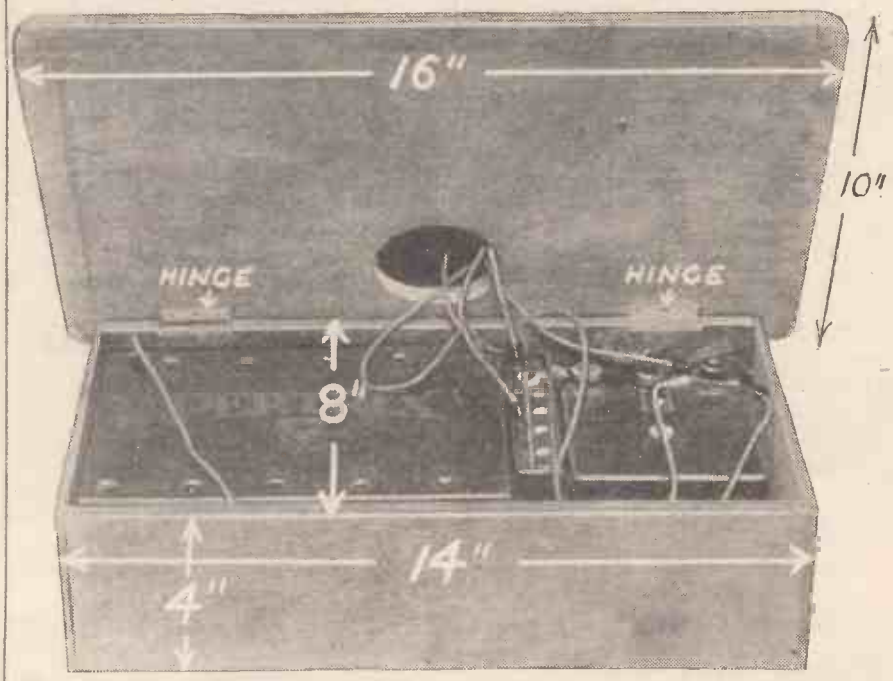
Making the Box

As will be seen from the photograph on this page, the corners of the lid are rounded off, and before commencing the sides and base of the box a hole will have to be cut in it, roughly in the position shown, through which to pass the various battery leads.

Next we come to the base, and the front and back sides of the box. These also are of $\frac{3}{8}$-in. material, and the exact dimensions of the original battery box are given on the photograph. By the way, while on the question of dimensions, the case illustrated is intended to house a two-volt accumulator, and if you decide to use four- or six-volt valves you will probably have to increase the size to take a larger accumulator.

For the two remaining sides, ordinary three-ply wood will answer the purpose quite well, and when these have been cut it remains only to screw the various parts together.

H.T., L.T. AND G.B. NEATLY PACKED AWAY



The batteries are all housed in a shallow wooden box, on the hinged lid of which the "Pylon" itself is mounted. A large round hole in the lid enables all the leads to be taken up to the set in a very neat manner, none of the wires showing externally at all.

The A.C. "PARATUNE"

Designed and Described by VICTOR KING.

A magnificent battery-less receiver constructed on the most up-to-date lines. It uses a mains-drive S.G. and its distance-finding qualities are astounding. By adoption of the "Paratune" principle it achieves great selectivity and a freedom from "break through" and other bugbears. Further, by a novel method of layout the mains portion is separated, and the outfit is particularly safe to handle.

WHAT an ideal place for set designers this country would be if all electric supply mains were A.C.—and of unified voltage and frequency!

Think of the *number* of circuits that could be developed employing the new high-magnification A.C. valves—think of the component standardisation that would result—think of—but, alas, if your only "mains" supply is that which is turned on by a tap, perhaps you would prefer not to think in terms of all-electric receiver designs!

No Bother with Batteries

But even faced as we are with a complete absence of uniformity in mains supplies, the fact remains that there are a great number of readers to whom an all-A.C. receiver *is* of interest, and this month—well, it is their turn to get busy with the soldering iron.

The A.C. "Paratune" is the first all-mains receiver to be published in the WIRELESS CONSTRUCTOR in which not only the H.T. and L.T., but grid bias as well, are all obtained from the mains.

Just think for a moment what that means. No batteries of any kind to be replaced—no accumulators to be carted off to the charging station at all sorts of inconvenient times—no crackles or instability due to a

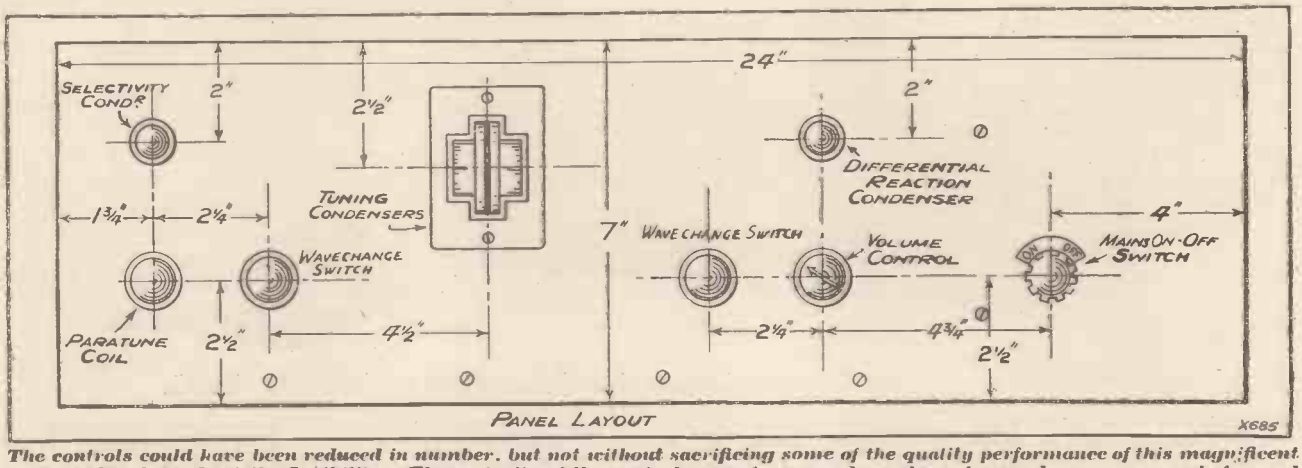
YOUR SHOPPING LIST FOR THIS SPLENDID ALL-MAINS THREE-VALVE SET

1 Panel, 24 in. × 7 in. × ¼ in. (Red Seal, or Lissen, Goltone, Paxolin, etc.).
1 Cabinet for above panel, to take baseboards as follow: one 18 in. × 10 in., one 6¾ in. × 10 in., and one 5⅝ in. × 10 in. (these sizes are calculated on the use of ⅜-in. wood) (Pickett, or Camco, Lock, Osborn, Kay, etc.).
2 ·0005-mfd. variable condensers with double-drum panel-control assembly (J.B., or similar type).
1 Solid-dielectric variable condenser, maximum capacity ·0003 mfd. (Ready Radio, or Burton, etc.).
1 Differential reaction condenser, not less than ·00013-mfd. capacity (Lotus, or Lissen, J.B., Igranic, Ormond, Dubilier, etc.).
1 50,000-ohm wire-wound potentiometer (Magnum, or similar type).
1 Mains-type on-off switch (Bulgin, or Igranic, etc.).
1 Three-pole and 1 two-pole change-over switch, both baseboard-mounting type with extension rods for panel control (Wearite).
1 "Paratune" coil unit (Wearite, or Ready Radio).
6 Baseboard-mounting type single-coil sockets (Lotus, or Igranic, Lissen, Bulgin, Keystone, Wearite, Magnum, Red Diamond, etc.).
1 1,000-ohm potentiometer or variable resistance (for H.F. grid bias) (Ready Radio, or similar type).
1 Horizontal type five-pin valve holder (W.B., or Junit, Bulgin, etc.).
1 ·01-mfd. fixed condenser (Mullard, or Dubilier, T.C.C., Igranic, Lissen, etc.).
1 ·0003-, 1 ·001- and 1 ·0005-mfd. fixed condenser (Dubilier, Lissen, and Ready Radio in set, or Telsen, T.C.C., Igranic, Ediswan, Ferranti, Mullard, Watmel, etc.).
1 ·5-mfd. Mansbridge type condenser (T.C.C., or Lissen, Dubilier, Mullard, Hydra, etc.).
3 2-mfd. Mansbridge type condensers (Lissen and Dubilier in set, or Igranic, T.C.C., Hydra, Mullard, etc.).
2 Five-pin-type valve holders (Lotus, or Telsen, Igranic, Dario, Benjamin, W.B., Clix, Junit, etc.).
2 H.F. chokes (Keystone and Varley in set, or Telsen, R.I., Lewcos, Lissen, Dubilier, Lotus, Igranic, Ready Radio, Wearite, Magnum, Parex, Watmel, etc.).
1 L.F. transformer (Telsen Radiogrand, or Igranic, Lissen, Ferranti, R.I., Mullard, Varley, Lotus, Lewcos, etc.).
1 2-meg. grid leak and holder (Graham Farish, or Dubilier, Igranic, Ferranti, Ediswan, Lissen, Mullard, etc.).
2 4-mfd. Mansbridge type condensers (working voltage 200) (T.C.C., or Lissen, Dubilier, etc.).
1 L.F. output choke (Lissen, or R.I., Ferranti, Atlas, Varley, Igranic, Wearite, Magnum, etc.).
1 L.F. smoothing choke (Igranic, or other good make as above).
1 Mains transformer for half-wave rectifying valve, with 4-volt 4-amp. winding for A.C. valves (Wearite, or R.I., Atlas, etc.).
1 Ordinary four-pin valve holder (for half-wave rectifying valve) (Lotus, or Lissen, Telsen, etc.).
1 25,000- and 1 1,000-ohm "Spaghetti" type resistances (Magnum, or Bulgin, etc.).
4 Terminals (Igranic, or Clix, Belling and Lee, Eelex, etc.).
1 Sheet of copper foil, 30⅜ in. × 10 in. (Paroussi, etc.).
1 Copper or aluminium screen (Paroussi, or Keystone, Ready Radio, Magnum, Wearite, etc.).
Connecting wire, flex, screws, alligator clips, soldering tags, mains plug, etc.

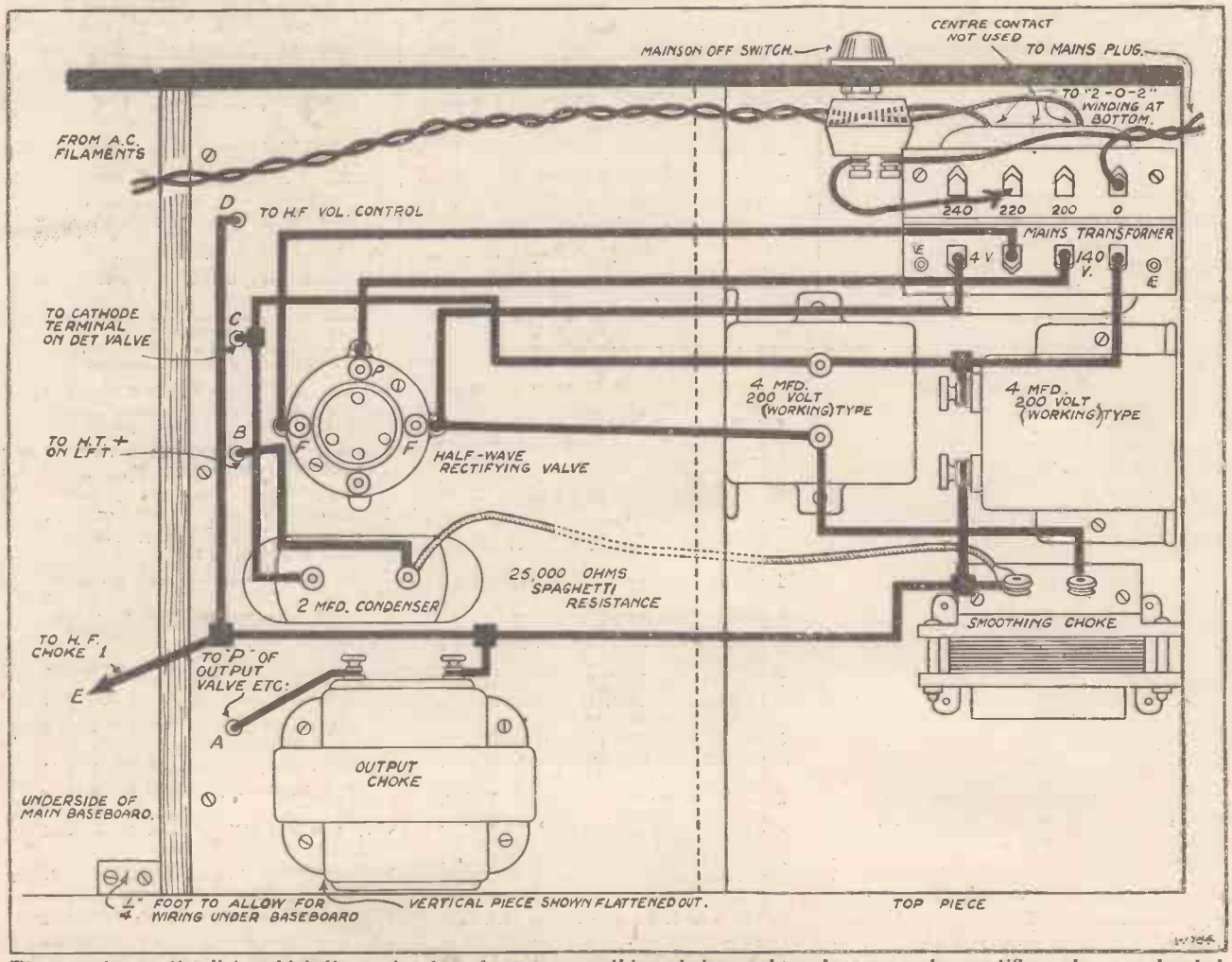
The A.C. "Paratune"—*continued*

partially discharged H.T. battery. A constant supply of "juice" on tap, so to speak, at all times. Absolutely trouble-free reception and, perhaps above all, almost negligible running expenses.

Sounds more like a dream set than a reality, doesn't it? But that is not all.



The controls could have been reduced in number, but not without sacrificing some of the quality performance of this magnificent mains set and much of its flexibility. The majority of the controls are of a secondary character, and you can search for and locate dozens of stations in the easiest, most comfortable manner whether or not you have had much previous set-handling experience.



The "mains section" in which the mains transformer, smoothing chokes and condensers, valve rectifier, etc., are located. It is obviously a great advantage to group all the mains apparatus in this way. It is divided from the rest of the set by metal-covered partitions, the arrangement being clearly shown in one of the photographs.

The A.C. "Paratune"—*continued*

Let us just consider it for a moment or two from the technical point of view.

Modern A.C. valves, almost without exception, have greater magnification factors than the equivalent battery-operated valves with which we are all more or less familiar. That means to say that when we devise an H.F. circuit for an A.C.-operated screen-grid valve, the overall amplification from the arrangement is higher than would be obtained from a circuit using a battery-operated valve.

That Selectivity Snag

But for the fact that there is one rather serious drawback, this "higher-mag. factor" could be put to very good account; in fact, *is* put to very good account in the A.C. "Paratune," because the "Paratune" scheme has overcome the disadvantage!

Have you guessed what the disadvantage is? As a matter of fact, it is to do with selectivity. The increase in amplification when using an A.C. S.G. valve applies, of course, to the local stations as well as to the distant ones.

The result is that in order to obtain a sufficiently high degree of selectivity for our present congested state of affairs in the ether, the aerial coupling has to be reduced, and weaker coupling almost always means poorer signals. So that in any ordinary arrangement it is not difficult to see that the gain from the use of an A.C. screen-grid valve is necessarily not so high as it might be.

But what about the A.C. "Paratune"; does it suffer from the common disadvantage? I am happy to say that it does not. The general principles of the "Paratune" arrangement are already too widely known to need repetition in detail here.

Easy Wave-Change

And the "Paratune" circuit—the WIRELESS CONSTRUCTOR scheme for super-selectivity—used in conjunction with a high-magnification A.C. S.G. valve, results in a combination that is just about *the* last word in modern H.F. practice.

This circuit, followed by an efficient detector and a conventional L.F. stage, is the basis of the A.C. "Paratune," a set that will bring in, and "sift," pretty well everything that there is worth hearing in the European ether.

The set incorporates wave-change switching—the change-over being effected by two simple controls placed conveniently on the panel, and when you are listening on long waves you need have no fear of the old trouble of the local station appearing on the dial, because the "Paratune" scheme effectively does away with this "breaking through" difficulty.

In other words, for those who are fortunate enough to be on A.C. mains the A.C. "Paratune" will fulfil a long-felt want. It provides superb quality, with (unless you live under a high-power station's aerial) *complete* separation of the two transmitters—and alternative programmes from a host of Continentals just whenever you happen to want them, irrespective of whether the "twin local" stations are radiating or not.

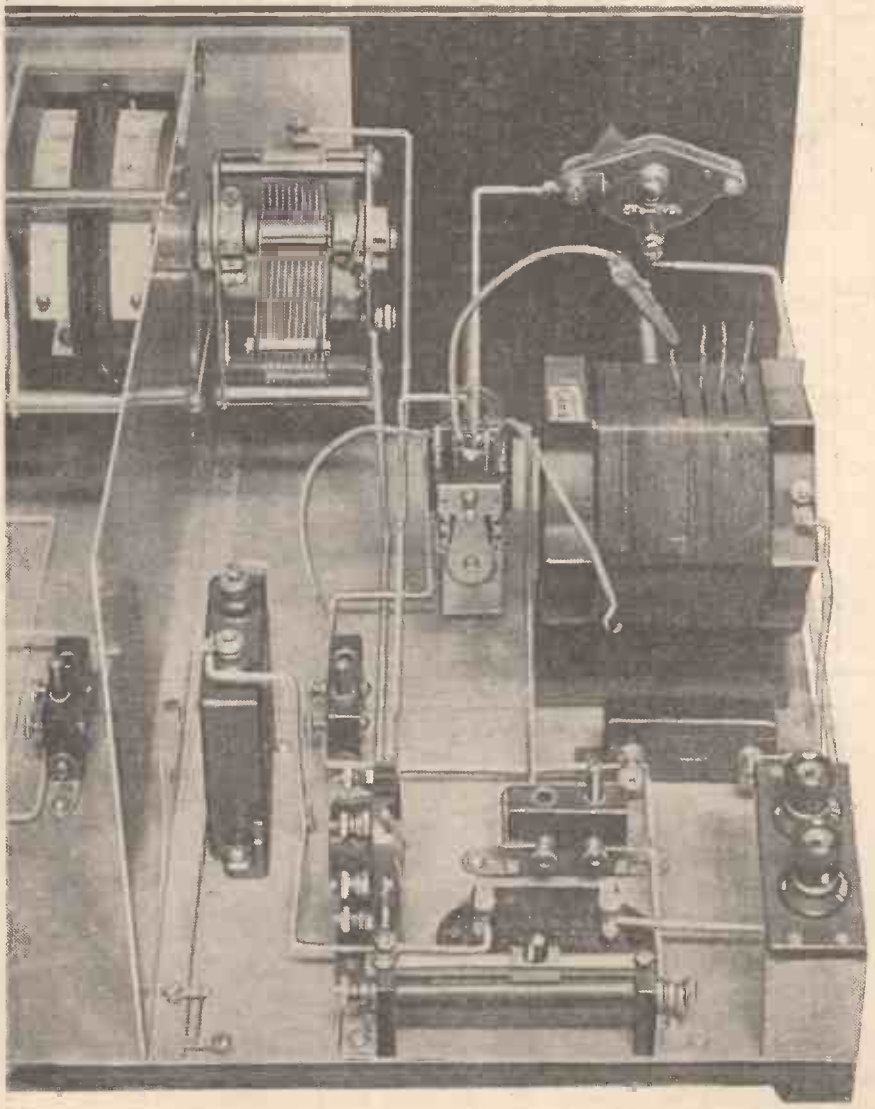
There is only one other point to which perhaps I should refer before passing on to the constructional procedure, and that is regarding the "knobs" on the panel.

Simplified Control

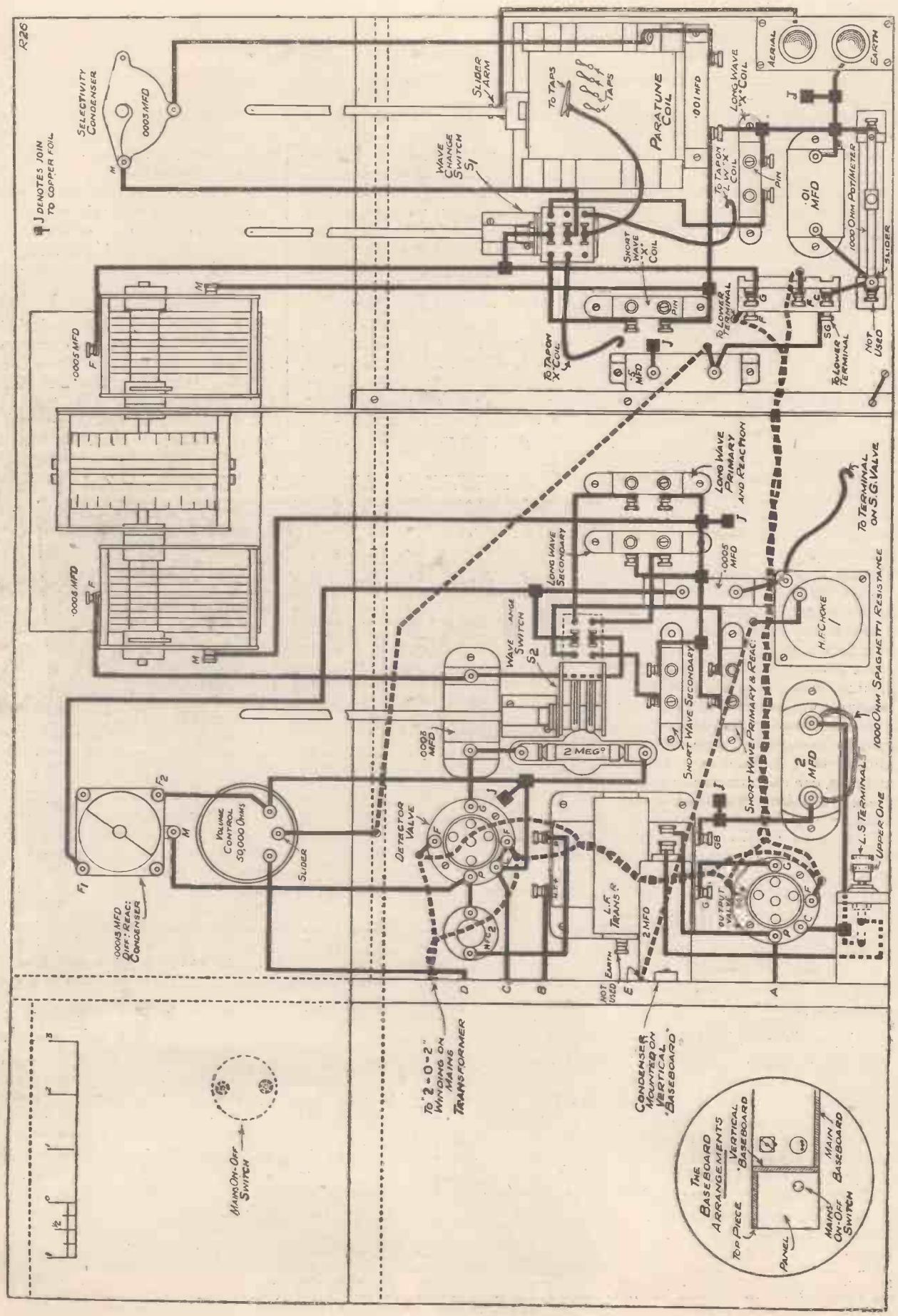
I am always inclined to think that a "knobby" panel tends to create an impression of difficult operation—but that is certainly not true of the present design.

The "Paratune" scheme—even if it does introduce two additional controls

PERFECT "PARATUNE" PERFORMANCE



Here you see the "Paratune" coil, and it is to this that the set owes its power to separate properly the large number of stations received by the S.G. H.F. stage.


R26
J DENOTES JOIN TO COPPER FOIL
SELECTIVITY CONDENSER
0003 MFD
SLIDER ARM
TO TAPS
TAPS
PARATUNE COIL
·001 MFD
LONG WAVE 'X' COIL
AERIAL
EARTH
WAVE CHANGE SWITCH S1
TO TAPON L.W. 'X' COIL
PIN
·01 MFD
1000 OHM POTMETER
SLIDER
SHORT WAVE 'X' COIL
TO TAPON 'X' COIL
·0005 MFD
·0003 MFD
LOWER TERMINAL
NOT USED
LONG WAVE PRIMARY AND REACTION
TO TERMINAL ON S.G. VALVE
LONG WAVE SECONDARY
WAVE CHANGE SWITCH S2
H.F. CHOKE
SHORT WAVE SECONDARY
SHORT WAVE PRIMARY & REAC.
1000 OHM SPAGHETTI RESISTANCE
2 MEG.
·0005 MFD
2 MFD
L.S. TERMINAL
UPPER ONE
VOLUME CONTROL 50,000 OHMS
SLIDER
DETECTOR VALVE
OUTPUT VALVE
L.F. TRANSF.
·0003 MFD DIFF: REAC: CONDENSER
TO "2-0-2" WINDING ON MAINS TRANSFORMER
CONDENSER MOUNTED ON VERTICAL BASEBOARD
MAINS ON-OFF SWITCH
THE BASEBOARD ARRANGEMENTS
TOP PIECE
VERTICAL BASEBOARD
MAIN BASEBOARD
PANEL
MAINS ON-OFF SWITCH

The A.C. "Paratune"—*continued*

—tends if anything to simplify the operating procedure, because it enables the locals to be "closed down" without delicate and, in many cases, frequent adjustments of the normal tuning controls.

That is just about all I need say regarding the capabilities of the set. The rest I prefer to leave to your own verdict, and so now let us concern ourselves with the construction.

First of all, it seems desirable that I should say a word or two regarding the choice of components, a complete list of which—with alternatives—is given elsewhere in the article.

The Parts to Use

The mere fact that the set is to be operated from the mains, and with high-efficiency valves, should be sufficient to emphasise the necessity for the use of reliable parts. Naturally, you will not need to confine yourself only to those used in the original set (mentioned in each case first), but at least you would be wise to make your choice from among the alternatives given.

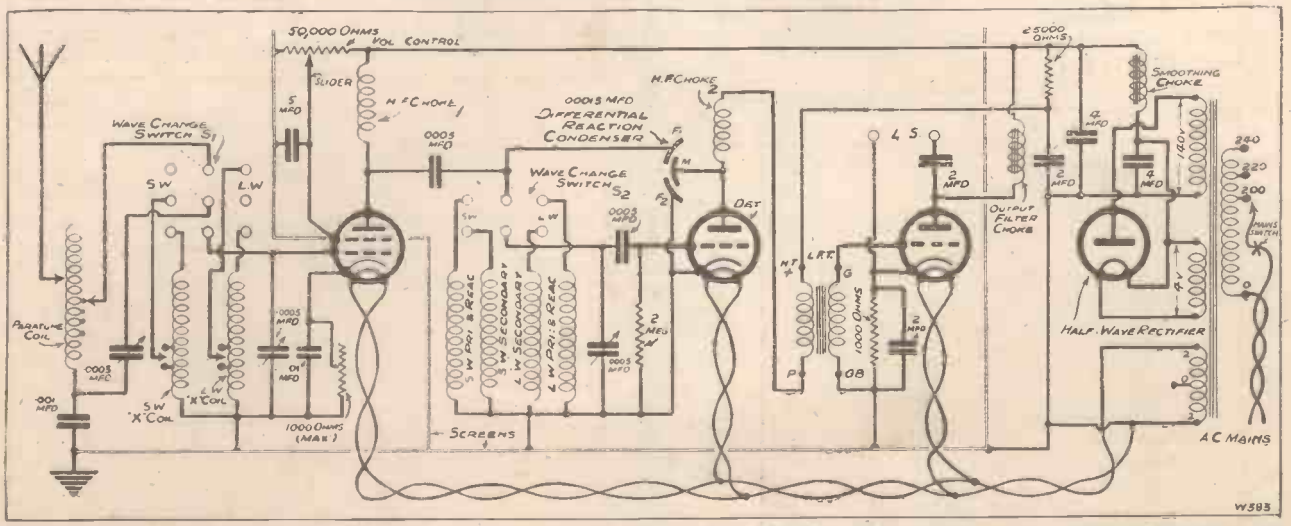
Start the construction in the usual manner by marking out and drilling the panel in accordance with the diagram provided. The hole for the variable condenser controls, over which the escutcheon plate is mounted, can quite easily be cut away if you use a fairly fine fretsaw blade and work with it fairly slowly.

To allow for the A.C. filament wires and one or two others which pass under the baseboard, the screw holes by which the panel is secured to the main baseboard should be arranged so that the underside of the baseboard is ¼ in. up from the bottom edge of the panel. At the back the baseboard is raised ¼ in. by means of small wooden feet placed at the two corners.

THE "PARATUNE'S" "POWER PACK"

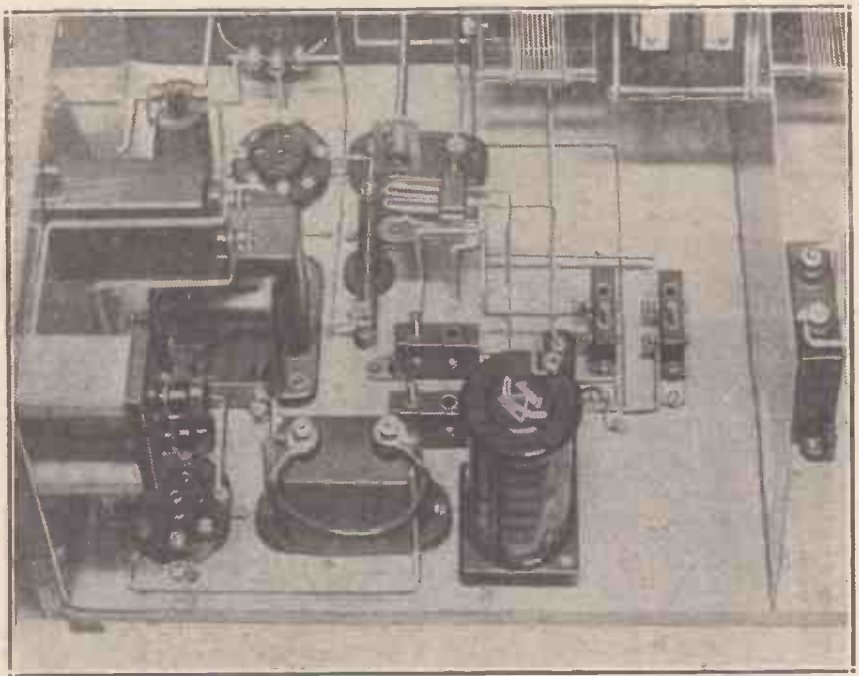
This view of the set turned upside-down clearly shows how some of the leads from the "power pack" pass under the baseboard and so to the "radio" part of the receiver.

A CIRCUIT THAT WILL INTEREST YOU



This diagram is well worth examining even if you do not intend to build this very excellent set. Note particularly the fascinating "Paratune" wave-changing and the complete coil-change that is effected in the H.F. intervalve coupling. The double lines indicate the screens that provide H.F. shielding and screening for the "power pack."

The A.C. "Paratune"—*continued*



The detector and L.F. stages of the A.C. "Paratune." The loud-speaker terminals are mounted on the "power-pack" partition, as shown, near the fixed condenser that figures in the loud-speaker output filter circuit.

You will be able to obtain a clear impression of the way in which the two smaller "baseboards" are arranged if you refer to the small sketch shown in the bottom left-hand corner of the wiring diagram.

The copper foil which covers the baseboards should not be cut up, but should be secured in position as one continuous piece covering the set baseboard, the vertical partition, and the upper side of the eliminator "baseboard."

Cutting the Screen

The screen used for separating the H.F. circuit from the detector should be cut away at the panel end so that it fits round the plate which carries the spindle for the right-hand variable condenser.

You can, if you like, secure the screen to this end-plate by means of the screws holding the drum assembly together, because the two have ultimately to be joined together electrically in any case. Do not forget, while

OPERATING PANEL FOR THE A.C. "PARATUNE"

(Circuit: S.G., det., and one transformer-coupled L.F. for A.C. mains).

VALVES.

1st: A.C. S.G. valve.
2nd: A.C. H.F. or det. type.
3rd: A.C. L.F. valve.

Note.—All above valves should be of four-volt type.

RECTIFIER VALVE.

U.30/250, or similar half-wave rectifying type with 4-volt filament.

VOLTAGES.

For 200-, 220-, or 240-volt A.C. mains (40 to 100 cycles).

Tapping on mains transformer should be arranged to suit voltage of your mains.

COILS.

"PARATUNE" COIL.—Can be made at home as described in December (or October) Wireless Constructor," or obtained commercially.

Coil holder nearest aerial terminal requires No. 250X coil.

Coil holder nearest first wave-change switch requires No. 60X coil.

Coil holder nearest screen on detector side requires No. 100 or No. 150 coil (depending on degree of selectivity required). In holder next to this one a No. 250 ordinary coil.

Coil holder nearest 1st H.F. choke will require a No. 35 or No. 40 coil (according to degree of selectivity required). No. 60 in remaining holder.

OPERATION.

SHORT-WAVE BAND (225-550 METRES).

Turn first and second wave-change switches to left.

Keep tuning controls as far as possible in step (in some cases it may be necessary to advance one slightly more than the other in order to maintain "lively" condition which indicates that set is in tune).

"Paratune" coil adjustment should follow the tuning dials. As wave-length is increased "Paratune" coil control should be turned in clockwise direction and vice versa. Correct setting for "Paratune" coil on a given station is indicated when signals are loudest.

Adjust degree of selectivity with knob immediately above "Paratune" coil control, but always use as near to maximum as possible.

Reaction can be used when searching, and will help to bring up strength of weak distant stations.

LONG-WAVE BAND (1 000 2,000 METRES).

Turn first and second wave-change switches to right.

Find best tap on "Paratune" coil by trial, and turn the slider adjustment until local station is eliminated on long wave (this only applies when set is being used in districts where local station "breaks through" on long-wave band. Otherwise "Paratune" coil adjustment should not be touched on long waves).

Tune exactly as on broadcast band, taking care to keep dials in step.

H.F. GRID-BIAS ADJUSTMENT.

Vary slider on 1,000 potentiometer for best results.

DIAL SETTINGS OF LOCAL STATIONS

Station	Settings		Station	Settings	

CONTROLS.

(Reading from left to right looking at front of panel.)

"Paratune" selectivity condenser (upper knob).
"Paratune" coil adjustment (lower).
First wave-change switch.
Drum-drive tuning controls.
Second wave-change switch.
H.F. volume control (lower knob).
Reaction condenser (upper knob).
Knob on extreme right is mains switch.

NOTE.—"Paratune" selectivity condenser can be used as auxiliary H.F. volume control.

FLEX CONNECTIONS.

From centre contact on left of first wave-change switch, to tap on short-wave "X" coil.

From bottom right-hand contact on same switch, to tap on long-wave "X" coil.

Remaining flex connection on this switch goes to tap on "Paratune" coil.

From first H.F. choke to terminal on S.G. valve.

Note.—These directions for flex leads are given looking at set from back.

PRECAUTIONS.

Never put your hand inside set or eliminator while mains switch is in "On" position.

Never drop anything metallic inside set when it is in operation—if you do, you may cause a short-circuit and burn out your valves.

The A.C. "Paratune"—*continued*

cutting this screen, to cut a hole for the S.G. valve. The centre of the hole, which should be 1¼ in. in diameter, is 1⅛ in. up from the baseboard, and in the position shown.

When the baseboard and screening arrangements are completed, the next job is to mount the various components. In this connection, to avoid the possibility of short-circuits due to the metal parts on the undersides of components coming into contact with the baseboard screen, you would be well advised to place a piece of cardboard under all the components in the actual set part with which this trouble is likely to occur.

By the way, before you fix the components at the L.F. end you will find it best first to drill the hole through which the wires are taken connecting the set to the eliminator.

At the L.F. End

There is another little precaution to which it would perhaps be as well to call attention, and that is to do with the output valve holder. Just slip the valve in to make quite certain that it clears the L.S. terminal strip and the horizontally-mounted 2-mfd. condenser before the valve holder is finally secured, because there isn't any too much room to spare.

When you have fixed all the components in the set part of the outfit, turn it upside down and secure those which constitute the eliminator circuit. Care should be taken to see that ample clearance is allowed for the rectifying valve.

The Filament Flex

Wiring the set up is the next task—not that you will find it a very difficult one if you work systematically and from the wiring diagram provided.

Start off with the flex wires joining the A.C. filaments, and pay special attention to the points at which they pass through the baseboard.

It is vitally important—not only with these wires, but with all the connections which are taken through the baseboard—for the insulation on the wires to be absolutely sound at the points where they pass through the metal baseboard screen.

There is one other danger of short-circuit troubles to mention before passing on. It is simply—beware of your soldering tags! It is so easy for soldering tags to slip round and make contact with the heads of the screws by which components are secured!

When the wiring is completed and the mains flex has been connected to the tapping on the mains transformer to correspond with the voltage of your local supply, the set is ready for test.

Therefore, insert the coils and valves (full information as to sizes and types is given in the operating panel), connect the set to the mains and switch on the mains switch on the panel.

Do not be unduly alarmed if the set seems dead for a minute or so, because with A.C. valves there is a time lag before the emission becomes normal. After that, however, tune in the local stations.

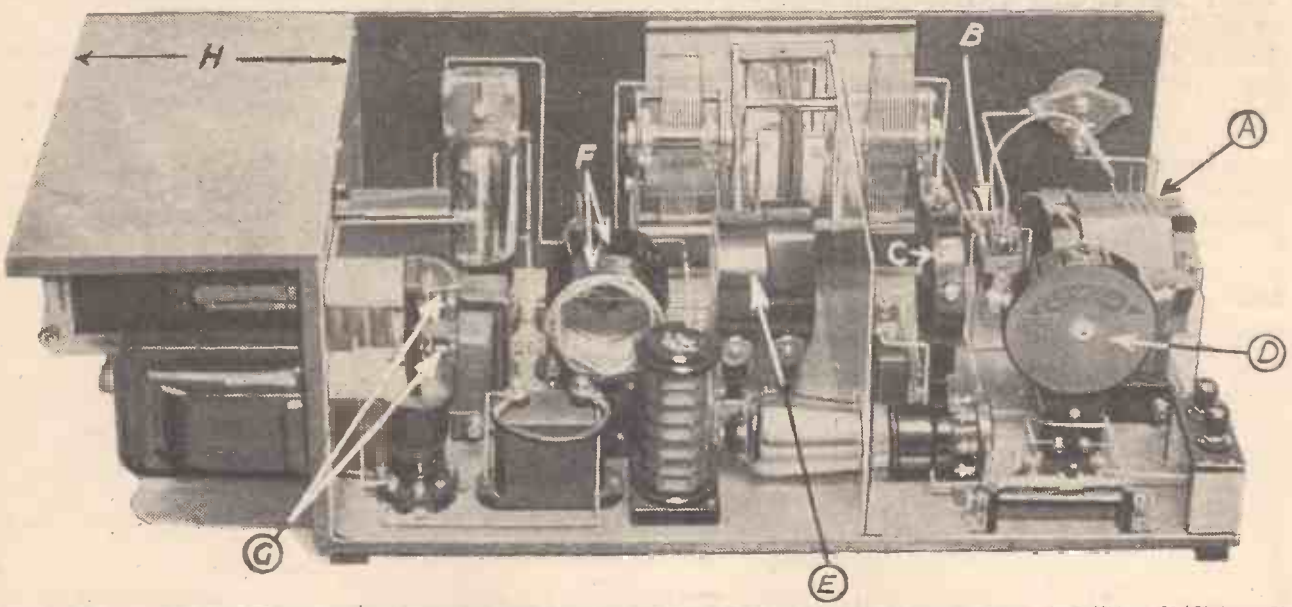
If these turn out to be much too loud (and they probably will be if you are anywhere near the local transmitters), the H.F. volume control and the selectivity condenser will enable you to reduce them to normal volume.

Reaction will be necessary only when you are searching for distant stations, and then you must be careful to keep both the tuning condensers "in step." (This "in step" condition is quite easily determined by the general liveliness of the set.)

The correct "Paratune" coil adjustment (on the broadcast band only) varies according to the wave-length to which the set is tuned. When you go up in wave-length, then the "Paratune" control must be turned in a clockwise direction, and vice versa.

On long waves the "Paratune" coil prevents the local station from "breaking through." You merely arrange the tapping clip at the centre-tap on the coil, or the one next to it, and turn the slider arm until the interfering station disappears.

SOME SALIENT FEATURES OF THIS FINE A.C. THREE-VALVER



The method of clipping on to the "Paratune" coil is shown at (A), and (B) denotes the first wave-change switch (S_1). At (C) is indicated the short-wave "X" coil (covering wave-lengths from about 225 to 550 metres), while (D) indicates the long-wave "X" coil. (E) is the long-wave secondary, while (F) shows the pair of H.F. circuit coils for the lower broadcasting wave-lengths. The filtered output terminals for the loud speaker are indicated at (G), while the mains section of the set is situated under the shelf marked (H).

POINTS FOR PURCHASERS

Some interesting items from the radio manufacturers and distributors about their latest lines.

A Big Reduction

A BIG reduction has just been announced by the Marconiphone Co., Ltd., in the price of their Model 56 receiver. With A.C. mains equipment this model now costs £26 instead of £35.

In the D.C. equipment the model is £23 instead of £32, whilst for battery operation the new price is £21 as against £30 10s. 0d. This well-known model employs a five-valve circuit (three H.F. stages), and full details can be had from the firm at 210, Tottenham Court Road, London, W.1.

Push-Pull Grid Bias

Ferranti, Ltd., Hollinwood, Lancs., advise us that they are now able to supply push-pull L.F. transformers with separate grid-bias tappings on the secondary to enable the output valves to be biased separately where required. A small extra charge is made for this, and although it is not usually necessary if the valves are within 20 per cent of their rated characteristics, it is certainly a point that will greatly interest the push-pull enthusiast.

This firm has also forwarded a copy of their new construction chart for an A.C.–H.T. supply unit suitable for use with any receiver of good design, and employing up to five stages. Capable of supplying 80 milliamps at 200 volts, without a trace of motor-boating and no mains hum audible on a good speaker, this is a very attractive proposition.

Clix Specialities

So many are the different Clix specialities that readers may be glad to know that a leaflet may now be obtained dealing with the whole series, profusely illustrated, and showing the new valve holder with its resilient sockets. WIRELESS CONSTRUCTOR readers can obtain a copy on application to Lectro Linx, Ltd., 254, Vauxhall Bridge Road, London, S.W.1.

Points for Purchasers

From J. J. Eastick & Sons, Eelex House, 118, Bunhill Row, London, E.C.1, we have received the Eelex Radio Bulletin and their latest coloured leaflet. This latter describes the various products sold under the name of Eelex, which include the coloured flex and terminals, and to eliminate wrong connections, treble-duty terminals, all sorts of eyes, pins, spades, hook ends, shrouded terminals for mains use, switches, lightning arresters, etc.

These are very clearly illustrated and offered at low prices, each gadget being full of interest to the constructor, and Messrs. J. J. Eastick will be pleased to forward a copy of the leaflet to any WIRELESS CONSTRUCTOR reader who is interested. The firm also is featuring the new "Buildurone" cabinets, the only tools required for which are a saw and a screwdriver.

The angle pieces supplied make it extremely simple to construct, and this system is sure to find many admirers.

MAKING SETS ALL DAY!

A busy scene in the new E. K. Cole works at Southend.

The Wireless and Gramophone Trader Year Book

The 1931 issue of the Wireless and Gramophone Trader Year Book and Diary will interest every trader and retailer, all the technical wireless and gramophone data being brought right up to date.

Well arranged in coloured sections for easy reference, the book is too well-known to need more than passing comment, but special reference must be made to the new 16-page feature entitled "Practical Service Methods," which covers economical and up-to-date methods of dealing with service and repairs and constructional jobs in installations, accessories and receivers. Just the book for the dealer.

It is issued at 3s. 6d., post free, to subscribers to the Wireless Gramophone Trader; the price to non-subscribers being 5s. 6d. (The Trader Publishing Co., Ltd., Bride House, Salisbury Square, E.C.4.)

The Chloride Chronicle

If you are able to obtain a copy of the Chloride Chronicle, published by the Chloride Electrical Storage Co., Ltd., of Clifton Junction, near Manchester, do not fail to read it carefully, for the autumn issue contains much interesting matter on that much misunderstood problem, the radio L.T. battery, as well as news and views of the firm's activities in various parts of the world, on sea and in the air.

For the Mains Man

F. C. Heayberd & Co., Ltd., 10, Finsbury Pavement, London, E.C.2, have sent us their new leaflet showing the constructor how to put together a mains unit. Well illustrated with circuit details and directions for wiring this is of great interest to the mains man, who should apply to the above address for details of the unit.

Clear photographs, diagrams, etc., and hints on how to connect the unit are included, so that readers who would like to take advantage of this well-known firm's products should lose no time in making their application for the new list No. 947.

By the way, F. C. Heayberd & Co. have asked us to point out that the wording of the advertisement of above which appeared in the December WIRELESS CONSTRUCTOR may give a wrong impression, and that no "eliminator" is required. If the valves in a receiver are substituted by indirectly-heated valves, all that is required for the latter is the appropriate L.T. transformer.

British Blue Spot

This firm has issued a strong warning to the trade against cheap imported articles which they have found passed off as genuine Blue Spots. They emphasise that the purchaser should look for the trade mark as advertised in the WIRELESS CONSTRUCTOR.

SAVOY HILL NEWS

New Importance of Regions—More Trouble with Brighton—Television Research—B.B.C. at Buenos Ayres—Broadcasting House to be Dry—Programme Development—High-Power Problems—Trouble at No. 10 Studio—Sir George Henschel—Song Celebrities—The Time Signal.

BY OUR SPECIAL COMMISSIONERS

New Importance of Regions

THE B.B.C. has decided to improve the status of its Regional organisation. This, of course, was inevitable if oft-repeated pledges about the Regional scheme were to be redeemed. In future the directors of the West, Midlands, North, and Scotland sections of the B.B.C. will occupy positions of real independence and importance.

More Trouble with Brighton

Relations between the B.B.C. and Brighton are said to be more strained than ever. Last summer there were negotiations for getting the Brighton municipal orchestra "on the air"; there was no definite conclusion, but the B.B.C. promised to test the orchestra and pass judgment on its quality.

Meanwhile, it is announced in the United States that arrangements have been made there for the relaying of the Brighton orchestra as soon as it gets on the British ether. Dr. Adrian Boult has been to hear the Brighton orchestra at least once.

It is not known what his report was, but there is a feeling in Brighton that the B.B.C. will turn them down because of alleged inferior quality. So Brighton is assembling its forces, both inside and outside Parliament, to persuade the B.B.C.

Other holiday resorts, notably Hastings, are also trying to get included in the B.B.C. programmes. The impression along the coast is that Eastbourne has benefitted a good deal from the regular broadcasting of the Grand Hotel orchestra there.

Television Research

The engineers of the B.B.C. are for the first time devoting attention to problems of television research. This year is likely to be a critical one in the history of television. Unless there is marked improvement of the Baird process before the end of the year, broadcasting facilities will almost certainly be withdrawn.

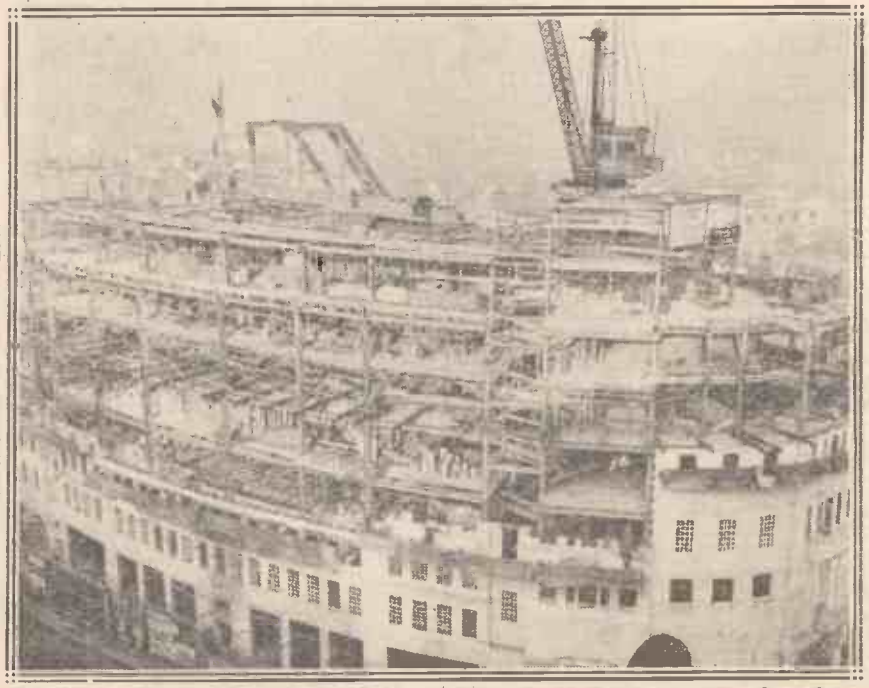
But the B.B.C. is anxious to avoid doing this; at least until after all possible technical development has been tried and fostered through co-operation with the Baird engineers. The B.B.C. does, in fact, take a rather more tolerant view of television than do any of the other big broadcasting concerns elsewhere.

B.B.C. at Buenos Ayres

A proposal has been made, and is still under consideration at Savoy Hill, that the British wireless trade and the B.B.C. should send a worthy joint exhibit to the big British Industries Fair in Buenos Ayres in the spring.

Mr. Macdonell, who originated the idea, is a former B.B.C. official now associated with the wireless trade. If the plan is approved, Mr. Macdonell would manage the exhibit in association with Mr. Gambier-Parry of the B.B.C. and Mr. A. Moody of the R.M.A.

WILL IT BE BIG ENOUGH?



This picture gives you a fair idea of the immensity of the B.B.C.'s new headquarters at Portland Place. But doubts have been expressed as to whether it will be big enough for the ever-growing B.B.C. departments and personnel.

Savoy Hill News—*continued*

Broadcasting House to be Dry

Although the plans for Broadcasting House allow for several refreshment buffets and at least one restaurant, there is no chance of the sale of alcoholic liquors there. Mrs. Philip Snowden has put her foot down in this matter.

It has been common knowledge for some time that the wife of the Chancellor of the Exchequer strongly disapproved of the practice of offering a little "spirituous" refreshment to distinguished visitors to the microphone.

There is to be none of this in the new building. Those who cannot broadcast in a "bone-dry" atmosphere can stay away from the microphone. It is not true, however, that all members of the staff of the B.B.C. are being required to take a pledge of "total abstention."

The first of the series, that from Cornwall some weeks ago, was an unqualified success. It is likely that the North of England will prove to be the most fertile field of endeavour for Mr. Young.

High-Power Problems

The difficulty of interference between high-power stations on adjacent ether channels is causing acute anxiety at Savoy Hill. It is no longer a case of disregarding international rules or conventions. Stations are working strictly in their allotted zones, but still there is interference.

Trouble at No. 10 Studio

No. 10 Studio, formerly "The Big Tree" Wine Warehouse, underground south of the Thames, has turned out to be remarkably successful from the point of view of technical qualities. On the other hand, its inaccessibility, the acute discomfort of its surroundings, and its inartistic environment, have combined to render the place increasingly unpopular among instrumentalists, artistes, and conductors.

Concerted Action

There has been a considerable agitation and a threat of "direct concerted action." From the B.B.C. angle, as the studio is only a temporary measure, to be abandoned in about six months time, when part of Broadcasting House is made available, there are obvious objections to the expenditure of more than the minimum amount required.

It seems likely, therefore, that those who have to perform in No. 10 must tolerate its discomforts.

Sir George Henschel

Sir George Henschel, the veteran composer and conductor, who has on several occasions distinguished himself on the microphone, is once again to make his appearance. This time his programme will be the same as that with which he opened the fiftieth season of the Boston Symphony Orchestra on October 10th, 1930, which, in turn, was a replica of the concert which he conducted for the same society on October 9th, 1880.

Song Celebrities

Madame Ritter-Ciampi and Madame Alexandra Trianti are to broadcast, the former (an international lieder singer) some time in February and the latter, a great opera singer, probably a little earlier in the year.

The Time Signal

The Music Department at Savoy Hill is making another attack on the "time signal." What gave rise to this was the super-imposition of the 9 o'clock signal (the six dots from Greenwich) on the transmission of the opera "Pelleas and Melisande."

This was regarded as outrageous, and the result has been renewed representations from the artistic authorities. About three years ago the B.B.C. experimented with the omission of the time signal on occasions when an important programme such as an opera slightly overran.

Outcry from Listeners

There was then such an outcry from large numbers of listeners who set their clocks by the broadcast time signal that the old rule of automatic transmission was restored. This time the reformers suggest that a solution would be to put out the time signal at 9.15 instead of at 9, thus considerably reducing the chance of mutilation of good music.

Something of the kind may be done, as there is growing sympathy with the view that the six dots on top of a symphony or the climax of an opera largely detract from the beauty and the pleasure of the performance.

THEY ARE AT A "BEAM" STATION!

This beaming group of visitors at the Dorchester Beam station includes Marchese Marconi (left) and the Rt. Hon. J. H. Thomas (centre).

Programme Development

The great success of most of Mr. Cecil Lewis's productions which he contributed after resigning the post of Director of Programmes at Savoy Hill has established a useful precedent now being developed.

Mr. Filson Young, the criminologist, editor, and author, who has been assisting the B.B.C. for five years in a kind of advisory capacity, is shortly to turn his attention to the important task of devising, building and producing provincial feature programmes, mirroring life and manners throughout the land.

The "EASY-STAGE" THREE

By A. S. CLARK.

An extremely simple but very efficient receiver, presented in a special manner so that anyone without previous set-construction experience may build it quite easily and be certain of getting excellent loud-speaker results.

How very different is the appearance of the outside of a large modern set from that of its predecessor of four years or so ago. Instead of rows of condensers, filament rheostats, and valve windows, present-day sets have only one or two small knobs apart from the tuning condensers, and the latter may consist merely of neat drum-drives taking up only a square inch or two of panel.

Modern Methods

Yes, that is all very obvious in more ways than one, but just lift the lids of the cabinets, and which set scores in simplicity? There can be no doubt the modern set will often be so packed that it is almost impossible to see the baseboard!

And what of the old set? Just a few widely-spaced components, wired up in what looks a simple manner. There were none of the complications of the modern set, which looks like an engineering job with its metal screens, drum-drive condensers, and additional components for de-coupling and similar purposes.

Certainty of Success

For the man who has constructed one or two sets these things do not have any terrors; in fact, the advanced constructor often revels in having all the possible extras and refinements he can. But to the enthusiast who has yet to make his first set—and there are many such—they present what appears a real difficulty.

No doubt he wonders whether it is possible to turn out a really simple set which will give him good results. He realises that super-selectivity, colossal power and great range are not necessary from his point of view, and therefore does not want to go through the apprenticeship of making crystal sets and one-valvers before he can undertake a loud-speaker set with the certainty of obtaining good results when it is completed.

The design of a set such as he requires cannot be produced easily. A tremendous amount of preliminary

YOUR "EASY-STAGE" SHOPPING LIST

- Panel, 14 in. × 7 in. (Lissen, or Red Seal, Goltone, etc.).
- Cabinet for above, with baseboard 10 in. deep (Camco, or Pickett, Lock, Kay, Osborn, etc.).
- 1 ·0005 variable condenser (Lotus, or Lissen, J.B., Polar, Dubilier, Igranic, Ready Radio, Ormond, Formo, etc.).
- 1 Geared dial for above, if it is not of slow-motion type (Lotus, or Igranic, J.B., Ormond, Lissen, Formo, Brownie, Ready Radio, etc.).
- 1 500,000-ohm three-terminal type volume control (Gambrell, or Varley, Igranic, Lissen, R.I., Rothermel, etc.).
- 1 "On-off" switch (Bulgin, or Lissen, Goltone, Igranic, Lotus, Ready Radio, Ormond, Red Diamond, Junit, etc.).
- 1 ·0001-·0002 differential reaction condenser (Dubilier, or Lissen, Lotus, Igranic, Ready Radio, J.B., Burton, Polar, Ormond, Magnum, Wearite, Parex, etc.).
- 3 Shock-absorbing valve holders (Clix, or Igranic, Telsen, W.B., Benjamin, Lotus, Lissen, Bulgin, Junit, Formo, Dario, etc.).
- 1 Special wave-change plug-in coil Unit (Lewcos, type T.T.P.B.).
- 1 ·0003 fixed condenser (Ready Radio, or Telsen, Lissen, Dubilier, Ferranti, Mullard, Ediswan, Igranic, Watmel, T.C.C., etc.).
- 2 2-mfd. fixed condensers (T.C.C. and Dubilier, or Igranic, Ferranti, Lissen, Mullard, Hydra, etc.).
- 1 ·0003 max. compression type variable condenser (Formo, or other good make).
- 1 2-meg. grid leak with holder (Dubilier, or Ediswan, Lissen, Igranic, Ferranti, Graham-Farish, Mullard, etc.).
- 1 ·25-meg. grid leak and holder (Graham-Farish, or other good make as above).
- 2 L.F. transformers of medium ratio (Lissen Super and Igranic Midget, or Telsen, Ferranti, R.I., Mullard, Varley, Lotus, Lewcos, etc.).
- 1 H.F. choke (Ready Radio, or Telsen, Lotus, Lissen, Dubilier, Varley, Igranic, R.I, Wearite, Parex, Magnum, Keystone, Watmel, etc.).
- 1 30,000-ohm resistance and holder (Ferranti, or similar type).
- Output choke (Magnum, or Lissen, Varley, Ferranti, R.I., Igranic, etc.).
- Ebonite strip, 10" × 12".
- 2 terminals (Igranic or Eelex, Belling & Lee, Clix, etc.).
- Plugs, sockets, wire, screws, etc., etc.

The "Easy-Stage" Three—*continued*

work is necessary. Every little operation must be considered from the point of view of the kitchen-table-pliers-and-screwdriver type of workshop. At the same time, efficiency has to be borne in mind, and everything must be a matter of common sense, no real technical knowledge being required on the part of the builder.

If you have never previously made a radio set, if you have no idea at all how to solder, if you are no expert with tools, if you cannot even follow an ordinary blueprint, and if you have never owned a wireless set—in spite of all these reservations you can make the "Easy-Stage" Three and get perfect loud-speaker reception, not only of your powerful nearby stations, but also of a large number of Continental stations.

How It Is Done

For the benefit of the reader who understands circuits and such-like technicalities, and to whom the set will appeal as much as to the inexperienced constructor, a few details of the theoretical scheme are given.

It is a three-valve arrangement of detector and two L.F. stages, both of which are transformer-coupled. Plug-in coils are employed, one "X" coil and a reaction coil being used for each wave-band.

Simple Switching and Control

A special holder for these coils is used, and a change-over switch is incorporated in it. A volume control is arranged across the secondary of the first L.F. transformer, and extra-special precautions against L.F. instability have been taken.

Now for the construction. I think most readers will agree that the wiring up of a set is the most difficult part of its production, especially if a neat and efficient job is desired. That being the case, you will not be surprised to hear that the greater part of the time spent in designing the "Easy-Stage" Three was taken up by the considerations of the wiring.

The outcome of this is that not a single wire in the set has to be bent. Every lead runs in a straight line from one point to another, and yet in the most efficient way possible. This, of course, has only been made practicable by a very careful arrangement of components.

The Safety Scheme

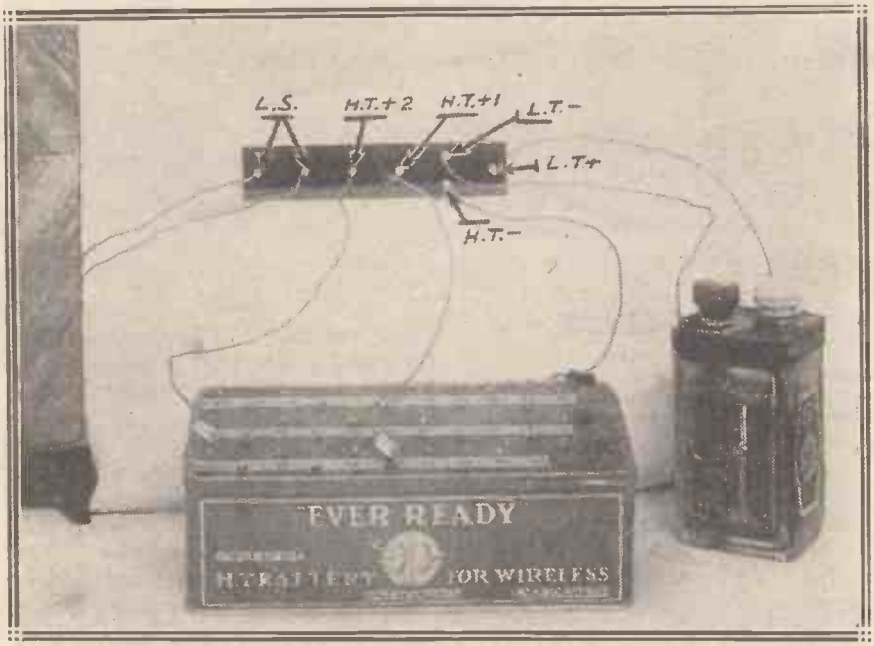
The whole construction is illustrated in photographs, which show every detail clearly so that no diagrams are necessary. First of all, you should turn to the No. 1 photograph. (Incidentally, you will note that most of the photographs are numbered in the order in which reference should be made to them for wiring purposes.)

In this photograph you will see the panel baseboard and terminal strip shown in plan form, with all the components mounted. The positions of the holes to be drilled in the panel are clearly indicated by dimensions.

You will note that instead of the usual battery terminals on the terminal strip there are a number of sockets arranged in a certain order. A piece of ebonite is provided with pins, also arranged in this order, to which the batteries are joined up in the manner indicated in another photograph.

This scheme enables all the batteries to be disconnected from the set in a moment, also there is no

INCORRECT BATTERY CONNECTIONS IMPOSSIBLE



This view of the battery connections from the batteries to the special plug shows the latter as you would see it if it were plugged in place on the terminal strip. It is immaterial which way round the loud-speaker leads are joined.

THE "WIRELESS CONSTRUCTOR" "EASY-STAGE" THREE

Circuit employed is a wave-change Det. and two transformer-coupled L.F. arrangement.

VALVES.

1st (nearest to coils) : H.F. or special detector type.
2nd : L.F. type with impedance about 10,000 ohms.
3rd : Power or super-power valve.

VOLTAGES.

L.T. : 2, 4 or 6 volts, according to rating of valves used.
H.T. + 1 : Up to 60 volts. Adjust for smooth reaction.
H.T. + 2 : 120 to 150 volts.
G.B. − 1 : 1½ to 4½ volts.
G.B. − 2 : Apply suitable voltage according to H.T. used and type of valve.

COILS.

Position nearest panel : 60X coil.
Coil coupled to above : 50 ordinary.
Position nearest aerial terminal : 250X coil.
Coil coupled to above : 100 ordinary.
Join flex leads to a terminal on the "X" coils nearest to them. (Try all terminals on "X" coils to see which gives best results.)

CONTROLS.

Centre large dial is for tuning.
Top right-hand knob is volume control.
Bottom right-hand knob is the "on-off" switch. Pull out to switch set on, and push in to turn it off.
Top left-hand knob controls reaction. Turn to the right for "increase."
Bottom left-hand knob is wave-change switch. Turn to the right for long waves, and to the left for medium waves.

OPERATION.

The adjustment of tuning and reaction is carried out in the usual way.
Start with the compression type condenser on the baseboard at maximum, and reduce it until the set is just selective enough. Leave it set at this position.
Always leave the volume control at maximum when reaction is in use.

The "Easy-Stage" Three—*continued*

possibility of joining them up to the wrong points. When the panel and terminal strip (see end of article) are drilled, the parts which go on them should be fixed in place.

Next fix the two pieces of ebonite in place, and then screw the remaining components to the baseboard in the positions shown. When this is done the set can be wired.

Each of the photographs Nos. 2 to 9 shows a few extra leads added each time, and point-to-point details for the leads are given in the following paragraphs. The numbers to which reference is made are those shown on the photo (No. 1) on this page.

Tackling the Wiring

If you use one of the alternative makes of components mentioned against each part in the list, you may find that the terminals do not fall in exactly the same positions as those on the original components. (In this case it may be necessary to run the leads round components.)

Some of the wiring is carried out by means of strips of copper foil; and this is tackled first. This is shown in place in the adjoining photograph. The strips should be about $\frac{3}{8}$ in. wide and the holes should not be made until the connecting strips are cut to size.

First of all join up 1 to 2 and 2 to 3 with one strip, also 4 to 5 and 5 to 6 with one strip; 5 to 10 and 10 to 9 can also be done with one piece, but the end which goes to 5 may have to be cut in a right-angle.

Similar right-angles will also be required at both ends of the last strip, which is used to join up 12 to 10 and 10 to 11.

Stage by Stage

The remaining wiring is carried out with ordinary tinned wire slipped in Systoflex, or with special insulated wire such as Glazite.

You will note that most of the photographs themselves are numbered, showing the order in which the various stages are tackled. There are four leads added in photograph No. 2 and they can all be seen quite clearly.

The points that are joined up are as follow: 3 to 7, 42 to 43, 44 to 45 (G.), and 46 to 47 (G.B.).

When you have joined up the leads shown in photo No. 3, the greater part of the L.F. end of the set will be wired. The leads shown in this picture are 55 to 57, 56 to 57, 52 (H.T.) to 53, 52 to 54, 58 to 59, 49 (P.) to 48, and 50 (G.) to 51. A separate piece of wire may be used for each connection if desired, and this applies to all the other leads.

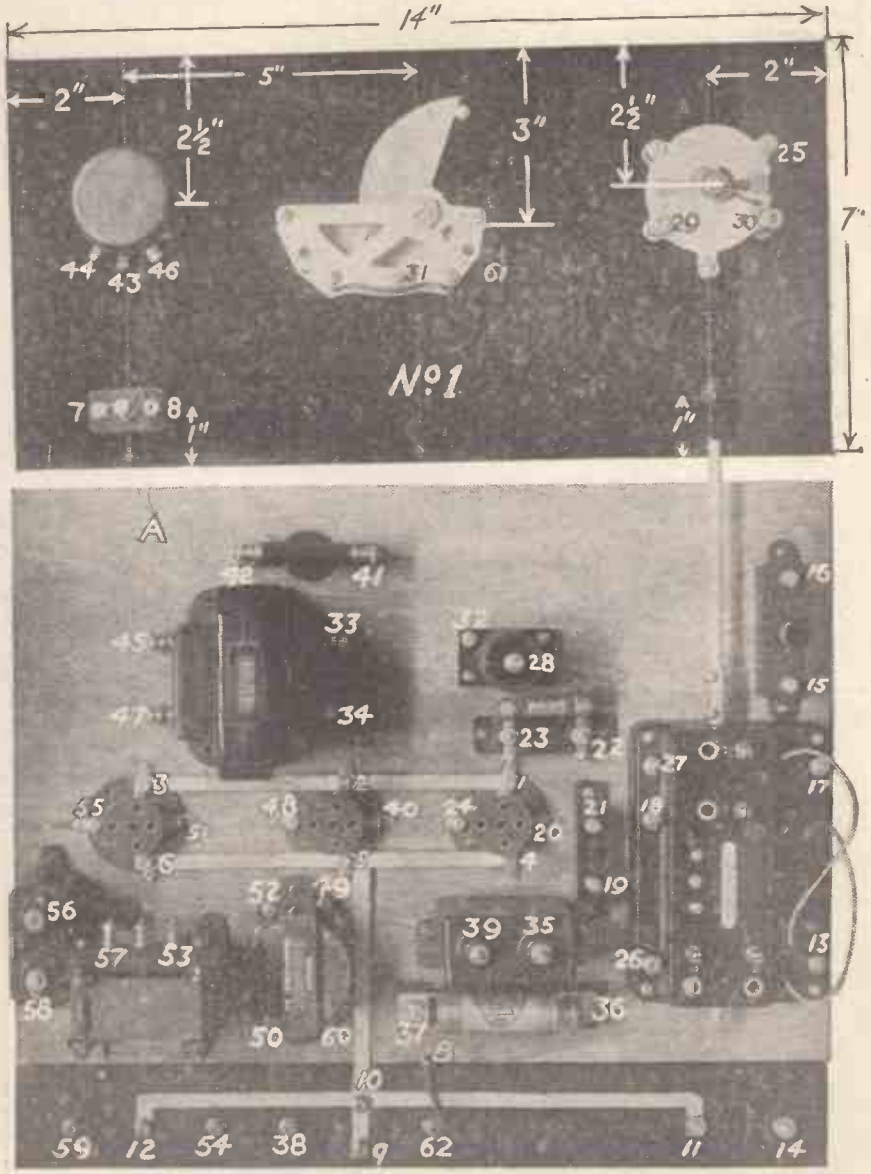
Four more leads are shown added in photo No. 4, namely, 35 to 36, 34 (H.T.+) to 35, 39 to 9 and 37 to 38.

Photo No. 5 shows four more leads added, all of which are quite short ones, and concern the main connections of the detector valve's grid circuit. It is important to keep these leads short, a fact which you will appreciate has been carefully carried out.

Grid Connections

This is a good illustration of the care which has been lavished on a proper arrangement of the

"FLATTENED OUT" FOR YOU TO "MAKE OUT"

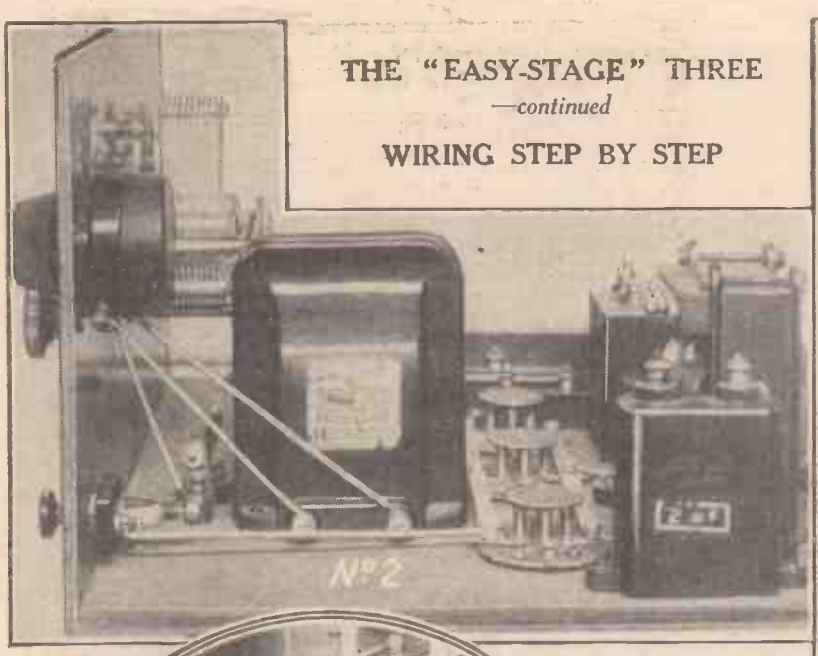


Here is a plan view photograph of the panel, baseboard and terminal strip with the components assembled, on which the dimensions for drilling the panel are very clearly shown. The numbers against the components are part of the specially simple scheme used to make wiring easy even for the novice.

THE "EASY-STAGE" THREE

—continued

WIRING STEP BY STEP



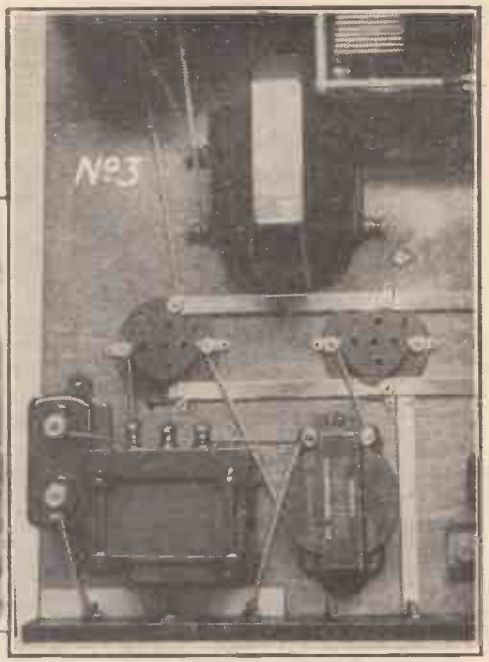
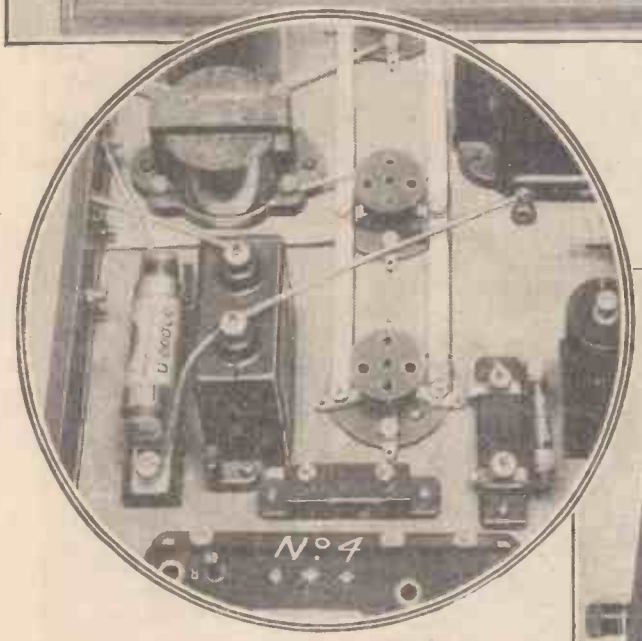
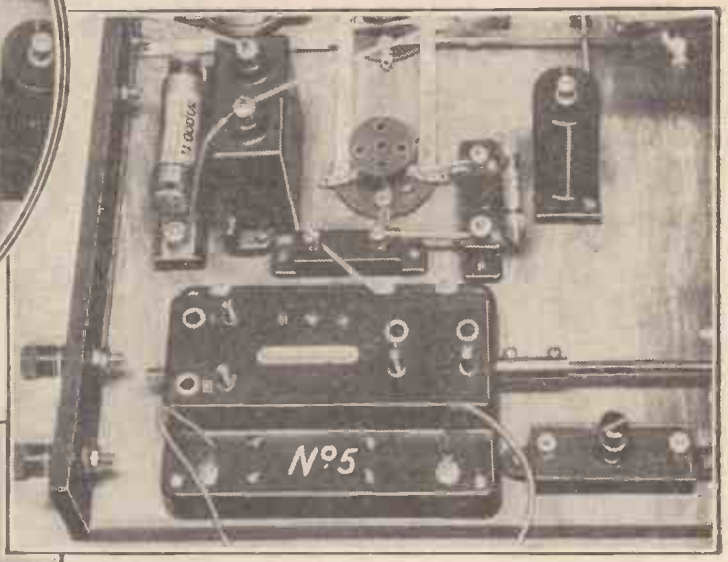
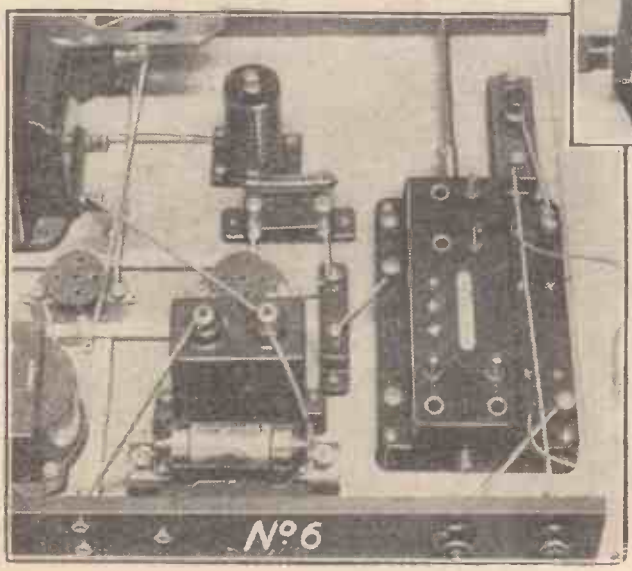


Photo No. 2 shows the first four leads put into place. They are at the L.F. end of the set, and further leads at this end of the receiver are shown in place in Photo No. 3.







In Photo No. 4 the connections to the de-coupling resistance and its by-pass condenser, both of which are part of the anode circuit of the detector, can be seen. The next two pictures show some of the wiring at the H.F. end of the receiver, including that to the grid of the detector valve. You will note that the leads associated with this latter point are very short, a matter which greatly assists efficiency.

components. The connections shown in the No. 5 photograph are 18 to 19, 20 to 21, 21 to 22, and 23 to 1.

Photograph No. 6 shows the addition of connections 5 to 31, 40 to 41, 32 to 33 (P.), 11 to 13, 14 to 15, and 16 to 17. Connections 18 to 61, 28 to 29, and 28 to 27 are shown in photograph No. 7.

The Flex Leads

The remainder of the stiff wiring is shown in photo No. 8, which incidentally shows the set complete, apart from the flex leads. The leads which have been added are 31 to 30 (both moving vanes), 24 to 25, and 24 to 26.

Photograph No. 9 illustrates the set ready to work, with valves, coils, and other accessories in place. There are three flex leads, one joined to 47 for

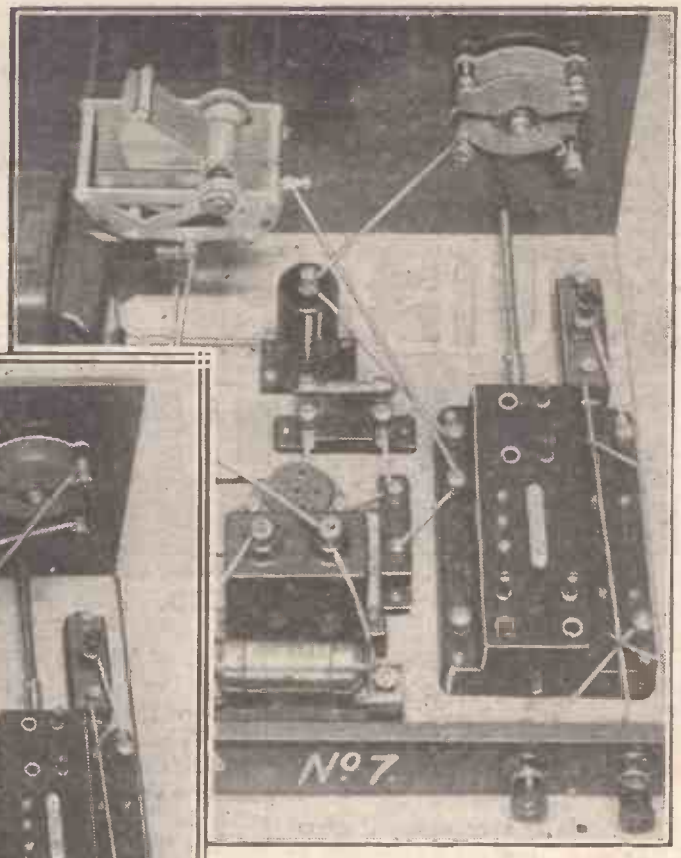
THE "EASY-STAGE" THREE

—continued

G.B.— 1, one to 6 for G.B.+, and one to 60 (G.B.—) for G.B.—2.

With the addition of these three leads the wiring is completed, and the set is ready to put into use. You may wonder why the L.T. positive lead was taken under the baseboard. The reason is that to take it across the top would make it unnecessarily long, and in the way of other leads. Incidentally, it is as well to cut a

(Continued on page 266.)



Among the leads shown added in Photo No. 7 are those to the top terminal of the H.F. choke. One of these goes to one of the sets of fixed vanes on the reaction condenser and the other to a terminal on the special coil holder.

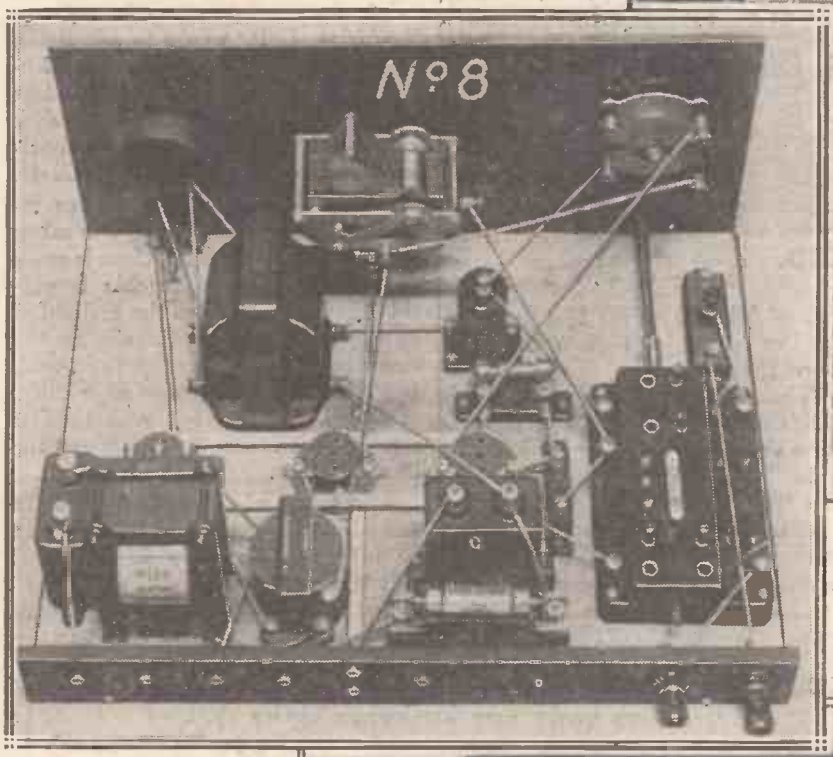
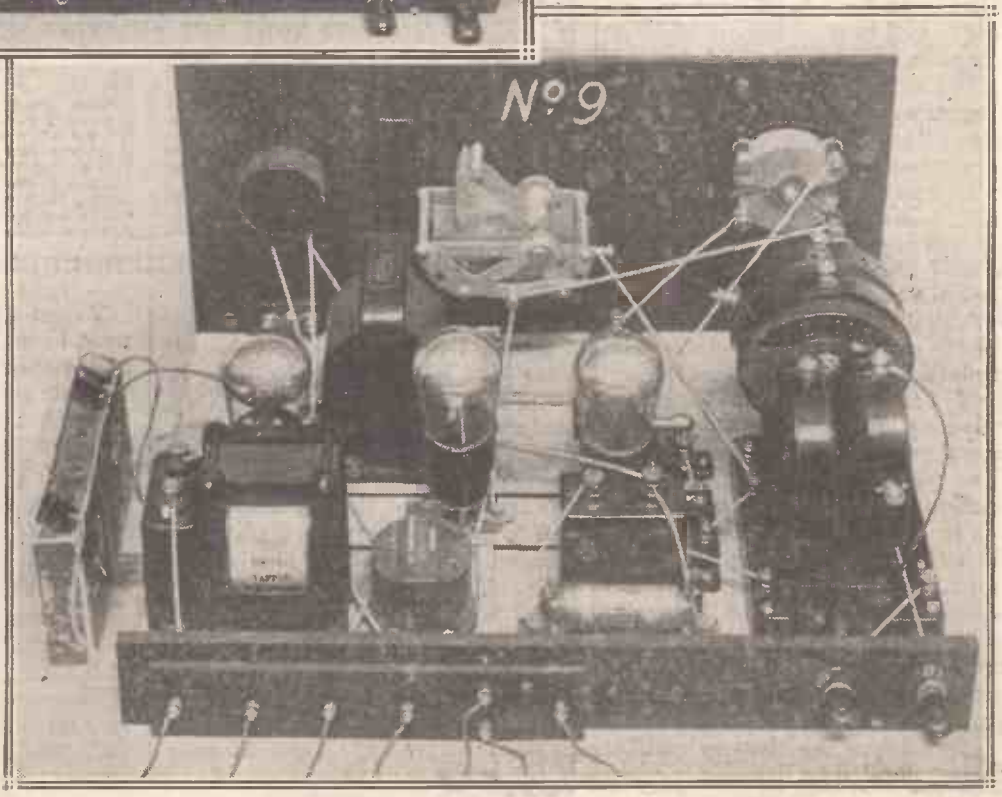


Photo No. 8 shows the final stiff-wire connections in place, and the set completed all but the flex leads which are required for the grid-bias connections. Although every lead runs straight from one point to another, you will agree that the wiring looks quite neat and pleasing.



In Photo No. 9 the set is shown all ready for its first trial. The G.B. battery has been connected up, and the valves and coils put in place. You will also see the special battery plug, with its leads, plugged on to the terminal strip, thus making it impossible to connect the batteries wrongly. The dimensions for the construction of this easily made strip are given at the end of the accompanying article.

Some interesting radio faults reviewed and questions answered.

By P. R. BIRD.

A "Frying" Noise

EVERY married man will feel a certain sympathy with G. S., of Southampton, who is in trouble because his set has started "frying."

"My wife is very annoyed about it," he says, "because it has cost over £4 altogether and, though it went fine at first, now all we can get is like a frying, sizzling noise, with the broadcasting as a background to it.

"She says she can get a good frying-pan at Woolworth's for 6d.—and what you cook in one of that kind is some good to you—but our wireless frying-pan is just a noise and nothing else! I've had an awful time since it went wrong. What causes this frying?"

Many readers who have experienced similar trouble will immediately say "L.F. transformer," and it is true that this is probably the commonest cause of frying trouble of this kind. There are, however, many other ways in which it can occur.

If the set uses an L.F. choke this may be the seat of the fault, or it may be a dud resistance—usually an anode or de-coupling resistance—but sometimes a grid leak or volume control.

Yet another quite common cause is a faulty cell in an H.T. battery, or even in a grid-bias battery, though this latter is much rarer than the former. All the above can give an almost continuous sizzle or "frying," combined with weak reception; and, of course, there are simply dozens and dozens of bad-contact faults which give intermittent sizzling and scratching.

Fortunately, the battery faults are easily located by listening-in with a pair of 'phones across 1½-volt tappings, or using a high resistance (several thousand ohms) in series with the 'phones to listen across larger sections of the battery. The faulty section shows up instantly by a loud "frying" and crackle.

For the other class of faults—breaks in transformers, poor contact in wiring, etc.—there is no better test than the 'phones and dry-cell method, which has often been described in this journal.

Dud Coupling Condensers

Several instances of bad reception and one of a ruined power valve remind me that not everyone realises the importance of using only good quality coupling condensers.

If a condenser of inferior quality is used you may get H.T. on the coupled-valve's grid, with disastrous results.

Short-Waver Won't Oscillate

In a letter all the way from Oran, N. Africa, L. P. wrote to ask if the short waves have "Jonahs"? Apparently his ordinary wave-length sets all work perfectly, but on short waves he never has any luck. Every short-wave set he builds refuses to oscillate.

As the components are all as recommended and every care was taken over spacing and wiring, there is small doubt but that the trouble is outside the set itself, or in the method of operating. Being continually on the move in different parts of the world, L. P. had tried all sorts of aerials, earths, batteries, etc., and thus it seemed that faulty operating was the likeliest cause.

All readers who have had difficulty in making a short-waver oscillate will be interested to know what caused this trouble, for it is still more common than it ought to be. Stated in two words, it was aerial coupling.

What are the "X's" For?

Several builders of the "Explorer" Four have raised the above query in connection with the two little "X's" that appear on the theoretical circuit diagram (October, 1930, issue). Although this point was explained in the article at the time, it may be as well to mention that these "X's" concern only the man who obtains the set's H.T. from D.C. mains.

Battery users and A.C. unit owners need not bother at all about the matter, but those who propose to run a D.C. mains unit with this set should place a 2-mfd. fixed condenser (high-working-voltage type) at each of the places marked.

To get good oscillation the aerial must be linked quite loosely with the grid circuit. So if the set uses a separate aerial coil it must be a *small* coil. A two-turn coil is generally sufficient.

If, on the other hand, the aerial lead clips on to the grid coil, it must be clipped low down (towards the earth end), or otherwise coupling will be too tight.

Sometimes a small condenser is used to vary aerial coupling, and in such a case it must be a really small condenser of the "neut." type; and very often it will need to be set nearly "all out" to get sufficiently slack coupling.

FROM D.C. TO A.C.

Many people hesitate over changing their sets from D.C. or battery to A.C. operation, because they are of the opinion that A.C. work must be full of snags. That is not so, as is shown below in this practical article

By G. W. EVANS.

THE listener who has electric light mains in his house has a very great advantage over the man who has no electric supply, and has to use batteries as his source of supply for the set. But many people do not make full use of their mains even when they have them.

I suppose most home-constructors commence their building of wireless receivers by making a battery model. Sometimes this will be all they want, and will give every satisfaction, but very often the time arrives when they begin to think of going over to the mains, either for H.T. only or for the running of the whole receiver. Then the inevitable question arises: "Shall I build a new set, or shall I convert my old one?"

The building of a new set is quite unnecessary if you are only going to take H.T. from the mains. Your old set can remain just as it is, and an H.T. mains unit can be employed to supply the necessary anode power.

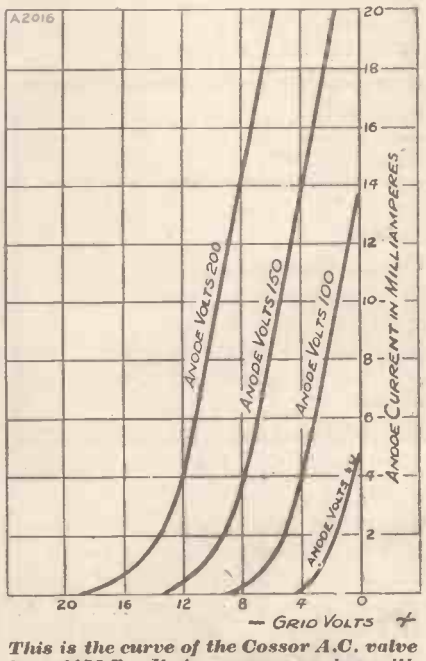
Your Safety Factor

When it comes to altering the set in order to use mains supply for heating the filaments of the valves, things may not be quite so easy. In the first place, apart from the fact that the filament wiring has got to carry raw A.C., we must not forget that indirectly-heated A.C. valves are very much more efficient in most cases than battery valves, so that we may expect to get more magnification per stage out of the set when A.C. valves are fitted.

This may or may not be good. Provided the set has a large margin of safety from instability and back-coupling, then the A.C. valves would probably mean a very great increase in the overall efficiency of the receiver; but if the set is giving a fairly high magnification per stage already, and the stages are not too well arranged on the L.F. side, or not properly screened on the H.F. side, then no end of trouble may arise when you put higher magnification valves in position.

I have come across cases where there has been severe motor-boating just because an A.C. valve was put in the first L.F. stage, though the rest of the set was left just as it was with battery valves in position. By the way, this method of converting from D.C. to A.C. is rather a useful one. There is no need to go the whole hog and convert every valve at once.

A HIGH-MAG. OUTPUT VALVE



This is the curve of the Cossor A.C. valve type 41M.P. It is a power valve with an impedance of 5,000 ohms and a magnification factor of 13.

A Gradual Change-Over

It is easy to buy or to make a little adaptor to plug into your ordinary valve sockets so that A.C. valves can be used, and A.C. filament wiring consisting of ordinary twisted electric lighting flex be connected to run the heaters of the new valves.

If the adaptor has no filament pins, but just plugs into the grid and plate sockets of the ordinary valve holder, then the ordinary wiring of the set need not be altered, because the A.C. wiring which goes to the filament sockets of the adaptor will make no contact with the filament sockets of the ordinary valve holders underneath.

And so by that means you can try A.C. valves in various positions in your set, just as and when you require them, and change them over one by one. When, of course, the whole set is finally to be changed over it is not advisable to use adaptors, but to use the correct valve holders and to re-wire the filament circuits of the set, using twisted flex.

Rheostat Regulation

When changing over from D.C. to A.C. there is no need to scrap your H.T. eliminator just because it has no L.T. output for A.C. valves. You can just buy a transformer for the A.C. filament circuit alone, making

From D.C. to A.C.—*continued*

sure that the transformer is a good one and is not liable to vary its voltage considerably as the number of valves used may vary.

For instance, if you want to convert your three-valve set a valve at a time, you do not want to get an L.F. transformer which will run three valves all right, but which when only used on one valve gives too high a filament voltage. A small rheostat capable of carrying an amp. or two, and consisting of only about three or four ohms, can usually be placed in circuit if you do have trouble of this kind, but it is best to get hold of a transformer which is guaranteed to be voltage-constant over a comparatively large variation in output.

The Transformer's Load

Where a large number of valves are eventually to be converted, you will find some difficulty in obtaining a transformer that will be constant in supply for one or the total number of valves, and I myself have recently converted a six-valve battery set in which, of course, I had to get a transformer capable of supplying the six valves satisfactorily, and at the same time I wanted to convert the set stage by stage.

In this case I had to put a variable resistance in the filament circuit, so that the voltage could be "broken down" when using a few valves, and this scheme proved entirely satisfactory.

Any little snags which cropped up in any particular stage could be dealt with before the final alterations were done. This way of doing things costs no more, though it takes a little longer, of course; but really you *do* know what is happening all the time.

For instance, suppose you have got an S.G., Detector, and two L.F. receiver, and you wish to convert it. If you want to get the whole lot done at once, you may have no end of a job to find out why and where the set has "gone into the air," if anything does go wrong; but if you start with the output valve, as I did, and work backwards towards the front of the set, you can deal with any little contingency that crops up, and easily cure it.

Stage by Stage

Starting with the output valve, work backwards through the set carefully, making sure that each stage is perfectly stable and free from hum. Do not worry about automatic bias at this stage, it can be done afterwards if you want it.

Then go on to the first L.F. and convert. If the set becomes unstable, you then know you have to put in more anti-boating devices, or arrange for a more suitable L.F. coupling. But that would be quite easy, because you know that if any trouble occurs it is entirely due to that L.F. stage. It is quite easy to rebuild only that part of the set if required.

The next thing to do is the detector stage, and here you may be troubled a little by hum; but this should not occur if you have been careful over the wiring of the heaters. It is an invariable rule never to take the filament wiring anywhere near the grid wiring of any stage if you can possibly help it, and to keep it, of course, away from any L.F. transformers.

USEFUL VALVES FOR A.C.

	Cossor	Marconi and Osram	Mullard	Mazda	Six-Sixty
S.G. ..	41M.S.G.	M.S.4	S.4V. S.4V.A. S.4V.B.	A.C./S.G.	4 S.G. A.C. 4 X.S.G. A.C.
Det. ..	41M.H.F.	M.H.4	354V.	A.C./H.L.	4 Det. A.C. 4 G.P. A.C.
1st L.F..	41M.L.F.	M.H.L.4	164V.	A.C./H.L.	4 Det. A.C.
Output ..	41M.P. or 41M.X.P.	M.L.4 P.X.4	104V. P.M.24B. (Pentode) A.C.104 A.C.064	A.C./P. A.C./P.1 A.C./Pen.	4 P. A.C. H.V. 4/1 H.V. 4/2

The earthing of the heater circuit, either by taking it to the cathodes of the valves (which in turn, of course, go to earth) or else taking the earth to the centre of your filament wiring in the transformer is a matter of choice and experiment.

From the point of view of the operation of the set there is no need to earth the heaters at all, but a certain amount of hum may be induced into the grid circuits of the valves from the heater wiring, even though this consists of twisted flex. You could, of course, use lead-covered cable; this would be better than twisted flex, but it is far more trouble and is not usually necessary.

However, we will assume you have got the detector done, using an A.C. valve which has an impedance of somewhere round about the same as your old battery valve.

Probably one of the M.H.4 or the Mazda A.C.H.L. valves will do here, but you will find that whatever make of A.C. valve you use in this stage the amplification factor will be something of the order of 35 and the impedance somewhere about 10,000 to 15,000.

'Ware Two S.G.'s

Having done the detector, and the L.F. side, and got it working properly, the next job, of course, is the H.F. This is more tricky, because the S.G. A.C. valve is very much more efficient than the battery S.G. valve, and instability is quite likely to occur.

To use the valve properly it is often necessary to increase the impedance of the anode circuit of the S.G. valve, but in many cases no alterations will be required to get quite good results, and all you may have to do is to screen the grid and anode circuits much more thoroughly.

If you have really bad trouble on the H.F. side, a line to the Query Department of WIRELESS CONSTRUCTOR will soon enable you to solve any trouble you cannot solve yourself. I must remind listeners, however, that it is extremely difficult to convert *two* screened-grid stages to A.C. unless you are prepared to rebuild the H.E. side of the set.

It can be done, of course, if care is taken, but it may mean considerable alteration in the design.

THE "KELSEY" ADAPTOR

Here is a natty little short-wave unit made by the designer of the famous "Antipodes" Adaptor, a device for short-wave reception that has been adopted throughout the world. Since Mr. Kelsey introduced this simple scheme of converting an ordinary receiver for short-wave reception he has carried out a great deal of experiment on the subject, and the adaptor described by him below is his latest creation.

By G. T. KELSEY

MR. VICTOR KING, with his famous "Explorer" series of receivers, was one of the first to tackle successfully that old problem of receiving short-wave signals without going to the trouble and expense of a special set for the purpose.

Converting Your Receiver

His scheme—which met with well-merited success—is to use an ingenious system of interchangeable coils, the details of which are already too widely known to need repetition here, and hundreds of listeners are using them every day.

But that is no comfort to all those readers who are in possession of non-"Explorer" designs.

For them the short-wave ether up to now has been pretty well non-existent, because prior to the "Explorer" sets there were very few designs suitable—or even adaptable—for transmissions taking place on wave-lengths below 50 metres.

And when you think that according to the latest figures given in the "Modern Wireless" World's Programmes, section there are upwards of 50 stations sending out really good transmissions between 19 and 50 metres, it does seem worth while to spend 30s. or so in order to be able to receive them—doesn't it?

What, you may ask, has the 30s. got to do with it?

The answer is simply this. Thirty shillings is an outside estimate of the cost of the parts with which to build the simple short-wave adaptor unit seen in the photos and described in this article.

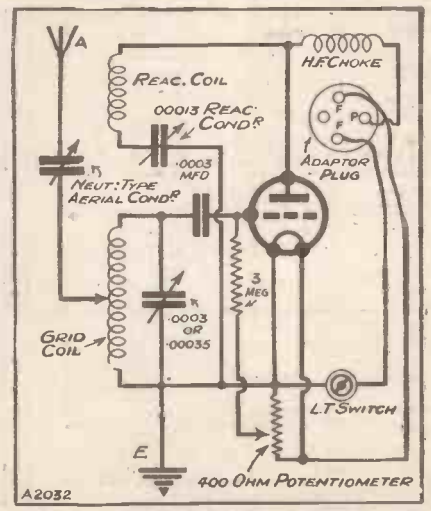
When you have built it, Australia, America, South Africa, in fact everything that there is worth hearing on the short-wave band, can be brought within the reach of your present broadcast receiver.

Fits Any Set

It matters not the slightest whether your set is purely a local receiver or a complicated "DX" design; so long as it has the conventional detector circuit followed by one or more L.F. stages it is quite suitable for use with this adaptor unit.

You are probably wondering how the adaptor is fitted. As a matter of fact, to join the unit to your existing

—AND THE CIRCUIT—



A simple circuit is used, so that there is nothing difficult in the construction or the operation of this ingenious unit.

THE PARTS—

1 Piece of copper or aluminium sheet, 12½ in. × 8 in. (For panel and baseboard) (Parex, etc.).
1 ·00035-mfd. variable condenser. (Formo, or Lotus, Polar, Ormond, J.B., Igranic, etc.).
1 Slow-motion dial (Ready Radio, or Igranic, J.B., Lissen, Ormond, Lotus, Formo, Brownie, etc.).
1 ·0001- to ·00015-mfd. reaction condenser (Lotus, or Lissen, J.B., Igranic, Dubilier, Ormond, Keystone, Formo, Ready Radio, Magnum, etc.).
1 L.T. switch (Lissen, or Igranic, Goltone, Lotus, Bulgin, Benjamin, Ready Radio, Keystone, Red Diamond, etc.).
1 Neut.-type series aerial condenser (Magnum, or Bulgin, Lissen, Igranic, etc.).
1 Sprung-type valve holder (W.B., or Lotus, Telsen, Lissen, Igranic, Benjamin, Clix, Dario, Bulgin, Magnum, Burton, Formo, Wearite, etc.).

—USED IN THE UNIT

1 ·0003-mfd. grid condenser (Formo, or Dubilier, Telsen, T.C.C., Lissen, Ediswan, Ferranti, Igranic, Ready Radio, Mullard, etc.).
1 3-meg. grid leak and holder (Dubilier, or Ediswan, Lissen, Mullard, Igranic, Ferranti, etc.).
1 Baseboard-mounting type potentiometer, 400 ohms (Ready Radio, or Lissen, Igranic, Wearite, etc.).
1 H.F. choke, short-wave or universal type (Igranic, or Magnum, Bulgin, Wearite, etc.).
2 Terminals, flex, Glazite, valve adaptor plug (see text), screws, wood for base-piece, alligator clip, etc.

COIL MATERIAL.

1 3-in. length of ribbed ebonite former (diameter 3 in. to outside of ribs) (Becol, or similar material).
10 ft. of No. 20 tinned copper wire (This may not be obtainable in quantities of less than ¼ lb.).
Wood screws.

The "Kelsey" Adaptor—*continued*

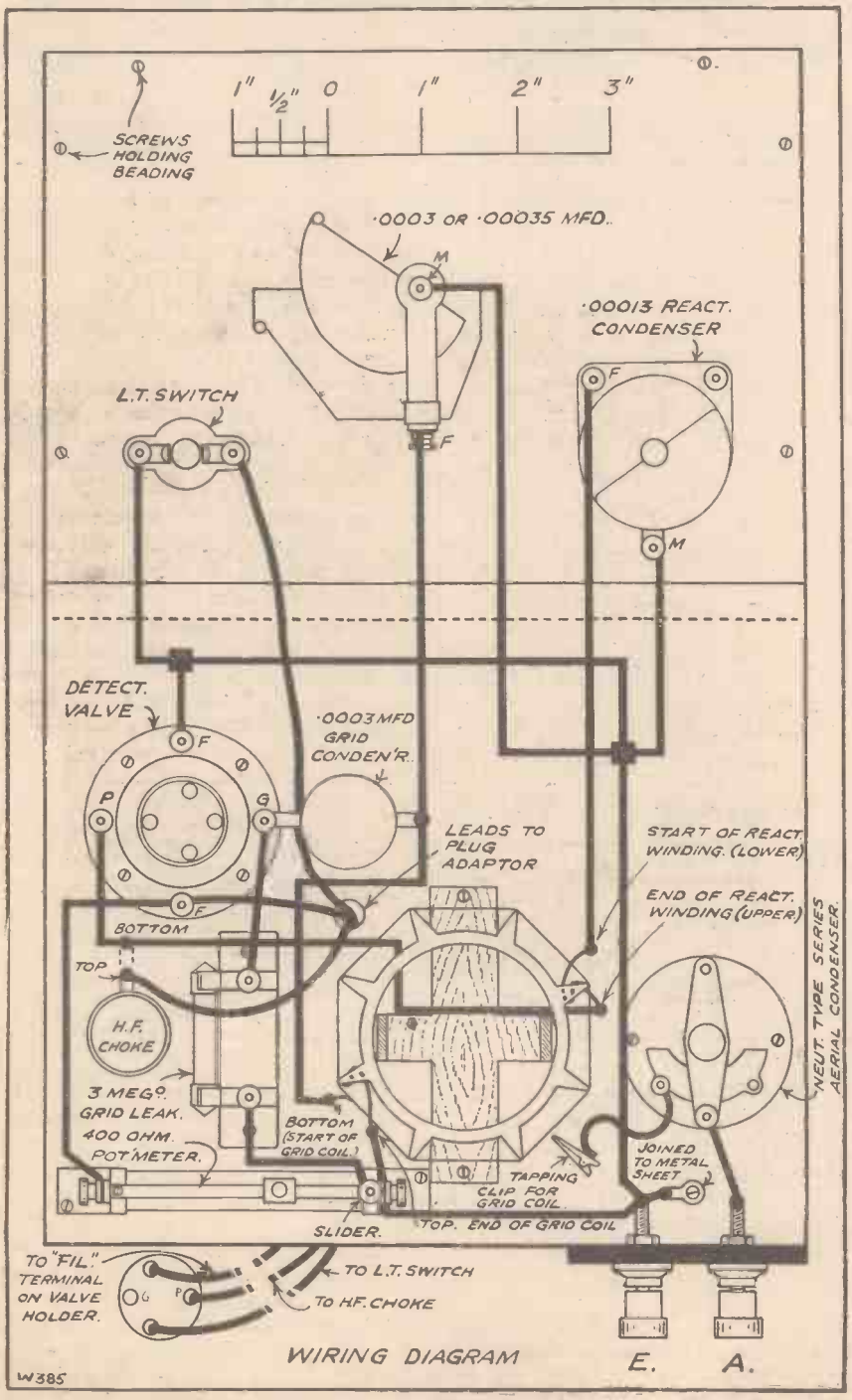
set is but the work of a few moments, and it involves no alterations or modifications to the present circuit arrangements. You simply transfer the detector valve from your set to the unit, and in place of this valve in the set you plug the lead from the adaptor.

This simple operation connects the adaptor unit to the appropriate position in your set; but, more than that, it automatically joins up the necessary batteries to the unit.

So that when you have changed over the aerial and earth leads you are provided with an entirely new band for searching—a band unlike those you have been used to, one which brings in countries in the remotest parts of the earth.

The way in which to spend your 30s. is shown in the component list. As has previously been mentioned, the total cost is liberally reckoned, and if you buy wisely you will probably find the total cost to be considerably less than the figure stated. But don't use "junk" parts for the sake of economy!

HOW THE COMPONENTS ARE PLACED



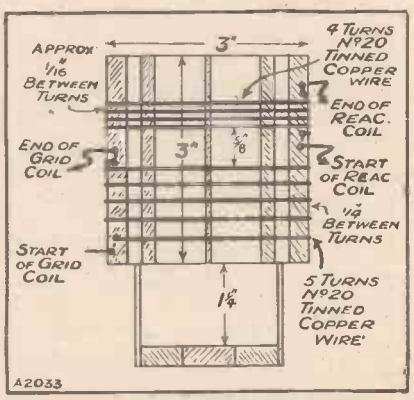
The positions of the components should be carefully noted, if your copy of the unit is to be as successful as the original.

Use Good Components

Efficiency on short waves is even more important than on the higher wave-band, and for this reason you would be well advised to choose only those parts which are of reputable make, a representative range of which is given in the component alternatives.

You cannot proceed very far in the constructional process until the special coil is made, so perhaps it would be best to deal with this first.

THE SPECIAL COIL



The home-made coil is easily constructed, as it merely consists of a few turns of bare tinned-copper wire.

By the way, the wave-range of this adaptor has been carefully checked with the Research Department wave-meter, and it covers from just below 19 to 47 metres. Your version will tune approximately over a similar range, providing due care is taken to follow the original specification.

Constructing the Coil

The construction of the coil is not a very difficult matter, especially if you refer to the detailed drawing given above.

As will be seen, the main grid coil consists of 5 turns of No. 18 tinned-copper wire, with spacing of ¼ in. between each turn. For the reaction coil the turns (four in all) need not be

The "Kelsey" Adaptor—*continued*

so widely spaced—$\frac{1}{16}$ in. between each should be ample.

There are two points of considerable importance which must be carefully borne in mind when winding the coil. The first is in regard to the distance by which the two windings are separated, and, secondly, the reaction coil *must* be wound in the same direction as the grid coil—that is to say, as if it were a continuation of the first winding.

An Important Point

The method in which to mount the finished coil is not of very great importance. Metal brackets must *not* be used, but otherwise so long as the coil is $1\frac{1}{2}$ in. away from the metal screen over the baseboard you can mount it in any way you find convenient.

For the metal panel and the screen over the baseboard you will next require the $12\frac{1}{2}$ in. by 8 in. piece of copper or aluminium sheet, and it should be bent to an "L" shape, with the vertical side $5\frac{1}{2}$ in. high.

You can, if you like, copy the original to the extent of fixing beading all round the vertical side, but this is purely for "show" purposes—and if omitted will not interfere in any way with the working of the finished adaptor.

The horizontal side is, of course, the one which covers the wooden baseboard, and when the "panel"—or vertical side—has been drilled, the baseboard screen can be screwed down.

The task of fixing the components is not a very terrible one, but there is one little precaution, even in this operation, which you would be well advised to follow carefully.

To avoid any possibility of shorts due to the metal parts on the undersides of components coming into contact with the baseboard screen, a small piece of cardboard should be placed under each one before it is screwed into position.

Simple to Use

The wiring is quite straightforward, and if carried out in accordance with the wiring diagram will not be likely to lead to any difficulties. The use of Glazite, or one of the other types of insulated connecting wire, is a wise precaution, on account of the panel and baseboard being of metal.

It seems hardly necessary to make any observations regarding the adaptor plug and the flex leads to it, because they are all shown in detail in the wiring diagram. You may, however, be wondering from where you can obtain an adaptor plug suitable for the purpose.

This is simply an ordinary gramophone pick-up adaptor plug, and is obtainable in several makes commercially—not that there is any real need to buy one at all. You can if you like use the base of a defunct valve, it will answer the purpose quite satisfactorily.

One of the very attractive features of this little short-wave adaptor is the ease with which it can be fitted to, or removed from, your present set.

This is probably as well, because if my surmise of the average set constructor is anywhere near correct, by the time you have finally completed the unit you will be "bubbling over" with enthusiasm to give it a try out!

First, then, remove the detector valve from your present set (if your set has any H.F. stages, the H.F. valves should be removed as well), place it in the adaptor, and stand the unit in a position at which you will be able to handle the controls easily.

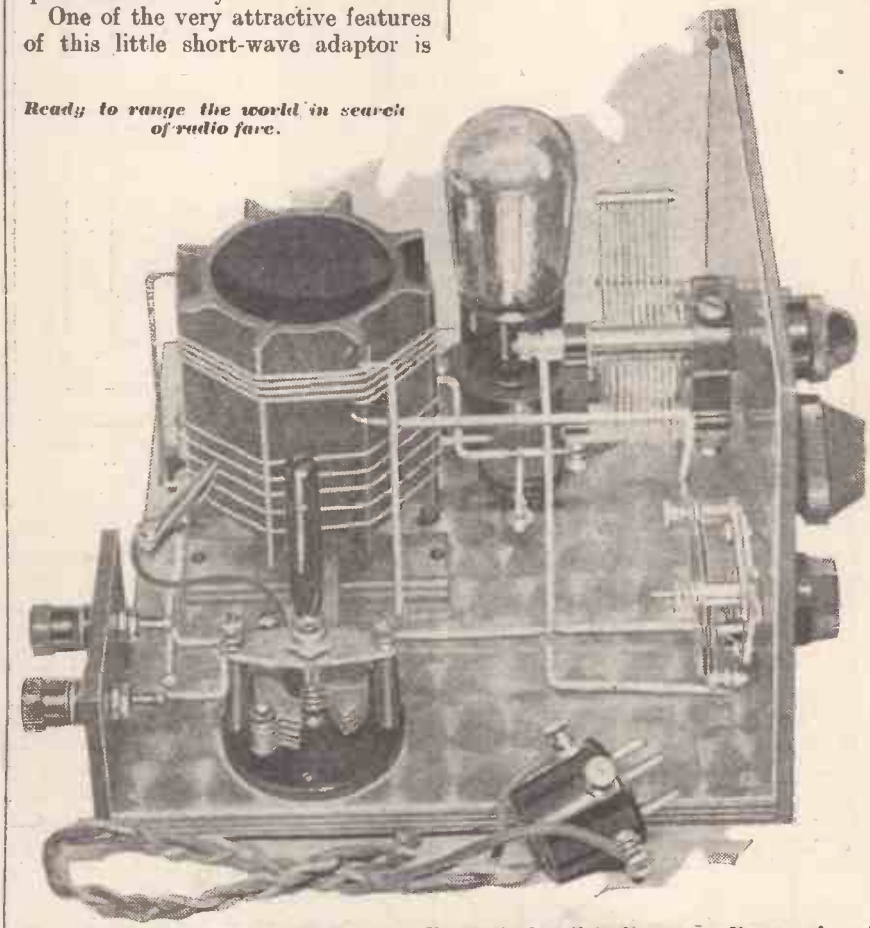
Plug the lead from the adaptor into the socket which normally carries the detector valve, and join the aerial and earth leads to the appropriate terminals at the back of the unit.

Searching for Stations

It is not advisable to use a loud speaker for the preliminary tests; in fact it is not an easy matter at any time to use a loud speaker when searching, because of the colossal distances over which you will be receiving and the particularly sharp tuning of short-wave stations.

When you have found a transmission of sufficient strength, then by all means change over to the loud speaker. But for the preliminary tests and when searching for distant stations, use a pair of 'phones connected to what are normally the L.S. terminals.

Ready to range the world in search of radio fare.



The "Kelsey" Adaptor ready for use. You just plug it in to your ordinary set, and immediately you have an efficient short-wave receiver.

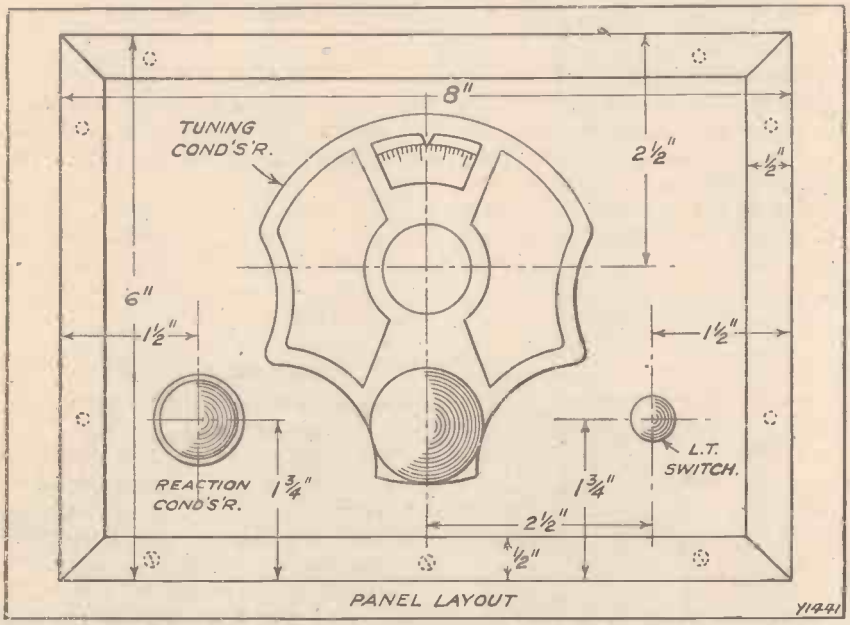
The "Kelsey" Adaptor—*continued*

The only control on the main set which requires to be touched when the adaptor is in circuit is the L.T. switch. Place this in the "on" position, also the filament switch on the adaptor unit, and with the clip from the small series aerial condenser attached to a point somewhere approaching the middle of the grid coil (the lower one), slowly increase the reaction condenser to determine whether the adaptor will oscillate.

When testing for oscillation, the slider of the potentiometer should be placed midway along the winding, and the moving vanes of the small series aerial condenser about halfway in.

The oscillation test should be carried out over the whole range of the tuning condenser, and apart from the possibility of one or two "dead" spots (these are caused by the aerial and are unavoidable) the adaptor should be found to oscillate throughout.

SIMPLE CONTROL IS A STRONG FEATURE



The controls of the adaptor are few and simple to operate. The L.T. switch is included in case you require to use the unit by itself as a one-valve set.

If any difficulty is experienced in obtaining oscillation you should try (*a*) altering the adjustment of the series aerial condenser; (*b*) shifting the clip on the grid coil to a turn higher up; (*c*) alteration of the potentiometer; and (*d*) increasing the H.T. voltage on the detector valve.

With regard to potentiometer adjustment, if you have difficulty in obtaining reaction you will probably find it helpful to move the slider arm towards the negative end of the winding.

Greater sensitivity, however, is usually obtained with the slider arm at the positive end, so that the ideal setting is for the variable contact to be as near to the positive end as is consistent with smooth reaction control.

By the way, the filament leads to the adaptor plug should, for preference, be connected in such a way that the one which comes from the L.T. switch is joined through to L.T. negative when the plug is inserted into the detector valve holder of your existing set.

If you join it up this way the negative end of the potentiometer winding will then be the one which is connected to the earth terminal, etc.

If you have any doubts as to whether the set is oscillating, touch momentarily with a moistened finger the fixed plates of the tuning condenser; whereupon a *double* click should be heard.

Searching for stations can, on this band, be carried out with the set in an oscillating condition. When you find a carrier-wave—or in less technical language, a howl—the reaction should be reduced until the set ceases to oscillate, and you should then hear signals.

Bear in mind that searching on short waves is very different from broadcast and long waves, and the tuning must be carried out very slowly. It is also imperative for reaction to be smooth.

Avoid that "Plop"

The unit should not go into the oscillating condition with a "plop," and if there is the slightest trace of roughness, try moving the potentiometer slider, varying the aerial series condenser and, if necessary, altering the position of the tapping clip on the grid coil. One or other of these suggestions will no doubt enable you to overcome the difficulty.

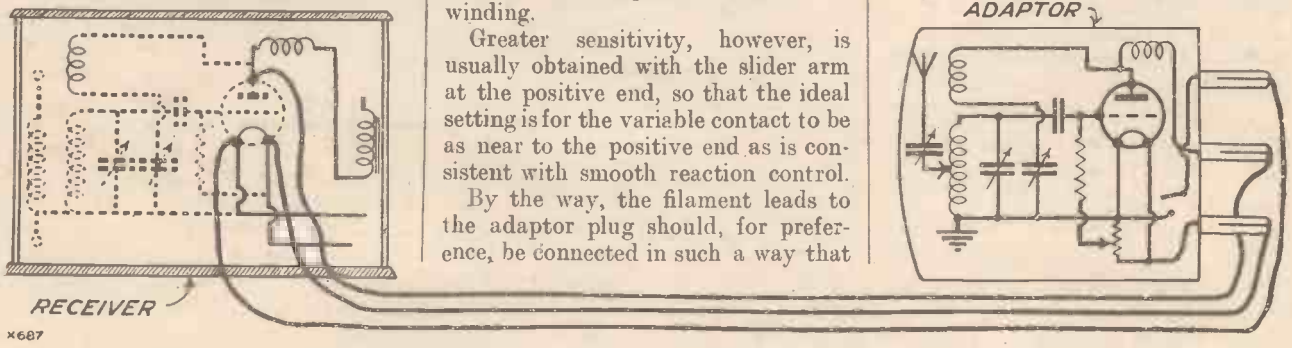
Do not be disappointed, particularly if you have never previously handled a short-waver, if you fail to achieve satisfactory "DX" results right away.

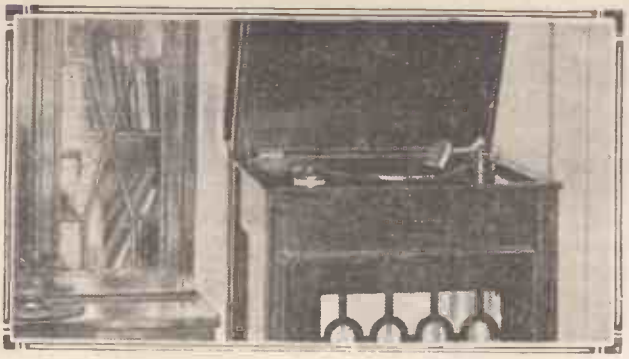
"Continentals" can be heard at almost any hour of the day, but when searching for the more distant short-wave broadcasters it is necessary to make allowances for the time differences which exist.

Certainly, nowadays, many of them put on special programmes to fit in with evenings corresponding to G.M.T.

REMOVE YOUR DETECTOR—

—PLUG-IN THE ADAPTOR





WITH PICK-UP AND SPEAKER

"Adequate" Volume—The Power Problem—Advantage of A.C.—An Excellent Pick-up—Fitting Volume Controls—Pentode Valves—Storing Records—Cutting-out Radio.

Conducted by A. JOHNSON-RANDALL.

MORE and more do I become convinced of the ever-increasing popularity of the gramophone pick-up. Practically every day my post contains a growing number of requests for details of modifications to existing sets?

Have you noticed the number of commercial designs on the market which have switching arrangements so that a pick-up can be used if desired?

In the future I believe that every set with one stage of L.F. will have pick-up terminals included. One of the most frequent questions I get is: "Will my set give sufficient volume for pick-up work?"

"Adequate" Volume

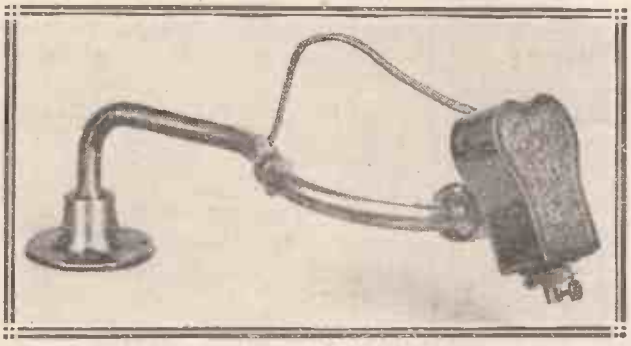
There was a time when three L.F. stages were needed, but these days it is possible to obtain pick-ups which give adequate volume with two stages. And with a pentode output there is no purpose in using three L.F. valves, in fact it would be difficult to prevent overloading except with very high anode voltages.

The question is, what is adequate volume? To my mind it is a strength sufficient for the *ordinary* living-room and equal to that which gives satisfaction in the case of the broadcast programmes.

Some people require the same volume as can be obtained from a large gramophone going "all out."

But a gramophone, even a small portable, can give a relatively big volume, and the average power valve needs a pretty "hefty" anode voltage to handle the same amount of energy without distortion. You cannot do it with 120 volts unless you have a very sensitive speaker, and experience has taught us that super-sensitivity and first-class reproduction rarely go hand-in-hand.

A SENSITIVE PICK-UP



The Wates "Star" pick-up which was reviewed in these columns last month. It is sensitive and extremely moderate in price.

The Power Problem

It is sad, but true. Moving-coil loud speakers and those cone units which are the next best thing are not super-sensitive, although they are certainly sensitive. But to get crystal-clear reproduction with no unpleasant little dithering on the loud passages, and to bring out the "low stuff," you must supply plenty of undistorted energy and in consequence you require anode voltages of 150 or more. Of course, I am only referring to volumes which are equivalent to those of the ordinary gramophone (with the shutters open).

But there is another side of the question. For good reproduction over the recorded band of musical frequencies give me the electrical equipment every time.

Advantage of A.C.

Those who have A.C. mains are particularly fortunate.

The battery user is compelled to economise in the matter of H.T. voltages. To get lots of current, and anode voltages of 150 or thereabouts, it costs money. The man with A.C. mains, however, has no difficulty. If his mains unit is a good one he can obtain 200 volts quite easily and, moreover, he can use "super-powers" to handle the energy. If he is limited to a small set he can use an A.C. pentode, and with one L.F. get all the amplification necessary.

D.C. mains are not quite so adaptable, but, still, it is possible to obtain 150–180 volts with a first-class unit working from 210–220-volt mains. The smoothing chokes have to have a low D.C. resistance, particularly if the anode current is heavy, in order to obviate excessive voltage drop.

Many cheap units fail in this respect, because it is impossible to turn out chokes that will give proper smoothing to small voltage drop, etc., at 30

BURNDEPT'S LATEST MODEL

This is the Burndept pick-up and tone-arm. It is of the needle-armature type and has a remarkably good frequency characteristic. Slightly increased sensitivity is provided at the lower end of the musical scale—a valuable feature.

With Pick-Up and Speaker—*continued*

milliamps or more at the price. Such chokes as these have to have a carefully designed core and are wound with comparatively thick wire.

An Excellent Pick-Up

Messrs. Burndept Wireless (1928), Ltd., recently sent us one of their latest pick-ups with tone-arm complete. One of the features claimed by the makers of this pick-up is the small strain on the record grooves owing to the extremely low damping of the armature.

The pick-up and tone-arm are very light in weight and nicely finished in oxidised copper. The two flexible leads from the magnets pass through the centre of the tone-arm, which is tubular, and are not visible when the pick-up is screwed into position on the turntable baseboard. Each pick-up is supplied with a cardboard template to ensure proper tracking.

The curve of the Burndept pick-up appeared in a previous issue of this journal, and it is a remarkably good one. There are no peaks between about 125 and 5,000 cycles.

At the higher frequency the curve begins to drop and at the lower frequency to rise. This lift-up at the lower end is a valuable asset in the reproduction of the bass, because this is approximately the point where the curve of the ordinary gramophone record commences to fall away.

The upper cut-off on a record is in the neighbourhood of 5,000–6,000 cycles, hence the Burndept pick-up covers the range perfectly and has the added advantage already mentioned.

By the way, those of you who refer to the maker's curve should bear in mind that the various bumps are quite unimportant in practice.

Three L.F. Stages

The Burndept pick-up is not as sensitive as some, and it requires three L.F. stages for powerful results. In the average receiver with two L.F. stages it should be inserted in front of the detector valve. I found that one R.C. stage, followed by a stage of transformer coupling and then the output valve, gave medium volume on a permanent-magnet-type moving-coil speaker.

The volume control across the pick-up should have a value of 10,000 ohms. The makers state that if a higher value is used the high frequencies and scratch are accentuated. On the other hand, a lower resistance reduces the higher musical notes.

There is no doubt that this pick-up is an excellent proposition, and Messrs. Burndept inform us that it is used by the B.B.C.

* * * *

Here are some queries of general interest which I have selected from those received during the past month.

Fitting Volume Controls

N. R. (Birmingham).—"Does it matter whether the volume control is fitted to the turntable cabinet or to the panel of the set? The type of volume control to which I am referring is the usual potentiometer connected straight across the pick-up."

SOME "STUNT"!

A new use for gramophone amplifiers? A microphone and a loud speaker are fitted to this car instead of the usual warning device. The microphone is connected to an L.F. amplifier, the output of which is joined to a speaker in the normal manner.

No, it is immaterial where you fit the volume control so long as it is joined between the pick-up and the input terminals of the amplifier. It is sometimes more convenient to fit it to the turntable cabinet.

Pentode Valves

L. J. (Barnehurst).—"I should like to increase the volume of my det. and one L.F. receiver so that I can use a pick-up in the detector circuit. I am thinking of using a pentode. Do I have to employ an output filter or does the pentode simply plug into the last valve holder in place of the power valve?"

It is usual to insert a pentode output transformer—which is merely a transformer having a suitable primary winding—in the anode circuit of the pentode. I cannot specify the ratio because I do not know what type of loud speaker you are using. I suggest you obtain one of those transformers which have several tappings so that you can experiment for yourself.

Storing Records

"GRAMO" (Ipswich) asks how he can best store his records. He says that if they are placed edgewise they are liable to warp, whereas if they are stored flat the weight of the pile on the bottom records will crack them.

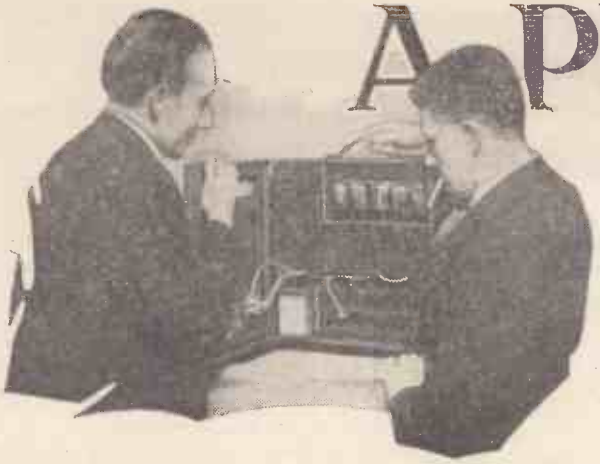
This all sounds very terrifying, but if my correspondent takes a glance at the methods used by most gramophone dealers I think he will find that the records are usually stored edgewise.

They are carefully packed on shelves which have just the right height and depth, and each record helps to support the other. If this scheme is employed they cannot warp very easily. "Gramo" will have comparatively few records, perhaps fifty or so, and so I suggest that he splits his shelf into several parts with the aid of vertical wooden partitions. Each of these little "cubby holes" can take, say, six records placed on end, and if these fit snugly there is not much likelihood of warping. I, personally, have never had a single record warp. Moreover, I scarcely think the modern record would crack if placed on a flat surface, provided the pile did not consist of more than a dozen records.

Cutting Out Radio

H. R. S. (Nottingham).—"My set is a four-valver, with a screened-grid H.F. stage. I am rather keen to modify it, thus making it a radio-gram. I have used a pick-up and adaptor which plugged into the detector socket, and I found that I could still hear the radio programmes. This was unsatisfactory. Surely this will not happen if I insert a proper switch so to bring the pick-up into circuit when required?"

You were probably using a badly-designed adaptor. These pick-up adaptors should only have three pins, two of which go into the filament sockets of the valve holder, the other making contact with the anode socket. In this case the preceding grid circuit is cut out.



A PRACTICAL MAN'S CORNER

Some valuable hints for the home-constructor.

By R. W. HALLOWS.

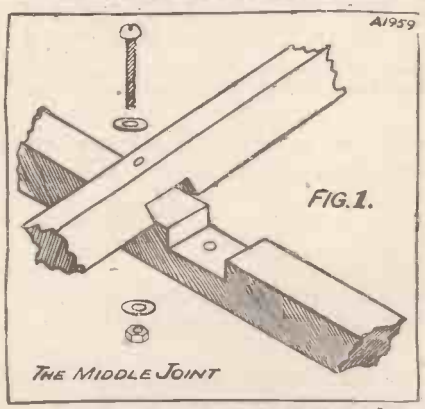
MANY people, I find, have difficulty in making the ever-useful halved-in joint satisfactorily, though actually it is exceedingly easy to do if only you set about it in the right way. The joint when finished should be so firm that the two portions are tightly united even before the securing bolt is put into place.

It Has Other Uses

This joint was illustrated in these notes in the December issue and is reproduced as Fig. 1. It will be seen that it is made by cutting a rectangular portion away from each member, the result being that the surfaces of the two parts are flush with one another.

I should mention, by the way, that its usefulness is not limited to frame-

A DIFFICULT JOINT



Here is the halved-in joint that many people find difficult to construct.

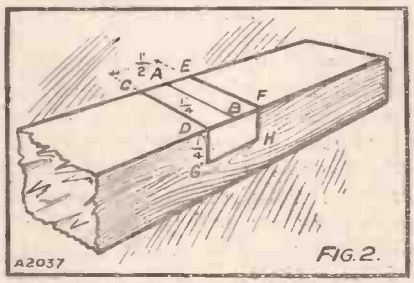
aerial making; it comes in very handily for a variety of home workshop cabinet-making jobs.

Don't forget, too, that the halved-in joint is not confined to the "X" form; you can make "T" joints just as well in this way.

Most of those who produce nothing but wobbly halved-in joints fail because their initial marking out is incorrect—or rather, perhaps I should say, because it is too correct. This dark saying I will now endeavour to explain.

If you have to halve-in two pieces of wood of ½-in. square section the natural thing to do is to draw first of all the line AB in Fig. 2, which indicates the mid-line of the joint, and then to mark in the thick lines CD and EF a ¼ in. on either side of it.

HOW IT IS DONE



"Merely a matter of accurate measurement."

Next GH is drawn exactly a ¼ in. below DF, and lines are drawn to meet its ends by means of the set-square. And what is wrong with this?

Exact Details

A piece of ½-in. wood is to fit into the slot cut. The slot is made exactly ½ in. wide; then a perfect fit should be ensured. Perfectly, but if you make CD and EF a full ½ in. apart you will find that when you have made your saw-cuts along them and removed the unwanted piece of wood the slot is *more* than ½ in. in width, so that the other member of the joint is a very sloppy fit into it.

What we actually need to do is to make the slot rather *less* than ½ in. in width. Even hard wood is to some extent elastic, and in wood-working the practical tight joint is one that is theoretically too tight!

The key move in making a halved-in joint is to mark it out first of all as shown by the lines in Fig. 2, but dotted and then to rule firm lines *well inside* the dotted ones. Here is the detailed procedure.

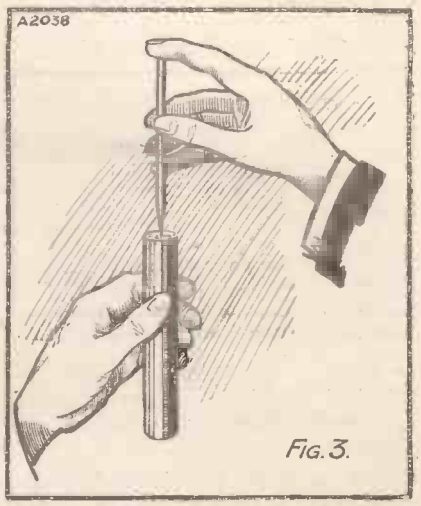
Rule the middle line AB and make light lines CD and EF parallel with it and a ¼ in. away on either side. Then rule in a firm line CD and a firm line EF, each 1/16 in. inside the light ones. Rule GH ¼ in. below DF and exactly parallel with it, and produce your firm lines to meet it.

Make a Tight Fit

With a tenon saw cut through CD and EF until you meet G and H. Take a ¼-in. chisel and remove the unwanted rectangle of wood. Trim up the inside of the slot very slightly with a file.

When you measure the width of the slot now you will probably find that it is about 7/16 in.; it may be a little more or a little less. Treat the other member of the joint in exactly the same way. Now see whether the two pieces look like fitting into one another with a little persuasion.

DRILLING BRASS ROD



Using a centre-punch for marking brass rod

A Practical Man's Corner—*continued*

If they do not, do a very little more work on each slot with a file. But do not continue filing until they are an easy fit. Stop when the two parts of the joint still refuse to enter one another when pressed with the fingers.

Persuasion

Now lay one member flat on the bench with the slot uppermost and place the other in position over it, its slot, of course, being on the underside. Take your mallet and tap the top member gently.

Continue the gentle persuasion with the mallet until the upper surface of the top member of the joint lies flush with that of the lower. Then pick up the finished "X" or "T," as the case may be, and you will be delighted to find that the two pieces of wood are fixed together without any shake or movement.

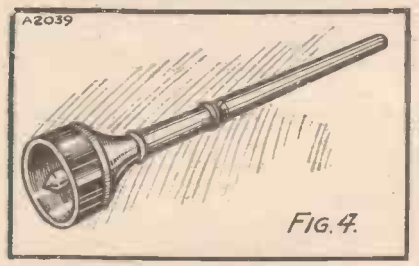
All that you have to do now is to pass a No. 26 Morse drill through the middle of the joint for the securing bolt.

Other Angles

So far we have considered only the right-angled "X" or "T" joint, but it is just as easy to make them at any angle. Here is the method.

Lay the two pieces of wood one on top of the other so that they cross at the desired angle. Use the sides of each as a guide for your pencil and rule in preliminary lines. Measure the distance between each pair of parallel lines, and you will undoubtedly find that it is a good deal over the half-inch.

THE BELL-PUNCH



A useful tool for centre-punching cylindrical objects.

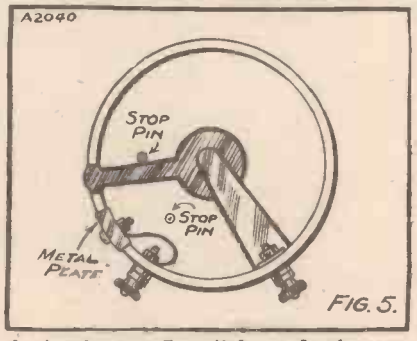
Rule inside lines ⅜ in. apart, and let these be your guide when making the saw-cuts. The golden rule is always to make the slot rather too small to begin with, for you can enlarge it slightly with the file if necessary.

Drilling Brass or Ebonite Rod

It often happens that we want to drill a hole in the centre of a piece of ebonite or brass rod when engaged in wireless constructional work. Such jobs arise when extension handles of any kind are being made, when we are ganging condensers, making formers for fixed resistors, and so on.

If one possesses a lathe the job is

USE FOR OLD RHEOSTATS



A simple on-off switch made from a rheostat.

quite easy, for the rod is simply put into the chuck and rotated, whilst the drill is mounted in a back-centre drill chuck. But without a lathe it is very easy to make mistakes, for the location of the centre must be done by eye, and the human eye is distinctly fallible in such matters.

I am assuming that neither a scribing block nor a bell-punch, such as that illustrated in Fig. 4, forms part of the tool kit. (I will return in a moment to the bell-punch.) Here is a method of centring which enables work to be done with quite a useful degree of accuracy.

First of all, make sure that you have filed off the end of the rod perfectly flat, and that its surface is at right-angles with the sides. Now hold the rod vertically in your left hand as shown in Fig. 3, and in the right hand take a scriber or a fine-pointed centre-punch.

Finding the Centre

Put the point of this tool at what you *think* is the centre, and then rotate the rod slowly with the left hand. You will easily be able to see whether the point of the tool remains still or travels eccentrically as the rod is turned. By slighting shifting its position as required you will have no difficulty in finding the approximate centre.

The bell-punch, which costs very little to buy, is an exceedingly useful addition to the tool kit. The type illustrated in Fig. 4 will centre any round material up to ⅜ in. in diameter, and this is a very useful size for the wireless man's workshop.

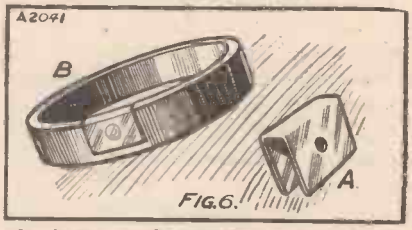
The rheostat is, nowadays, almost as out of date as the coherer, for modern dull-emitter valves are now made to fit 2-, 4-, or 6-volt batteries without any intervening resistance. Most of those, though, who have been wireless enthusiasts for any length of time must possess collections of old rheostats for which there is no apparent use.

Actually, rheostats of most patterns can be turned very easily into excellent on-and-off switches. Figs. 5 and 6 show how the deed is done.

The first process is to remove the resistance wire windings, and to insert a small contact plate into the insulating ring previously carrying them. Fig. 6 gives an idea of the way in which this is carried out.

From a piece of sheet brass, German silver, or other suitable

THE FIRST STEP



The brass contact plate inserted in the ring.

metal, cut a strip about ⅜ in. in width by 1 in. in length. Bend this into the shape of a narrow "U," as shown in Fig. 6a. In the rim of the insulating ring file a shallow slot ½ in. in width.

Fitting Stops

The depth of the slot should be such that when the plate is slipped over the ring and pressed down into the slot, the surface of the metal is just level with the face of the ring. Drill a hole right through the plate and ring, and pass a 6 B.A. bolt through. Take a wire from this bolt to the rheostat terminal that is *not* connected to the contact arm.

A couple of stop pins are required to prevent the contact arm from going too far in either direction. If you have no proper contact pins in stock, you can make them either from a piece of studding or from 4 B.A. or 6 B.A. screws.

HOW MANY STAGES?

The "Wireless Constructor" Ideas Committee discusses a subject that is frequently a bone of contention between set designers. But they arrive at a completely unanimous conclusion on at least the most vital issue.

AT the last meeting of the WIRELESS CONSTRUCTOR Ideas Committee, Victor King mentioned that he had recently engaged in an interesting argument with one of his friends.

It seemed to him that their topic would form an excellent subject for the Committee to discuss. In short, it was this.

In America the tendency has always been to extend valve stages; while British practice is, on the contrary, to get as much out of each valve as possible and limit the stages to the barest minimum.

American Eight-Valvers

"I know," said Victor King, "that nearly all Americans have A.C. mains and that they do not have to worry about running costs, and that the *raison d'être* of their popular eight-valvers is mainly to achieve selectivity and stability in mass-production duplication. Nevertheless, it seems to me that our policy of striving for the minimum of components and of valves has a greater significance than is apparent in mere economy. I would certainly very much like to hear what you fellows have to say about it. But don't forget that discussion we had on a similar subject a few months back. That time, however, we dealt specifically with the size of sets built according to existing conventions, and using existing components and valves.

Important Questions

"This time I would like your opinion as to the merits or demerits of shaping our progress in valve, component and accessory design to obtain the minimum of parts in our sets. It seems to me that either America or Europe is wrong.

"My questions really bind themselves down to:

"1. Do we want high-mag. valves?

"2. Are several low-mag. stages better than one or two high-mag. stages?

"And the factors to consider are: selectivity, overall sensitivity, quality of reproduction, initial and running costs, stability and ease of control.

"The queries do not directly concern us as much as the Radio industry, the designers and makers of valves particularly. But it is up to us to give them a lead if this is possible."

In continuance of the discussion, Mr. A. S. Clark said:

"At present it is difficult to say with any real certainty which scheme of development is the right one, and it will be necessary for both to be carried much farther before the answer will be obvious.

"To aim at efficiency seems the logical way, for simplification of the methods used to obtain efficiency can always follow. At present it may be easier to get certain results with numerous valves, but this method appears to me to be taking the lazy man's path without looking ahead.

"Although I am in favour of small, efficient sets, I do not agree with those who consider that they are cheaper to manufacture. Components for such receivers have to be made more carefully than those for small-gain-per-stage sets, and they are often more complicated.

Using the Mains

"It is, therefore, quite possible that a number of simple, uncritical components can be made more cheaply than a few 'precision-type' parts.

"I do not think the use of mains has very much bearing on the matter, for a small set using the efficient mains valves has as much advantage over a battery-operated set as a multi-valve mains receiver.

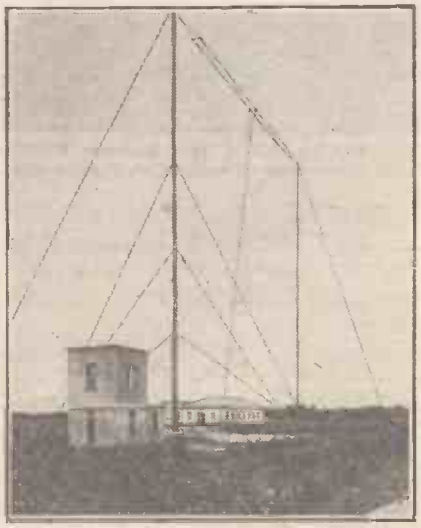
"Then there is the question of selectivity, which, like the main question, has its decision in the future, for our present theories regarding selectivity with good quality are all topsy-turvy. If it is eventually universally accepted as O.K. to get selectivity with one sharply-tuned circuit, then this is a great point in favour of few valves.

"On the other hand, if many tuned stages are to be necessary, we might as well have many valves. The Stenode Radiostat seems to bear out very strongly the possibility of the latter being unnecessary.

Background Noises

"Another point is the matter of background noises. It is often said that a quiet background is one of the advantages of many stages. Since background noises are partly valve noises, I doubt whether the background on a multi-valve set would be less than from a very efficient two- or three-valve set if the overall magnification were the same. In fact, it might quite conceivably be more.

"RADIO MILANO"



The well-known Milan broadcasting station. Milan has a lady announcer and uses 8·5 kw. of power on 501 metres.

How Many Stages?—*continued*

"A strong argument in favour of development along maximum efficiency lines is to be found in the ever-increasing popularity of transportable sets, and the demand for a really small and light portable set.

Often Overlooked

"De-coupling is a factor which is often overlooked. A set using more than one stage is bound to be liable to the effects of back-coupling. The likelihood of such coupling causing troubles increases with the number of valves, and therefore more de-coupling devices and special precautions against unwanted coupling are needed.

"You will have gathered that in my opinion the answer to Mr. King's second question can really be answered definitely only in the light of future developments, but that personally I think fewer valves will win.

"If we do go in for fewer stages, then, of course, we shall want high-mag. valves; but even if we do not eventually concentrate on small sets there is no reason why we should not still have high-mag. valves. They can be used in low-mag. stages by suitably arranged coupling devices and then those who want high-mag. can have it for the super-efficient, simple sets which will never die right out whatever happens.

"They will always be kept alive by the demand, to which I previously made reference, for smaller and lighter portables.

"The fact that manufacturers seem to find it easier to turn out, on a commercial basis, a mass-produced multi-valver with low-mag. stages than an equally effective, highly efficient small set (also mass-produced), is an admission of inadequate research departments and slip-shod methods in workshops and assembly rooms."

A PRE-WAR VALVE SET

This valve set was constructed in 1913. The constructor of this historic relic is seen beside it during its exhibition at a radio show held at Lausanne, Switzerland.

Mr. Johnson Randall then said:

"My friend, Mr. Victor King, puts forward an argument in which there are many points in favour on both sides.

Those Long-Wavers

"To my mind the most progressive method of obtaining efficiency is to aim at high mag. per stage, thereby limiting the number of valves to as few as possible.

"Valves in this country are more expensive than they are in America, and radio set manufacturers have certain royalties to pay, which increase with the number of valves used. These charges, of course, have to be passed on to the purchaser, and consequently large sets are necessarily expensive.

"The American idea is to have a number of tuned H.F. stages, each stage having a comparatively small magnification, the tuning of each individual circuit being on the flat side. Thus it is possible to gang these circuits together, operating them from one control. It must be remembered that the Americans are not concerned with wave-change switching problems. In this country we have the long-wave stations to consider.

Vastly Different Conditions

In a scheme of this type any slight differences in the individual circuits do not show up so much as they would if high-efficiency sharply-tuned stages are employed. There is no reason why British manufacturers should not do this if they wish, but there is the cost of the valves and the royalty to be considered.

"The problems in the two countries seem to be so different that it is difficult to compare them. I understand that in America selectivity is vital, and that in New York State alone there are more than forty broadcasting stations. It is true that many of these transmit on a very low power, but in any case it seems logical to conclude that high selectivity is essential if interference is to be avoided.

Simplifying the Tuning

"Moreover, large sets with single controls are easier to operate on distant stations than comparatively small high-efficiency sets with more than one tuning control.

"In any case, two H.F. stages seem to be all that are required in this country for the reception of the stations that matter.

"For the tuning-in of the more powerful transmissions thumb-control condensers, which can be operated more or less simultaneously, give practically the equivalent of 'ganging,' and have the additional advantages of individual movement when very fine tuning is needed.

"Except from the point of view of mass-production methods and prices, I do not think that the Americans

(*Continued on page* 267.)

PURE LISSEN CURRENT FROM YOUR MAINS!

You cannot get purer current for radio than the pure D.C. current of a Lissen Battery—BUT IF YOU WANT TO USE AN ELIMINATOR USE A LISSEN ELIMINATOR.

Because no current from any eliminator is smoother or more silent than the current from a Lissen eliminator. No eliminator output is more constant, none is so free from hum.

Lissen have made eliminators safe—notice that the neat moulded cases of these Lissen Eliminators are made entirely of insulating material—see also the thickly insulated "cab-tyre flex" that Lissen have used.

Lissen too have made it easy for you to choose the right eliminator—there are only four models and they satisfy the requirements of 90% of listeners. In producing these eliminators, Lissen have compared their current with the purest form of current known, namely the Lissen Battery, and have got as near to that standard as it is humanly possible to do.

If you are buying an eliminator, be sure to see a Lissen Eliminator. Your Dealer will be pleased to show you one that will suit you.

TYPES AND PRICES.

D.C. MODEL "A"
(100-150 volts and 200-250 volts).

Employs 3 H.T.+ tappings: H.T.+1 giving 80 volts for S.G. valves; H.T.+2 giving 60 volts at approx. 2 mA. for detector valves; H.T.+3 giving *120/150 volts at 20 mA. Price 27/6

D.C. MODEL "B"
(100-150 volts and 200-250 volts).

Employs 3 H.T.+ tappings: H.T.+1 and H.T.+2 are continuously variable (by means of two control knobs) and capable of giving any desired voltage up to *120/150 volts at approx. 2 mA.; H.T.+3 giving *120/150 volts at 20 mA. for power valves. Price 39/6

*(The output voltages given from D.C. models operating from 100/150 volt mains are approximately 75 per cent. of those quoted.)

A.C. MODEL "A"
Tappings as in D.C. Model "A" (100-125 volts and 200-250 volts). Price £3:0:0

A.C. MODEL "B"
Tappings as in D.C. Model "B" (100-125 volts and 200-250 volts). Price £3:15:0

LISSEN ELIMINATORS

LISSEN LTD., Worple Rd., Isleworth, Middlesex.

THE "ROTALOG"

By S. R. WILLIAMS.

"Now, WHERE did I put that tuning chart? Oh, bother! That means I shall have to search for the station again." Station logs and tuning graphs are all very well until they get mislaid. You cannot lose the "Rotalog," for it is a part of the set and shows at a glance wave-lengths, stations, and tuning degrees.

THE average radio enthusiast who has had any experience at all of finding foreign stations is almost invariably a pessimist when it comes to inviting friends round for a demonstration of what the set will do. And well he might be!

It is not often that *I* give way and ask someone to visit me for the definite purpose of hearing one particular station. But on a recent occasion—and then more by way of settling an argument than for anything else—I very rashly asked a friend to come and hear for himself how well I received Budapest. Everything would, I am sure, have been well, but for one rather regrettable incident.

The Elusive Log

The argument, or more politely, the discussion, had waxed so very keenly that when the gentleman in question arrived to "hear for himself," I had completely forgotten the dial setting at which the station was to be found!

I firmly resolved after that to keep a careful log of all the stations I received, but even the log had a nasty habit of tucking itself away into some remote corner at the moments when I most required to refer to it.

Simple Materials Used

So to do away once and for all with my difficulty of recording station settings, I devised a rotary log scheme which is mounted on the actual set panel. It is so arranged that by turning the "control" knob on the front of the panel I can refer in an instant to the wave-length and dial reading of any station I may happen to want.

There is nothing very difficult in the construction of the gadget, and all that you will require in the way of tools are an ordinary hand-drill, a fretsaw and a pair of scissors.

The materials, which in all probability you will have on hand, consist of a piece of three-ply wood slightly larger than four inches square, a small length of tapped brass rod (an ordinary meat skewer can take the place of the latter if you do not happen to have a piece of tapped brass rod), a piece of white drawing paper and a small black knob.

The "Wheel" Construction

First of all find a space on the panel which will allow for the rotation of the 4-in. "wheel" at the back, and drill a hole centrally to take either the skewer or the brass rod.

Next, with the fretsaw cut out a 4-in. circular disc from the three-ply wood, and cover one side of it with the drawing paper.

Next proceed to divide the paper up into as many divisions as you want station records. Actually, I have contented myself with twenty-two in the original, because if you make it many more the "window" in the panel has to be much narrower in order to allow only one division to show at a time.

Fixing to the Panel

When you have marked out the necessary divisions in pencil, draw the lines in with ink, or, better still, with Indian ink.

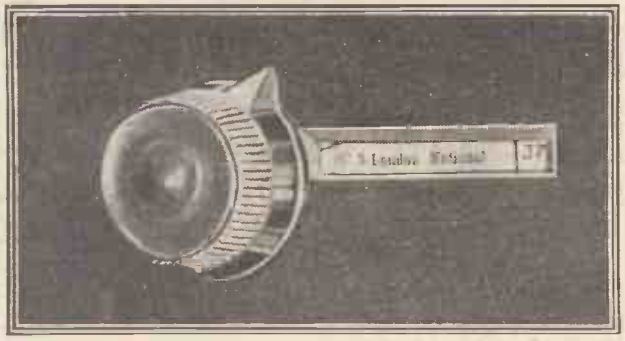
The next thing is to obtain a printed list of stations in which wave-lengths are given in a type-size suitable for cutting out and sticking in divisions round the circle.

Having cut out from such a list a suitable number of stations that you can receive, and stuck down their various names, either in alphabetical order or in order of wave-length, you will next require to cut a slot in the panel. For this purpose the fretsaw will again be required. Assuming that you have followed the original in the matter of divisions, the shape and position of the slot can be obtained from the diagram.

To complete the device you merely drill a hole in the centre of the disc so that the skewer or the brass rod can be forced tightly into it. The spindle thus formed is then pushed through the hole already drilled in the panel, and the rotating disc is held flush against the back of the panel by means of the knob, which should be screwed on to the spindle at the front of the panel.

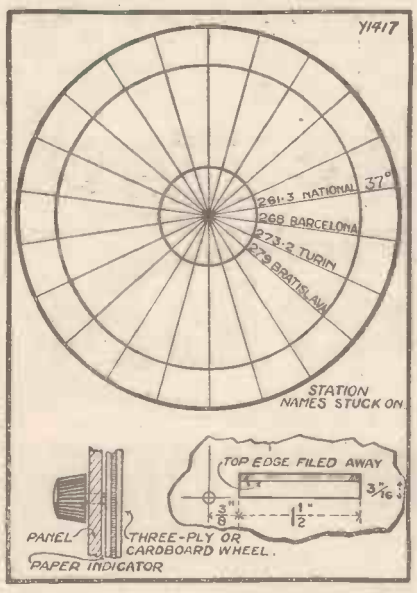
The dial settings at which the various stations are received will, of course, have to be filled in as the information comes to hand.

NOTHING COULD BE NEATER OR MORE EFFECTIVE



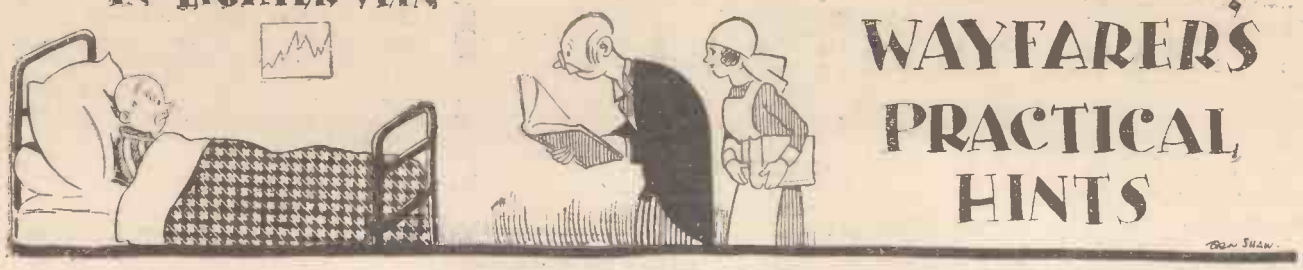
Here is the "station-finder" mounted on an ebonite panel. It is very fascinating to use and adds greatly to the appearance of any receiver.

BEHIND THE PANEL



There is very little for you to do before you can reap the benefits of this ingenious though simple little gadget. Here are the necessary diagrams.

IN LIGHTER VEIN



WAYFARER'S PRACTICAL HINTS

OFTEN have I suggested to the Editor that I might be allowed to describe for the benefit of readers the invaluable practical hints which my fertile brain is constantly evolving. Hitherto, however, other members of the Staff have always snaffled this job for themselves and have refused to let me have anything to do with it.

Professional jealousy, I suppose! This month I managed to sneak my copy off to the printers without their seeing it, and you are now going to have some genuinely worth-while hints upon home-construction. Gather round, therefore, and for goodness sake stop twiddling your thumbs.

My Workshop

I can, I suppose, claim to have had as much practical experience as most people. Years ago, at the very beginning of the wireless era, I converted my potting shed into a workshop and Mrs. Wayfarer promptly converted it back again into a potting shed. The building now serves a twin purpose, she calling it by the one name, I by the other, except when I am writing high-brow articles, and then, of course, I call it the laboratory.

A REAL WORKSHOP

"I never pass the door without hearing the noise of sawing wood."

Every day I spend several hours in my workshop, which is provided with an exceedingly comfortable armchair, wherein I perform no small part of my labours. There is also a bolt on the inside of the door. Even Mrs. Wayfarer admits that my industry is enormous.

"I never pass the door of your workshop," she says, "without hearing the noise of sawing wood."

An armchair, then, I consider, the first essential item of the workshop equipment, for it is in this that great ideas are born.

There must also be a cupboard in which to stock french polish, lubricants, and so on. Speaking of lubricants, I can recommend two excellent brands. One has a red triangle on the label, and the other a hand of the same colour.

We come next to the tool drawer and its equipment. The first item is undoubtedly a corkscrew, for taking out the corks of french polish and lubricant bottles with a screwdriver is a messy and exasperating business.

This month our irrepressible contributor breaks into technicalities and tells you how to equip your workshop on the lines of his own at Mudbury Wallow.

Contrary to what other writers have stated, no other workshop equipment is really essential, as I shall explain presently, but if you like there is no reason why you should not add a few pairs of pliers, and nippers and tweezers and things, a screwdriver, some spanners, a hacksaw, and a coke-hammer. The last comes in handy for taking down either old sets or self-opinionated visitors.

"Crocodile Bite"

A word as to the method of stocking the tool drawer—and this is one of the most practical of my practical hints. Acquire a roomy shooting coat fitted with what are termed hare pockets. Garbed in this, and, of course, a pair of trousers as well, visit each of your friends in turn and express a wish to see his workshop. The rest is easy.

Be careful, though, how you stow some of the larger tools acquired in this way. I once had a sad little adventure myself after winning a saw from Tootle, and another from Primpleson on the same afternoon.

One I stowed down the right leg of my trousers and the other down the left. On my way home I was unlucky enough to step upon a piece of orange peel, and in hospital the doctors had to turn up "crocodile bite" in their books of reference before they could discover how to treat my case.

My own method of constructing good-looking wireless sets demands, as I have previously indicated, no tools but a corkscrew. I fling the set together and march with it proudly into the workshop of Captain Buckett.

"Easy-to-Make" Set

"Now *that's* what I call a set," I say, planking it down on his bench.

"Lorks!" says he.

"I bet you you couldn't make one as neatly."

"If I couldn't make a better job of it than that," bellows the captain, "I'd eat my blinking hat."

"I'm sure you couldn't."

"I bet you a bob I could; in fact, I will bet you that I can have a go at this set and that even you will admit that it is better a piece of work when I've finished it."

"Done with you," I say, whereupon he offs with his coat and gets to work whilst I stand over him and criticise. At the end of an hour or two I have a beautifully made set.

"BUILDING YOUR OWN"

"He offs with his coat and gets to work!"

"And now I'll thank you for that bob," says he.

I run hastily round to Professor Goop's house, explain that I have left my purse on the piano, borrow half-a-crown, get eighteenpence change from the captain and carry off the set in triumph.

I bet you've never read a much more practical hint than that either!

Next, let us take some of those simple little jobs that we are all so fond of doing if we can get nobody else to do them for us. I think, perhaps, I had better deal in this first

In Lighter Vein—*continued*

practical article of mine with some methods of making use of old components. Too many people merely fling into the dustbin old variable condensers which have served their time in the receiving set. Actually, there is a goldmine in these.

Have you never seen in your daily paper the advertisements of those who offer to pay good hard cash for old false teeth?

A Steady Income

There is a nice steady income awaiting any reader who cares to carry into practice this hint for turning time-expired variable condensers into discarded dentures.

The *modus operandi* is simplicity itself. The first process is to convert the condenser vanes into dental plates. This is done in the following way: Remove one of the vanes from its resting place and hold it in the right hand.

Upon the tongue place a large stone. Insert the plate between the top of the stone and the palate and close the jaws smartly. The vane is thus moulded into the correct shape instantly. Nothing remains but to stick orange pips round its edge with Seccotine.

So far as I am aware, no use has ever been found for burnt-out valves until my Brain (yes, that capital is intentional) got to work upon the subject. Here is the solution of what

He whacks it with his spoon, and the table rocks with laughter.

is admitted to be one of the world's greatest problems.

Carefully remove the cap of the valve and place this aside. Now paint the bulb an appetising brownish colour. Next time you have a week-end guest place it in his egg-cup at breakfast-time. He whacks with his spoon; there is a loud bang, and the table rocks with laughter.

As for the cap, stuff into it as much of an old sock as you can ram home, and stick over this a neat cover of some bright-coloured material. Round the rim paint "A Present From Hubby." Your better-half will be most appreciative of the neat little pincushion so made when you present it to her as your birthday offering.

Old terminals with their shanks cut off make very elegant evening studs; in fact, Professor Goop uses nothing else. At dinner parties his neat idea never fails to win admiration, for he always wears as his upper stud a terminal plainly marked "Input."

Before the meal the lower one is marked "Low tension," but before it has ended he removes the nut and replaces it with one marked "High tension." A pretty compliment to his host's cuisine, is it not? The professor also uses panel knobs secured by 2 B.A. screws as brace buttons, but this I think is going a little too far.

Vagabond Hats

Old loud-speaker cones are readily turned into vagabond hats for the missus, or they may be stuffed with straw and placed inverted on the tops of sticks to catch earwigs. Disused inductance coils should on no account be thrown away. They should be placed carefully in belfries in order to provide nesting places for bats.

Let us now leave the subject of giving old components new leases of life and consider the construction of a useful device for the wireless set. Are you satisfied with your telephones? "Constant Reader" and "Father of Nine" and "Just a Mother" have all been writing letters lately to one of the B.B.C.'s journals to say that telephones give purer reproduction than loud speakers.

It is all very well for "Constant Reader" and "Father of Nine" and "Just a Mother" to say so, but you and I, being well versed in cosines and decibels and things, know that it is quite impossible for the ordinary telephone to reproduce any but the tiniest part of the musical scale.

M.C. Telephones

But why not moving-coil telephones?

Here indeed is a chance for the home-constructor, though no one but me has ever thought of the idea. In saying this I am not boasting, I am merely stating a fact. Actually the construction of moving-coil telephones is a simple, interesting and highly instructive job for the home workshop.

The only parts required are two moving-coil driving units of the permanent-magnet type, complete with cones and chassis and a supply of hoop iron.

The two moving-coil units are connected together in series and placed with the bells of their cones facing one another. Neat and comfortable headbands are then contrived from the hoop iron.

They are so heavy that you have to stand on your head to listen with them.

In use, moving-coil telephones are a revelation. They are, of course, an ounce or two heavier than 'phones of the usual type, but if the head is so soft as to be inconvenienced by the pressure of the headband the ear-pieces may rest upon suitable cushions placed upon either shoulder. An alternative is to lay the moving-coil headphones upside down upon the floor and then to stand on one's head inside them whilst listening to the programmes.

Next Month . . . ?

It has been suggested to me that when listening in this position there might be a risk of a rush of brains to the head. I consulted my doctor on the point, and after carefully tapping my head with one of those little mallet things he assured me that there could be no possible danger of any such thing.

I think I have written enough to establish my claims as a practical hinter. In honour of my debut as a writer of hundred per cent practical stuff, next month's issue of the WIRELESS CONSTRUCTOR will be a gala number, the spot feature being my "Inverted" Three, a remarkable receiving set in which a pentode is used as high-frequency amplifier, and a screen grid as the output valve. Look out for the set that will make wireless history.*

*You needn't and it won't.—ED.

TROUBLE-FREE SET BUILDING

Guaranteed Kits for all "Wireless Constructor" circuits

THE "EASY-STAGE" THREE

		£	s.	d.
1	Panel, drilled to specification, 14 × 7 × 3/16 in.		4	6
1	Cabinet, with baseboard 10 in. deep	1	3	6
1	ReadiRad ·0005-mfd. variable condenser		4	6
1	ReadiRad Duograph S.M. dial		6	6
1	Igranic ·5-meg. megostat		6	0
1	ReadiRad on and off switch			10
1	ReadiRad ·00015 differential condenser		5	0
3	Telsen 4-pin valve holders		3	0
1	Lewcos wave-change plug-in coil holder		12	6
1	ReadiRad ·0003-mfd. fixed condenser			10
2	Dubilier 2-mfd. fixed condensers		7	0
1	Formo type J condenser ·0003		1	6
1	ReadiRad 2-meg. grid leak and holder		1	4
1	ReadiRad ·25-meg. grid leak and holder		1	4
2	Telsen "Radiogrand" L.F. Transformers, 3-1, 5-1	1	5	0
1	ReadiRad "Hilo" choke		4	6
1	Mullard 30,000 resistance and Holder		5	0
1	Varley L.F. choke	1	0	0
1	Ebonite strip, 14 ×2 × 3/16 in.		1	8
1	Ebonite strip, 8 × 1½ × 3/16 in.		1	0
2	Terminals, Belling Lee "B"		1	0
4	Pieces copper foil, 3" wide, 8", 8", 6" and 12" long respectively			6
1	Packet "Jiffilinx," for wiring		2	6
7	Clix plugs and sockets		2	3
3	Valves to specification—Det., L.F. and Power	1	7	6
4	Lewcos coils, 60X, 250X, 40 and 100		19	3
	Flex, wire, screws, wander plugs, etc.		1	8
	TOTAL	£9	10	0

KIT A less valves and cabinet, £6 19 0, or 12 equal monthly payments of **12/9**

KIT B with valves less cabinet, £8 6 6, or 12 equal monthly payments of, **15/3**

KIT C with valves and cabinet, £9 10 0, or 12 equal monthly payments of **17/6**

THE "KELSEY" ADAPTOR

		£	s.	d.
1	Aluminium sheet, 12½ × 8 in., drilled and bent to specification		5	0
1	Baseboard, 8 × 7 in.			9
1	Framework, 8 × 6 in.		2	6
1	Lotus ·00035-mfd. variable condenser		5	6
1	ReadiRad Duograph sun dial		6	6
1	ReadiRad ·00015 differential reaction condenser		5	0
1	ReadiRad on-off switch			10
1	Bulgin N.7 neutralising condenser		4	9
1	Telsen 4-pin valve holder		1	0
1	ReadiRad ·0003 fixed condenser			10
1	Dubilier 3-meg. grid leak and holder		2	9
1	ReadiRad 400 B.M. potentiometer		2	9
1	Bulgin short-wave choke, H.F.3		3	0
1	Junit terminal block			8
2	Belling-Lee "B" terminals		1	0
1	Coil to specification, ready wound		7	6
1	Plug adaptor		2	0
1	Packet "Jiffilinx," for wiring		2	6
	Flex, screws, crocodile clip, etc.		1	2
	TOTAL	£2	16	0

or 12 equal monthy payments of 5/2

The A.C. "PARATUNE" RECEIVER

		£	s.	d.
1	Panel, drilled to specification, 24 × 7 × 3/16 in.		8	0
1	Hand-polished cabinet, 10" deep	1	15	0
3	Baseboards, 18 × 10 in., 6½ × 10 in., 5½ × 10 in.		3	6
1	J.B. dual, ·0005, with double thumb-control	1	8	6
1	ReadiRad ·0003 Brookmans condenser		3	6
1	ReadiRad ·00015 differential reaction condenser		5	0
1	Igranic Megostat, 50,000-ohm potentiometer		6	0
1	Bulgin switch, S.85		1	9
1	Wearite 2-pole change-over switch with bracket and extension		4	0
1	Wearite 3-pole change-over switch with bracket and extension		4	6
1	ReadiRad "Paratune" coil		8	6
6	ReadiRad single-coil holders		5	0
1	ReadiRad 1,000 potentiometer		3	6
1	Junit 5-pin H.V. valve holder		1	9
1	Dubilier ·01-mfd. 620 fixed condenser		3	0
1	ReadiRad ·0003-mfd. fixed condenser			10
1	ReadiRad ·0005-mfd. fixed condenser			10
1	Dubilier ·5-mfd. fixed condenser		2	6
3	Dubilier 2-mfd. fixed condensers		10	6
2	Telsen 5-pin valve holders		2	6
1	ReadiRad "Hilo" H.F. choke		2	6
1	Telsen H.F. choke		2	6
1	Telsen L.F. "Radiogrand" transformer, 5-1		12	6
1	ReadiRad 2-meg. grid leak and holder		1	4
2	T.C.C. 4-mfd. fixed condensers		12	6
1	Varley 20-henry L.F. choke	1	0	0
1	R.I. Hypercore L.F. choke		17	6
1	Atlas half-wave mains transformer	1	5	0
1	Telsen 4-pin valve holder		1	0
1	Link resistance, 25,000 ohms, ReadiRad		1	6
1	Link resistance, 1,000 ohms, ReadiRad			9
4	Belling-Lee "B" terminals		2	0
1	Sheet copper foil, 30½ × 10 in.		4	0
1	ReadiRad screen, to specification		2	6
1	Dubilier ·001-mfd. fixed condenser, type 620		2	0
6	Lewcos coils—250X, 60X, 100, 35, 60, 250	1	7	3
3	Mullard mains valves, to specification—S.G., H.F., Power	2	16	0
1	Mullard half-wave rectifier, D.U.10		15	0
2	Packets "Jiffilinx," for wiring		5	0
	Flex, wire, screws, 2 crocodile clips, soldering tags, plug adaptor, etc.		2	6
	TOTAL, including valves and cabinet	£17	14	0

KIT A less valves and cabinet, £12 8 0 cash, or 12 equal monthly payments of **22/9**

KIT B with valves, less cabinet, £15 19 0 cash, or 12 equal monthly payments of **29/3**

KIT C with valves and cabinet, £17 14 0 cash, or 12 equal monthly payments of **32/6**

ANY COMPONENT CAN BE SUPPLIED SEPARATELY IF DESIRED.

1931 RADIO OUT OF INCOME. FREE CATALOGUE OF SETS, SPEAKERS, EQUIPMENT AND COMPONENTS, SELECTED BY OUR EXPERTS AS REPRESENTING THE FINEST VALUE OBTAINABLE.

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TO INLAND CUSTOMERS. Your goods are despatched post free or carriage paid.

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TO OVERSEAS CUSTOMERS. All your goods are very carefully packed for export and insured, all charges forward.

Ready Radio R.R. LTD.

159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.

Telephone: Hop 5555 (Private Exchange) Telegrams: READIRAD, SEDIST.

Ready Radio (R.R., Ltd.), 159, Borough High Street, London Bridge, S.E.1.

AS WE FIND THEM

The Burndept "De Luxe"

MESSRS. BURNDEPT WIRELESS (1928), LTD., Eastnor House, Blackheath, London, S.E.3, recently sent us for test one of their latest model 1850 A.C. Receivers de Luxe."

The set is designed for all-mains operation on lighting supplies of 100/110 and 220/230 volts, 40-60 cycles. Full-wave rectification is employed. The circuit utilises three indirectly-heated cathode valves, viz., a screened-grid H.F. valve, and a grid-leak detector, which is transformer coupled to a super-pentode (Mazda AC/Pen). The output is taken through a 2-1 step-down transformer.

The makers state that the total power taken from the mains is 33 watts—approximately thirty hours' running on one unit of electricity. The tuning controls are drum-operated and are calibrated in wavelengths, 210-560 metres and 900-2,100 metres.

Control of Volume

There is a volume control operating on the aerial circuit, a reaction control and a switch for changing over from medium to long waves and for radio-gramophone. When the set is "on" a red light appears at the top of the front panel, and a double-pole mains switch is fitted in compliance with the I.E.E. safety regulations. At the back of the cabinet are two terminals to which a gramophone pick-up may be connected, the L.F. amplifier being brought into circuit for the reproduction of gramophone records by the rotation of the wave-change pick-up switch on the panel. A cone-type loud speaker completes the equipment.

The receiver is a very attractive-looking job and bears evidence of careful and highly-skilled design. On test we found it to be quite free from hum and perfectly stable in operation.

The Burndept A.C. de luxe receiver. It is a splendidly finished and highly attractive set. Wave-change switching, together with arrangements for using a pick-up, are incorporated.

Sensitivity and selectivity were both excellent. It is a first-class receiver, efficient in every way, and fully upholds the high standard which the Burndept Co. endeavours to maintain in all its products. The price of this set in oak is £34 15s., and in mahogany £35 14s.

Lewcos Fixed Potentiometer

Messrs. The London Electric Wire Co. and Smiths, Ltd., Church Road, Leyton, E.10, recently sent us one of their fixed potentiometers, type 16. The component is designed to improve reaction control, and is arranged so that the grid-leak return in a leaky-grid detector circuit is taken to a point on a resistance winding instead of to L.T.+ direct.

The dimensions of the potentiometer are $1\frac{13}{16}$ in. by $1\frac{5}{16}$ in. by $\frac{7}{8}$ in. high. There are four terminals, two of which are connected to L.T.+ and L.T.— respectively. Thus the resistance, which has a value of 400 ohms, is placed across the L.T. battery. There are two other terminals, one giving a tapping at one-half of the total resistance and the other at one-third. The grid return may be taken to either of the terminals.

The same firm also supplies a more elaborate model in which grid-leak clips and a ·0015-mfd. H.F. by-pass condenser are included. The resistance of this potentiometer is 600 ohms.

There is no doubt that the inclusion of a detector potentiometer is a useful refinement and is well worth trying in sets of the detector and L.F. type which are employed for "DX" reception.

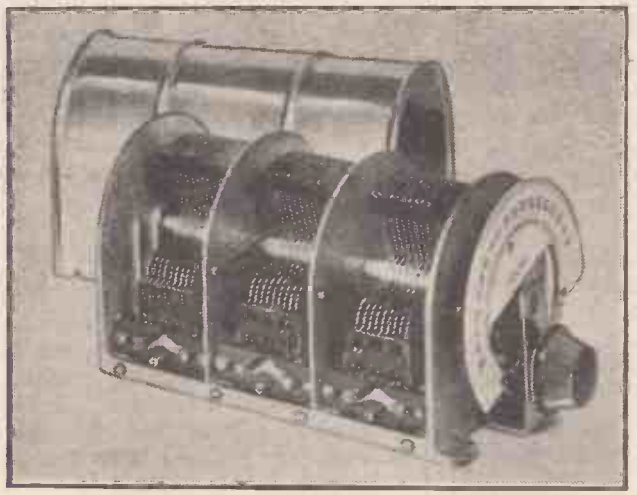
As We Find Them—*continued*

Polar Three-Gang Condenser

Messrs. Wingrove & Rogers have submitted one of the latest three-gang condensers for test. This instrument is intended for use with carefully matched circuits, and has one tuning control, which operates the three sets of moving vanes simultaneously. The condensers each have a value of ·0005 mfd., and are screened from each other.

The mounting itself is a stout aluminium casting, the condenser vanes being of brass.

Moreover, an aluminium shield is screwed over the whole assembly, thus completely enclosing the condensers, which are not only screened from each other, but also from all external effects.



This is the Polar triple gang condensers. The sections are screened, and an aluminium cover encloses the whole assembly. All vanes are of stout brass sheet and the condenser is thoroughly well made.

In the specimen submitted the spacing between the vanes was remarkably accurate, and there was no sign of side- or end-play in the movement. The control is of the slow-motion type, and is quite free from "stickiness" and slip.

This condenser is valuable in suitably chosen designs, in which the coils can be placed at proper intervals in relation to the condenser assembly.

Like all Polar components, the mechanical workmanship is excellent.

With regard to the insulation, this was tested at 500 volts and proved to be infinity.

"Becol" Formers

Messrs. The British Ebonite Co., Ltd., Nightingale Road, Hanwell, W.7, have produced a new type of low-loss former. The previous formers had six and nine ribs, but the latest models have eight. They are supplied in two sizes, viz., overall diam., 2½ in.; inside diam., 1¾ in.; and overall diam., 2⅝ in.; inside diam., 2 in. These formers should prove very useful to those constructors who make their own coils. If desired, bases with four or six contacts may be obtained to suit "Becol" formers.

Identification Tabs

Messrs. Money Hicks, Ltd., 102-110, Hackford Road, London, S.W.9, have submitted a set of their "Cortabs de Luxe"—a convenient means of readily identifying the various battery leads.

These tabs are coloured black and red and are shaped so that the flexible lead passes through at two points. All battery positive tabs are red, and the negatives are black, in accordance with convention.

In the case of the G.B. and H.T. tabs there is a white space in the centre to enable the listener to insert the correct voltage value in pencil.

Included in the sample carton were tabs marked "Pentode valve H.T." and "S.G. valve H.T."

Igranic Fixed Condensers

Messrs. Igranic Electric Co., 149, Queen Victoria Street, London, have recently placed on the market a new range of fixed condensers. These condensers are supplied in the following capacities: ·1 mfd., 2 mfd. (250-volt and 550-volt working voltage), and 4 mfd. (250- and 550-volt w.v.). They are intended for use in H.T. mains units, choke filter output units, and for by-passing purposes, etc.

The makers state that the condensers are tested at approximately three times their normal working voltage. Terminals are fitted in addition to soldering tags, and compactness is a feature.

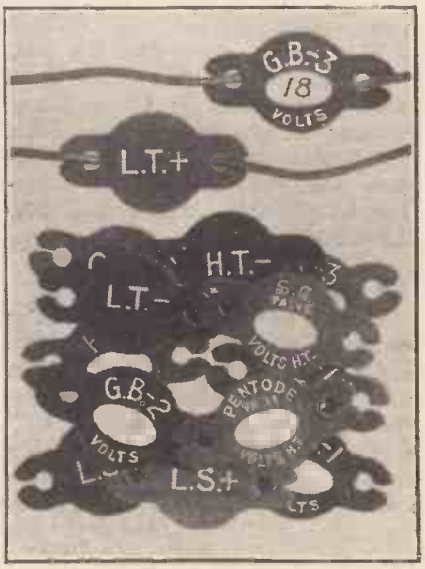
The Lewcos fixed potentiometer is designed to improve reaction control. These units form a valuable refinement in receivers of the Det. and L.F. types.

We have employed a number of these condensers with satisfactory results in our laboratory.

The same firm has also produced a new range of L.F. chokes of the "constant inductance" type.

The type C.15 has an inductance of 20 henries, with polarising currents up to 15 m.a., and a D.C. resistance of 1,000 ohms.

The type C.30 is rated at 20 henries, and will carry up to 30 m.a. The prices of units vary from 10s. 6d. up.



A group of "Cortabs de Luxe." These identification labels are placed on the various battery leads and make it practically impossible to connect the set up incorrectly.

The "Gramodaptor"

By C. MAXWELL.

A novel device with which any set can be transformed into an efficient radio-gram. Its construction is of particularly inexpensive character.

WHEN the electrical reproduction of gramophone records was first introduced it was a real novelty. After a short while it was looked upon as a luxury, but now it is something that everyone goes in for sooner or later if he owns a radio set.

When this time comes you are "well away" if your set has provision for connecting a pick-up into circuit; but if it has not, you must decide upon a method by which the receiver can be adapted. You can either wire a suitable switch or jack into the set, or you can make an adaptor for plugging into one of the valve sockets.

Gives Grid Bias Too

The insertion of a switch or jack makes alterations to the set's internals necessary, and may result in long grid leads, which are far from desirable. The use of an adaptor does not entail any alterations to the set, and such a device can be employed with any receiver.

The usual type of gramophone adaptor has one big drawback, and that is that provision is not made for biasing the valve with which it is used. Not only can this be very undesirable from the point of view of quality, but it may in some cases produce an unnecessary waste of H.T. current. This latter occurs when such an adaptor is used in the first L.F. valve holder instead of its more usual position in the detector valve holder.

Another Advantage

The "Gramodaptor," which is well illustrated on this page, is so designed that the correct value of grid bias can be applied to the valve. It also has another great advantage which puts it far away ahead of any other adaptor for pick-ups.

It has a volume control incorporated in it. Quite a large number of sets which have no provision for a pick-up also are not provided with a volume control of any sort, a component which is very necessary for record work.

It's Easy to Make

Even if your set has a volume control, the one on the adaptor may be of even greater use, because it enables the fluctuating voltages to be controlled before they are applied to the first L.F. valve in use. This makes it possible to avoid overloading any of the valves, a thing which the control on the set would often not be capable of doing.

The diagram and photographs are really complete in themselves so far as the constructional work is concerned, so that little need be written about it.

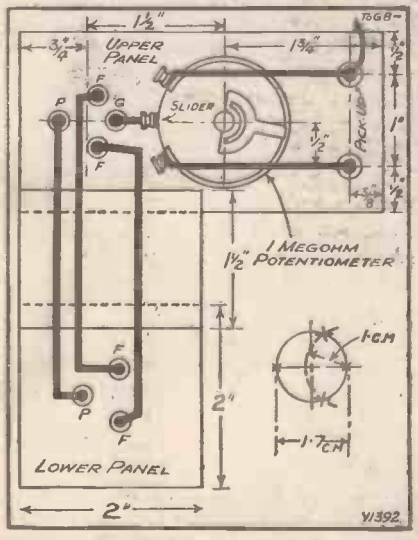
(*Continued on page 268.*)

NOT MUCH TO BUY!

MATERIALS REQUIRED TO MAKE THE "GRAMODAPTOR."

1 Terminal-type volume control, ½, 1, or 2 megohms (Lissen, or Varley, Igranic, Gambrell, R.I., Magnum, Wearite, etc.).
2 Insulated terminals (Belling & Lee, or Igranic, Eelex, etc.).
2 Pieces of ebonite, one 4 in. × 2 in. and one 2 in. square.
3 Valve pins and four valve sockets (or similar-sized sockets.)
2 Pieces of wood, 2 in. × 1½ in.
Wire, screws, flex, etc.

DOES THREE JOBS



Besides enabling a pick-up to be quickly connected to a set, this handy gadget introduces an efficient volume control and permits proper grid bias to be applied.

INSTANTLY ACTIVE

The adaptor can be placed in operation in a matter of seconds.

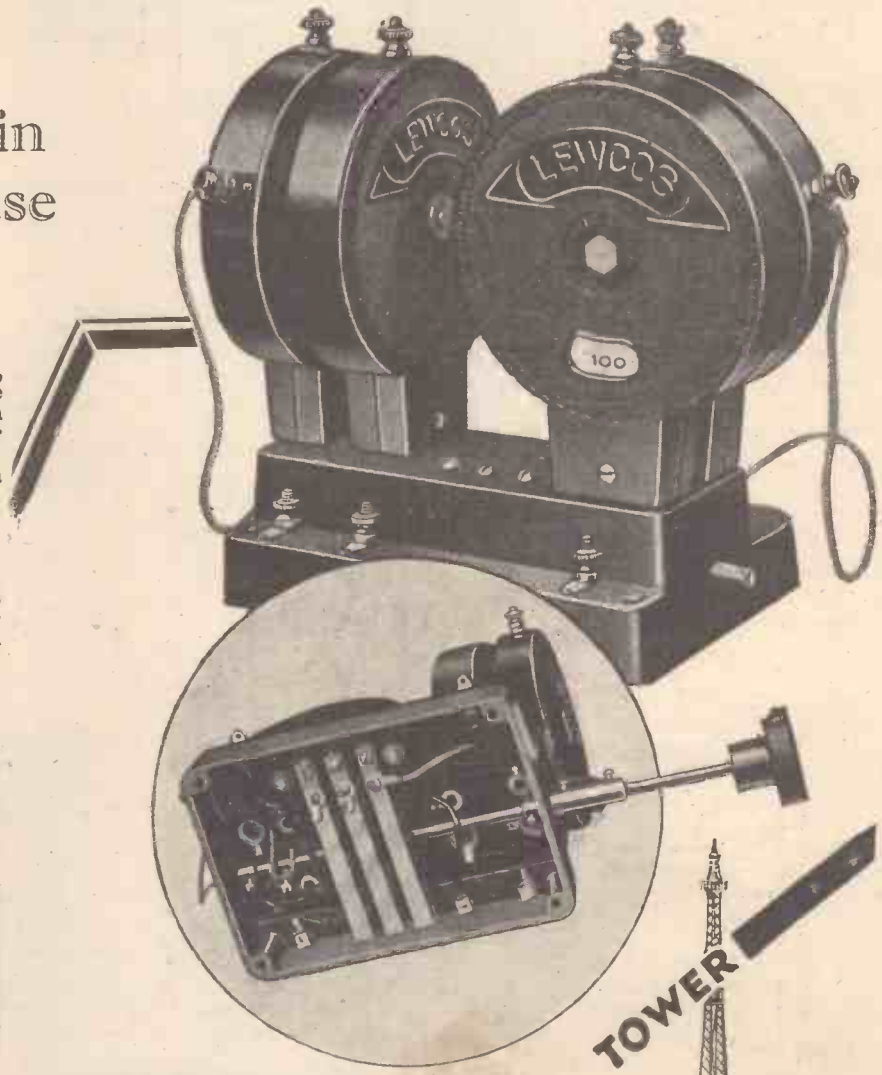
An irksome task eliminated

No more Coil Changing with this NEW LEWCOS ACHIEVEMENT

The Lewcos Twin Two-Pin Base

Price 12/6

Ref.: TT/PB.



Many users, both expert and amateur, testify that the Lewcos Two-Pin Coils have reached a standard of efficiency on which it would be difficult to improve, but another device to eliminate coil changing when Two-Pin Coils are used has recently been perfected.

With this new Lewcos achievement you can switch from the Medium Broadcast Waveband 235-550 m. or to the Long Waveband 1,000-2,000 m. by the turn of a knob. The twin sets of coil holders are arranged at right angles to each other in order to prevent damping by the coils not in use.

This useful component comprises a moulded base containing switching apparatus conforming to telephone practice, viz. cam-operated blades with silver contacts.

Its robust design, high-class materials and workmanship ensure efficiency.

Recommended Coils for use with the Lewcos Twin Two-Pin Base:
60 X 40 C.T.
250 X 100 C.T.
Specially suitable for circuits such as the "Magic" series described in "Popular Wireless."

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10.

The Lewcos Twin Two-Pin Base is specified for the "Easy-Stage" Three Receiver described in this issue.

LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

OSLO-THE SNOW STATION

The description of a personal visit to one of the most interesting of the European broadcasters.

By Our Own Correspondent.

"I HOPE it snows when you are at Oslo," wrote a Norwegian reader to me, knowing that I was en route via Malmo to the north. "If it does, you'll see Oslo Radio as it really is." I do hope my correspondent didn't mean it unkindly, for though it didn't actually snow, it nevertheless was horribly cold!

There were signs of snow clouds at Gothenburg, and they told me that it had been snowing heavily at Oslo. Incidentally, the distance from Malmo to Oslo is about the same as that from London to Newcastle, and the travelling is foul. I'm sorry, Norway, but it *is* foul!

Oslo Radio was a consolation. The people of Norway are homely. For that reason I like Norway even better than Holland; and the officials at Oslo took pity on a poor traveller and gave me warm hospitality as well as the opportunity of seeing how seventy-five kilowatts are put out into the icy air of Norway.

Above the Pines

We in England forget that Norway is cold, and that Oslo is the most northerly important broadcaster. At home one tunes in Oslo as a big voice on the long waves—1,060 metres, to be exact—and marvels at the silver clarity of the transmission. Many of the northern Continental stations have this characteristic of exceptional clarity.

But how many listeners can visualise the spidery Olso masts standing high above small pines and thin-trunked trees in an otherwise barren piece of open country?

How many listeners can realise that snow often does cover the huge aerial wires, feeders, and mast guys, causing a deal of bother at the transmitting end in the way of altered aerial capacity.

What doubtless adds to the spidery look about the masts is the fact that they are both 'balanced." That is, the lattice work at the lower ends does not bed into a solid cement base, but tapers off to a fine point at a kind of ball joint.

The whole mast rests on this comparatively tiny ball, and is held vertical only by the guy wires, which are massive stranded cables with elaborate means for tightening. The ends of the guys, it is true, are anchored to huge granite slabs.

Wind Up!

The station itself is a hideous building between the masts. It is hideous to an architect's eye, that is, but is a joy to an engineer, for the building has been erected to fit the transmitter! Architecturally it is even uglier than the new red-brick building of the Northern Regional will be, and that is saying something!

The lead from the aerial (a T-shaped aerial with three wires in

HAVE YOU HEARD IT WORKING?

This is Oslo's transmitter. According to the new system of rating, it has a power of 75 kw., while it broadcasts on a wave-length of 1,060 metres.

"Spray Painting"

A Fascinating Article in which SELWYN JEPSON, well-known short story writer proves that he is as handy with the "Gun" as with the pen

One day's work will make a shabby old car look as if it had just left the coach-painter—and there will be no bill to follow!

"OH, it's easy!"

"Yes?"

"No brush marks, no difficulty with awkward crevices—on it goes, as evenly as you can wish—a surface like lacquer. Why! A child can use it!"

"Y-yes?"

"But by that time he has sold it to you for the modest sum of forty-five shillings, or thereabouts. A real paint-gun, the sort of thing Sir William Morris makes his hundred thousand cars look so bright and shiny with."

Thus Mr. Jepson, commencing an intensely fascinating and useful article on spray-painting in the home.

For this alone, you will find that the FEBRUARY Issue of the NEW LONDON is well worth getting. But there is a whole host of other good things. Make sure of your copy.

Here are some of the well-known folk whose work appears in the FEBRUARY Issue of the NEW LONDON:

GILBERT FRANKAU
E. BARRINGTON
DON PORTBURY
H. MORTIMER BATTEN
RITA WEIMAN
W. J. LOCKE

And there are others! Splendid Stories—Excellent Articles. Why not place a regular order for the NEW LONDON?

The NEW LONDON Magazine

For FEBRUARY. *At all Newsagents - 6d.*

Oslo—The Snow Station—*continued*

parallel, and two in the down-lead) comes straight down vertically to the feeder arrangements from the transmitter, and technically it seems ideal.

There is a fine steel ladder running up the side of each mast, but a strong, icy wind was blowing, and I did not press for an invitation. Instead, I followed my guide into the warm atmosphere of the control-room, where there is the desk, with the usual relay buttons and warning lights, which is the key to the whole station.

Oslo was not broadcasting then, but as there was then only about half an hour to go, I should see the control desk in action.

A Neat Layout

The controls are at one side of the room, and the man in charge faces the main part of the transmitter. The tuning of the intermediate stages of the transmitter is carried out with variometers, somewhat like those which the Marconi people used in their standard jobs—as fitted in the first 2 L O in Marconi House.

The transmitter is of the "open" variety; that is, there are few panels, and the essential components such as valves, condensers, coils, and meters are grouped on metal stands supported on insulated rings standing on the polished floor.

A little "fence" of silk cord (the cinema kind of stuff) forms a safe gangway between high-voltage groups,

AMONG THE PINES

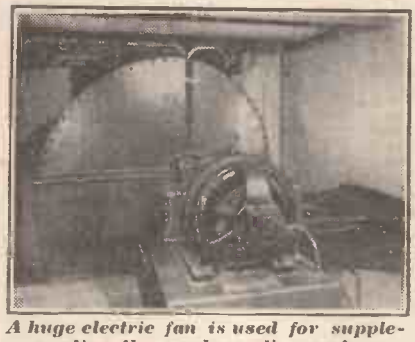
Amidst the snow and pine-trees, Oslo's masts strike a somewhat incongruous note.

and long extension handles allow adjustments to be made at a distance of several feet. Pilot meters close up to the controls show the operators what they are doing.

The generator hall is a rather uninteresting place if one does not wish to go deeply into technicalities, but it is one of the neatest layouts I have seen.

The Telefünken people have been responsible for most of the plant, and they have made a good job of it. There are separate little generators for grid bias and the valve filaments.

HIGH-POWER COOLING



A huge electric fan is used for supplementing the anode-cooling system.

The L. T. current runs into hundreds of amps., of course, as is the case with all these big transmitters.

A curious thing is a huge electrically-driven fan for cooling the anode-cooling circulation system. Even noisier than this is the power transformer group. The transformers are oil-cooled, and are fitted with little reserve oil tanks like motor-cars. And the noise!

The Buzzing Transformers

All these big transformers buzz when they are working, but there is nothing to beat a thousands-of-volts oil-cooled transformer on full load! There is a fair amount of heat, too, and it is welcome.

The whole transmitter building is kept at a reasonable temperature (even when it is snowing!) by a comprehensive central-heating system, and the engineers told me that this was a great help in keeping the transmitter itself in good order and the wave-length constant.

Some of the gramophone-record broadcasts which one occasionally hears from Oslo are broadcast from the control-room, where there is an electrically-driven turntable and a pick-up of German manufacture.

The whole general atmosphere of Oslo is of "officiousness." State control is very evident. I asked the engineer in charge why the huge power of 75 kw. was necessary, considering the size of Norway and the position of Oslo on the map.

"Norway lives on the sea," explained the engineer, waxing patriotic, "and she likes to keep in touch with wanderers and with ships all over the world. We have had reports from Egypt and from Africa."

So that giant station, favourably situated on a high hill eight miles out of Oslo itself, does "reach out some," as our American friends say.

TWO USEFUL HINTS

Panel Protection—For Small Taps

THE jaws of your vice are roughened to enable them to grip the work securely. If you clamp an ebonite panel in the vice without any protection you will almost certainly damage its surface.

Obtain a lump of cobbler's wax, and cut two pieces of thick card to fit the jaws. Rub one side of each card with the wax, so that its surface is quite sticky, put both cards in the vice with the waxed sides towards the jaws, and clamp up tight.

When you open the vice the cards will adhere to the jaws. They can be taken off or renewed with little trouble, and they will form a perfect cushion to grip any work which is soft enough to take an impression from the bare jaws.

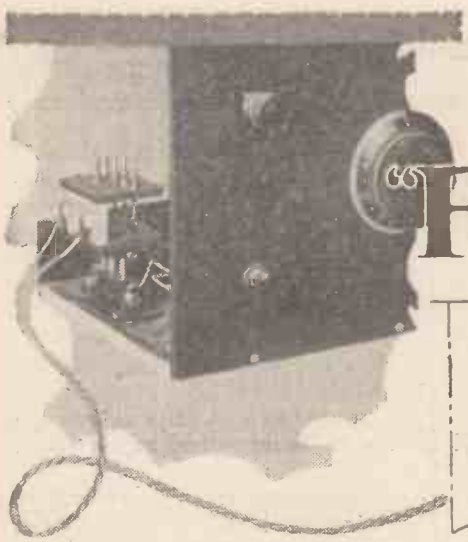
For Small Taps

Small taps, from size 4 B.A. downwards, are slender enough to be easily broken by rough handling. I never like using an ordinary tap-holder for these little tools, since it is all too easy to exert too much force.

My own holder is a simple device, consisting of nothing more than a telephone terminal, the kind with a hole drilled through the body to take a 'phone tag. The squared end of the tap fits into this hole, and the head of the terminal is screwed down on to one of the flat faces of the square.

With such a small tap-holder one can feel much more easily how much force he is using, since its "arms" do not provide unnecessary leverage.

A. D. V. H.



THE "FRAMER"

TRY YOUR SET WITH A FRAME AERIAL

On this page you will find full details for making a simple little adaptor which will enable you to connect a frame aerial up to your set without having to modify the receiver in any way.

IN these days of crowded ether it is often desired to use a frame aerial to obtain better selectivity and consequently easier separation of stations that are close together. As a rule, however, one does not wish to use the frame permanently, and some form of adaptor which enables the frame to be plugged into the set without altering the latter in any way is very useful.

The constructional details of such an adaptor are given on this page. It can be used on a very large variety of sets, and makes a useful addition to any frame aerial.

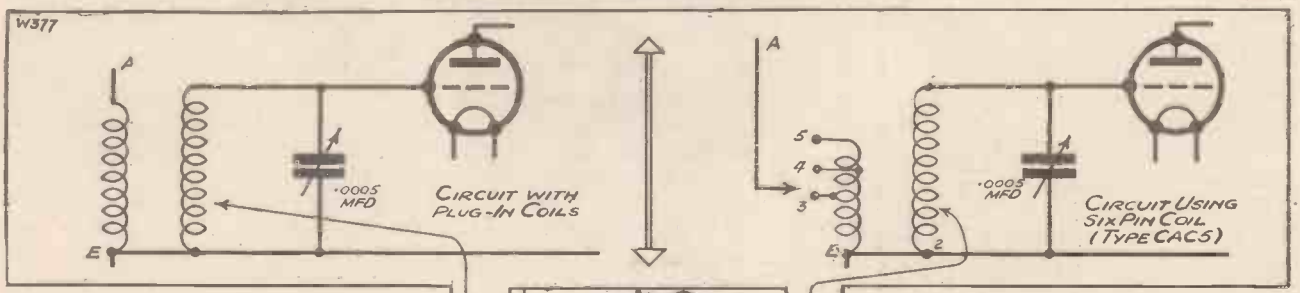
Easily Fitted

It is suitable for sets which employ either ordinary two-pin coil holders or coil holders of the six-pin variety. The frame winding is arranged to take the place of the grid coil of the H.F. valve to which the aerial is coupled.

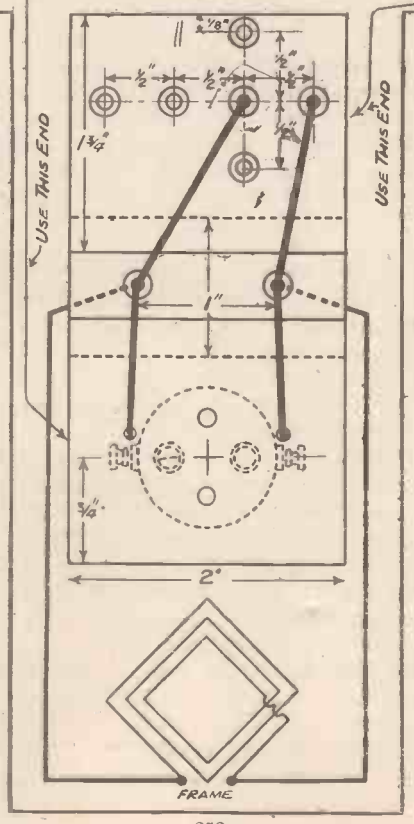
Of course, the set should have one H.F. stage (two are preferable), so that the question of a reaction winding on the frame need not be considered. A simple set consisting merely of a det. followed by one or more L.F. stages is not really suitable for frame-aerial work, and therefore such sets can be neglected.

The adaptor itself consists of an ordinary coil mount to which is attached a piece of ebonite carrying six pins arranged in the normal way.

INCREASES SELECTIVITY



To use the "Framer" on a set using plug-in coils, its two-pin adaptor is placed in the coil holder which usually takes the grid coil.



With a set using six-pin plug-in coils the other side of the "Framer" is used, when the frame becomes connected in place of the usual grid winding.

The two are joined in such a way that either can be plugged into a suitable holder.

The leads from the frame aerial are joined up to two terminals, which are wired-up as shown in the diagrams to the two contacts of the two-pin coil holder, and to pins Nos. 1 and 2 of the six-pin plug.

With Six-Pin Coils

It is usual with six-pin coils for the tuned or grid winding to be connected to pins Nos. 1 and 2, and for this reason these two pins are permanently wired-up. The other four pins are provided for use in special cases where the tuned winding is joined to two other pins.

In this case the leads from the frame are connected direct to the nuts on the pins concerned, instead of to the two terminals as usual.

The TRAUTONIUM

Details of a new musical instrument, the timbre of which may be altered very much in the same way as the stops are used on an ordinary organ. The sounds are produced by electrical oscillations.

By DR. ALFRED GRADENWITZ.

WIRELESS engineering has brought within everybody's range an almost unlimited supply of musical enjoyment; never, before its advent, had music been so widely appreciated, never had it been allowed on such a large scale to assert its entertaining and educative powers. However, the time has now come when music even in another direction will profit by radio, deriving from it a new means of expression and obtaining through its co-operation unsuspected and almost unheard-of effects.

PLAYING A SOLO

The "keyboard" of the Trautonium is like a long ruler with a wire running above it. By pressing this wire down on to the ruler at different points varying notes are produced.

The idea of providing musical instruments worked by electric waves readily suggests itself to anybody acquainted with wireless principles, every radio broadcast being based on electric vibrations transmitted to a distance and at the receiving end retransformed into sounds by the acoustic vibrations set up in a membrane.

What will happen, one is inclined to ask, when the vibrating membrane of a loud speaker is fed not with microphone currents (or, rather, their reproductions at the receiving post), but by arbitrarily produced low-frequency vibrations? Will such vibrations bring about musical effects of a similar kind to those of wireless broadcasts? That such will be the case cannot possibly be doubted. In fact, more than one inventor has tackled that interesting problem, and our readers will doubtless remember Theremin's Ether-Wave Instrument, which enables such beautiful effects to be obtained.

Variable Timbre

Dr. F. Trautwein, working at the Radio Testing Station of the Berlin Academy of Music, has been approaching the problem from a different point of view. What he wished to achieve was, on the one hand, the construction of a musical instrument easily mastered and so low-priced as to secure for it large numbers of adepts, and, on the other, a means of so varying the *timbre* as not only to imitate all known instruments, inclusive of the human larynx, but to produce unknown and, so far, unsuspected, musical effects. Moreover, an instrument such as this should be subject to no limitation with regard to the range of its sounds.

Resistances between 0·5 and 4 megohms and capacities intermediary between 1,000 and 10,000 centimetres are used to set up electric vibrations corresponding to audible frequencies. The actual range of sounds is adjusted for by controlling the capacity of the circuit, whereas the pitch is varied, thus playing the melody on the keyboard (manual), by altering the resistance.

Unusual "Keyboard"

The keyboard (manual) in its most simple form comprises a "ruler" about a metre long, carrying along its entire length a wire which is pressed down with the forefinger, thus producing a sound of a pitch variable from one point to the other. A scale running the whole length of the ruler facilitates the play of the instrument.

A transformer is used to produce the variable *timbre* by setting up the characteristic trains of vibrations (or sound formants).

Organ Effects

An instrument such as this is admirably suited to single-voice playing with an unlimited variety of *timbre* and any graduations of pitch. A simple switch enables the range of pitch to be altered at a moment's notice, thus transposing automatically as desired.

Moreover, the inventor has designed similar types of "Trautonium," enabling several sounds to be produced at the same time and functioning after the manner of an organ. Ten voices are thus provided (one for each finger), the actual *timbres* being adjusted by means of switches resembling organ-stops.

TRAUTONIUM TRIO

Here we see three people playing on three separate Trautonium instruments, each giving a different timbre.

Outwardly the "Trautonium" is designed on the lines of an up-to-date wireless receiver, but with a "ruler" used as manual.

Our News Bulletin

That Referendum

ALTHOUGH the B.B.C. recently announced its intention of taking a referendum of the views of listeners on the planning of programmes, no definite move has yet been made as we go to press. Exactly how the referendum will be arranged seems to be undecided.

Denmark Does It

The Danish broadcasting authorities have already taken a referendum, and their method was to print a list of the main programme features on the back of the licence renewal forms; listeners were asked to make their votes when they renewed their licences, and in this way about 60 per cent of the total number of listeners voted. A fairly representative opinion was thus obtained.

Britain Best

Although a well-known gossip writer in a Sunday newspaper recently stated that after a visit to the States the writer had formed the opinion that American radio was far ahead of British, it is interesting to note that in a well-known American magazine called "Current History," the broadcasting services of the United States and this country are compared—in a way which is highly complimentary to our own B.B.C.

No Advertising

It seems that Americans envy us because our broadcasts are free from what is described as "advertising chatter," and in America a series of songs about eyes is sponsored by an optician, a Life Insurance Company, and an optical lens maker.

"Full of Trash"

"The British listener," says "Current History," "lacks none of the good music that we must pluck from a heaven full of trash and then be grateful for it to the courtesy of an advertiser."

Fine Programmes

The writer of the article recommends the policy of the B.B.C. in attempting to please 75 per cent of the listeners 75 per cent of the time, instead of 90 per cent of the listeners all the time. He thinks that in Britain listeners have "demonstrations of what genuinely fine programmes and enlightened ideal can produce."

We hope this will not make Sir John blush!

The B.B.C. Van!

The "Daily Telegraph" had an interesting little anecdote the other day. An armoured car was on its way from the makers to be delivered, when it stopped near an old lady who stood at her house door.

"So you've arrived," she said, with great satisfaction.

The drivers, a little mystified, agreed that they had (as a matter of fact they had stopped for a drink).

(*Continued on page* 258.)

OUR NEWS BULLETIN

—*continued from page 256*

"You've been very quick in coming," said the old lady. "Now come in and see for yourself. It's still going on," she added.

The drivers were naturally rather bewildered, and their faces must have expressed this, for that started a doubt in the old lady's mind.

"You've come from the B.B.C. to see what's wrong with my wireless, haven't you?" she asked.

The drivers' reply was not put on record.

Communal Concerts

Southampton listeners are taking up communal wireless and very soon they will be able to hear wireless programmes in their own homes without buying wireless sets. The Works Committee have recommended the Town Council to give permission to a relay broadcasting service to wire the town and establish a central transmitter and sub-stations.

1/6d. a Week

This company will receive the ordinary B.B.C. programmes on a central receiver, and then, by a licence from the Postmaster-General, will relay to subscribers. The latter will pay only 1s. 6d. a week and provide their own loud speakers.

We understand that the relaying company is prepared to pay the Corporation £250 a year for every 1,000 subscribers, with a minimum payment of £500.

Bad for Trade

Although this idea is interesting, and no doubt very beneficial to listeners, one must acknowledge the fact that this sort of thing is not going to be very helpful to the wireless trade, and a lot of the romance of picking up one's own programmes will undoubtedly be missed by subscribers to any such relay system as this.

Nevertheless, for those who just want to plug in and get what they are given the system no doubt has advantages

The Irish Station

The Free State Government of Ireland has decided to build a new central high-power broadcasting station at Athlone. The idea is that listeners with crystal sets in all parts of the country will have good reception, and it is hoped to cater for about two million people. The station will cost £47,000.

French Theatre Subsidy?

Judging from the news from Paris, it looks as though listeners all over the world will soon be able to hear performances of the Comedie Française broadcast. This is the French National Theatre, and as the directors of this theatre are in need of support and a subsidy from the government, it is likely that they will now take a favourable attitude with regard to broadcasting.

A further £24,000 is needed, and if the directors allowed the broadcasting of certain performances it is understood that the money would soon be forthcoming.

Progress at Slaithwaite

If tests have not actually started by the time these lines are in print they should be heard very shortly from the Northern Regional transmitter at Slaithwaite, near Huddersfield,

The site has already been chosen for the Scottish Regional station.

The Western Regional

Apparently a site has not yet been fixed on for the Western Regional, and if the B.B.C. is to maintain its slogan of "One Regional a year" it will have to get busy, as it is very doubtful whether the Scottish

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OUR NEWS BULLETIN

—*continued from page 258*

transmitter will be working before 1932, and there seems little likelihood of the Western Regional being on the air before 1933.

Baird Television

The first report of Baird Television, Ltd., which was formed last year to amalgamate Baird International Television and Baird Television, Ltd., states that substantial progress has been made during the year under review, both in the laboratories and in commercial exploitation of the Baird inventions at home and abroad.

After crediting £6,295 for interest received, the operations for the year ended June 30, 1930, resulted in a debit of £35,034, which increases the total of development account to £131,782.

Patent rights and trade marks appear in the balance sheet at £513,045, and cash and Government securities at £149,042, out of a total of £864,029.

The auditors' certificate is qualified as to the value of advances to and investments in subsidiary and associated companies. No provision has been made for possible losses by the subsidiary companies.

A TIP FOR DRILLING

ANYONE can make a hole in a piece of ebonite or wood with the aid of a drill brace and a twist drill. What is not so easy is to keep the drill straight, so that the axis of the hole is at right angles to the surface of the material.

A punch mark on the surface of your panel ensures that the point of the drill will not wander in starting the hole, but when you come to the terminal you may find that it leans to one side or the other. The only cure then is to enlarge the hole so that the terminal can stand upright, and this is a poor makeshift at best, and not by any means a workmanlike job.

The old hand finds little difficulty in keeping his drills upright, because he knows just where to place his eyes so that he can see what is happening. Until you acquire this knack, which only comes by practice, try using a small set-square as a guide.

You want the kind of square which is used by instrument makers, a steel one with arms only an inch long. Stand this on the panel close to the drill, with one arm pointing upwards.

You will then find it quite easy to look down over the top of the drill brace and to keep the drill parallel with the upright arm of the square. If you tilt the drill out of the perpendicular in any direction you will spot the fault at once and correct it.

A. V. D. H.

A HOME-MADE LOUD-SPEAKER UNIT

We have often published details for making cone speakers, but this is the first time a simple loud-speaker unit has been described. And though simple to build, the unit is in every way effective, and gives excellent results.

By H. T. SAVAGE

ONE does not often hear of amateurs making their own cone loud-speaker units, but there is no reason why anyone who can handle a drill and a hacksaw should not enter this fascinating field of radio work.

Quite Simple

The parts are simple—a magnet, a pole-piece, a coil (known as a bobbin), a reed, a driving rod, and some steel bolts. The tools required are simple, too, and do not extend beyond a hacksaw and a drill.

The changes can be rung on these parts by having more than one magnet, more than one pole-piece, and more than one bobbin, and there is an unlimited field for experiment in the shape and thickness of the reed, and in the position of the pole-pieces of different shapes.

which, while not possessing any adjustment, gives good results.

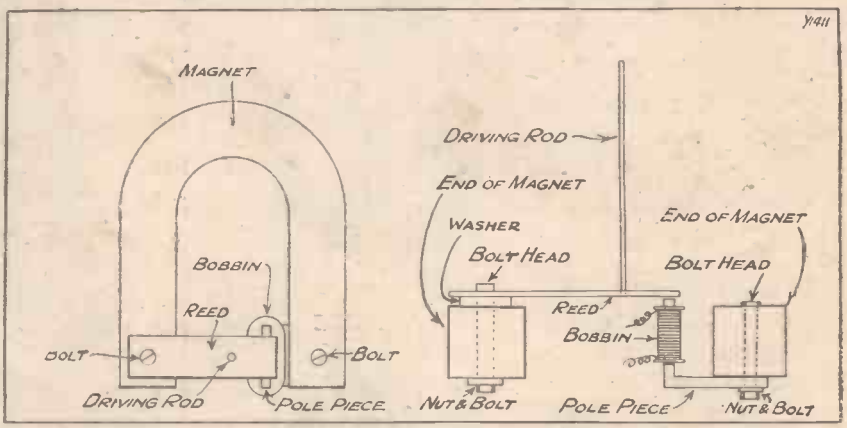
Several firms (Darwin's, or Levick Swift & Sons, of Sheffield, for instance) make a speciality of making these magnets, and in the one illustrated holes were provided by the makers large enough to take 2 B.A. rod or steel bolts.

Pole-pieces and bobbins can be found inside the units of horn loud speakers, which in many homes will be found reposing on cupboard shelves, but they both can be purchased.

Making the Pole-Piece

Pole-pieces are generally made of special metal, which has the property of not retaining residual magnetism, and are also generally laminated, which gives them added efficiency; but failing the manufactured pole-piece, a fairly satisfactory substitute

HOW THE UNIT IS ASSEMBLED



Elevation and end view of the completed loud-speaker unit, which is easily constructed for a few shillings.

For example, the reed might be made ⊢- or L-shaped, and trials could be made as to the best position along the length of the reed for the driving rod.

The matter of providing an adjustment for the reed, so as to allow for a gap giving the greatest sensitivity without chattering, will also provide readers with an interesting task.

Examination of the sketch will reveal a very simple arrangement is found in a strip of Swedish iron, bent cold in a vice to L-shape.

Reeds can be cut with a hacksaw out of mild steel, one-sixteenth of an inch thick, or thicker, and the driving rod, made of thin, steel rod, is tapped into the reed, generally somewhere near its centre. More simply, a hole can be drilled in the reed, and threaded brass or steel rod secured thereto by nuts on each side.

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A HOME-MADE LOUD-SPEAKER UNIT

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The coil or bobbin is slipped on to the L-shaped pole-piece, which is bored for the bolt which passes through the end of the magnet.

The reed is also bolted to the magnet, a steel washer separating them, and the thickness of this washer (or washers) will determine the width of the gap between the end of the reed and the top of the pole-piece.

The gap must be small, and the smaller the gap that can be achieved without allowing the reed to chatter the greater will be the sensitivity of the unit.

If the bobbin purchased is, say, of 1,000 ohms, two could sometimes be used in series, but there is only room, generally speaking, for one on the pole-piece. A spot of liquid glue will hold the bobbin in place.

The Ends of the Windings

The ends of the windings of the bobbin have, of course, to go to the loud-speaker terminals, and as they are very delicate it is best to take them to a couple of terminals mounted on a small square of ebonite, which in turn can be mounted upon the same beam of wood to which the unit will be attached. A simple way of doing this latter is to obtain a strip of rigid brass and fix through it a single screw passing through the centre of the opening in the magnet, into the wooden beam.

If the receiver has a choke-filter output, or has an output transformer, it will not matter which way round the loud-speaker leads are placed. But if not, the right way should be found, or the magnet will become weakened in time.

"Right Way Round"

The right way round is that which causes the greater deflection of the reed to the pole-piece; in other words, that in which the greater tendency to chattering occurs. As stated before, chattering can be prevented by using a thicker washer under the reed.

MICROPHONIC VALVES

Curing that noisy detector.

HERE is a novel use for sticking-plaster, quite different from that of repairing punctures in the skin of the constructor. It is to restrain the microphonic tendencies of detector valves. In a sensitive set even the best of valves is liable to display some microphonic tendencies when used as detector, particularly if the loud speaker is built into the cabinet which houses the set.

How the Howl is Caused

The trouble is that the glass bulb vibrates at its own natural frequency, and passes on these vibrations by way of the "pinch" to the filament supports. The filament is thus set in motion, and continually changes its position with respect to the grid and the plate of the valve.

The plate current is thus modulated and either horrible pongs or—worse still—"singing-round-the-ring" occurs. "Singing-round-the-ring" means that shortly after the set is switched on a low, gentle moan begins to issue from the loud-speaker, and rapidly becomes an ear-splitting roar.

Air waves from the loud speaker set the detector valve bulb into gentle vibration. This produces a weak corresponding sound from the loud speaker. Sound waves of this frequency pass through the air and the solid parts of the set to the detector valve, increasing the amplitude of the vibrations.

Damping the Glass

The loud speaker produces a louder sound—and so on and so on until the howl or roar builds up. The simplest and best cure is to apply damping to the valve bulb, just as we apply it to a piano string by means of the soft pedal.

When you have a microphonic detector, take a reel of ½-in. sticking-plaster and cover the bulb completely with it. This tip is usually very effective. Remember, though, that it can only be used with dull-emitter valves whose bulbs never become more than just warm under operating conditions.

The bulbs of bright valves or of semi-dull emitters become pretty hot when they have been in action for a short time, and the heat is sufficient to reduce a sticking-plaster winding to a horrid, sticky mess.

R. W. H.

CURING INTERFERENCE

Sir,—The following tip may be of use to other home-constructors who suffer, as I do, from the interference bogey.

My particular trouble is a picture-house generator about thirty yards from my set. The problem, therefore, as you may imagine, was how to receive any broadcast, other than the local, at all.

When I tell you that my set is built to your "Push-Pull" Five design you may realise how tantalising the position was.

Tried Nearly Everything

Well, I tried working without an earth, with earth taken through banks of large condensers, with no aerial, frame aerial and directional loop. I tried every kind of selectivity unit I read or heard about, and, in effect, nearly, but not quite, gave up wireless in disgust.

I now can listen in comfort to all the stations the "Push-Pull" Five will bring in, which, as you know, means nearly every main transmitter in Europe, with a few from Asia and Africa thrown in when conditions are good, and luck not so bad.

The interference has not disappeared, but compared to its original nerve-tearing racket it is now negligible, and a thing of no account.

And this is how the cure was effected:

How He Cured It

Simply a variable condenser in series with the earth lead from the set. I use an old-type .0005 mfd., and the operation is, simply, turn knob until interference is weakest, with the dials of the set about mid-position.

For the very greatest benefit it is worth while to readjust the "earth" condenser for widely separated stations—i.e. near top or bottom of set tuning dials.

I trust this will be of help to some other unfortunate, and wishing your paper continued success.

I am,
Yours sincerely,
A. G. ALEXANDER.

Manchester.

P.S.—This arrangement has been tried out locally by fellow-sufferers, both from picture-house and tram noises, and in every case has greatly minimised interference.—A. G. A.

THE "EASY-STAGE" THREE

—continued from page 223

little groove for it in the baseboard.

Here are the dimensions for drilling the battery plug. The two L.S. pins, the H.T.+2 and H.T.+1 are all 1¼ in. apart, and L.T.+ is 2½ in. from H.T.+1. A line joining the L.T.— and H.T.— pins would be 1¼ in. from L.T.+. L.T.— and H.T.— are 1 in. apart, namely, ½ in. on either side of a line joining the other five pins together.

The actual spacing, of course, is not very important, but what is vital is that the sockets are in exactly the same relative positions as the pins in order to ensure a nice smooth fit. Incidentally, in this connection it is desirable to drill the holes for the pins a little larger than is required by their shanks, and before tightening up their nuts to put the plug in position with the pins right home in their sockets.

When you remove the plug after tightening the pins you will then find that it slides out quite easily, and can be refitted without such trouble as would occur if the pins and sockets did not coincide properly.

The Selectivity Control

You will find a table in which all the details about accessories and operation are set out in a convenient and compact form. Apart from the question of convenience of reference, this panel is extremely useful for cutting out and sticking to the lid of the cabinet, where it will always be handy and will improve the set's appearance.

I do not think it is necessary to add much to the details in the operating panel, and there is only just one point requiring further mention, and that is the series aerial condenser. This is really a selectivity adjustment, and should be set at such a capacity that selectivity is just sufficient for the lower broadcast band.

In this position it will not be found to affect long waves much, except that if any medium-wave interference is experienced on long waves it will cut it down quite a lot. If you are very near a powerful station, and find that the condenser does not give you enough selectivity, a wave-trap can be used with the set.

There, that is all! So you can start right away with the utmost confidence and have a set of which you can be really proud constructed in a very short time.

GETTING TERMINALS TO GRIP

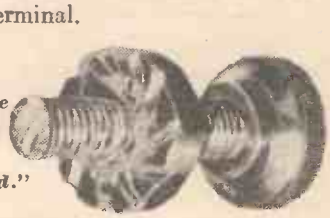
By "Amec."

You may not believe in diabolical possession, but, all the same, there seems to be a peculiar species of radio demon which delights, now and again, in influencing an odd terminal or two on the panel, and in making it refuse to tighten up satisfactorily.

At various periods in my radio career I have been perplexed by the obstinate manner in which one or more terminals will resolutely refuse to grip the panel and remain tight. Put it down to careless working on my part if you like; but I feel sure that I am not the only one!

There is, I have found, at least one almost infallible cure for a non-sticking terminal. It is a simple cure; and you will find it illustrated in the photograph herewith.

Merely dissemble the entire terminal from the panel, place the terminal in a vice (incidentally, it should be well padded in the vice with bits of rag to prevent scratching and burring of the sides), and then file a series of nicks on the panel face of the terminal, in addition to roughening up the whole of this under-surface of the terminal.



How the terminal is "roughed."

Replace the terminal in the panel and screw up tightly. In ninety-nine cases out of every hundred you will find that the terminal will remain perfectly tight up against the panel, the roughening of its under-surface having been sufficient to impart to the terminal just that little bit of extra "bite" which is needed to make it remain permanently tight.

HOW MANY STAGES?

—continued from page 236

have any advantage over the British set designers.

"As I have said before, the question of royalty and the price of valves have to be considered, and until things alter I think the high-gain-per-stage precision receiver will hold its own.

"Of course, from the point of view of battery sets it is hopeless to attempt to use multi-valve low-amplification sets owing to the big anode current required."

During the major part of this discussion Mr. Kelsey had preserved a somewhat forbidding silence. It was obvious he had some bombshells up his sleeve, and at this juncture he proceeded to drop them!

"Sweeping Questions"

"With all due respect to my colleagues," he said, "and while fully appreciating the soundness of the views that have been expressed, I cannot help thinking that in some respects their method of approaching the subject has been somewhat similar to putting the cart before the horse.

"Mr. Victor King asks, 'Do we want high-mag. valves?' and 'Are several low-mag. stages better than one or two high-mag. stages?'

"In attempting to arrive at satisfactory answers to such sweeping questions as these, ought we not to ignore American practice altogether and approach the questions more appropriately from the standpoint of what is required in *this* country?

"Success to both the set designer and the manufacturer will, in my opinion, only come in full measure when the public is offered just what is required to fulfil the conditions with which they are faced.

"Let Us Forget America"

"They are not concerned with Americanised British receiver designs any more than they would select for preference an American car with left-hand steering for use in a country where the rules of the road are opposite to those for which the car was designed.

"No; let us forget America, and consider the questions absolutely from the point of view of our own conditions.

"If we can decide just what we want a set to do, surely it will then be an easy task to decide whether

(*Continued on page 268.*)

HOW MANY STAGES?

—*continued from page 267*

low- or high-mag. will most nearly enable us to do it.

"That brings us to the question of what we can reasonably expect of a set for broadcasting conditions in England. And in my view a set would have to be:

"(*a*) Selective. (A condition rendered necessary not only for distant listening, but, with the advent of Regional transmissions, for local reception as well.)

"(*b*) Capable of giving faithful reproduction.

"(*c*) Sensitive (under which heading, since it concerns distant reception, I include wave-change switching).

"(*d*) Simple to operate; and

"(*e*) The cheapest possible to fulfil the above conditions.

The Five Vital Points

"Now, both from the points of view of the designer and the manufacturer what most conveniently and efficiently enables us to arrive at a suitable design—high- or low-mag. stages?

"Point number one is distinctly in favour of high-mag., because we have only to call to mind the "Paratune" circuit to see that we can get all the selectivity we want without multi-stages.

"Secondly, super-quality is more likely to be obtained with fewer high-mag. stages, because, as Mr. Clark mentioned, multi-stages lead not only to the possibility of greater distortion, but to the need for complicated de-coupling precautions.

"Then what about sensitivity? Again, surely we shall get what we want much more easily with high-mag. stages, because if only from the point of view of wave-change switching multi-stages must inevitably lead to complications.

"The answer to point number four is obvious. Ease of operation is bound to come if we limit the number of valve stages.

"The only other point that we have not yet considered is that of cost. Here, again, to my way of thinking, the balance is heavily in favour of high mag. and few stages.

"By following up this line we save money not only on royalties, but on components, valves, and upkeep costs.

"It is no use to consider the question of upkeep costs with the idea of mains operation in our minds, because it will be many years before there is anything like uniformity of supplies in this country, and until then we must always consider those who, through force of circumstances, are confined to batteries.

"Thus, to sum up, I am convinced that our activities should without a doubt be concentrated upon the development of high-gain-per-stage circuits.

"I cannot see that any useful purpose would be served by concerning ourselves with multi-low-mag. stages, because, apart from royalties and upkeep costs, it must be remembered that, unlike the Americans, we for the most part are able to use outdoor aerials, which is an important consideration."

And, as Mr. Victor King said, that is that!

THE "GRAMODAPTOR"

—*continued from page 246*

The dimensions for the marking out of the positions of the valve pins and sockets are given on the wiring diagram.

If you prefer you can make a template for this purpose by pressing the pins of a valve on to a soft piece of paper. You will find it easier to wire up the adaptor with one of the wooden sides removed.

How To Use It

To put the adaptor into use is the work of a few moments and is extremely simple. It will usually be best to remove the detector valve from its holder, place the adaptor in its place and then put the valve into the adaptor, the flex lead going to 1½ volts negative on the G.B. battery.

In cases where there are two L.F. stages to the set, and the above gives too much power, the adaptor can be used in the first L.F. valve's holder. In this case the flex lead attached to one of the pick-up terminals should be taken to the same socket on the grid-bias battery as the plug which supplies the first L.F. valve when working on radio.

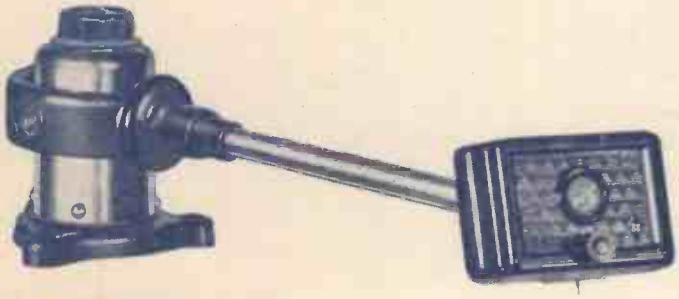
The leads from the pick-up are, of course, taken direct to the two terminals. If there is a volume control on the set, put it at maximum and control the volume entirely by the control on the adaptor.

INDEX TO ADVERTISERS

All communications concerning advertising in "Wireless Constructor" must be made to John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Telephone: City 7261
FOR ADVT. RATES SEE PAGE 259

FOR SIMPLE 2 AND 3-VALVE SETS

BLUE SPOT 101K



The wonderful sensitivity of 101K makes it the ideal speaker for use with the smaller type of receiver, as it will give magnificent reproduction on quite small inputs. But whatever the type of receiver, 101K will ensure results which stamp it as pre-eminent in its class.

PRICE **75/-**

AND FOR YOUR PICK-UP...

BLUE SPOT 88

Blue Spot 88, the world-famous pick-up, gives a new meaning to gramophone music. Until you obtain this pick-up you are depriving yourself of the best reproduction of your records. Ask your dealer for a demonstration and you will be both delighted and amazed.

Wonderful reproduction has not been obtained at the expense of record wear. Blue Spot 88 has been designed to reduce wear to the absolute minimum and is counter-balanced and runs on ball bearings. But study its novel features at your dealers.

PRICE **63/-**

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Absolutely New for 1931!

These four components are the immediate response to latest developments in valves, wavelengths, and mains power uses. They are lowest in price consistent with fitness for purpose and the standard of service guaranteed by the makers—one of the oldest established component and set manufacturers in the industry.

The New GENERAL PURPOSE FILTER OUTPUT CHOKE.

For output filter smoothing or L.F. coupling (maximum D.C. 60 m.a.). A small general purpose choke encased in beautiful green bakelite, for portables and other receivers where space is limited. *D.C. Resistance* 400 *ohms. Inductance* 23 *henries. Maximum D.C.* 30/60 *milliamps. Size* 2 x 2½ x 2½" *high. List No. D*Y25.

12/6

12/6

The New "POPULAR WIRELESS" AND "MODERN WIRELESS" DUAL RANGE COIL.

No more wavelength troubles.

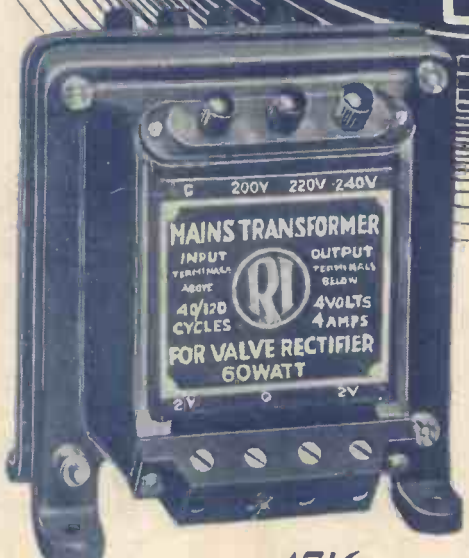
These coils, perfectly manufactured and laboratory tested on the wavemeter and inductance bridge, ensure best results and save the trouble of winding and assembly. Remember the maker's name on this coil is your surest guarantee of highest efficiency. *List No. BY20.*

The New 60 WATT MAINS TRANSFORMER.

A real Mains Power job.

The latest development in mains transformers for modern mains valves. A fine robust component suitable for A.C. mains 100/120 volts or 200/250 volts, 40–100 cycles.

250–0–250 volts, 60 m.a. for H.T.
4 volts C.T.—2 amps. rectifier valve filament.
4-v. C.T.—4 amps. for indirectly heated valves.
6-v. C.T.—3 amps for directly heated valves.
Maximum output 60 *watts.*
Size: 4½ x 4⅞ x 5" *high.*



List No. EY24. 47/6

17/6

The New VALVE FILAMENT MAINS TRANSFORMER.

Supplies the heater element of A.C. indirectly heated valves and other 4-volt filaments. Converts receivers using mains for H.T. only into all-electric in conjunction with A.C. valves. *4-volt C.T.—4 amps. Size:* 2½ x 3 x 3½". *List No. EY25.*

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and for the New Complete R.I. Catalogue. ***If difficult to obtain write to makers***

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