REGISTERED AT THE G.P.O. AS A NEWSPAPER.

1/- FULL-SIZE BLUEPRINT FREE INSIDE

Popular Wireless & Television Times

JOHN SCOTT-TAGGART'S FIRST THREE-VALVER FOR FOUR YEARS

EVERY WEDNESDAY PRICE 3D

No. 720.
Vol. XXIX.
March 21st, 1936.

With Every Copy this week

FULL-SIZE BLUEPRINT of the CENTURION

AN OUTSTANDING RECEIVER AT A *Record Low Price*

By

John Scott-Taggart

M.I.E.E., F.Inst.P., Fel.I.R.E

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THOSE GHOSTS!
FRENCH PLANS
ATLANTIC AIRWAYS

RADIO NOTES & NEWS

GERMANY AHEAD?
S.W. BLANKET
RADIO RESEARCH

The Ghost Broadcast

THE B.B.C.'s recent interest in matters supernatural has prompted several of my correspondents to inquire what I think of ghosts. Frankly, I think as little of them as possible.

Like most people, I've never *seen* one, but I've known people who have. A one-time colleague of mine, a clergyman, knew a fellow who spent a night in a haunted room with a companion. They agreed not to stir, and covered the floor with a white powder to show footprints (if any). When morning came what appeared to be the footprints of a large bird were found passing through the room, though doors and windows were sealed effectively.

The incident was never explained; and though we may laugh at ghost broadcasts it is curious of how many inexplicable happenings one hears.

Medicine Man of the Clouds

HAVING noticed some remarks I made last year about the Flying Radio Doctor of Australia, "Bushman" sends me some particulars of the work done by Dr. A. Vickers from his base at Cloncurry, Queensland. The account reads like a fairy tale, and, what is more, has many a happy ending in real life.

To summon the doctor from hundreds of miles away, the prospectors in the Never-Never country use "pedal transmitters," which are like stand-still bicycles. Each is fitted with a typewriting keyboard, so all they have to do to transmit is to pedal for dear life (which puts on the power) and spell out the message on the keys. Next thing they know is an aeroplane circling round—the doctor has called!

This is great stuff, and I'm glad to hear that Gaumont-British are going to put it on the screen for us.

Radio-Paris to Move

WHEN I commented on the compliment the French were paying us in following our lead by placing their Empire station near the middle of the country, I did not know how quickly and thoroughly the task would be carried out. Now it is announced that Radio-Colonial is to be in its new place and working on 50 kw. before the end of the year. (Note the 50—our Empire stations use a maximum of 15 kw.)

Radio-Paris, emulating our National station, will also move to the central site, and will increase power to 150 kw. before this year is out.

Carrying It Too Far?

BEING enthusiastic is all very well, but are not some of us overdoing our zeal for radio?

There is this case of the chap who went to a big fight, for example—I believe it was the recent Jack Petersen-Len Harvey affair—paying five guineas for a seat right up close to the ringside. He took out his opera glasses, and then, to the astonishment of his neighbours, produced a small box, a pair of 'phones, tuned in, and proceeded to listen to a commentary on the fight that was going on within a few yards of his nose!

Savours of excess, don't you think? By the time you have seen and heard a fight, tuned in the commentary on it, and reviewed it on the "flicks," you have qualified to the point where you ought to put the gloves on yourself!

Flying the Atlantic

FURTHER details of those proposed seadromes along the line of an Atlantic cable make exciting reading. The project, indeed, seems to be of the feline slumberwear type (known also as the cat's pyjamas).

An important feature of such seadromes is that landing on them is claimed to be *easier* than on most existing aerodromes. No hills or mountains, no trees or buildings, no wireless-beam interference from adjacent stations to worry about. And the deeply submerged landing-stage supports would be unaffected by surface waves.

The height of the landing stage, operators' quarters and so forth would be well above that of the highest seas, so that fury of the waters would pass below, between the slender "legs" of the supporting structure.

What with this scheme, the new Zeppelin, and the proposed Anglo-American route it seems that Old Man Atlantic has had his day.

An Early Morning Shock

BACK in our February 29th issue I happened to mention a correspondent who picked up an American police message that was divertingly vague—so vague that the artist and I treated it as a joke. Another reader now tells of the opposite side of the picture, revealed in a broadcast of sheer horror.

In this instance the U.S. police broadcast revealed the discovery of the body of a man, fully dressed, whom the gangsters had left dead on the sidewalk after cutting off the tops of all his fingers to prevent identification.

This grisly piece of news crossed the Atlantic on medium waves; it had been broadcast late at night in the States, corresponding to 4 a.m. by our time.

Welsh Bombshell

IF you have ever absent-mindedly thrown a lighted match on a big spill of petrol, or in a can of explosives, you will appreciate my feelings when opening a letter from C. J., of Aberystwyth. A solid peace split into a million crashes!

Without any of your "Dear Sir" or "Excuse my glove" preamble, C. J. jumps off the paper straight at my throat. Apparently under the impression (erroneous) that I am depriving Wales of a National station of her own, he makes out a case for the Principality with all his powers.

As I stagger back to my corner for the last round, I am surprised to notice a postscript saying, "*I will admit nobody wants 'The Silent Fellowship' again.*" This brings me up as fresh as a daisy again for another bout, for though Wales is a mountainous mystery to me, I do know one thing—that in the eyes of many there the B.B.C.'s worst offence was the suppression of the Fellowship.

Has Germany Won?

EVER since broadcasting began Britain has had more licensed listeners than any other country in Europe—until now. But by the time these words appear I rather think that Germany will have collared the lead.

(*Continued on page 53.*)

The CENTVRION

AN OUTSTANDING RECEIVER—

THERE has been a great deal of criticism for several years of the policy I have adopted of making the principal set of the season a four-valve receiver. My return to a second spell of the limelight of the technical press was heralded by a three-valve receiver, the S.T.300, which certainly had a very considerable success. It therefore seems a little like ingratitude to forsake the public that supported the S.T.300. But actually this public have probably long since built one of the more ambitious of my press designs. The fact remains, however, that by now there must have grown up a very large new public who do not require a set of such ambitious character as, say, the S.T.600 or S.T.700.

Experience of the home-constructor public over many years shows that there are different grades of constructor and that the public passes from one grade to another, just as there are three grades at a university—namely, first-year, second-year and third-year students.

The time has come when I must go back to the earlier grade instead of progressing in the direction of greater and greater performance.

After all, there are many different makes of motor cars and a designer who concentrated on the de-luxe models would be leaving a vast market to other designers; and it has been suggested to me that I have concentrated too much on the more expensive public and ignored what is so often described as "the good old three-valve set."

Except for a "star" version of the S.T.300, I have not designed a three-valve set for over four years. The S.T.300 Star was a modification, but it was still—in nearly all its

by JOHN SCOTT-TAGGART

M.I.E.E., F.inst.P., Fel.I.R.E. MCMXXXVI

—At a Record Low Price

essentials—the S.T.300. Now four years is a very long time, so far as radio history is concerned, and there have been numerous changes in technique and in ether conditions. Some of the developments in technique have left me lukewarm so far as their application to home construction is concerned. The developments in the ether are, however, beyond our control, and we must design sets to cope with such conditions. The problem of selectivity is the greatest looming before us, and as regards swamping by the local B.B.C. stations, the designer's conscience, at any rate my own, has become sensitive to an extent which would have been thought fantastic four years ago.

For example, it would not have been thought unreasonable to give the constructor twenty or thirty stations in a bad B.B.C. swamp area. Yet now my own standards are such that on the S.T.700, for example, I insisted on over fifty stations being capable of being received within one mile of the two Brookmans Park aerials.

The designer's conscience (and again I speak for myself for the moment) has also driven him to seek out methods of reception which will involve a minimum of control operations while still giving as efficient a set as possible. The S.T.300 had a variety of controls, all of which altered wavelength, and calibration was rather a "business." The position of couplers had to be noted down, and to go back to a particular station involved a considerable amount of time and a certain degree of uncertainty. Nevertheless, the great merit was that you could

CHEAPEST S.T. DESIGN EVER PUBLISHED

get very good results. The S.T.300, and other contemporary designs even more so, did not provide a solution of swamping by the B.B.C. Moreover, this was before Droitwich was erected, and so that fearsome source of interference was not one of our problems.

Two Great Factors

The need for greater selectivity brought in its train the need for great *sensitivity*. The reason for this is that when the couplers of the S.T.300 were reduced to give great selectivity the signal itself would sometimes be so weak that it was not worth receiving. We then get to the S.T.400 stage which is the beginning of a series of four-valve sets. But there are two great factors which have made it possible to go back once more to three valves without prejudicing performance. One of these is that I have abandoned the attempts made in the S.T.300, S.T.400 and S.T.500 to obtain sufficient selectivity in the main set to cut out interference from the B.B.C. I have developed that as an entirely separate problem which is dealt with by the use of an extractor system first used in connexion with the S.T.600 and then developed to a very high pitch of simplicity and efficiency in the S.T.700. This step, at one fell swoop, raised the sensitivity of the set as much as fifty times in some circumstances, as it was no longer necessary to reduce the sensitivity of the receiver by reduction of coupler adjustments. The technical reasons for this will be given in greater detail later in this article, but for the moment you can accept it as a technical fact that by the aid of a Triple Extractor system, which involves no extra valves, it is possible to get better results on a foreign station with three valves than with four not using a Triple Extractor. You can put it in a different way by saying that the S.T.400 used its extra valve chiefly to give greater selectivity.

In the S.T.600 and the S.T.700 the extra valve has been primarily used for giving greater sensitivity, with the result that these two sets will give full loudspeaker signals from innumerable stations, even though the aerial only consists of two or three feet of wire lying on the floor.

"Most Agreeably Surprised"

There is a tremendous reserve of sensitivity in these sets, and for that reason I have felt more and more inclined to go back and see what could be done with three valves.

I have been most agreeably surprised, and **the present receiver, the "Centurion," is the result of my work of producing with three valves a result which comes up to my standards of modern radio reception.**

Apart from the actual design of the receiver itself there are two factors which contribute to its value under modern conditions. The first has already been discussed and is the Triple Extractor which enables the set, even within a mile of the

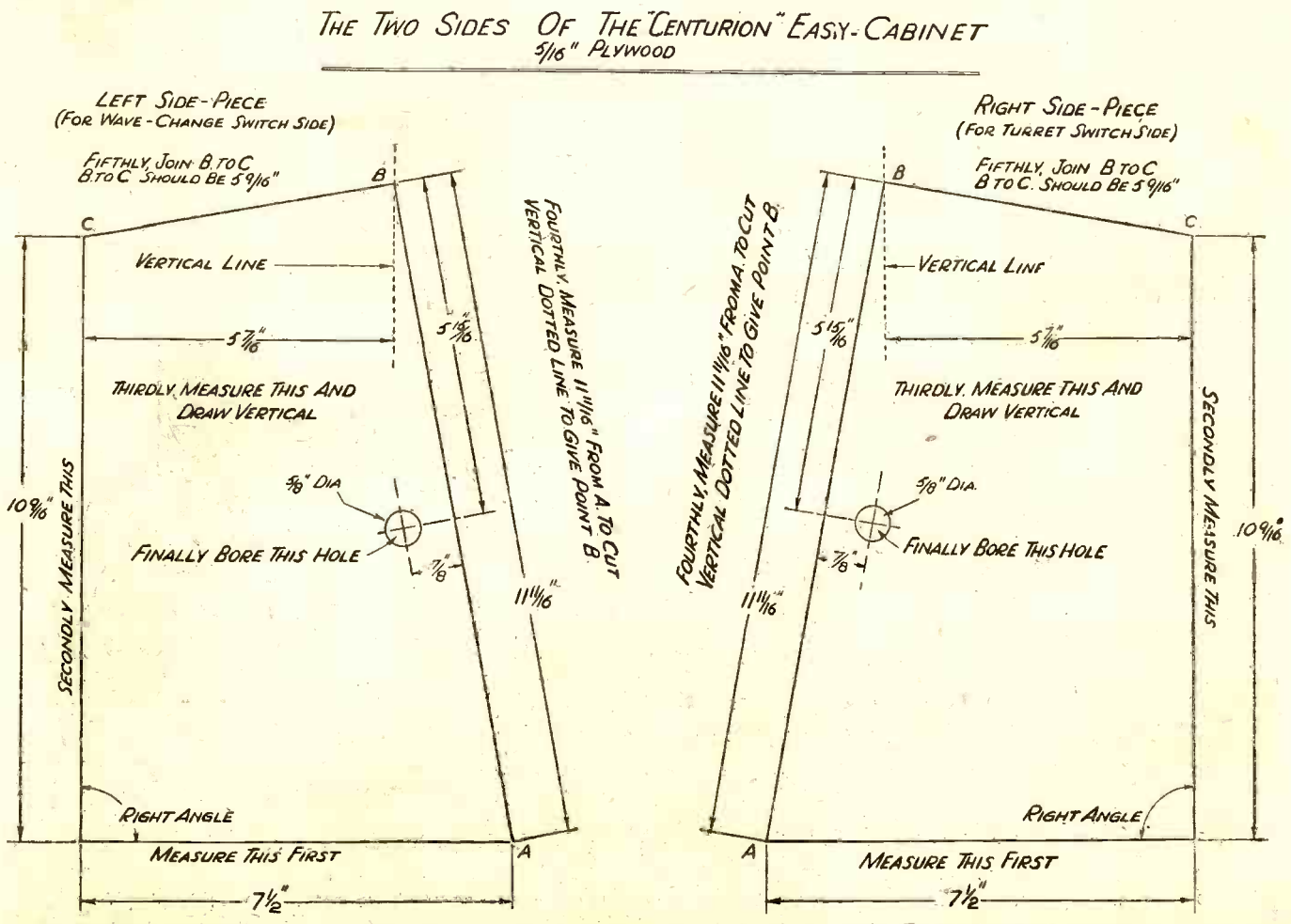


Fig. 1.—These are the two side-pieces for the "Centurion" Easy-Cabinet. 5/16 in. plywood is used, and care should be taken to adhere to the dimensions given.

LOCAL STATION INTERFERENCE ABOLISHED

B.B.C., to be used at its maximum, or nearly maximum, sensitivity; whereas, without the Triple Extractor the attempts at selectivity would so impair signal strength that very few foreign stations would be loud enough even to hear, far less to work a loudspeaker at full strength.

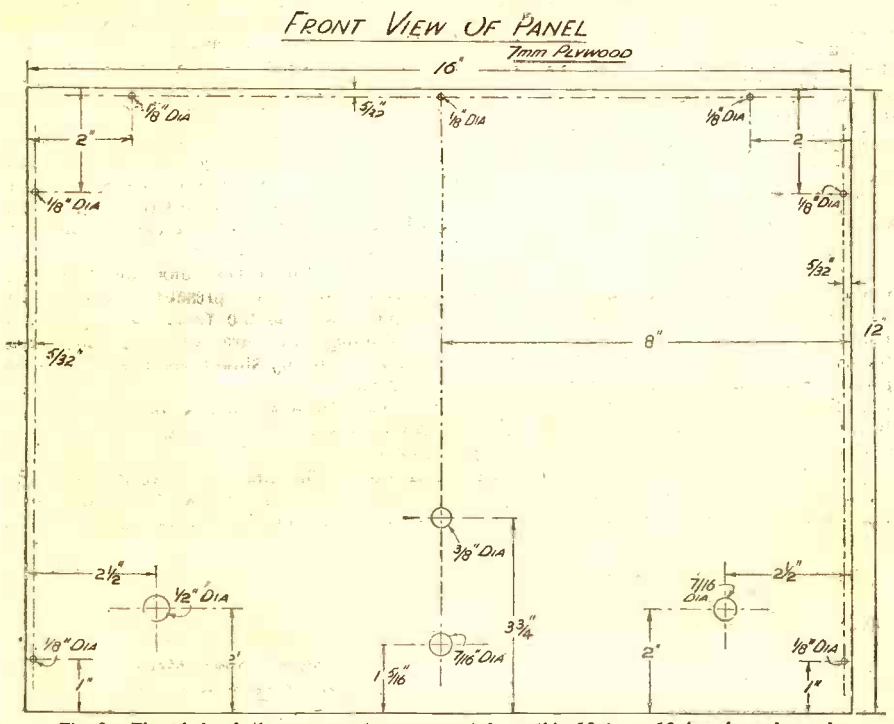


Fig. 2.—The whole of the components are mounted on this 12 in. x 16 in. plywood panel. Those who do not wish to carry out the drilling operation themselves can purchase the panel ready cut and drilled.

The second reason is one which has acquired more and more importance over the last four years. It is the growing strength of broadcasting stations. There has been a rapid progressive increase in the power of European broadcasting transmitters. There is hardly a single station which has not multiplied its power by several times since 1930. Consequently, four valves—from a sensitivity point of view—are not nearly so desirable as they were four or five years ago. If the process continues, in a few years' time it may be quite unnecessary to use high-frequency amplification at all. In this connection it is to be noted that most modern super-heterodynes do not use an initial stage of high-frequency amplification.

A Far More Satisfactory Set

The great rising power of foreign stations, which would be strikingly apparent by comparing any list to-day with the corresponding list of stations four years ago, has brought the three-valve set once more into the realm of practical politics. I have done more than my share to put the three-valve set out of business, but the introduction of the Triple Extractor and the increasing power of foreign stations make the three-valve set once more a type which may be looked upon with favour and even enthusiasm.

If four years ago people were delighted with the S.T.300, they will certainly be far more delighted with the "Centurion," since it is in every respect a far more satisfactory receiver giving a higher all-round selectivity, complete freedom from B.B.C. interference if the Triple Extractor is used, a sensitivity sufficient to bring in about sixty stations with regularity and a log of about a hundred stations all told.

The volume of output will depend upon the last of the three valves, the type chosen being left to the constructor. You have here the opportunity either of a large volume on fewer stations (i.e. the stronger stations) or ample room-strength on practically all stations. The small power valve is more sensitive than the larger power valve and will, therefore, give louder signals on some of the weaker stations. For a three-valve set the small power valve is, for that reason, recommended, but of course it has the additional advantage of economy in H.T. current.

Very High Performance

So far, I have not considered at all the question of initial cost or upkeep expense. Performance has been the main consideration in all my receivers, except perhaps the S.T.300, which was produced at a time when no one would look at a set having more than three valves. Initial cost does remain a very important factor in every phase of life. I am not suggesting that you can do with three valves what you can do with four, but I do definitely say that you can do with three valves now what required four valves some years ago. **Moreover, I suggest that 80 per cent of constructors will be able to obtain with the "Centurion" all that they desire, and certainly far more than they expect from three valves. I can assure all would-be constructors that I would not go back, after four years, to a three-valve design unless I were thoroughly satisfied that it would "deliver the goods."**

> ★ "I WAS REALLY ASTONISHED AT THE PERFORMANCE OF THIS SET."—J. S.-T. ★

As a matter of fact, I was really astonished at the performance of this set. Perhaps I have been rather prejudiced against three valves and have not given them a fair trial under the two new conditions which I have outlined above, namely, the Triple Extractor in swamp areas and the increase in power of foreign stations. There are, of course, other

THE AUTO-DIAL RENDERS STATION SELECTION SO EASY

A giant scale with over a hundred stations indicated by name and accurate individual calibration are two of the features of this great new S.T. design.

SELECTIVITY WITHOUT LOSS OF SENSITIVITY

factors, such as the coil unit and H.F. pentode valve, which lend distinction to the technical performance of the "Centurion," and there are equally important features, such as the method of construction, the simplicity of tuning, and the special Auto-dial which enables you to tune instantaneously to any named station which has once been received.

A Big Saving in Cost.

As regards initial cost, the saving is far greater than one might at first imagine. Not only are a valve holder, a valve, and coupling components saved, but costly decoupling components, which are in the nature of an insurance against motor-boating and instability, but which may be omitted, thus reducing cost, in the case of a three-valve set. The decoupling components which consist of resistances and condensers do not contribute to the sensitivity, selectivity or, in normal cases, the quality of reproduction. They are really there to make the set fool-proof against any high-tension battery or any mains unit. The cost of these necessary precautions will be realised when I say that in the case of the S.T.600 the cost of decoupling amounted to 15s. 6d. In addition to this, several more shillings go in components which are precautionary as regards the high-frequency side of the apparatus. When you deal with the three-valve set the safety measures can be cut down drastically without involving any risk and the "Centurion" here described is quite adequately decoupled and will work on batteries or a mains unit.

Quite frankly, I have tried to save every penny possible in every part of the apparatus but without taking any risks whatsoever as regards performance. I do not think that any set has ever been designed at such a low cost for anything like the results provided.

The total H.T. consumption from this receiver is 9 milliamperes, and you can use one of the cheap five- or six-shilling 120-volt high-tension batteries which would be quite inadequate for four-valve receivers using large output valves.

The extra consumption of the four-valve set is not so much because there are four valves but because one uses a large output valve. **With the "Centurion" one can use the very cheap batteries with every confidence. The low H.T. consumption makes the set very economical to run. When the H.T. battery requires replacement one of the cheap standard types is once more used.**

Having decided that a very good performance, coupled with very low initial cost, was essential, I then turned my attention to such problems as ease of construction, certainty of obtaining the author's own results, and ease of operation. The system of construction is the simplest it is possible to imagine. It is the same "Uniplane" arrangement introduced in the S.T.700. All the parts are mounted on a single sheet of plywood. This system of construction makes it possible for a planned view to convey the whole of the wiring, and perspective drawings are unnecessary. The arrangement which has been popular for many years, consisting of a vertical panel and a horizontal baseboard, adds greatly to the complexity of construction, and no single drawing can convey the positions of the wires connecting panel components to baseboard apparatus.

In addition to the single plane construction of the set itself, I have devised an "Easy-Cabinet" which consists of three pieces of wood, a top and two sides, which are screwed to the panel and then form a very handsome self-contained receiver which looks even better than in a conventional cabinet, but which costs only a matter of 3s. 6d. extra. All the constructor has to do is to screw these three pieces of wood to the panel, a matter of a few minutes' work, and there he has an absolutely complete receiver. If he desires he can fit a cloth back, but this portion of the set will usually be facing a wall and will not be seen. It is worthy of note that most commercial radio-gramophones have open backs, while some have an open bottom and an open back.

Special additional cabinets for the "Centurion" have been suggested by commercial firms but I am sure that readers will be very satisfied indeed with the Easy-Cabinet which is included in the receiver and included in the price of the kit of parts. The cost of the set is about 56s. 6d., which includes the cabinet. This compares with 72s. 6d., which was the cost of the component parts for the S.T.300 without a cabinet, so that you will see there is a very substantial reduction in cost to the constructor, while there are very substantial additional merits.

Simplicity of Control.

An examination of the photographs and drawings will reveal the simplicity of the controls. There is a knob on the left side-piece of the Easy-Cabinet; this is not a control at all, but simply a wavechange switch. This switch is part of the coil assembly, the coil being of the S.T.700 type. The switch knob is not in any way mounted on the side of the cabinet; there is simply a hole in the side to permit the switch spindle extension rod to pass through.

On the right side-piece of the set there is another switch which again is not mounted on the side-piece of the cabinet but on the main panel, like all the other components. This switch is for switching the set on and off and also for providing two degrees of selectivity, namely, normal selectivity and extreme selectivity. This switch is something quite novel in radio receivers. I mean the application of the switch to this particular purpose. When the switch is turned to the left the set is off; when you turn it partly to the right the selectivity is at "extreme." When the switch is fully round to the right, selectivity is normal. This switch, incidentally, controls volume, but it is not normally used as a volume control. It will be found that signal strength is zero, of course, when the switch is off; medium when the switch is in the intermediate position; and loud when the switch is full right.

THE POWER SUPPLY

BATTERIES:
H.T. 120 v.—Drydex, Marconiphone, G.E.C., Aerialite, Milnes H.T. Unit, Lissen, Fuller.
G.B.9 v.—Drydex, Lissen.
L.T.2 v.—Exide, Lissen, Fuller.

MAINS UNITS:
Ekco, Atlas.

SUITABLE LOUDSPEAKERS

W.B., Rola, Blue Spot, Amplion, Wharfedale.
(No significance attaches to the order of makes.) J. S.-T.

KEEP STRICTLY TO THESE PARTS

Components.	Make Used by Designer.
Coil unit	Colvern, as for S.T.700.
1 ·0005-mfd. aerial balancing condenser... ...	Ormond R.483 (small knob provided, but Graham Farish knob may be used to match).
1 Main tuning condenser and long pointer ...	J.B., as for S.T.700.
1 ·0005-mfd. condenser (volume control) ...	Graham Farish Litlos Log-midline.
1 ·0005-mfd. anode reaction condenser.... ...	Graham Farish do. do.
1 On-off and change-over switch	Graham Farish Turret.
1 Anode reaction choke	Wearite H.F.P.J., marked H.F.J.
1 ·00005-mfd. grid condenser	Lissen mica.
1 ·0005-mfd. H.F. by-pass condenser	Lissen mica.
1 ·01-mfd. screen decoupling condenser ...	T.M.C.-Hydra T.17.
1 1-mfd. condenser	T.C.C. type 50.
1 1-megohm grid leak	Erie.
1 L.F transformer	Varley Niclet 1 : 3·5.
3 4-pin valve holders	Benjamin Vibrolders.
6 Terminals (A., E., H.T.+1, H.T.+2, L.S.—, L.T.+.)	Belling-Lee type R.
1 Panel 16 in. × 12 in. × 7 mm.	Peto-Scott.
1 Easy-Cabinet	Peto-Scott.
1 Terminal strip 6 in. × 1½ in. × 3-16ths in....	Peto-Scott.
3 Aluminium brackets	Peto-Scott.
3 Wander plugs (Grid+, Grid−1, Grid−2)...	Belling-Lee Midget 101.
"Maxamp" Wire	Peto-Scott.

VALVES.

V1, Hivac VP215; V2, Cossor 210RC; V3, Cossor 220PA.

Optional Aerial and Earth Equipment: Aerialite "Levenstrand," Electron "Superial," Graham Farish "Filt" Earthing Device.

EASY TO MAKE—SIMPLE TO OPERATE

What this switch does is to put two different bias voltages on the H.F. pentode valve one being zero voltage and the other, say, $-4\frac{1}{2}$ volts. The switch is connected to the tappings of the grid bias battery, which is of the 9-volt type. In the full right position of the switch zero voltage is applied to the grid of the pentode. In the intermediate position of the switch about $4\frac{1}{2}$ volts is applied to the grid.

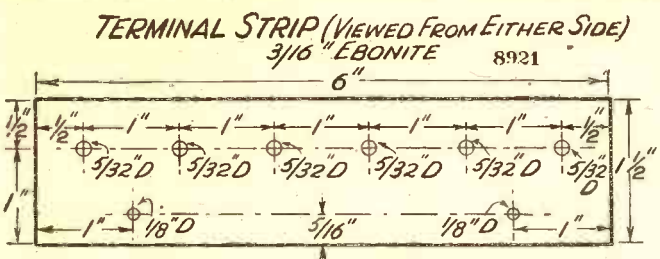


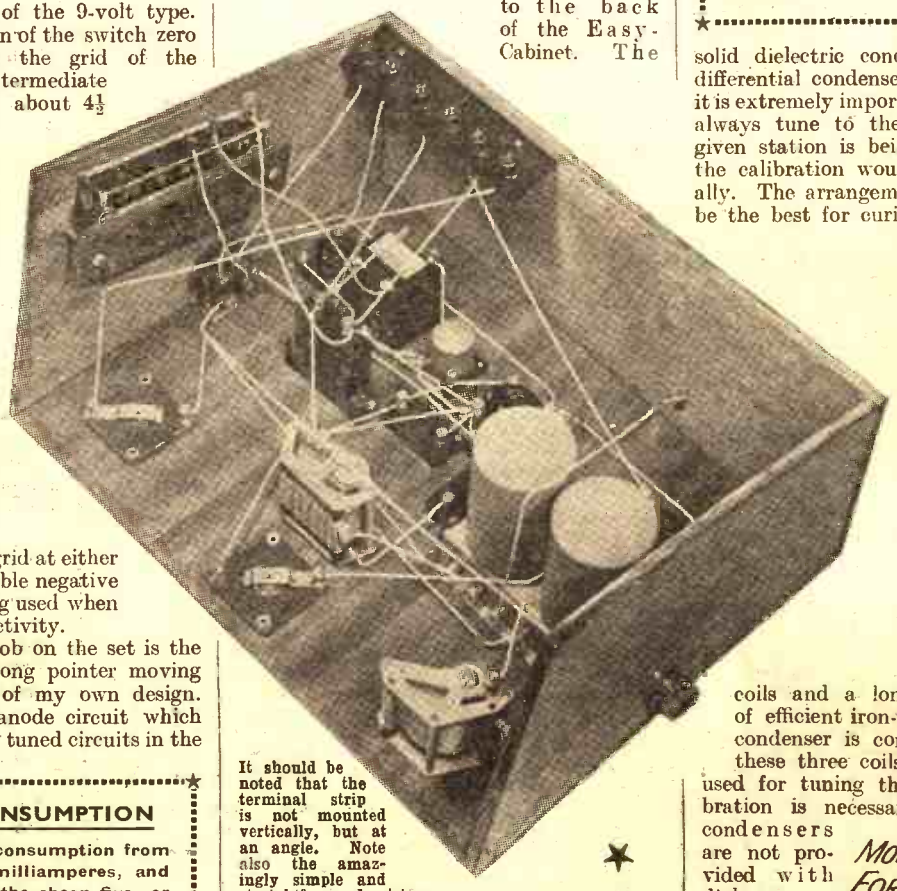
Fig. 3.—The terminal strip is mounted on two small brackets, the dimensions of which are given on the next page.

In other sets that I have designed using a variable-mu H.F. pentode, I have used a potentiometer for varying the bias on the grid. But in actual practice I found that one usually works the potentiometer at certain positions and that on a three-valve set one could dispense with the cost (which is quite appreciable) of a potentiometer and simply control selectivity by working the grid at either zero volts or at a suitable negative voltage, the latter being used when one desires special selectivity.

The main tuning knob on the set is the one which turns the long pointer moving over the special dial of my own design. This knob tunes the anode circuit which is the second of the two tuned circuits in the receiver. The first circuit, which is associated with the aerial, is tuned by the knob on the left of the panel. This knob is not calibrated in any way; you simply turn the main tuning knob till the pointer is opposite the station you desire and then the "balancer" knob, which tunes the "aerial" circuit, is turned till the station is heard. The knob immediately beneath the main tuning knob provides anode reaction, while the knob on the right of the panel is the volume control. This is a ·0005-mfd. solid dielectric condenser, which is an aerial coupler. It affects the selectivity of the first tuned circuit, which selectivity is improved when this knob is turned to the left; signal strength, however, increases if the knob is turned clockwise—i.e. to the right. This knob is used not only for selectivity but also for volume control, giving a gradual variation.

The Terminals

On this occasion the terminals which are for connection to the accumulator, H.T. battery, aerial and earth, are on a small strip of ebonite screwed to the back of the Easy-Cabinet. The necessary two or three wires between components and this terminal strip are connected after the set is built.



It should be noted that the terminal strip is not mounted vertically, but at an angle. Note also the amazingly simple and straightforward wiring.

The circuit is more or less self-explanatory. The special switch calls for some comment. It is really a combination of an on-off switch (having two contacts) and a single-pole double-throw change-over switch having three contacts. In the circuit the two switches are shown side by side but separate. Actually they are all mounted in the single Graham Farish turret switch. The change-over switch puts either zero volts or $4\frac{1}{2}$ volts negative on the grid of the H.F. pentode valve. It should be pointed out that the actual voltage may not be $-4\frac{1}{2}$ volts, but might be -3 volts or -6 volts; $-4\frac{1}{2}$ volts is suggested, but if you have fewer volts it will mean that signals will be stronger when the switch is in the intermediate position.

The reaction, it will be noticed, is obtained by means of an ordinary ·0005-mfd. solid dielectric condenser and not by a differential condenser. The reason is that it is extremely important that the set should always tune to the same point when a given station is being received, otherwise the calibration would be wrong occasionally. The arrangement shown is found to be the best for curing the troubles which arise through alteration of tuning with different values of reaction. A condenser of ·0005 mfd. is connected from the anode of the detector valve to the negative of the filament, and this value is important and should not be altered.

The Triple Extractor is a separate box containing a Triple Extractor coil and three air-tuning condensers. The Extractor coil consists of two medium-wave coils and a long-wave coil, all being of efficient iron-cored type. A tuning condenser is connected across each of these three coils, a small knob being used for tuning the condenser. No calibration is necessary, and therefore the condensers are not provided with dials.

The Triple Extractor unit has two external terminals, one of which is

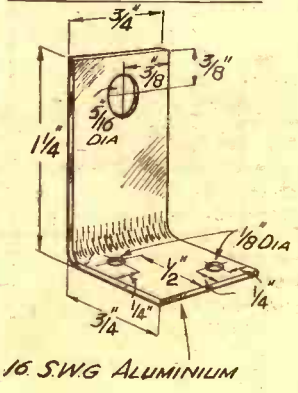


Fig. 4.—The turret switch is mounted on the panel by means of this bracket, the spindle protruding through a hole in the cabinet side-piece.

LOW H.T. CONSUMPTION

"The total H.T. consumption from this receiver is 9 milliamperes, and you can use one of the cheap five- or six-shilling 120-volt high-tension batteries."—J. S.-T.

ONE HUNDRED STATIONS

"If four years ago people were delighted with the S.T.300, they will certainly be far more delighted with the "Centurion," since it is in every respect a far more satisfactory receiver, giving a higher all-round selectivity, complete freedom from B.B.C. interference if the Triple Extractor is used, a sensitivity sufficient to bring in about sixty stations with regularity, and a log of about a hundred stations all told."—J. S.-T.

THE S.T. "CENTURION"—THE SET

connected to the aerial and the other to the aerial terminal of the receiver. The unit is placed near the set or on the window-sill, or at some other convenient point between the lead-in and the receiver.

The purpose of the Triple Extractor is to keep out the three stations most likely to give trouble, namely, the Droitwich station, which is tuned out by means of the middle knob, and the local Regional and medium-wave National stations. For example, in Glasgow one would set the two outer knobs to tune out the Scottish National and Scottish Regional stations, while the middle knob could be used for cutting out Droitwich, although as this station does not give trouble in Glasgow the knob could be set to some value where it does not cut out a long-wave station. Readers in Birmingham will very much appreciate the cutting out of Droitwich but they only have one medium-wave station to worry about, so that one of the other medium-wave knobs need not be used; it can be set to the Midland Regional programme—i.e. to the same station as the other medium-wave knob. Constructors in London will require all three knobs.

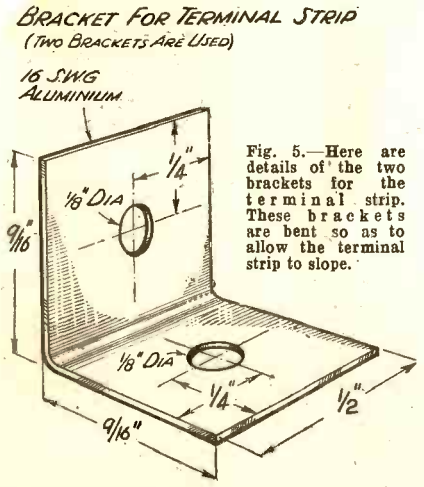


Fig. 5.—Here are details of the two brackets for the terminal strip. These brackets are bent so as to allow the terminal strip to slope.

Extractor Optional

Whether you build the Triple Extractor unit or not is a matter for your own judgment. This will depend upon where you live and to what extent you wish to receive stations close in wavelength to interfering B.B.C. stations. If you do not mind a certain amount of overlapping near the wavelengths of the B.B.C. stations, you do not need the Triple Extractor. Likewise, if you do not live in the swamp areas there is no necessity at all why you should build the Triple Extractor unit.

The selectivity of the "Centurion" as it stands without the Triple Extractor is very good and my advice, therefore, is to build the set exactly as it is and then later, should you wish to add the Triple Extractor you can do so. I have not the slightest doubt but that the set as it is will give complete satisfaction to most readers, while those living under severe swamp conditions can add a device which once for all will stop all interference from the B.B.C.

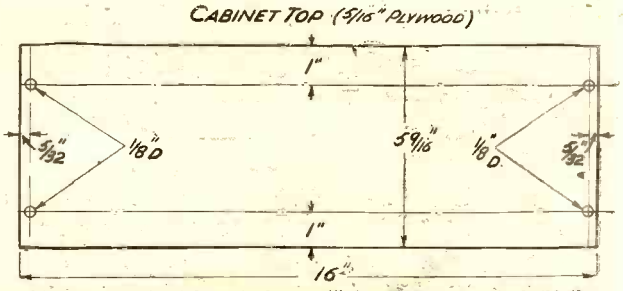
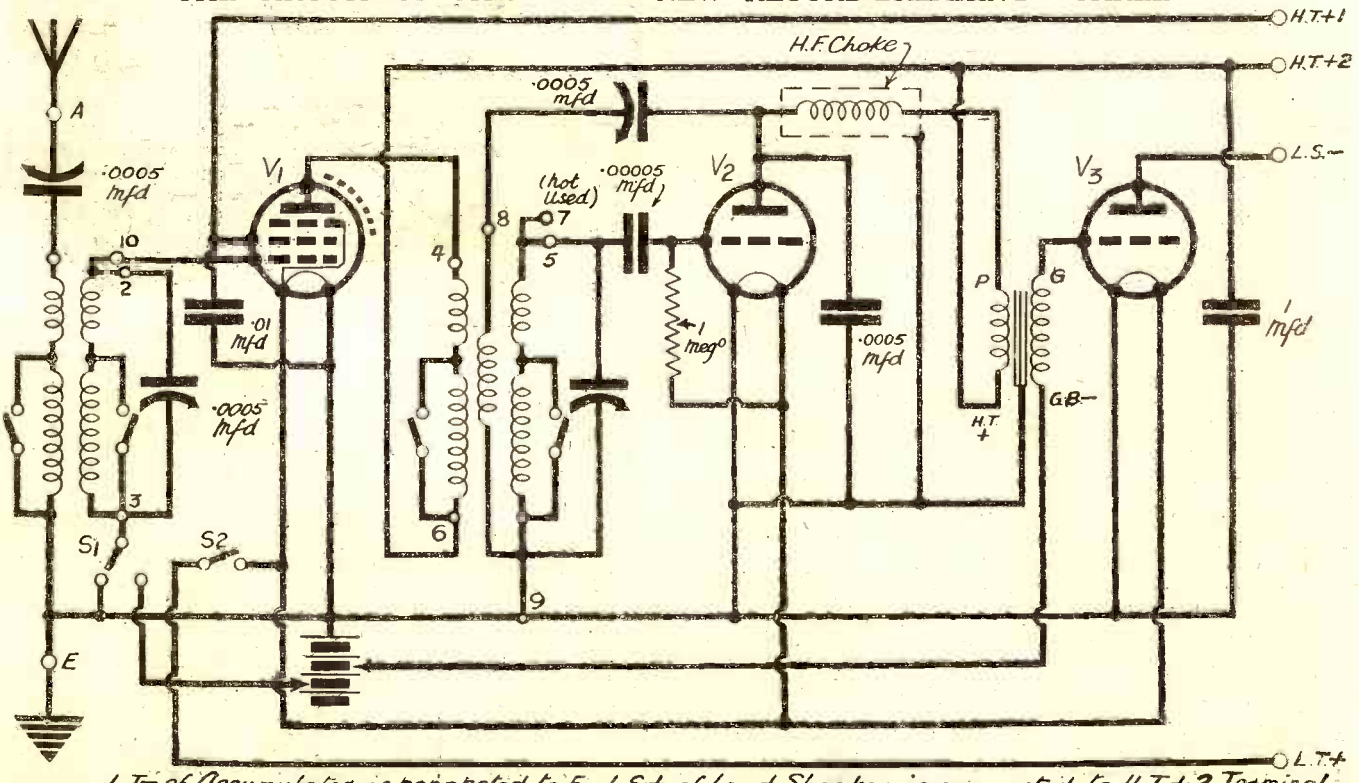


Fig. 6.—You don't have to be a skilled cabinet maker to build the Centurion "Easi-Cabinet." The addition of three pieces of wood, viz., the top and two sides, to the panel provide a handsome and inexpensive cabinet.

without in any way cutting down the sensitivity of the set for foreign station reception.

The dial is the same as that for the S.T.700, and marks, in the opinion of those who have used it, a new era in the easy finding of a station. It will be seen that there are over a hundred stations arranged in two semi-circles. The outer semi-circle is for the medium-wave stations, while the inner semi-circle is for the long-wave stations. In between the two sets of stations named

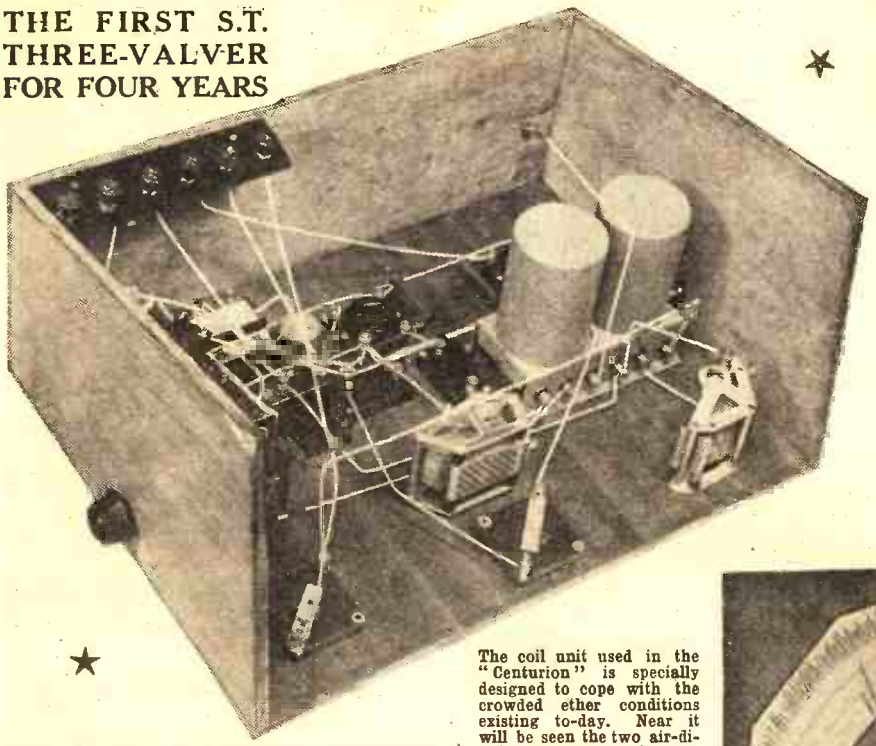
THE CIRCUIT OF THIS GREAT NEW RECORD-BREAKING "THREE"



The total anode current consumption of the "Centurion" is only 9 milliamps, yet it has sufficient sensitivity to bring in about sixty stations with regularity and a log of about a hundred stations all told.

THAT RECEIVES ONE HUNDRED STATIONS!

THE FIRST S.T. THREE-VALVER FOR FOUR YEARS



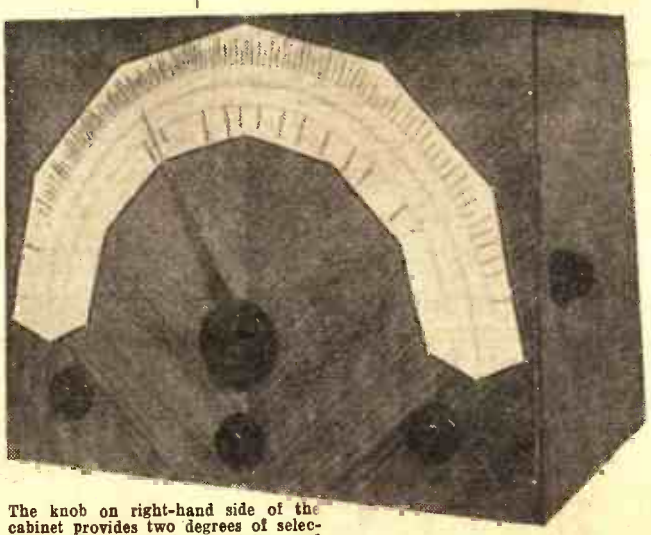
The coil unit used in the "Centurion" is specially designed to cope with the crowded ether conditions existing to-day. Near it will be seen the two air-dielectric variable condensers.

will be found two thin semi-circular lines close together. These are called the dot-lines. The outer one is used for the medium-wave stations, while the inner one is used for the long-wave stations. The method of using the dial is to tune to a station accurately using reaction and not having the signal too loud, and then to mark a dot with a pencil on the outer dot-line (if the station is on the medium waves). Then join this dot by means of a straight pencil line to the end of the name of the station being received. This is done for all the stations you can identify. The same procedure is adopted for the long-wave stations.

The great merit of this arrangement is that you can always move the pointer to the dot of the station you desire and you will then be absolutely certain of being exactly tuned in. This puts the constructor in a position far different from that of a listener to a commercial set where the station names are, in nine cases out of ten, only approximately calibrated. To be able to go instantaneously to any desired station in this way is a joy to anyone who has previously had to rely on guess-work or on calibration numbers written on a scrap of paper. The object of the dot-lines is to enable one to be sure of absolutely accurate calibration even though component parts may differ slightly. It is quite impossible to print a dial which will be exact for every set made, as condensers and inductances vary very slightly but quite sufficiently to put any calibration "out." The only difference then between one "Centurion" receiver and another as regards calibration will be a slight difference in the angle of the line joined to the dot and the station named, which, of course, does not matter at all.

THE TRIPLE EXTRACTOR

The Triple Extractor makes it possible to get better results on a foreign station with three valves than with four not using the Triple Extractor.



The knob on right-hand side of the cabinet provides two degrees of selectivity, viz., normal selectivity and extreme selectivity.

DELIVERS THE GOODS

"I would not go back, after four years, to a three-valve design unless I were thoroughly satisfied that it would deliver the goods."—J. S.-T.

TOO HASTY!

It pays the Service-man to study the watchmaker's methods.

MY friend Robinson is young, keen and intelligent. What he lacks in experience he makes up for in pushfulness. Incidentally, he runs a set-repairing business.

It was while repairing a small set that he put his foot in it. The set was very erratic in its behaviour, and he was repairing it while it was running, which is quite safe if you know what you are about.

Unfortunately the set was rather a compact one, and my friend grew hotter and hotter, and more and more impatient as his efforts to "cure" the set were unavailing. Finally he located the trouble—or thought he did—in an obscure condenser in an awkward corner.

How to get at the condenser was the trouble.

Now my friend was already fretting and fuming about having so much trouble finding out the cause of the complaint. Consequently, he should have studied how a watchmaker goes about his job. Working with a delicate mechanism like a watch he has to be careful. It would not do to get exasperated if a wheel refused to go in or come out.

The watchmaker, when he finds a particular job trying to the nerves, does not become rash and smash something. He calmly puts down that particular piece of work and takes up a fresh piece. After a time he forgets his annoyance, and is able to tackle the job in a saner frame of mind.

This is what Robinson should have done. Instead, however, he first tried to get at the condenser with his fingers, then with a screwdriver, and finally, just when he had forced his long-nosed pliers through a tangle of wires to reach the offending component there was a flash and four valves gave up the ghost.

There is a very sound psychological reason why he could have successfully repaired the set if he had smoked a cigarette after having found out the cause of the trouble and before starting to remedy it. Quite independent of the fact that he should have disconnected the H.T.

W. N.

HOW TO MAKE

THE TRIPLE EXTRACTOR

CUTS OUT YOUR LOCAL STATIONS LIKE A KNIFE!

IF you use ·0005-mfd. air condensers of other makes you will most probably need a larger box. You must not fit your condensers closer together than described, and the coil assembly should not be nearer to the side of box or nearer to condensers.

N.B.—The Extractor condenser used in S.T.600 should not be used, but the better Ormond condensers, e.g. as used in S.T.300, S.T.400 and S.T.500, are all right. The efficiency of the condensers is of extreme importance; for that reason, I have given as alternatives to Polar only condensers proved on measurement to be satisfactory.

THE COMPLETE UNIT

This is the Wearite model of the Triple Extractor which can be purchased ready made.

(a) Collect and examine (handling carefully) the three specified ·0005-mfd. air variable condensers and the Wearite Triple Extractor coil assembly which I designed for this unit.

(b) Using Fig. 7 and Fig. 8, mark out and prepare the wooden top and sides of box, unless bought prepared.

(c) You are now going to build the box. Lay one end-piece of box, face upwards, on a table. Knock in about ⅛ in. deep four ¾-in. ordinary nails at the points indicated in Fig. 7. Hold one side-piece vertical on end. Driving in two of the nails in the prepared end-piece, nail end-piece to side-piece. Drive the other two nails through into the end of the other side-piece which is held vertical on end.

Drive four ordinary ¾-in. nails ⅛ in. into other end-piece in the same way and complete frame of box. Now lay drilled wooden panel right way up on the table and knock in about ⅛ in. deep six ¾-in. ordinary nails in positions marked on Fig. 8. Lay panel on box frame and hammer in the nails. Sand-paper any rough edges and, if desired, stain. (I used Jackson's—of Mitcham, Surrey—oil varnish stain, walnut shade, a size 6 tin being more than enough for both set and Triple Extractor.)

(d) Using two ⅜-in. No. 6 B.A. countersunk-head brass screws and nuts, fix the Triple Extractor coil assembly inside the box the right way round. Fit terminals A1 and A2. Fit the three Polar ·0005-mfd. condensers. Write with a pencil the markings C1, C2 and C3 on the ends (not vanes) of condensers in order shown on diagram. This will enable you to identify each condenser.

(e) Preferably using "Maxamp" wire in the manner described in the Rapid Construction Guide, wire up as follows: (do not confuse coil numbers with wire numbers; wire numbers are in circles). Tick off wire numbers in list as connections are completed.

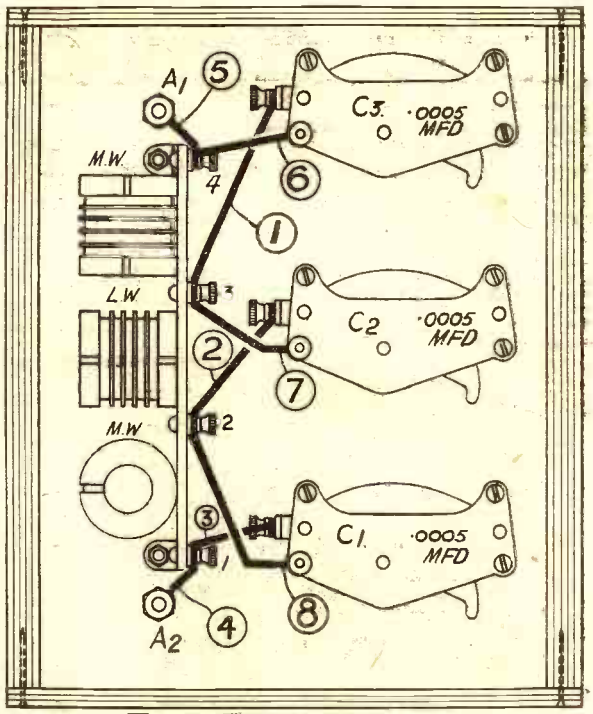
Wire (1). C3 fixed vanes terminal at side *joins* coil terminal 3.
Wire (2). C2 fixed vanes terminal at side *joins* coil terminal 2.
Wire (3). C1 fixed vanes terminal at side *joins* coil terminal 1.
Wire (4). A2 terminal *joins* coil terminal 1.
Wire (5). A1 terminal *joins* coil terminal 4.
Wire (6). Coil terminal 4 *joins* C3 moving vanes terminal on top.
Wire (7). Coil terminal 3 *joins* C2 moving vanes terminal on top.
Wire (8). Coil terminal 2 *joins* C1 moving vanes terminal on top.

(f) Check wiring by asking a friend to read out the above wiring instructions while you look at Triple Extractor. In case of error, correct at once.

(g) Fit knobs of condensers.

THIS COMPLETES TRIPLE EXTRACTOR.

J. S-T.



Triple Extractor Unit View from Underneath

The whole of the wiring of the Triple Extractor can be seen in the above diagram, and in this unit, as in the mains set, Uniplane construction has been carried out.

FORMING THE BOX

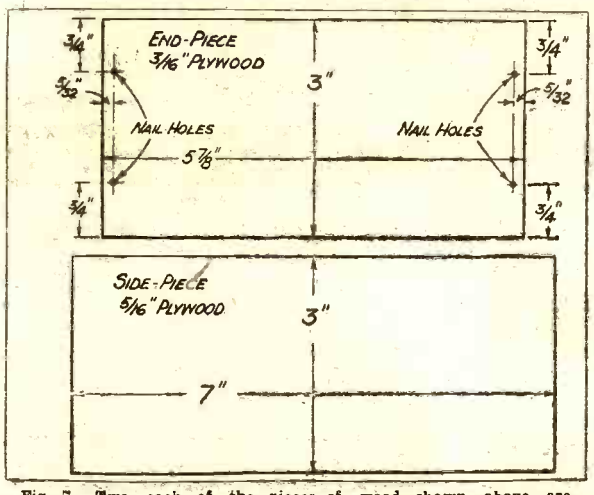


Fig. 7.—Two each of the pieces of wood shown above are required for the Triple Extractor box, the end-pieces being marked out as indicated for the nail holes.

HOW THE PANEL IS DRILLED

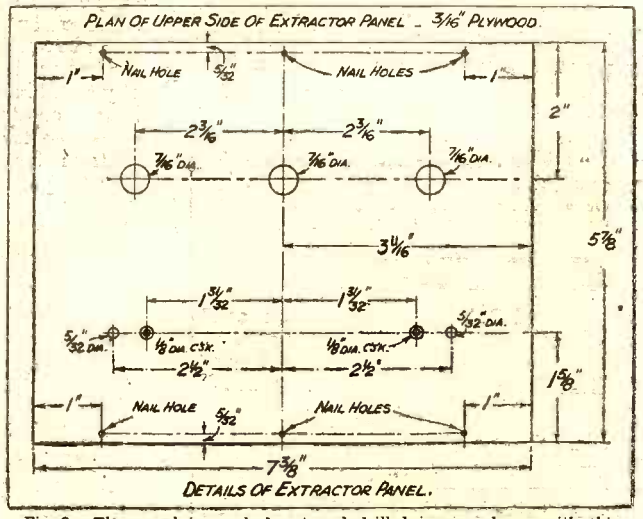


Fig. 8.—The panel is marked out and drilled in accordance with this diagram. It is secured into position by six nails as described.

★

THESE ARE THE PARTS REQUIRED FOR BUILDING THE TRIPLE EXTRACTOR

COMPONENTS	MAKE USED BY DESIGNER	SUITABLE ALTERNATIVES
1 Triple Extractor iron-core coil	WEARITE	J.B. "Popular Log" (without dial or slow motion, but with small knob), Ormond R.483 (log condenser) with small knob.
3 ·0005-mfd. air variable condensers	POLAR No. 4 with knob (mention S.T.700).	
1 Wooden box—5 wood pieces	PETO-SCOTT	
2 Terminals, A1, A2	BELLING-LEE (type R.)	

PETO-SCOTT PILOT AUTHOR KIT EXACT TO SPECIFICATION

IMPORTANT PILOT AUTHOR KITS are only obtainable direct from Peto-Scott. We can supply any Kit featured in this journal during the past three years. Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire purchase terms are NOT available to Irish and Overseas Customers.

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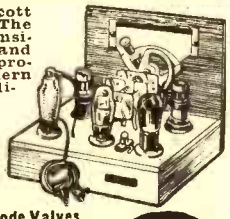

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- Automatic Grid Bias
- Full Vision Slow Motion Tuning
- Detector, S.G., Pentode Valves
- Modern Air-spaced Coils

KIT "A" comprising all parts, including ready drilled chassis and panel, less Valves, Speaker, Cabinet. **Cash or C.O.D. Carriage Paid, 35/-, or 2/6 down and 9 monthly payments of 4/-.**

2/6 DOWN

KIT "B" with valves. Cash or C.O.D. Carriage Paid, **£2/19/9**, or 5/- Deposit and **11** monthly payments of 5/6.

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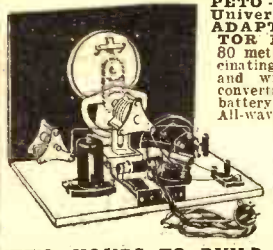
Do you know that you can hear world-wide programmes on your existing set? Simply build the **PETO-SCOTT 1936 Universal Short Wave ADAPTOR-CONVERTOR KIT** (covers 13-80 metres), and this fascinating unit instantly and without alteration converts your A.C. or battery set to a modern All-waver.



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TWO HOURS TO BUILD—A LIFETIME OF ENTERTAINMENT

KIT "A" CASH OR C.O.D. £1:19:6 *Carriage Paid.*

Or 2/6 down and 10 monthly payments of 4/3

All parts for building, including full-size Blueprint and assembly instructions, less cabinet.

SEND FOR FULL DETAILS and FREE BLUEPRINT

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GARRARD A.C.6 Induction Electric Motor (*illustrated*). Complete with 12in. turntable, 12in. Unit Plate and fully automatic Switch. For A.C. mains only. Send only **2/6**; balance in **11** monthly payments of 4/-. Cash or C.O.D. Carr. paid, **£2/2/6.**

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GARRARD Type "B" RADIO-GRAM UNIT, with A.C.6 Induction Motor. A.C. Mains 100-250-v., 50-60 cycles. Automatic stop. On motor-plate with pick-up and tone-arm. 12in. turntable. **Cash or C.O.D. Carriage Paid, £3/2/6.** Send 9/- only; balance in **11** monthly payments of 5/9.

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Model 36S P.M. Speaker. Suitable for any output and incorporating improved Microlode device. **Cash or C.O.D. Carr. Paid, £2/2/0,** or yours for 2/6 down, balance in **11** monthly payments of 4/-.

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W.B. Stentorian Junior Model 36J. Cash or C.O.D. Carr. Paid, **£1/12/6**, or 2/6 down and **11** monthly payments of 3/-.

ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D., CARRIAGE AND POST CHARGES PAID

CENTURION KIT "A" £2:16:6

CASH or C.O.D. CARRIAGE PAID.

These are the Parts used by Mr. John Scott-Taggart and CONTAINED IN PILOT AUTHOR KIT "A."

		s.	d.
2	**Peto-Scott** ready-drilled and polished cabinet side pieces 1 cabinet top, and 1 grid bias battery spar with 6 screws	3	6
1	**Peto-Scott** panel, 16" × 12", with 7 screws	3	3
1	**Peto-Scott** terminal strip, 6" × 1½"		8
3	**Peto-Scott** aluminium brackets, with nuts and bolts		6
1	**Colvern** coil unit	12	6
1	**Ormond** aerial balancing condenser	4	0
1	**J.B.** main tuning condenser with long pointer	5	6
2	**Graham Farish** log-mid-line condensers ...	4	0
1	**Graham Farish** turret switch	2	0
1	**Wearite** anode reaction choke	2	0
2	**Lissen** mica condensers	1	0
1	**T.M.C.** Hydra fixed condenser		9
1	**T.C.C.** fixed condenser	2	6
1	**Erie** grid leak	1	0
1	**Varley** Niclet L.F. transformer	7	6
3	**Benjamin** Vibrolder valve holders	2	6
6	**Belling-Lee** type R terminals	1	6
3	**Belling-Lee** Midget 1019 wander plugs ...		6
	Connecting wire, screws, flex	1	7

KIT "A," CASH OR C.O.D. Carr. Pd. £2 16 6

Complete Kit of components exactly as FIRST specified and used by Mr. J. Scott-Taggart, and shown in detailed list in centre column, but less valves. Extractor Kit and Peto-Scott cabinets.

5/- DOWN

Yours for 5/- down and 12 monthly payments of 5/-.

KIT "B" CASH or C.O.D. *Carriage Paid* **£3:19:6** ● **OR YOURS FOR** Balance in 11 monthly payments of **7/3** **7/3**

As for Kit "A," but including set of 3 FIRST specified valves, less cabinet and speaker.

KIT "CT" CASH or C.O.D. *Carriage Paid* **£4:17:0** ● **OR YOURS FOR** Balance in 11 monthly payments of **8/9** **8/9**

As for Kit "A," but including FIRST SPECIFIED valves and **Peto-Scott Centurion Table Cabinet**, less speaker.

KIT "CC" CASH or C.O.D. *Carriage Paid* **£5:14:6** ● **OR YOURS FOR** Balance in 11 monthly payments of **10/6** **10/6**

As for Kit "A," but including FIRST SPECIFIED valves and Peto-Scott upright Consolette cabinet, with speaker baffle. Less speaker.

KIT "CLL" CASH or C.O.D. *Carriage Paid* **£5:17:0** ● **OR YOURS FOR** Balance in 11 monthly payments of **10/9** **10/9**

As for Kit "A," but including FIRST SPECIFIED **Consolette cabinet**, with speaker baffle, less speaker.

STRUCTAKIT

COMPRISES ● **2 Peto-Scott** cabinet side pieces, cabinet top and battery spar, **all drilled and polished**, with screws. ● **Drilled and polished** walnut veneered panel, with nickel-plated screws. ● **Drilled** ebonite terminal strip. ● 3 brackets and 2 nuts and bolts. **Exactly as specified by Mr. John Scott-Taggart. Cash or C.O.D., 7/6.** Postage 9d. extra.

CASH OR C.O.D. 7/6

CENTURION CABINETS

CONSOLETTE

(Illustrated). A beautiful cabinet built from the finest woods, Australian walnut veneered front and wings, attractive corded silk fret backing and complete with speaker, baffle-board and battery shelf. Overall dimensions: W. 20", H. 24", D. 12½". **Cash or C.O.D.**, 35/-. (Carriage and packing 2/6 extra).

YOURS FOR 5/- Balance in 6 monthly payments of 6/-

TABLE MODEL

Exquisitely designed walnut finished cabinet with sloping front and crossbanded moulding. Constructed of carefully selected wood and hand French polished. Overall dimensions: W. 18½", H. 14½", D. 12". **Cash or C.O.D., 17/6.** (Carriage and part packing 2/6 extra).

Yours For 2/6

Balance in 5 monthly payments of 4/-.

TYPE "LL"

Australian walnut veneered front. Hand French polished, macassar fret with corded silk backing. Speaker baffleboard. Lift-up lid. Overall dimensions: W. 20½", H. 15¾", D. 14½". **Cash or C.O.D., 37/6.** (Carr. and part packing 2/6 extra.)

YOURS FOR 5/-

Balance in 6 monthly payments of 6/6.

S.T.700 BATTERY VERSION

KIT "A" CASH or C.O.D. £3:19:6 *Carriage Paid*

or 7/- down and 11 monthly payments of 7/6.

KIT "B." Cash or C.O.D. Carriage Paid, **£5/11/6.**
Or 10/- down and 11 monthly payments of 10/3.
KIT "CT." Cash or C.O.D. Carriage Paid, **£6/9/0.**
Or 12/- down and 11 monthly payments of 12/-.
KIT "CC." Cash or C.O.D. Carriage Paid, **£7/6/6.**
Or 13/6 down and 11 monthly payments of 13/6.
KIT "CLL." Cash or C.O.D. Carriage Paid, **£7/9/0.**
Or 13/9 down and 11 monthly payments of 13/9.

CENTURION EXTRACTOR UNIT

		s.	d.
1	**PETO-SCOTT** Extractor plywood panel and 4 side-pieces, all ready drilled and French polished, complete with necessary screws ...	2	0
1	**WEARITE** Triple Extractor iron-core coil ...	7	6
3	**POLAR** No. 4 ·0005-mfd. condensers ...	13	3
2	**BELLING-LEE** "R" terminals, A1, A2 ...		6
	MAXAMP connecting wire and screws ...		9

Extractor Kit, Cash or C.O.D. Carr. Paid **£1 4 0**

If Extractor Kit is required with the Kits "A," "B," "CT," "CC" and "CLL," add £1/4/0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

CENTURION FINISHED INSTRUMENTS

Built with FIRST SPECIFIED COMPONENTS. Complete with valves. Fully Assembled in Walnut Cabinet and Ready to Play. Aerial Tested on Actual Broadcasting. Accomodation for all Batteries which are extra.

TABLE MODEL

Cash or C.O.D. Carriage Paid. £5/17/6. Deposit 10/-; balance in 11 monthly payments of 10/9.

CONSOLETTE

With Peto-Scott S.3 matched speaker. **Cash or C.O.D. Carriage Paid £7/14/6.** Yours for 15/-; balance in 11 monthly payments of 14/.

TYPE "LL"

With Peto-Scott S.3 de luxe matched speaker, **Cash or C.O.D. Carr. Paid, £8/12/6** or 15/- down; balance in 11 monthly payments of 15/9.

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THE "CENTURION"
RAPID CONSTRUCTION GUIDE
— THE SAFE ROAD TO SUCCESS —

THIS Guide is as detailed as previous ones of mine, although the set is much simpler to construct. The absolute novice is told where to start and what to do, even to the best way of pushing in a pin! If you prefer, YOU CAN BUILD THE "CENTURION" FROM BLUEPRINT ALONE. But tens of thousands have reported that my Rapid Guides save them time and guarantee success.

If you have bought a complete kit, including my "Easy-Cabinet," or if you have bought a kit of the Easy-Cabinet, cross out sections C, D, F, J, K.

(A) Collect and examine required components. Check each item to see that it corresponds to my list of parts **actually used.** Handle J.B. tuning condenser with care, keeping moving vanes closed. Bending of vanes would affect calibration of station names.

(B) Tighten terminal securing nuts (not terminal heads) on components where necessary.

(C) Using Fig. 2, mark out on the front (not back) of panel the positions of the holes. With a fine-pointed bradawl prick all the hole positions. Using a $\frac{1}{8}$-in. twist-drill, start each $\frac{1}{8}$-in. hole carefully, using light pressure and turning the drill in a reverse direction at first; this is to avoid splitting the veneer. Continue drilling these $\frac{1}{8}$-in. holes in ordinary way. Centre-bits are recommended for all the remaining larger holes in panel, but twist-drills may be used. Drill these holes.

(D) If you are going to use my Easy-Cabinet system and have not bought the pieces ready prepared, carry out instructions in this section (D). If you have bought the pieces ready prepared, skip this section (D). Cut to size and drill cabinet top (Fig. 6), drilling $\frac{1}{8}$-in. holes as advised above. Using Fig. 1 and keeping to the order of drawing the lines shown, mark out the cabinet side-pieces on the sides which will show.

(E) Take the left-hand (looking from front) side-piece and top-piece and hold them together and resting on a flat surface. Prick with a bradawl through the prepared holes in the top-piece into the top of the side-piece. Insert two $\frac{5}{8}$-in. No. 4 round-head brass screws and screw top-piece to side-piece.

Now do the same with the other side-piece. Lay the assembled top and sides aside.

(F) Mark out and drill the terminal strip as Fig. 3. Prepare two mounting brackets as Fig. 5.

(G) Fit two mounting brackets to inside of the terminal strip using $\frac{3}{8}$-in. 6BA round-head brass screws and nuts, these screws going through the $\frac{1}{4}$-in. holes in strip.

(H) If you wish to stain the side-pieces and top, do so now. (I used Jackson's, of Mitcham, Surrey, Oil Varnish Stain, colour walnut, size 6 tin.)

(J) Cut out, drill and stain the spar (see Fig. 9) which holds grid-bias battery in place.

(K) Lay the panel face downwards on a cloth-covered table (to avoid scratching veneer). Lay blueprint right way round on back of panel. Keep blueprint steady with a weight. Using bradawl, prick through to panel the fixing holes of all the components that go on the back of the panel. If in doubt about any holes, check by laying component over its picture. Remove the blueprint. Using blueprint as check for their positions, screw down the following in order given: S.T.700 coil unit with extension piece, $\frac{1}{4}$-in. No. 4 round-head brass screws being used; three Vibrolders (get them right way round), using $\frac{1}{4}$-in. No. 4 round-head brass screws; bend up the soldering tag which projects from terminal G on V2 valve holder; two Lissen mica condensers, using $\frac{3}{8}$-in. No. 4 round-head brass screws, taking extreme care that the right capacities are put in the right place, as these condensers look alike from the top; Niclet transformer (right way round), using $\frac{3}{8}$-in. No. 4 round-head brass screws; Wearite screened choke (marked H.F.J. although catalogued H.F.P.J.) with its earthing-tag to correct side as shown in blueprint, using $\frac{1}{4}$-in. No. 4 round-head brass screws; 1 mfd. (T.C.C.) condenser, using $\frac{1}{2}$-in. No. 4 round-head brass screws. Bracket for Turret switch. Fit Turret switch on bracket. Fix knob. Fit volume control condenser without knob. Fit reaction condenser without knob. Fit aerial balancer condenser without knob. Taking care that the whole panel will not rest on the spindle of the J.B. main tuning condenser (whose moving vanes should be closed), fit the J.B. condenser (without knob and pointer) to panel, putting its bush washer on the front side of panel under fixing nut, which should not be too tight. THIS COMPLETES THE FIXING OF COMPONENTS.

Now you are going to wire the components, and for this you need the blueprint.

Lay panel face downwards resting it on two books or cloth-covered blocks of wood; this is to prevent scratching of veneer and to prevent pressure on control spindles.

The recommended wire is of the kind that permits the insulating covering to be slipped back, revealing the bare end of the wire. "Maxamp" wire by Peto-Scott is about the best I have tried, and is also of suitable thickness. It is strongly recommended as being very much easier to use than bell-wire or similar stiffish wires. My advice is to use it as follows:

Cut off 6-ft. lengths at a time from the coil, as required. Push back insulation about 1 in. and, without increasing this inch, slide the bunched-up fullness of the insulating covering well back along the wire. Using only about $\frac{1}{2}$-in. of the bared end, connect the wire looping it (preferably clockwise) round under the terminal-head of the component to be wired up. Shape wire along route indicated in blueprint and a reference, if desired, to the photographs.

Allow an extra $\frac{1}{2}$-in. on the length of the wire for connection to the terminal it is going to. Cut through the insulated wire, slip insulation back $\frac{1}{2}$-in. and, without increasing this $\frac{1}{2}$-in., work the bunched-up fullness back along the wire, thus covering the bareness at the starting end. Now loop the finishing end (preferably clockwise) under its terminal-head. This detailed account is of a process which actually takes only a few seconds and will enable you to do the wiring more neatly and in double-quick time.

(L) USING BLUEPRINT, WIRE UP THE BASEBOARD COMPONENTS. Do not finally tighten any terminals until all the wires are on.

(1) Coil unit terminal 10 to V1 valveholder terminal G.

(2) Coil unit terminal 9 to V1 valveholder filament negative terminal.

(3) V1 valveholder filament negative terminal to V2 valveholder filament negative terminal.

(4) V2 valveholder filament negative terminal to reaction choke screen (fixing screw).

(5) Reaction choke screen (fixing screw) to Niclet core (fixing screw).

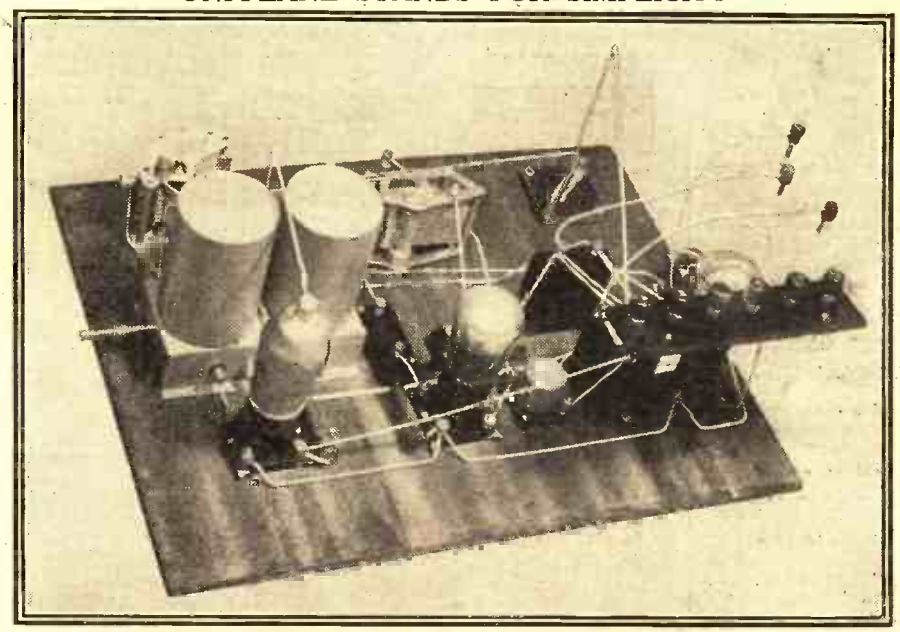
(6) V2 valveholder filament negative terminal to 1-mfd. condenser.

(7) 1-mfd. condenser to V3 valveholder filament negative terminal.

(8) V1 valveholder filament positive terminal to V2 filament positive terminal.

(*Continued on next page.*)

UNI-PLANE STANDS FOR SIMPLICITY



The construction of the "Centurion" is based on the Uni-plane system used so successfully by Mr. Scott-Taggart in the S.T.700. There are no awkward wires to run from the panel to a chassis. Every component is mounted on the panel itself, and the actual construction of the set is the simplest thing imaginable.

"CENTURION"—A 1936 S.T. DESIGN

(9) V2 valveholder filament positive terminal to V3 valveholder filament positive terminal.

(10) Coil unit terminal 2 to aerial balancing condenser fixed vanes terminal.

(11) Coil unit terminal 3 to aerial balancing condenser moving vanes terminal.

(12) Coil unit terminal 6 to 1-mfd. condenser.

(13) Coil unit terminal 3 to turret switch terminal A.

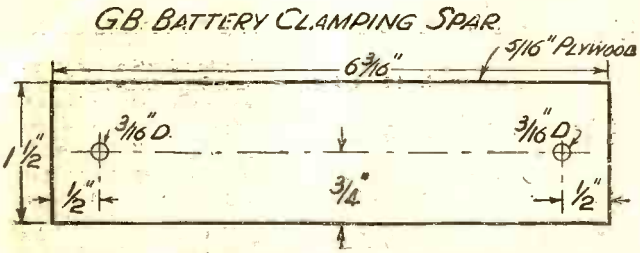


Fig 9.—The grid-bias battery is held in position against the side of the cabinet by a length of ⅛-in. plywood cut and drilled as shown above.

(14) Turret switch terminal C to V1 valveholder filament negative terminal.

(15) Main tuning condenser fixed vanes terminal to ·00005-mfd. grid condenser.

(16) Coil unit terminal 5 to main tuning condenser fixed vanes terminal.

(17) ·00005-mfd. grid condenser to V2 valveholder grid terminal.

(18) Main tuning condenser moving vanes terminal to V2 valveholder filament negative terminal.

(19) Reaction condenser moving vanes terminal to coil unit terminal 8.

(20) Reaction condenser fixed vanes terminal to ·0005-mfd. fixed mica condenser.

(21) ·0005-mfd. fixed mica condenser to reaction choke.

(22) Reaction choke to V2 valveholder anode terminal.

(23) ·0005-mfd. fixed mica condenser to V2 valveholder filament negative terminal.

(24) Reaction choke to Niclet terminal P.

(25) Niclet terminal H.T.+ to 1-mfd. condenser.

(26) Niclet terminal G to V3 valveholder grid terminal.

(27) V1 valveholder screen-grid terminal marked A via ·01-mfd. tubular condenser to V1 valveholder filament negative terminal.

(28) V2 valveholder grid terminal via 1-megohm to V2 valveholder filament positive terminal.

(29) Turret switch terminal E to V3 valve filament positive terminal.

(30) Coil unit terminal 4 to lead for subsequent connection to anode of H.F. pentode V1.

(31) Volume control fixed vanes terminal to coil unit terminal 1.

Each grid-bias lead is prepared as follows: Take a suitable length of "Maxamp" wire, and prepare it as usual to have ½ in. of bare wire at each end. Bend one of the ends ½ in.

THE EASY-CABINET

The "Centurion" is built into an "Easy-Cabinet," which consists of three pieces of wood; a top and two sides. All the constructor has to do is to screw these three pieces of wood to the panel, a matter of a few minutes' work, and then he has an absolutely complete receiver.

from the end back on itself and push the loop so formed into the hole in the side of the Belling & Lee Midget wander-plug, having loosened the head of wander-plug. Tighten head of wander-plug. Fit other end of wire to correct component.

(32) An 8-in. lead connected to the 1-mfd. condenser and having at the other end a wander-plug marked Grid +.

(33) An 11-in. lead connected to Niclet G.B.— terminal, the other end being fitted with a wander-plug marked Grid – 1.

(34) An 11-in. lead connected at one end to turret switch terminal B and fitted at the other end with a wander-plug marked Grid – 2.

(M) If you have built the Easy-Cabinet frame (as I assume), fix the completed panel on the frame as follows:

Slacken grub screw on coil unit switch extension piece. Slip extension piece close to coil unit. Take the panel and slip the turret switch spindle through the hole prepared for it in the cabinet side-piece. The extension piece of the wavechange switch spindle will now rest on the front edge of the other side-piece. Push this side-piece gently aside to allow the panel to come into position on the frame. Screw panel to frame, using ⅝-in. No. 4 roundhead brass screws. Slip extension piece into position as shown on blueprint. Tighten the grub screw in the extension piece.

INDIVIDUAL CALIBRATION

Individual calibration is one of the great advantages of the Auto-dial. Pencil lines joining the correct tuning positions indicated by the pointer and the names of the stations provide absolute accuracy.

(N) Fit terminals in terminal strip. Fit strip to underside of cabinet top, using two ½-in. No. 4 roundhead brass screws.

(O) COMPLETE WIRING AS FOLLOWS:

(35) L.T. + terminal on strip to turret switch terminal D.

(36) L.S.— terminal on strip to V3 valveholder anode terminal.

(37) H.T.+2 terminal on strip to 1-mfd. condenser.

(38) H.T.+1 terminal on strip to V1 valveholder screen-grid terminal marked A.

(39) Terminal E on strip to 1-mfd. condenser.

(40) Terminal A on strip to volume control moving vanes terminal.

This completes the wiring.

(P) Mark in following manner the fixing holes for grid-bias battery spar, which clamps the battery to the left side of the Easy-Cabinet looking from the back. Prick with bradawl the lower fixing hole, which is 1 in. up from the bottom edge of the side-piece and 2 in. from the back edge (farthest from panel). Slip a 1½-in. No. 8 roundhead brass screw through the hole in one end (either end will do) of the grid-bias battery clamping spar and insert the point of the screw in the fixing hole just pricked. Give the screw one turn to prevent its falling out. Swing the spar round until it is parallel to the back edge of sidepiece. Holding spar against sidepiece, prick through the other hole (in spar) into cabinet sidepiece with bradawl.

Insert a second 1½-in. No. 8 roundhead brass screw through the upper hole in spar into pricked hole in sidepiece. Give this screw one turn to prevent its falling out. Slip spar along the screws and insert the 9-volt grid-bias battery between spar and sidepiece of cabinet, with the battery sockets facing towards the back (away from panel) and the positive end of battery nearest top of cabinet.

BEAR THIS IN MIND!

The method of construction used in the "Centurion" is the simplest it is possibfe to achieve. In the Uni-plane system all components are screwed down on to a single straight-forward wooden panel. The blue print is therefore a true picture of the wires and tells you all you need to know.

You CAN'T go wrong if you follow the blueprint and this Rapid Construction Guide.

Taking care that the voltage figures on side of battery remain in view, screw up spar fixing screws until battery is firmly clamped into position. (If you have used screws that are too long, you will need to put cardboard or a wad of paper between spar and battery, otherwise screws would go right through cabinet side-piece.) FIT G.B. plus plug in positive (plus) socket, G.B.—1 in 3 V. socket, G.B.—2 in 4½ V. socket.

(Q) The dial (or scale, as it is often called) may be of paper, card, or white celluloid, and is exactly the same as that used on the S.T.700. The celluloid scales are obtainable for 3s. post free from Celluloid Printers, Ltd., Kingston-By-Pass Road, Surbiton, Surrey. Temporary cards are obtainable by sending 2d. in stamps to Amalgamated Press, Ltd., Bear Alley, London, E.C.4 (the order should not contain any questions which are not dealt with by this department). The following applies to the fitting of the paper or card dial.

(*Continued on page 57.*)

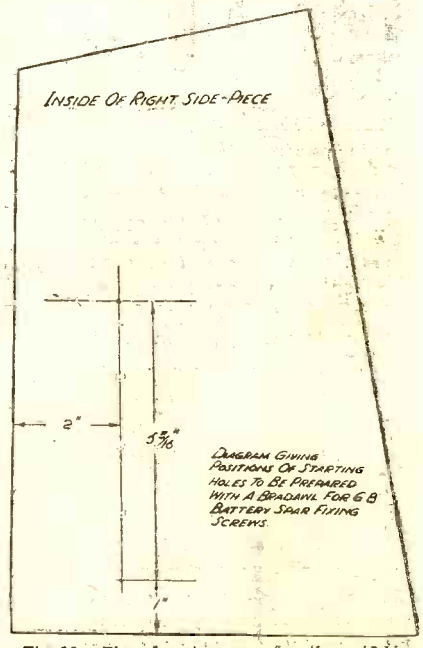
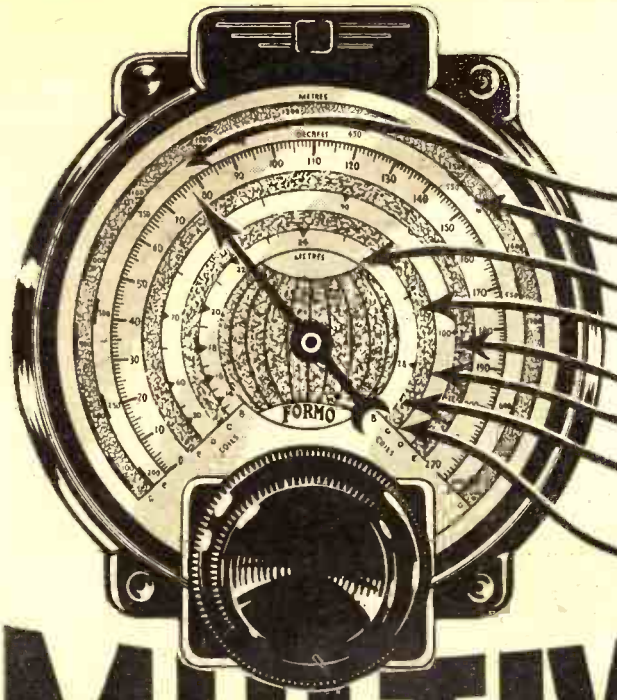


Fig. 10.—The clamping spar for the grid-bias battery is screwed into the position indicated here.

ASTONISHING NEW BROADCASTS



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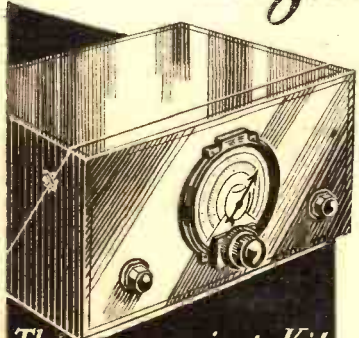

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RADIO MYSTERY CIPHERS

By LOUIS C. S. MANSFIELD

This week Mr. Mansfield breaks away from the type of cipher he has been explaining and discusses one of the oldest types of principle writing, a method of sending secret messages that was used by Julius Cæsar, and which consequently bears the name of Cæsarian Cipher. Naturally, it has been greatly elaborated since the days of the Romans, but messages are still sent by secret services using ciphers based on the centuries-old system.

JULIUS CÆSAR left his influence not only on the world's history, on its customs and on its languages, but also on its secret writings—CIPHERS.

Although various forms of cipher writings were known a thousand years before his time, he it was who first made a habit of coding all his important documents, including his military orders.

For this purpose he used a progressive alphabet with which he wrote D for A, E for B, F for C, etc. A progressive system, by the way, is any system in which the symbols run consecutively, as D, E, F for A, B, C, or 21, 22, 23 for H, I, J, etc.

From the fact that Cæsar used this system so largely the name of "Cæsarian Ciphers" has been given to any and every method which uses the progressive system as its base.

From the experience which the reader has already had, he will soon see that if we have a sufficiently lengthy text coded in this way, and providing no other complication has been introduced, we would have very little difficulty in translating the message. However, complications are often introduced by omitting common letters and common words, or by stringing all the symbols together into one long line, or dividing them into groups of, say, five letters. Another little habit is to change the key alphabet frequently so that a symbol which stands for G in one place means M in another.

If, in addition to all these things, the actual cryptogram in our hands happens to be a very short one, composed of, say, only two or three words, then it requires a fairly experienced person to handle it.

There is, however, a method by which all Cæsarian ciphers, or other progressive systems, can be "broken" almost mechanically, no matter what the complications are; and the little trick which is outlined here is the very first which one learns in secret service work, and which one applies first to all ciphers which an operative is called upon to decipher.

Suppose one day that the desk phone rings, the chute opens and out slides the following little poser in which all the symbols have been strung together:

R F C W F Y T C Z C C L

The first thing we do is to copy out the message and to rule vertical columns under each letter. In each of these columns we complete an alphabet, which starts at the letter standing at the head of that particular column. For instance, under R we write S, T, U, V, etc., finishing up with Q (the letter before R); under F we write G, H, I, J, K, L, etc., finishing with E. Under C we write D, E, F, G, etc., finishing with B.

We do this with every cipher letter in the message, and, of course, since we complete an alphabet under each symbol, we now have twenty-six lines of letters.

Here is an interesting little point. If the cipher is based on the Cæsarian principle *the correct plain text translation of the message will be found on one of the twenty-six lines.*

Let us try it with the cipher given above, and see what happens:

R F C W F Y T C Z C C L
S G D X G Z U D A D D M
T H E Y H A V E B E E N
U I F Z I B W F C F F O

If you look carefully, you will see that the plain message has started to come out on the third line, though, of course, it might come out on any of them, according to the cipher alphabet used.

After a message has been coded, the order of the letters is very often reversed before being transmitted, and in this case the plain text will naturally come out back to front, so that we have to read from right to left instead of from left to right, as in the ordinary way.

When this happens it takes a fairly quick eye to spot the message, and often the amateur cannot for the life of him see it, although it stares him in the face and simply shouts.

Here is an example:

K B B Y B S X E V B E Q
L C C Z C T Y F W C F R
M D D A D U Z G X D G S
N E E B E V A H Y E H T
O F F C F W B I Z F I U

If you look carefully at the fourth line and read from right to left, you will find it spells out the message, "THEY HAVE BEEN." It takes a bit of seeing, doesn't it? When it is mixed up with thousands of other letters, it is harder still.

When the key alphabet is varied from time to time, the *complete* translation does not appear on the one line, but bits of it come out on one and other bits on other lines, as in the following:

R E C W E X S B X A A J
S G D X F Y T C Y B B K
T H E Y G Z U D Z C C L
H A V E A D D M
B E E N

The same steps and stairs process often becomes apparent in reverse order, and this is when it does get hard to see.

"P.W." CIPHER No. 7

For weeks past the enemy batteries have been finding their objectives with mathematical accuracy!

The High Command, worried by a rumour of a new radio invention being used by enemy gunlayers, requests the help of a secret service agent to investigate.

This spy is dropped behind the lines from an aeroplane and, two weeks later, sends the following code message by carrier pigeon:

IQNALYXHCZYAHULICX ULQYHMHUFJSJIWNIAY PUB.

Arrange the letters given above in the necessary columns as explained by Mr. Mansfield, and see if you can determine the message. As usual, we are offering a prize of Ten Shillings for the first correct solution opened after the closing date.

Send your solution on the back of a postcard, with your name and address, and post it to "P.W." Cipher No. 7, Tallis House, 1, John Carpenter Street, London, E.C.4. (Comp.).

All attempts must reach us on or before Tuesday, March 24th. Your attempt can be sent in a sealed envelope if you wish. The Editor's decision is final.

SOLUTION TO LAST WEEK'S PROBLEM

Cipher No. 6

THIS SHIPMENT OF PARTS HAS BEEN BROUGHT IN BY S.S. ANODE. SHE WILL LIE IN THE ESTUARY UNTIL THE TIDE RISES HIGH ENOUGH TO BERTH. THEN THE SWAG WILL BE TAKEN OFF. THE PRIZE OF TEN SHILLINGS for the first correct solution of Cipher No. 5 to be examined after the closing date, has been awarded to Mr. A. L. Liddell, 50, Harcourt Street, Newark, Notts. The correct solution was given in our March 14th issue.

Sometimes the message will weave a distinct geometrical pattern, like part of a diamond, as a diagonal, or something similar, depending on the exact variation of the system which has been employed.

This week's cipher has been coded on the Cæsarian principle, but the reader will need to keep his wits about him if he is to read off the message.

ABOUT THESE PROGRAMMES

Higham Burlac is in a prophetic mood this week and discusses the future of the B.B.C.

IF ever you catch me objecting to broadcasting in Welsh or Gaelic it will be well for you to recollect that I do so from the narrow point of view of a radio critic. As such, I think that broadcasting in this country ought not to be used for emphasizing nationalism, the language of this realm being English. Disagree, if you like; but without heat or vituperation, which are the last resources of the man who lacks better arguments.

I hear so many glowing appreciations of Larry Adler's band of mouth-organs that I give in and admit that I must be mistaken and that it is a great and notable "turn." Well, I hope that I may live to see Sir Thomas Beecham conducting it one day when Larry is having a "breather" and rest after having well-nigh loosened his scalp at a Command Performance.

Those Non-listeners.

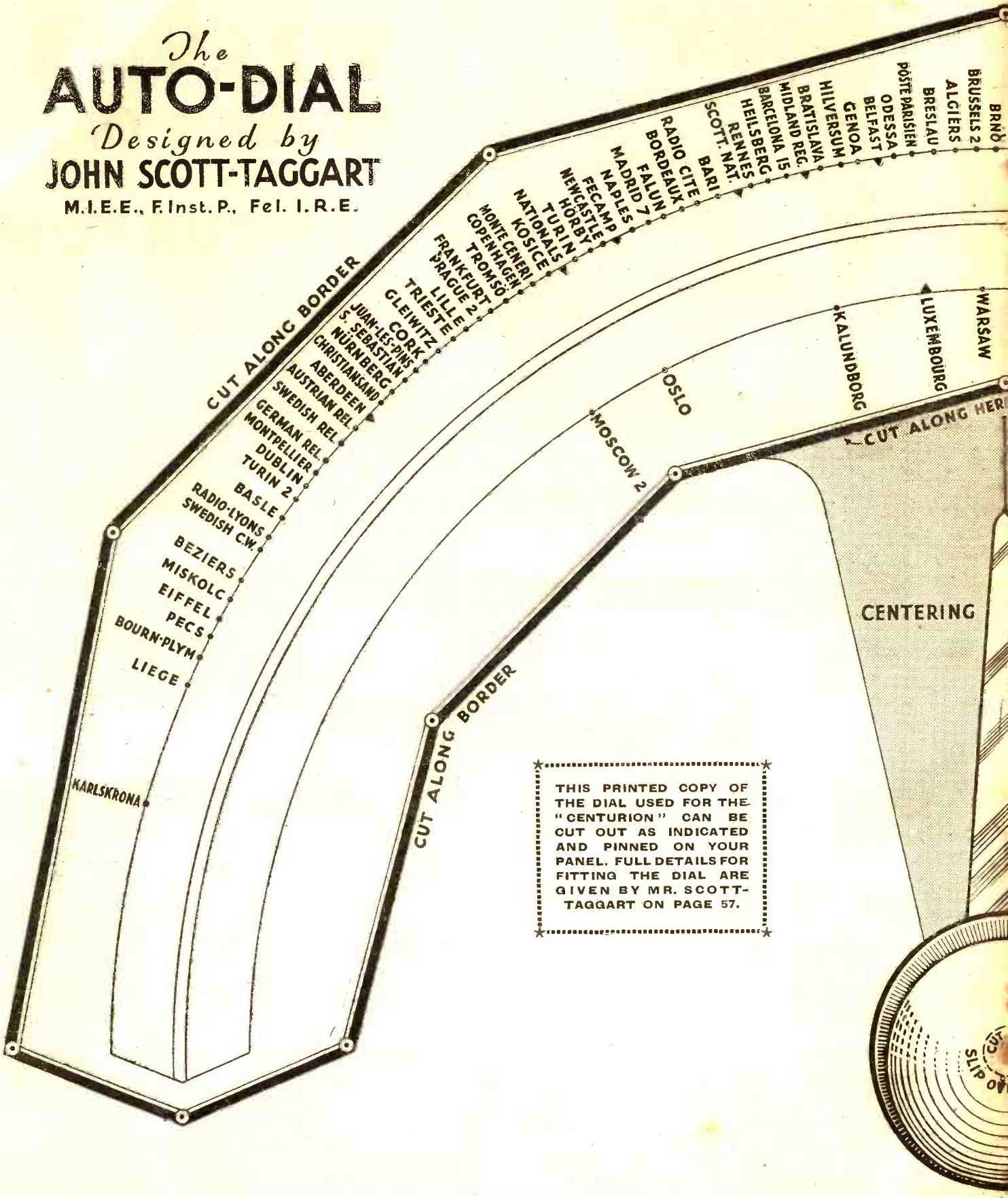
What is the whimsicality of mind behind the steadfast refusal of some people to use a radio receiver? People with "nerves," who need the maximum of quietness, one can forgive, though nowadays the wireless is so technically excellent that it can be adjusted to no more than the sound of a person speaking quietly in the room. The musical extremists, who declare that a false note ruins their peace of mind for hours, and that anything like a gramophone record or broadcast performance of music is an

(Continued on page 58.)

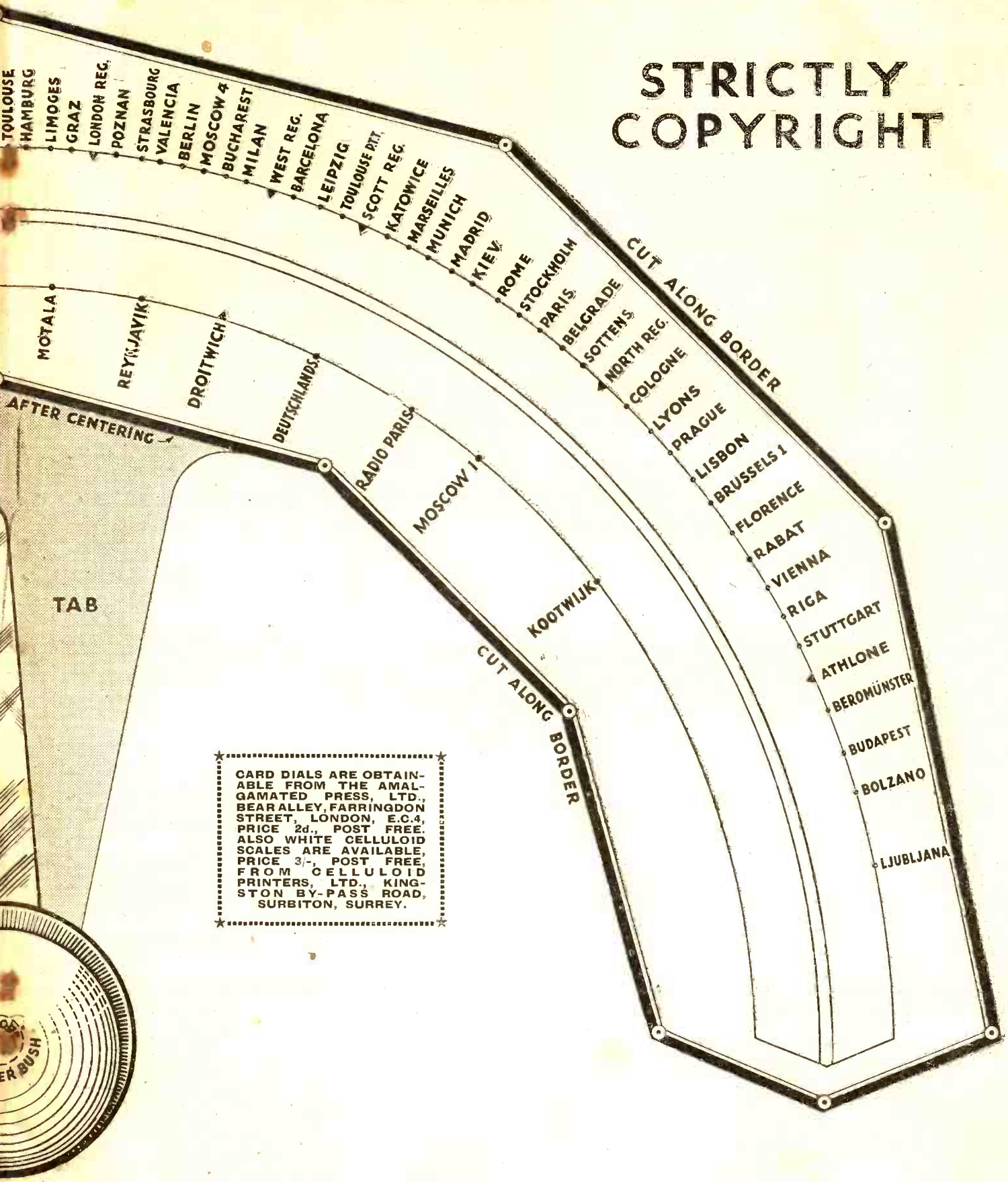
The AUTO-DIAL

Designed by JOHN SCOTT-TAGGART

M.I.E.E., F.Inst.P., Fel. I.R.E.



THIS PRINTED COPY OF THE DIAL USED FOR THE "CENTURION" CAN BE CUT OUT AS INDICATED AND PINNED ON YOUR PANEL. FULL DETAILS FOR FITTING THE DIAL ARE GIVEN BY MR. SCOTT-TAGGART ON PAGE 57.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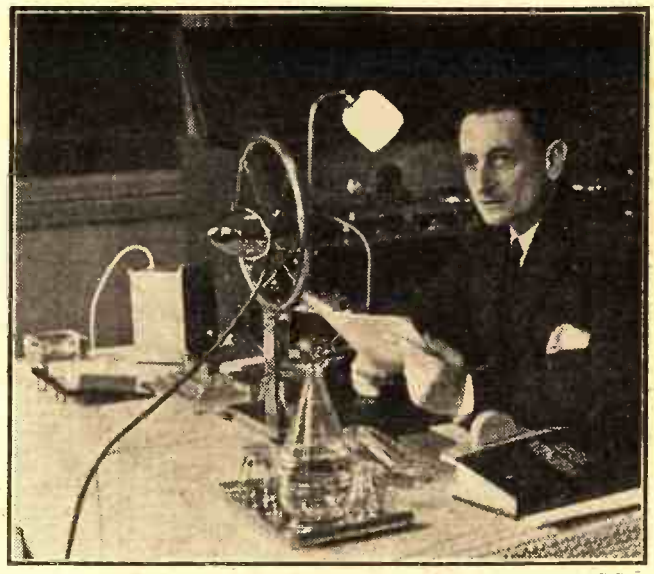
LEARNING FRENCH THROUGH YOUR RADIO

This week we present Part 8 of the fascinating language series contributed exclusively to "P.W."

By S. C. GILLARD, M.A.



This is Monsieur Gabriel Guillot, one of the two announcers at Lyon P.T.T. The gramophone playing table can be seen in the background.

YET another gramophone recital, my object being to bring you acquainted with one or two slight variations of those formal announcements made by announcers which you already know. The recital this time is one of those old Sunday afternoon Decca record recitals from Radio-Paris.

ALLO! ALLO! ICI RADIO-PARIS. MESDAMES ET MESSIEURS: LE 118e CONCERT ORGANISÉ (*or-gah-ne-zeh*) PAR LA COMPAGNIE DECCA VA COMMENCER. (The 118th Concert organised by the Decca Record Company is going to begin.)

LE CONCERT COMMENCE AUJOURD'HUI AVEC UNE VALSE DE CHOPIN, ENREGISTRÉE SUR DISQUE DECCA, NUMÉRO 1234. (The concert begins to-day with a Chopin waltz, recorded on a Decca record, number 1234.)

The record is played, and the announcer says:

VOUS VENEZ D'ENTENDRE UNE VALSE DE CHOPIN, etc., etc.

Introducing the second record, he says:

APRÈS LE DISQUE QUE VOUS VENEZ D'ENTENDRE LE PROGRAMME CONTINUE AVEC UN FOX-TROT INTITULÉ "L'AMOUR," ENREGISTRÉ PAR JACK HYLTON ET SES BOYS SUR DISQUE DECCA, NUMÉRO 1235.

We listen to the record, and then to the announcer's voice, saying:

VOUS AVEZ ENTENDU LE FOX-TROT "L'AMOUR," etc.

VOICI MAINTENANT UN MORCEAU QUI A POUR TITRE "LES TROIS ARBRES," INTERPRÉTÉ PAR ALBERT WHELAN ET ENREGISTRÉ SUR DISQUE DECCA, NUMÉRO 1236. (Here is a piece which has for title "The Three Trees," etc.)

After the playing the announcer says:

LE DISQUE QUE VOUS VENEZ D'ENTENDRE PORTE LE NUMÉRO 1236.

VEUILLEZ ÉCOUTER MAINTENANT. (Here follow a number of Jack Hylton records in succession.)

After the last of them is played we hear the announcer say:

NOUS VOUS RAPPELONS QUE LES MORCEAUX QUE VOUS VENEZ D'ENTENDRE SONT ENREGISTRÉS PAR JACK HYLTON ET SES BOYS SUR DISQUES DECCA, NUMÉRO 1237, 1238, 1239, etc., and he continues:

VOICI MAINTENANT UNE CHANSON PAR LE GRAND ARTISTE F. B., ENREGISTRÉE. Etc., etc.

After this is over the announcer observes:

BEAUCOUP D'AUDITEURS ONT REDEMANDÉ CETTE MÉLODIE. NOUS VOUS RAPPELONS, CEPENDANT, QUE CETTE MÉLODIE A ÉTÉ ENREGISTRÉE SUR DISQUE DECCA, NUMÉRO 1239. (Many listeners have asked for this tune again. We remind you, however, that this tune was recorded on a Decca record, Number 1239.

The concert concludes with these words:

MESDAMES ET MESSIEURS: CE MORCEAU TERMINE LE CONCERT EXCEPTIONEL ORGANISÉ PAR LA COMPAGNIE DECCA. NOUS FIXONS RENDEZ-VOUS DIMANCHE PROCHAIN À DEUX HEURES. (This piece terminates the exceptional concert organised by the Decca Record Company. We make an appointment next Sunday at 2 o'clock.)

Let me extract the several new words and phrases from the above.

le concert commence	the concert begins
aujourd'hui	to-day
le programme continue	the programme continues
un morceau	a piece
le disque porte le numéro	the record bears the number
nous vous rappelons	we remind you
beaucoup d'auditeurs	many listeners
ont redemandé	have asked for
cette mélodie	this tune
ce morceau termine le concert	this piece ends the concert
nous fixons rendez-vous	we make an appointment
dimanche prochain	next Sunday

IMIT. PRON.:
le(r) ko(ng)sair kom-mah(n)ss; oh-joor-dwee; le pr. ko(ng)-tin-ü; mor-soh; port le(r) nü-meh-roh; noo-voo-rap-plo(ng); boh-koo doh-de-ter; o(ng) re(r)-de(r)-mah(n)-deh; set meh-loh-dee; noo-feek-so(ng) rah(n)-deh-voo.

A list of further variations would include the following:

Le disque précédent est—— (The previous record is——)

Écoutez, pour terminer, la marche "Colonel Bogey," enregistrée par——. Or:

Pour terminer ce concert, écoutez la marche "Colonel Bogey," etc.

Le numéro de ce disque est—— (The number of this record is——)

Le disque que vous venez d'entendre termine le concert—le 119e de la série qui vous est offert chaque dimanche. Nous vous prions de bien vouloir adresser toute correspondance au sujet de ce concert à la Maison Decca (here follows the address). (The record which you have just heard ends the concert—the 119th of the series which is offered to you every Sunday. We beg you please to address all correspondence regarding this concert to the Decca Co., etc.)

Now for something quite new. I want you to consider that phrase "JACK HYLTON ET SES BOYS," particularly the word SES (his). In English we call this word "HIS" a POSSESSIVE ADJECTIVE. It is a POSSESSIVE ADJECTIVE in French as well. Of course, you know all the English POSSESSIVES, don't you? MY, THY, HIS, HER, ITS, OUR, YOUR, THEIR (i.e. my book, his father, our faults, etc.). Perhaps the POSSESSIVE ADJECTIVES are not quite as simple in French, because of the two GENDERS (Masc. and Fem.) and the two NUMBERS (sing. and plur.).

(*Continued on page 52.*)

PLURAL OF NOUNS AND ADJECTIVES

(*Continued*)

4. Nouns ending in -au or -eu, and Adjectives ending in -eau, form their Plural by adding -x.

le couteau *(koo-toh)* knife, les couteaux *(koo-toh)* knives; le tuyau *(twee-oh)* tube, les tuyaux *(twee-oh)* tubes; le neveu *(ne(r)-ve(r))* nephew, les neveux *(ne(r)-ve(r))* nephews; beau *(boh)* fine, beaux *(boh)*; nouveau *(noo-voh)* new, nouveaux *(noo-voh)*. But bleu *(ble(r))*, blue, bleus.

5. Nouns ending in -ou follow the general rule and add -s.

le trou *(troo)* hole, les trous *(troo)* holes; le sou *(soo)* halfpenny, les sous *(soo)* halfpennies.

But the six following Nouns take -x instead of -s.

le bijou *(be-shoo)* (jewel); le caillou *(ki-voo)* (pebble); le chou *(shoo)* (cabbage); le genou *(sh'noo)* (knee); le hibou *(he-boo)* (owl); le joujou *(shoo-shoo)* (plaything).

6. Nouns ending in -ail follow the general rule.

le detail, les details; l'éventail, les éventails (fan).

Main exceptions: le bail, les baux (lease); le travail, les travaux (work); le corail, les coraux (coral), etc.

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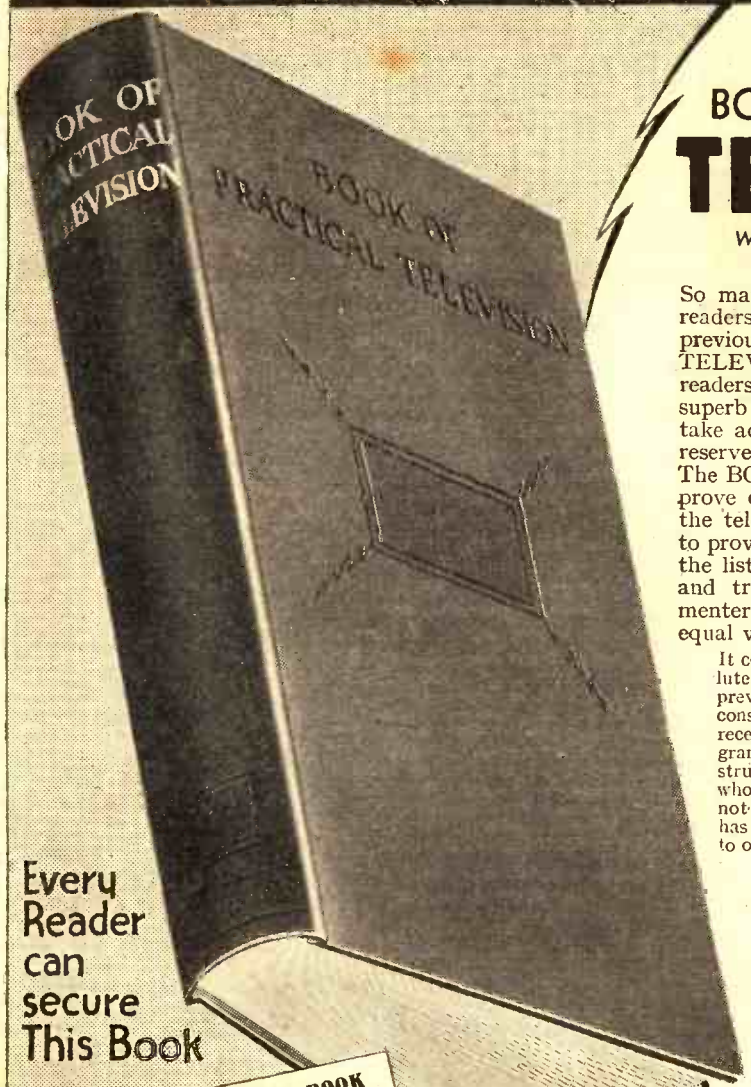

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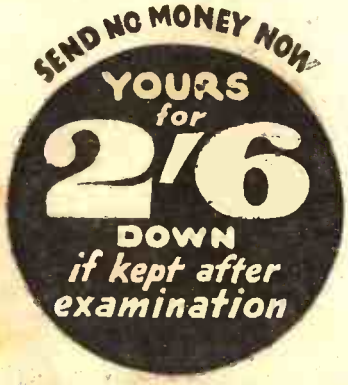

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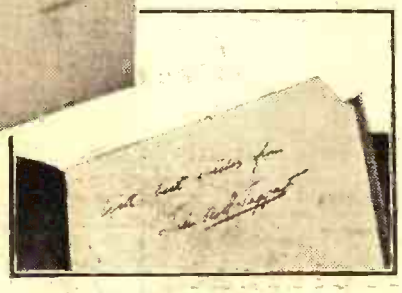

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10	CNROEIAT	20	GEANIEVT

THE SIMPLE RULES:

THIS is No. 8 of the unique POPULAR WIRELESS competitions, and no reader should miss it. The working out of your entry will prove an interesting test of your knowledge of common radio terms, and the prizes would be treasured highly by any radio enthusiast. And, remember, to try for one costs you just—*Nothing!*

All you have to do is to rearrange the letters given in each of the 20 groups above so that they make proper words. Each jumbled word is a common term used in radio. Every letter must be used up. Thus, you can see that No. 1 makes VOLT.

If some of the other jumbles beat you, do not be downhearted—perhaps nobody will get them all right, so just write down as many as you can and send them to us. On the other hand, if you *can* straighten out all the other 19 letter groups, well and good.

In either case, take the initials of the words you have completed (20 or less, that is), and make the longest single dictionary word you can from them. Any or all of the initials to be used once only! To send in, write down your answers on a sheet of paper with the numbers, below put your "initials" word, and add your name and address at the top. Write *in ink* only. Enclose the sheet in an envelope and address to:

"P.W." Jumbled Words,
1, Tallis House, John Carpenter Street, London, E.C.4 (Comp.).

One entry only may be sent by each reader, and must arrive on or before March 28th. The six letters which contain the most correct solutions will be the winners—but should more than six give all the 20 correct solutions, the winners will be determined by the longest words made from the initials.

No correspondence will be allowed, or responsibility taken for delay or non-delivery or otherwise, and the Editor's decision will be final. Employees of the proprietors of "P.W." must not compete.

BATTERY A.V.C.

Solving the problem of satisfactory automatic volume control in battery sets.

By K. D. ROGERS.

THE provision of satisfactory A.V.C. in battery-operated receivers has long presented set designers with no easy problem. The provision of delayed A.V.C. with only the directly-heated diode available has been the main trouble. Now, however, the matter of getting A.V.C., and delayed A.V.C. at that, is by no means difficult, a circuit very similar to that used in the mains sets being possible, except, of course, that the bias has to be obtained from a battery instead of from the anode-cathode current of the valves.

The reason for the solution of the designers' problem is the arrival on the market of the battery indirectly-heated double-diode valve. This has been introduced by Cossor in the form of the 220 D.D., the first indirectly-heated double-diode to be released.

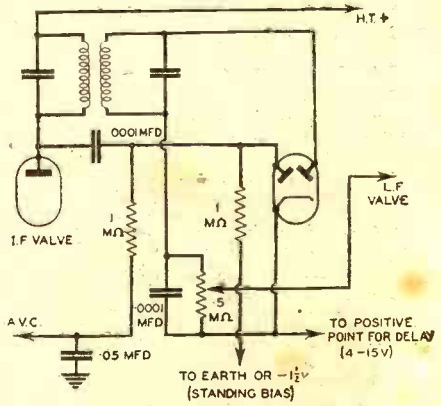
THE SOLUTION

to the set designer's problem of delayed battery A.V.C. is to be found in the indirectly-heated battery double diode. Here is the Cossor 220 D.D.

It consists of two diodes, one of which is intended for detection of the signal, while the other provides the voltage necessary for A.V.C. These derive their electron current from the same cathode. The 220 D.D. in many cases should be followed by a stage of L.F. amplification preceding the output valve; for this purpose the user has a wide choice of valves (e.g. triode, screened pentode, etc.) to suit the particular conditions imposed by the output valve. If the diode is used in combination with a high sensitivity output pentode such as the 220 H.P.T., however, the L.F. stage may be dispensed with and the 220 H.P.T. may be fed directly from the diode. This method is particularly recommended.

By using one of the diodes to provide the A.V.C. voltage, it becomes possible to prevent the A.V.C. system from coming into operation unless the signal would overload the output valve in its absence. In this way the sensitivity of the receiver is in no way impaired by adding automatic volume control to it. Such a system, in which A.V.C. only comes into use on a signal exceeding some pre-arranged strength, is called "delayed A.V.C."

A SIMPLE CIRCUIT



How the bias has to be arranged for delayed A.V.C. using the indirectly-heated double diode.

In the 220 D.D., delay voltage is arranged by a small positive voltage on the cathode obtained from a high resistance potentiometer across the H.T.

(Continued on next page.)

BATTERY A.V.C.

(Continued from previous page.)

supply. No current will flow until the peak voltage of the signal exceeds the delay voltage, after which rectification will take place in the normal way, providing a D.C. voltage change which can be passed back to the grids of the preceding variable-mu amplifier valves to control the sensitivity of the set. The return circuit for the signal diode is made to cathode so that it is not affected by the delay voltage.

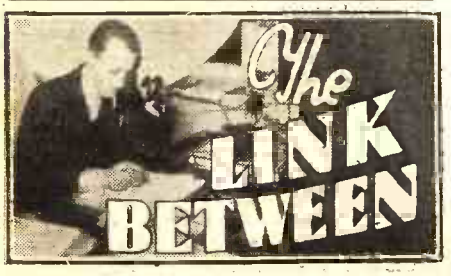
The circuit reproduced here shows how the valve is used to provide delayed A.V.C. The ordinary bias battery is employed, but the cathode of the double-diode valve is connected to a point *positive* to the negative filament line of the set. In other words, if your ordinary battery bias for the set (L.F. valves and so forth) is 9 volts negative, you have either to change the bias battery to one of, say, 16 volts, or add an extra battery in series. Then you tap off the nine volts for the L.F. or H.F. biasing of the set, starting from the negative end. That brings the tap of the bias battery, which is joined to L.T. — (usually regarded as the G.B. plus), to a point just over half-way along the battery towards its positive end.

Bias Considerations

The remainder of the battery is used for adjustment of the bias to the diode cathode, the cathode being tapped into the bias battery at a point *positive* to the point which joined to the L.T. — of the set.

In the circuit on the preceding page that point is shown by the lead marked "to positive point for delay (4 — 15 v.)," while the lead marked "to earth or — 1½ v. (standing bias)" is the normal 1·5 volts negative bias usually given to the H.F. valves of the set. In other words, it is 1·5 volts negative to the tap on the bias battery which is connected to the negative L.T. feed.

Let me put the whole matter in a few words. The diode cathode is at *positive* potential in regard to the L.T. negative of the set, while all the other bias points of the set are at negative potential (as usual) with regard to the same L.T. — point. The delay on the diode A.V.C. system is dependent on the amount of positive bias that is applied, and as can be seen in the diagram this is usually varied according to requirements when setting the set to between 4 and 15 volts positive.



THERE'S an old saying that there are none so deaf as those that don't want to hear. It leads me to wonder whether perhaps there isn't, after all, a method in the madness of those constructors who don't want to solder. At any rate, as one who can solder, I have come to the conclusion that it is something of a mixed blessing. When I think of the number of leaky kettles and pans that I have been let in for the job of repairing, I can see the wisdom of being content with the terminal method of connecting up!

All the same, the ability to solder is, in my opinion, a great asset (pots and pans excluded), for, apart from the question of wiring, there are so many little jobs which the constructor is likely to encounter which cannot satisfactorily be carried out *without* soldering.

But this is hardly the time or place to start a discourse on soldering, and, in any case, the advantages of being able to solder will, I am certain, be recognised by all of you. What I *do* want to say, however, is that if you are keen to master the tinker's art, it is a fairly safe gamble that you will succeed first time if you use B. I. "Resinkor" solder and "Coraline" soldering paste.

I am not trying particularly to sell them—in any case, I am quite certain that they sell themselves—but I am just passing on a home truth for which I can vouch. You can draw your own conclusions from the fact that these soldering aids are made by one of the largest cable makers in the country—British Insulated Cables, Ltd.; and if they don't know what is best for the job, well, who does? At any rate, you have my word for it that I would not be without "Resinkor" and "Coraline."

Looking Ahead

From all the information that I have been able to gather, it seems pretty certain that the new London Television Station will be well under way in about a couple of months time. I should like to think that the inauguration of this new service was going to affect all of us, but, alas! I am afraid that the question of cost is going to be something of an obstacle during the early months.

But that applies only in so far as "seeing" is concerned, and, quite apart from that, if I am not mistaken, the "sound" side of these forthcoming broadcasts is going to be well worth hearing.

There is, I believe, some talk that certain of these broadcasts will be put over on the medium waves as well, but I imagine that the majority of you fellows will prefer to be "independent" of the B.B.C. in this respect by building your own ultra-short-wave outfits.

You can rest assured that "P.W." will, as usual, be well to the fore in providing you with all the information you will require on the subject; in fact, there is a tremendous amount of activity going on at present in the labs. which looks very significant to me. But, in the meantime, I have come across a book which, because I think it will interest you, I am going to include in our literature service.

As a matter of fact, this book—which is the Eddystone Ultra-Short-Wave Guide—goes very thoroughly into the question of ultra-short-waves, and it includes several practical receiver designs. I am afraid that it is not on the "free list," which is hardly to be expected in view of the excellent way in which it has been prepared, but those of you who would like a copy can obtain one from me at a cost of one shilling.

I am being quite sincere when I say that I think it is excellent value for money, for it provides a very good insight into the whole subject, and the article on aerial systems is particularly useful. Applications should be addressed to me in the usual way, but will you kindly make your P.O.'s payable to Stratton & Co., Ltd. Incidentally, you can send stamps to the value if you prefer. **(No. 395.)**

Noise Suppression

For the second of my "potted reviews" I have chosen the T.C.C. condenser catalogue, mainly because it includes a very useful section on the subject of man-made static interference suppression. Unfortunately, the "noise racket" doesn't seem to get any better, in fact, if my district may be taken as criterion, it is getting infinitely worse.

Those of you similarly troubled will be able to glean quite a lot of useful information from the catalogue in question, and, quite apart from that, it is a publication which should be in the hands of all constructors, for it gives full details of T.C.C.'s famous range of fixed condensers. **(No. 396.)**

Will readers please note that applications for the catalogues reviewed in "The Link Between" should be addressed to G. T. Kelsey, John Carpenter House, John Carpenter Street, London, E.C.4, mentioning the number given at the end of the review.

LEARNING FRENCH THROUGH YOUR RADIO

(*Continued from page 44.*)

THESE POSSESSIVES BEING ADJECTIVES HAVE TO AGREE IN GENDER AND NUMBER WITH THE NOUNS THEY QUALIFY. Grasp this fact straight away, for, believe me, you will frequently err if you don't.

Let me give you the POSSESSIVES first. Here they are :

MASC.	FEM.	PLUR. (both genders)	
mon	ma	mes	(my)
ton	ta	tes	(thy)
son	sa	ses	(his, her, its)
notre	notre	nos	(our)
votre	votre	vos	(your)
leur	leur	leurs	(their)

LEARN THESE BY HEART (horizontally—i.e. *mo(ng)*, *mah*, *meh*) :

mo(ng)	*mah*	*meh*
to(ng)	*tah*	*teh*
so(ng)	*sah*	*seh*
notr	*notr*	*noh*
votr	*votr*	*voh*
ler	*ler*	*ler*

The big rule to learn in connection with these POSSESSIVES is that they agree in gender and number with the OBJECT POSSESSED, and not with THE PERSON OR THING WHICH POSSESSES. I can best explain this by an example. Take the two sentences: "He has lost HIS book" and "She has lost HER book." As the French for the word "book" is a Masculine noun—"le livre"—HIS book and HER book are both translated "SON LIVRE." DON'T BE TEMPTED TO WRITE "SA LIVRE" FOR "HER" BOOK. "Le livre" is the THING POSSESSED in both cases. It is Masculine, and so demands the Masculine form of the POSSESSIVE.

This question of AGREEMENT doesn't arise in the PLURALS, since there is only ONE plural form, and this does for both GENDERS. For instance: My books = mes livres (*meh leevr*), etc.

There is another important rule to learn in connection with POSSESSIVE ADJECTIVES. That is, that BEFORE A FEMININE NOUN BEGINNING WITH A VOWEL OR A SILENT *H* THE MASCULINE FORM OF THE ADJECTIVE IS ALWAYS USED, e.g. :

Mon ami, Henri (My friend, Henry). Mon ami, Louise (My friend, Louise).

Here is a selection of phrases which I took at random from a book. Look at them carefully. See how the POSSESSIVES are used.

sa longueur d'onde	its wavelength
son émission	its broadcast
un de nos correspondants	one of our correspondents
leurs faces de bois	their faces of wood
leurs gros yeux	their big eyes
de nos jours	in our time
son existence	his, her, its existence
leur capitale	their capital
dès sa naissance	since his, her, its birth
nos ancêtres gaulois	our Gallic ancestors
ses possessions	his, her, its possessions
Londres ouvre ses portes	London opens its (her) gates
leur conquête	their conquest
leurs exactions	their exactions
sa vie propre	his, her, its own life
son monopole	his, her, its monopoly
son saint patron	his, her, its patron saint
ses appels	his, her, its appeals
leur fortune	their fortune
son extérieur	his, her, its exterior
pour sa part	for his, her, its part
à sa place	in his, her, its place
à notre époque	in our time
ses traits	his, her, its features
sa marine	his, her, its navy

Now let us correct our last week's test. You remember, we were telling the time in French.

IL EST UNE HEURE DIX-SEPT DU MATIN, une heure vingt-cinq, deux heures moins vingt-quatre, une heure et quart, deux heures sept, trois heures moins huit, trois heures trois, trois heures vingt et un, quatre heures moins un quart, quatre heures seize, quatre heures et demie, cinq heures moins un quart, cinq heures moins quatre, cinq heures, cinq heures douze, cinq heures et quart, cinq heures vingt-trois, cinq heures et demie, six heures moins un quart, six heures moins dix, six heures, minuit cinq.

IL EST SEPT HEURES CINQ DU SOIR, sept heures et quart, sept heures et demie, huit heures moins vingt-cinq, huit heures, huit heures dix, huit heures vingt-trois, huit heures et demie, neuf heures moins un quart, neuf heures moins quatre, neuf heures une, neuf heures onze, neuf heures et quart, dix heures, dix heures et demie, onze heures moins vingt-neuf, onze heures trois, onze heures et quart, midi cinq.

How many right ? The lot ! Très bien ! (Very good !) (*treh be'ah(n)*).

This week, as a test, I want you first to learn the following words. They concern the family :

le père (*pair*) father ; la mère (*mair*) mother ; le frère (*frair*) brother ; la sœur (*ser*) sister ; le fils (*feece*) son ; la fille (*fee'y*) daughter ; le grand-père (*grah(n)-pair*) grandfather ; la grand'mère (*grah(n)' mair*) grandmother ; le petit-fils (*p'te-feece*) grandson ; l'oncle (*o(ng)kl*) uncle ; la tante (*tah(n)t*) aunt ; le neveu (*n've(r)*) nephew ; la nièce (*nyess*) niece ; le cousin (*koo-za(n)*) male cousin ; la cousine (*koo-zeen*) female cousin ; le beau-père (*boh-pair*), plur. les beaux-pères (*boh-pair*), father-in-law ; la belle-mère (*bel-mair*), plur. les belles-mères (*bel-mair*), mother-in-law ; le beau-fils (*boh-feece*), plur. les beaux-fils (*boh-feece*), son-in-law.

And then translate into French :

My father ; his mother ; their brothers ; our sister ; your son ; your daughters ; my grandfather ; her grandmother ; his grandmother ; thy aunts ; our uncle ; your nieces ; my cousin and (et) his sister ; their son-in-law and his aunt ; our niece and her sisters and her brothers ; their grandson and his sister ; your cousin and her mother.

FREE SEEDS for Gardening Enthusiasts

One of the lovely new varieties of nasturtium is the GOLDEN GLOBE, a beautiful no-trouble plant, the seeds of which should be planted out of doors now to ensure a brilliant display in the garden later on. Amateur gardeners will be interested to know that a generous FREE PACKET of these new seeds is given away in every copy of this week's special Spring Sowing and Planting Number of POPULAR GARDENING—price 2d. as usual. This issue has a splendid cover printed in full colours and is sure to be in great demand.

RADIO NOTES & NEWS

(*Continued from page 25.*)

The February figures are not out at the time of writing, but look at the showing for January. At the end of the month our total was 7,479,680; Germany's total was 7,413,490.

The net British increase during the month was 76,500. In the same period Germany put on 220,000 odd.

Unless there has been a radical change in the rate the figures to be announced will show *Deutschland Über Alles.*

Radio As Surgeon's Aid

DID you hear the remarkable S O S a week or so ago, when doctors were asked—in the hope of saving a child's life—to notify if they had treated a particular form of illness recently?

It reminded me of the famous case in Austria. In that instance, not only was it necessary to find a rare drug, but some details of the treatment were in doubt, until a specialist who happened to hear the broadcast request for the drug realised that he was one of the very few who could save the threatened life. Despite the million-to-one chance against, radio consultation and air transport then enabled a complete recovery to be made.

Greek Renaissance

THE recent political upheavals in Greece appear to have had their effect on radio there. Until now, Greece has had only one station—if you can call it a station—which was active in the Salonika area for about two weeks out of the fifty-two, during the International Fair.

Now, however, the ether around 235 metres is enlivened daily from Salonika. From Monday to Saturday the programme starts at 7 a.m., and goes on practically without a break right until 8 p.m. On Sundays, for a special treat, there is a solid hour and a half of rollick, from 11.30 a.m. till 1 p.m.

Your chances of tuning-in to these lofty jinks are not roseate, for the power employed is only one kilowatt.

Short-Wave Blanket!

WHAT looks like a first-class short-wave mystery has intruded itself into my letter-bag this week.

Amateurs in various parts of the country report that, for the first time on record, the short waves were completely blanketed one afternoon recently, and there was a general fade-out which prevented reception.

There has already been much speculation about this, some of the observers believing that a secret system is being tested for war-time work; others, less suspicious or romantic by nature, simply remark on the fade-out, and "cuss" in passing.

Inquiries at Broadcasting House threw no light on the matter. If any of my sleuth readers care to do so I shall be pleased to hear from them.

Paris Television

POSTE-PARISIEN is installing intermediate-film apparatus for 180-line television transmission.

* * *

One French set-maker is shortly to demonstrate a 7-metre listen-and-look set, and other firms are busy experimenting with television receivers.

* * *

Eiffel Tower is giving daily television programmes on 8 metres. The week-day transmissions are from 4 to 4.30 p.m., and on Sundays there is a two-hour programme, starting at 5.30 p.m.

The accompanying sound broadcasts are from Paris P.T.T. on 431·7 metres.

New Radio Research Station.

A SUFFOLK reader informs me that Bawdsey Manor, the country estate of Sir Cuthbert Quilter, near Felixstowe, is being turned into a radio research station. It has been purchased by the Air Ministry, which is already putting up masts, although the estate will not be fully transferred for several months.

Felixstowe is situated conveniently for the Continental air service routes, and research in civil as well as in military aviation will be conducted there. The beautiful gardens are said to have cost some £40,000 to lay out, but apparently the Air Ministry is to pay little more than half that sum for the whole property.

The B.B.C. "Ghost"

I AM still shuddering from the "effects" of that "ghost" relay. Those howls and other noises! Ugh! But I wonder if the ghost was really there—despite the evidence of the sudden temperature drop in the cellar. I fancy any self-respecting spectre would dodge that array of instruments, "mikes" and powdered floors, to say nothing of the dog and the group of watchers.

ARIEL.

BARRY KENT CALLING!

THE LUXEMBOURG "BATTLE" BEGINS

The latest news about the B.B.C., including details of a Sunday programme change, and a revision of dance band fees.

AFTER a long period of quiescence, during which the B.B.C. has appeared to follow a policy of "live and let live" with regard to commercial broadcasting in English from the Continent, it has now been decided to embark upon an active campaign to stop this kind of Continental broadcasting.

The first shot in the new campaign was fired in the refusal of the application of Radio-Luxembourg for permission to relay the King's broadcast on March 1st. This was followed by important representations in high political quarters aimed at inducing the Government to instruct the Foreign Office to make urgent requests to the foreign governments concerned to withdraw licences from the stations in question. The next step was to arrange for an extension of control of wireless exchanges to prevent the inclusion in their offerings of any but B.B.C. programmes.

* * *

A Programme Shake-up

Wonder of wonders! The B.B.C. really intends to try changing its regular programme arrangements. I mean that on Sunday, April 26th, for instance, instead of the lighter programmes being on the Regional system, as usual, they will be on the National network. This is how the main items will be disposed: National—Brass Band, Celebrity Trio, Troise and his Mandoliers, B.B.C. Orchestra (Scotland), Mantovani and his Tipica Orchestra, B.B.C. Military Band, Commodore Grand Orchestra, the Melodies of Christendom, and the Play "Gallipoli."

Meanwhile on the Regional there will be the Cedric Sharpe Sextet, Chamber Music, the London Symphony Orchestra, and the Theatre Orchestra. I have left out the "Service" items. This is the first time since the beginning of the B.B.C. that there has been such a re-shuffling on Sunday.

* * *

Armistice Day, 1936

There is much discussion at Broadcasting House about the right programme for Armistice Day this year. With the Scott programme last year the B.B.C. definitely broke with the war atmosphere tradition of the celebration of November 11th. It is not easy, however, to find subjects as appropriate as the Scott Antarctic "saga" of exploration. No decision has yet been taken about this year's programme, but I gather that it is probable that the wonderful life of Dr. Nansen will be dramatised for the occasion.

* * *

A Real Gipsy Programme

Mr. R. H. Eckersley, Mr. Val Gielgud, and Mr. de Lotbinière have been touring the various permanent gipsy encampments paying surprise visits in order to find out at first hand exactly what goes on. The idea is to bring to the microphone an actuality programme of "Romany" life. I hear that excellent progress is being made, and that there is a good chance of a really striking programme being built round Petulengro's Camp near Harpenden.

* * *

A Kipling Release

The B.B.C. is concluding arrangements with the executors of the estate of the late Rudyard Kipling to make available to listeners a great part of the works of that poet. The first fruits of the new arrangement will be enjoyed in June. The Children's Hour and the Regional programmes will benefit as well as the National transmissions.

* * *

Cricket Tests, 1936

After much cogitation the B.B.C. has decided to invite Mr. Howard Marshall to be the chief commentator for the cricket test matches this summer. Mr. Marshall also will be entrusted with the task of selecting his collaborators. The season will be partly a training period for the big Australian series of 1937, "down under."

* * *

B.B.C. Staff Problems

The staff of the B.B.C. are again considering the formation of an association of their own to rank with the "Whitley Councils" of Government departments. This is not a simple problem, because if the B.B.C. staff break away from the present free and easy system of relationships with their chiefs, they may sacrifice such advantages as the Christmas Bonus which they now get as an annual "extra." There is, however, a feeling that purely staff interests require something of the nature of a trade union. The debate continues.

* * *

More Money for Dance Bands

Jack Payne's public protests recently about the inadequacy of the fees paid by the B.B.C. to dance bands have had some effect. I find there is a general if not large upward revision in the rates of pay for bands invited to put on special studio shows for the B.B.C. It is hoped that this will enable the B.B.C. to attract the best bands more often. This is definitely a move in the right direction from the listeners' standpoint.

THE RADIO BULLETIN

Our special weekly feature giving news of all the latest activities concerning the radio industry.

AMPLION PICK-UP

THERE are many enthusiasts who are keen to adapt their sets for record reproduction but who, on the other hand, are not prepared to scrap their existing acoustic gramophones. For these **Amplion** are marketing a **pick-up head** for attachment to ordinary gramophone tone-arms, and the price is 12s. 6d.

The construction of this attachment is very similar to that of the head of the well-known Amplion pick-up unit.

* * *

McMICHAEL DEVELOPMENT

A very practical example of the progress being made by **McMichael Radio** is the fact that **the firm's factory** at Slough **is being enlarged.** Four new bays are being added to the Production and Research Buildings, and a further addition is a modern two-story building to accommodate the enlarged office staff. The total area of additional floor space which has been planned amounts to over 10,000 square feet. It is expected that the constructional side of the work will be completed in about two months' time.

* * *

FOR VALVE VOLTMETERS

A valve voltmeter is a very useful piece of apparatus for checking up the H.F. side of a set. But it needs a suitable valve, the essential factors being a high and constant input impedance.

There is a valve specially designed for valve voltmeters of the anode-bend type, and that is **the Marconi type A577.** This is an indirectly heated triode with the grid taken to the top cap, and it operates with a filament voltage of 4 and a filament current of 1 amp. The maximum anode volts are 200, mutual conductance 2 milliamps per volt, and the impedance is 3,000 ohms.

The price is £3.

* * *

NEW PHILCO FACTORY

A new London factory, the third to be erected by the firm at Perivale in four years, was recently opened by **Philco.** This new factory is more than twice as large as the first two factories combined, and the output six times as great.

It is interesting to note that the present output schedule is four sets per minute.

Ex-service men and women are so well represented at the Philco factory that a Philco branch of the British Legion—60 strong—has been formed.

* * *

BATTERY TRANSPORTABLE

A completely new self-contained battery transportable has many advantages; it can be taken into any room and, in fact, anywhere since it needs no aerial or earth. Neither is it dependent upon mains supply for its energy.

Among the recent releases is **the model B.88 Battery transportable** marketed by **Beethoven Radio.** This set comes within the five-valve category and incorporates two high-frequency pentodes, an electron-coupled frequency changer, a double-diode triode, and a dual pentode quiescent push-pull stage. It has delayed A.V.C. and an undistorted output of 1,200 milli-watts. The illuminated Airplane dial is calibrated in station names, and there is a switch for optional dial lighting.

Sockets are also provided for a gramophone pick-up and external loudspeaker.

The price is 15 guineas, complete with batteries.

* * *

THE E.M.I. OUTPUT METER

All keen service-men are interested in apparatus designed to make their work easier and more accurate. Here are details of a new instrument which fulfils this purpose.

It is **the E.M.I. Service output meter,** and is a portable instrument incorporating a very sensitive dead-beat Weston movement. The calibration is in milliwatts and decibels, three ranges being incorporated. The case and mounting are of insulated material finished in grey, and the range selector switch and terminals are mounted on a small platform in front of the instrument. Twin flexible leads with **spade tags** and string clips are included.

An impedance of 5,000 ohms renders the instrument suitable for most types of output valves.

An illustrated book of instructions is provided with each instrument, and service agents can obtain full details from E.M.I. Service, Ltd.

RESULT OF "P.W." COMPETITION No. 5

The Prize—A B.T.S. "ADABAND" SHORT-WAVE CONVERTER—for the most apt "Signature" Song Title for a well-known person has been awarded to:

Mr. H. J. McDonald, 25, Argyle Street, Euston Road, London, W.C.1,
who selected Mr. HORE-BELISHA using "Broadway Rhythm."

A number of other interesting efforts were received, among which the following are deserving of special mention:

GEORGE ROBEY—"Underneath the Arches."
HENRY FORD—"Get Out and Get Under."
Mr. NEVILLE CHAMBERLAIN—"Brother, Can You Spare a Dime?"
CHARLIE CHAPLIN—"Actions Speak Louder than Words."

OLYMPIC GAMES TO BE TELEVISED

QUITE early this year the German Broadcasting Company reopened the high-definition television service for Berlin. It will be remembered that the two ultra-short-wave transmitters by means of which Berlin had been provided with a high-definition television service since March of last year, were destroyed by the fire at the Radio Exhibition in August. Suitable new transmitters were erected in a remarkably short space of time by Telefunken. To enable a reopening of the service as soon as possible the Post Office decided to retain the 180-line definition with 25 frames-per-second, as it would have taken considerably longer than the three months stipulated to provide transmitters of a higher definition.

At the opening of the new service this year ten public televiewing rooms were in operation in various parts of Berlin, and one at Potsdam. In one of the opening speeches it was stressed that the service must be regarded as *experimental*, in view of the imminent technical improvements (higher definition and, possibly, interlaced scanning).

Programmes are now broadcast daily from 8 p.m. to 9 p.m. local time, and a second session has been arranged from 9 p.m. to 10 p.m. About fifty people can comfortably see the television programme in the public televiewing rooms, so that roughly 500 persons can attend each session, which makes a total of 1,000 regular visitors an evening. No charge is made for admission. The programmes change every week, so that up to the present facilities have been provided for thousands of Berliners to see the television programmes.

Daily News Reel

Last year the programmes consisted only of films. Direct scanning of persons has now been added, which greatly enhances the entertainment value of the broadcasts. In the main, excerpts of the latest film releases are provided, together with a light entertainment programme by well-known artists in direct television. The broadcasters have decided to give the programmes topical interest by taking their own daily news reel, a new edition of which will be broadcast each night. This news-reel feature can be considered as a standby until technical facilities are available for the direct transmission from actual events

(*Continued on next page.*)

A GREAT BOOK

Dear Sir,

I received your "Book of Practical Television," and it was beyond all my expectations. I was amazed that such a technical subject could be put into such simple, clear and concise language.

Thanking you for your quick and safe delivery, and your great book.

Your appreciative reader,
G. HENSHALL.

23, Carpathia St.,
Garston, Liverpool 19.

OLYMPIC GAMES TO BE TELEVISED

(*Continued from previous page.*)

by means of the so-called "electric eye." It was foreshadowed at the opening of the new service that the chief events of the Olympic Games, to be held in Berlin from August 1st to August 15th, will be televised without the help of film.

Apart from the sight and sound broadcasts from 8 p.m. to 10 p.m., every evening a sound-only programme will be relayed from the Deutschlandsender from 5 p.m. to 7.30 p.m., and from 10 p.m. to midnight. This is to give listeners an opportunity of becoming used to reception on ultra-short-waves. Wavelengths.—Sound: 7·06 metres; Vision: 6·72 metres. **A. G.**

WATCH YOUR VALVES

IF a valve is at all tight in its socket—and they often are—it is very easy to damage the valve unless you take care when you want to remove it. Most people just grab hold of the glass bulb and prise it about from side to side until they loosen it and then haul it out. All this is very bad for the valve, because the glass bulb is only stuck into the base by means of a sort of plaster-of-Paris cement, and is not intended to be treated roughly. Once you loosen the bulb in the cap you are very liable to get it twisted about, in which case the leading-out wires will almost certainly soon be broken.

The proper thing to do when a valve is tight is to take hold of the *base* itself, without touching the glass bulb. Incidentally, the same thing applies to an electric light bulb, and I once saw what might have been a very nasty accident when somebody was forcing an electric light bulb down in a defective light-socket and the glass collapsed.

J. H. T. R.

THE "CENTURION" RAPID CONSTRUCTION GUIDE

(*Continued from page* 38.)

Leaving the centring tab attached, cut out dial along borders. Cut out (razor blade essential) the hole for slipping over bush, where marked on the tab. Stand the set up in its normal position, front of panel facing you. The moving vanes of the main tuning condenser should be "closed." Put your left hand round the back of set and gently hold the rear end framework of main tuning condenser. Do not touch the vanes. Remove the fixing nut and washer from the main tuning condenser's spindle portion, which can be seen from the front of the panel.

Slip the hole in the centring tab over the spindle bush (the threaded brass collar), and hold centring tab against panel by fitting washer and then nut loosely. Lay set (in Easy-Cabinet) on its back, front of panel uppermost. Centre the dial into its correct general position; as a guide it may be noted that the top point should come opposite the middle fixing screw of panel (i.e. half-way along top edge).

Ensure dial is in correct position by measuring the distance from the lowest point on the left-hand end of dial to the bottom edge of panel; this distance should be the same as that from the right-hand end of dial to bottom edge of panel.

(R) Prepare 16 ordinary plated brass pins (if a pin is of a type that could be bent, it can be used) by cutting them diagonally with wire-cutters or pincers about ⅛ in. from their heads. You now have 16 very short and pointed pins. Any other type of very short miniature nails may be used.

There are 16 small circles with white centres along the border of dial. Keeping dial flat on panel, start with the top circle and prick through centre of circle with some thin pointed instrument (I used a drawing-pin) for about ⅛ in. Insert a prepared pin into this hole and push home with any hard, flattish-headed instrument (I used the handle of a screw-driver). Carry out the rest of the fastening-down of dial in following order: Circle between pin just inserted and condenser spindle; the two circles (on outer border) on each side of top circle; the two circles (on inner border) between last-inserted two pins and spindle. Carry on in this way, working towards the ends, keeping dial flat.

(S) CUT CENTRING TAB OFF WITH SAFETY-RAZOR BLADE by cutting along inner border where indicated (where tab is joined on). Tear away the tab from the condenser bush; there is really no need to remove the fixing nut to do this. Tighten up the fixing nut on bush of main tuning condenser.

STAND SET IN ITS NORMAL POSITION WITH DIAL FACING YOU.

(T) Turn projecting spindle of main tuning condenser fully anti-clockwise (fully left). Slip the large J.B. knob and long pointer on to end of spindle with the pointer pointing exactly horizontally to the left. Tighten grub-screw, which is the little screw which fits into edge of knob and is on opposite side to pointer. (Do not touch screw which secures the pointer.)

(U) Turn spindles of volume control, anode reaction condenser and aerial balancing condenser fully anti-clockwise (fully to left). Fit their knobs with their white spots or pointers exactly in a horizontal direction to the left. Tighten up their grub-screws.

(V) Fit knob on wavechange switch spindle (no special direction) and on turret switch spindle.

YOUR SET IS NOW COMPLETE. (See separate article next week on installation and operation.) **J. S.-T.**

ABOUT THESE PROGRAMMES

(*Continued from page* 40.)

abomination—these may be suffered to sit and quiver with the ecstasy of their own purism.

But there are those who find some recondite joy in remaining aloof from what the rest of us are crazy about, like the youth who, when bicycling was all the rage, say about the early 1900's, told me that he did not bike *because it was so common*. That is just naughtiness or ingrowing mind and requires treatment when encountered.

The recent celebrations of the invention of the cinematograph, which "featured" some of the early films, set one thinking of the beginnings of broadcasting here. Apart from the thrill of first hearing an amateur broadcasting gramophone records, my own particular most-treasured memory is that of sitting in a large room high up in a building on the Surrey end of Blackfriars Bridge, and hearing Melba sing at Chelmsford. There was a 7-valve receiver and it fed about twelve pairs of telephones, which were passed round the numerous company like pipes at a Red Indian powwow. This was in 1920.

Some "Thumping Problems"

Present-day broadcasting having reached the stage of development at which one man can speak to the whole world at once, there seems to the lay mind little room for technical improvement except the conquest of "fading," the elimination of atmospheric disturbances and man-made static, and of the interference of one station with another—all pretty thumping problems but not so formidable as those which have been solved since 1914, taken all together. Therefore it is impossible to escape the conclusion that further development, besides the popularisation of television, must occur in the output, that is, in the programmes—their composition, presentation and distribution.

Looking ahead to the days when the B.B.C. will have a much larger revenue, bold intellects untrammelled by narrow regulations and "red tape," and when it is more subservient to public opinion, I see a service comprising entertainment, sport, instruction, religion, and utility features (time, weather, markets, finance, etc.), not jumbled together as they are now, but each with its own special station. What an expansion of each feature would then be possible!

A Vision of the Future

I see the time when, instead of the B.B.C. having to scour the world for talented broadcasters, the best artists will compete for a "place in the ether"; when parliamentary proceedings are broadcast as a matter of course, "compèred" by experienced House of Commons men; when the student, the housewife, the collector and connoisseur, the bookman, scientific man, and artist, business man, soldier, sailor, tinker and tailor, will listen to his or her special station as hungrily as they now peruse the special printed organs of their callings. There must be a *modus* worked out, reconciling the interests of the Press, the Theatre and the Music Halls with those of the listening public, even though this should entail the introduction into the output of certain stations of broadcast advertising and some form of financial co-operation between the B.B.C. and the interests aforementioned.

We Cannot Stand Still

At present, broadcasting *as a whole* is standing still in this country. That cannot continue. To stand still is, in effect, to fall back. There is no true equilibrium in any organic system. You have to get on—or get out; to go on or get behind. Petty changes, the livening up of Sunday programmes, the addition of 2·37 per cent of more dance music at the cost of an equivalent loss of Russian fireworks or of talks on the Inner Meaning of Everything, are but ripples—mere departmental give and take. They do not effect any vital development. It is to the Board of Governors that we must look for vision and breadth of vision.

Young Bill says, What's come over Pa? He has a funny look in his eye to-night. Prophetic frenzy, my boy! Let us, therefore, return with a dull thud to 1936. Bransby Williams—bless me! there's a perennial! I seem to have heard of him ever since my schooldays—is always so good that gratitude almost prevents me from remarking that his most recent broadcast, though thoroughly delightful, disappointed me because all three of his pieces were rhymed. Did any of you, I wonder, have the same experience?

The New B.B.C. Organ

I suggest that we might enjoy "Young Ideas" better if they would find some other duty for the talented person who at present begins to play the piano immediately each speaker is announced—an Idea which is also Young, but annoying in practice.

I have read somewhere that the B.B.C. are to install the biggest organ in the world, or the biggest cinema organ, or words to similar effect. It is not the details that are important but the superlative. I hope that I have been misinformed this time, for I do not like the transatlantic sound of this description. I find that my set will reproduce any of the cinema organs which are broadcast with a most satisfying tumult and thunder. If five or six extra rows of keys are required I can only say that as the average cinema organ seems to be able to imitate almost any sound of man, nature, or machinery, I do not see what more is desired, unless it be the ability to play a weather report or do "Gert and Daisy."

TECHNICAL JOTTINGS

Comments on various items of interest to all readers.

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

A Giant Broadcaster

AT the recent Paris Inter-Continental Broadcasting Conference it was made known that the B.B.C. intends to double the power of the London Regional with the object of improving listening conditions for those on the South and East Coasts. But this is small fry compared with the reported intention of Italy to put into service a 500-kilowatt transmitter which will be heard, to say the least of it all over Europe.

At the Conference a good many criticisms of this proposed Italian Broadcasting Station were raised, although the Conference, not being concerned with political matters, did not pursue the subject. It seems pretty certain that such a powerful transmitter would interfere seriously with broadcast reception over a large part of the Continent and in this country, too, of course.

The Question of European Wavelengths

One of the subjects which inevitably came up for consideration at this Conference was the question of the Lucerne Wavelength Plan. It was soon decided, however, not to suggest any interference with the Plan, and consequently the wavelengths of the principal B.B.C. and foreign stations will presumably continue as at present for at least the next two or three years. The Paris Conference only really concerned itself with wavelength problems in so far as these affected the Empire short-wave services.

Claims for Extra Channels

The old problem of additional wavelengths is always cropping up, and practically every country is pressing forward its claims for extra channels, owing to the expansion of its broadcast system. There is no doubt that the whole question will have to be taken up again in the near future, but in the meantime these Conferences obviously cannot concern themselves with the claims of different countries individually.

Push-Pull Advantages

One of the advantages of substituting a pair of valves in push-pull in place of a single output valve is that, assuming the output stage to be properly designed, you will practically get rid of any harmonic distortion. If, however, you are using 3-electrode valves for the purpose it is necessary to put in an intermediate low-frequency stage or, alternatively, use an input push-pull transformer having a relatively high ratio between the output and the detector stage. It is better to use the former arrangement with a fairly low ratio push-pull transformer between the 3-electrode output valves and the intermediate low-frequency stage, this latter being in turn resistance-capacity-coupled to the detector. If you do not want to use the intermediate low-frequency stage you can use pentode valves in the push-pull output.

Adjusting the Valves

For best results in such a case, however, it is important that the high-tension current consumption of the two valves shall be as nearly as possible the same, and this can be brought about by adjustment of the priming-grid voltages. Assuming the characteristics of the two valves to be the same—and on this point you should satisfy yourself and not just go by guesswork—then you can secure the necessary adjustment of the priming grids very simply by connecting them together so that the same voltage applies to them both.

Testing the Characteristics

I have said that you cannot be at all sure that the characteristics of the two valves are exactly the same, even though the valves are of identical make and specification, and therefore in actual practice it is often a good plan to use a potentiometer, the end terminals being connected respectively to the two priming grids, whilst the high-tension positive input is brought in to the centre terminal of the potentiometer. The total resistance of the potentiometer element, by the way, should be about 10,000 ohms.

If the valves are absolutely identical in all respects, obviously the proper setting of the slider will be at the centre, but you will usually find that it is necessary to shift it a little from the central position so that different proportions of the resistance are put in series with each of the grids and in this way you will eliminate any hum and probably improve the quality and reproduction. The total resistance of the

(Continued on next page.)

TO OUR READERS

Owing to the unusual pressure on our space this week, we have reluctantly had to hold over a number of our regular features and articles by well-known contributors such as Alan Hunter and Victor King.

But the omission is only temporary; they will be back again soon, and NEXT WEEK you will not only be able to read

MORE ABOUT THE "CENTURION"

but also many of the valuable and interesting regular feature articles that go to make "Popular Wireless" the Leading Radio Weekly Journal.

TECHNICAL JOTTINGS

(Continued from previous page.)

potentiometer may be higher than the figure mentioned, but if it is much *lower* you will find that the potentiometer arrangement is not fully effective.

Looking for Trouble

When a set begins to go wrong, unless there is some fairly obvious place to look for the trouble, such as a bad resistance or potentiometer, or a switch which is not making proper contact, you can generally get to the root of the trouble most quickly by measuring the voltages and currents at different parts of the circuit: the results of these measurements will tell you quite a lot. With an ordinary "straight" type of receiver this is a very simple matter as a rule, even with a multi-valve set. But with a superheterodyne circuit there are certain difficulties which have to be specially dealt with. With a superhet circuit, for example, you may find by your meter tests that the voltages and currents are apparently correct and yet the receiver is not giving satisfactory results.

A Superhet's Tuned Stages

When you consider the number of tuned stages in a superhet—and it is quite common for a superhet receiver to have as many as seven tuned stages—and bearing in mind that all of these stages need careful trimming, you will easily see where the difficulties come in. As a rule the trimming instructions accompany the set or, if you are building a set from a published design, the trimming instructions will be given with it. But if you do not happen to know the proper settings for the intermediate frequency transformer trimmers and for the trimmer of the oscillator-tuning condenser, you are liable to find things pretty troublesome.

An oscillator, however, will get you out of your difficulty.

Adjusting the Trimmers

To trim the intermediate frequency transformers you adjust the tuning control of the oscillator for the intermediate frequency specified to be used in the receiver and connect one output lead to earth and the other to the input of the primary of the first intermediate frequency transformer.

In this way when the receiver and oscillator are both working you merely have to adjust the trimmers of the intermediate frequency transformers until you get maximum signals. In the same way you can then use the oscillator to feed the aerial and earth terminals of the receiver and adjust the trimmers of the ganged condenser.

The Intermediate-Frequency Transformers

When connecting the aerial as abovementioned for adjusting the trimmers of the intermediate frequency transformers, it is a good plan to put in a blocking condenser in the lead from the oscillator to the primary of the intermediate frequency transformer so as to prevent any short-circuit to earth, as there may not be any such condenser included in the oscillator.

INDEX TO ADVERTISERS

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd.—Saturday, March 21st, 1936. S.S.

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Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for the following week's issue.

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