

The **Wireless Constructor** 6^d

INCORPORATING "MODERN WIRELESS"

Vol. XVII.

APRIL, 1934.

No. 90.

S **T** **A** **R**
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S **T** **A** **R**
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CONTENTS

	Page		Page
The Editor's Chat	283	Round the Dials	204
How To Obtain Better Radio ..	284	Points for Purchasers	204
S.T.300 Star—Your Guide to Success	285	Big Power at Bisamberg	205
About This Manual of Mine ..	290	The World's Short-wave Broadcasters	306
B.B.C. News	291	Some Wireless Cabinet Woods ..	307
Voices on the Air	292	As We Find Them	310
Some Novel Television Ideas ..	293	In Lighter Vein	311
The Manual of Modern Radio—More Praise from Radio Experts	295	Rapid Radio Repairs	313
Topical Tips	296	Readers' Results with the "S.T. Super"	314
From My Armchair	297	The New Power Valves	315
The "Adapto" 3	299	What Readers Say	316
Questions I Am Asked	303	Sound or Vision with One Receiver	320

As some of the arrangements and specialties described in this Journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

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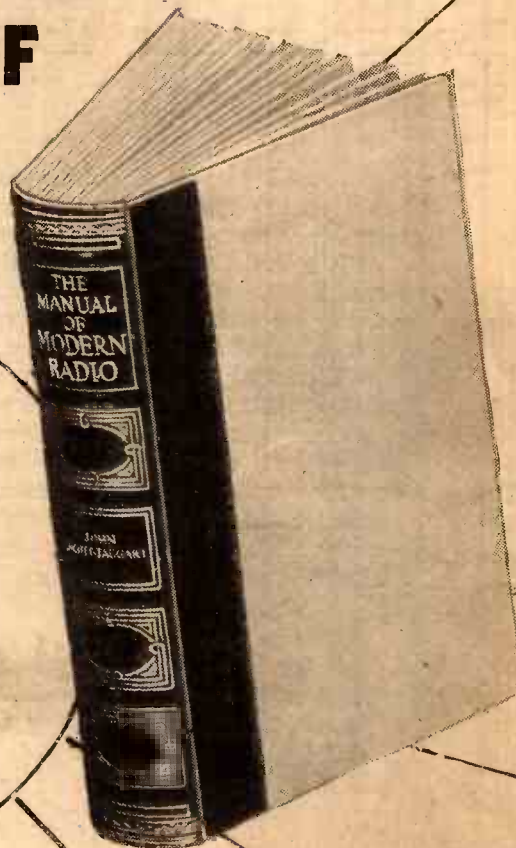


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The Choice of Critics

THE
EDITOR'S
CHAT

THE WIRELESS CONSTRUCTOR

INCORPORATING
MODERN WIRELESS

A Bold Challenge—What Constructors Want—The S.T.300 Star

SAYS John Scott-Taggart in this issue: "If you can get a performance even approaching that of the S.T.300 Star with any other three-valve receiver, no one would be more keenly interested than myself."

And if you study S.T.'s article on the S.T.300 Star, you will realise that he has very little chance of getting in touch with a reader who has built any other three-valver capable of "even approaching" the S.T.300 Star!

Will you venture to contradict Mr. Scott-Taggart when he says: "I know the extent to which every published wireless design is built, and all the figures prove that the wireless constructing public has preferred performance to simplicity, and that those who prefer simplicity and who criticise my methods have no alternative to offer"?

Sound Commonsense

If you consider the foregoing statement, particularly in conjunction with the study of other conditions to-day, you will realise that it is sound fundamental commonsense. It is no good making a fetish of simplicity when extraordinarily difficult conditions prevail in the ether.

If you still want to maintain first-rate performance with your set, you have inevitably got to have a set capable of overcoming adverse wave-length conditions. A "Simple Simon" sort of receiver is not good enough these days.

* * *

S.T. was the first designer of recent years to be bold enough to tell the wireless constructing public a rather unpalatable home truth: namely, that simplicity was not necessarily the keynote to success, and that the more one chased after the elusive ideal of the pretty-pretty, simple-simple type

of set, the further one got away from the ideal of guaranteed performance.

To quote again from Mr. Scott-Taggart's article: "It is no use pretending that any ham-fisted, dithery-minded person can obtain as good results from one of my multi-control sets as the more experienced amateur. . . . By that I do not mean that an expert knowledge is required. But if results better than those obtainable with a single-control set are desired, it is clear that some intelligence is required, and if properly

going to build the S.T.300 Star, and then thank their own lucky stars that they had the chance of building a three-valver which is such an absolutely satisfactory answer to the chaotic conditions of the ether to-day.

* * *

We are including in this issue another very interesting contribution by A. S. Clark—a set for short-wave reception entitled the "Adapto" Three.

In brief, it is a dual-capacity receiver which gives you the best of everything in short-wave reception. The set represents excellent economy in first cost and upkeep; and by simply turning a switch you can change the set from a straight three-valve design to an efficient short-wave superhet adaptor for hooking up to your ordinary receiver.

The merits of this set are so obvious that we are sure all short-wave enthusiasts will give it a sincere welcome.

A Second Chance

The B.B.C. has decided to give "30-line" television another chance, despite the fact that a recent broadcast appeal to users of television apparatus resulted in an almost negligible response.

Why the B.B.C. has decided to carry on with the 30-line definition system is a mystery; a higher definition system has been more or less promised for some time past.

We understand that if the new series of 30-line television transmissions does not result in exciting more popular response from those who own television sets than it has done in the past, the 30-line system will be definitely dropped within a few months. Probably a new series of ultra-short-wave television transmissions will then be started.

"A GREAT SUCCESS IN EVERY WAY"

We have all used the S.T.300 Star circuit. The sets are a great success in every way and we look forward to your further radio developments.

J. HARRISON,
ERNEST A. R. HANSON,
C. COX.

14, Eagle Street, Toll End,
Tipton, Staffs.

The above is a typical letter from three readers of THE WIRELESS CONSTRUCTOR. Further appreciations are published on page 324.

applied will result in astonishingly successful operation of the set. . . . This applies to the S.T.300. . . . In other words, if you possess any aptitude for working a wireless set, you will be able to capitalise it, and draw handsome dividends in the form of dozens of additional stations received with greater strength and clarity."

That is straight talking, and from what I know of readers of THE WIRELESS CONSTRUCTOR, they will realise that it is not only straight talking, but commonsense.

And that is why thousands are



I SUPPOSE valve overloading is the cause of fully fifty per cent of the distortion that is heard in radio receivers. Usually, it is either the detector or the output valve that is expected to deal with too much "signal" voltage.

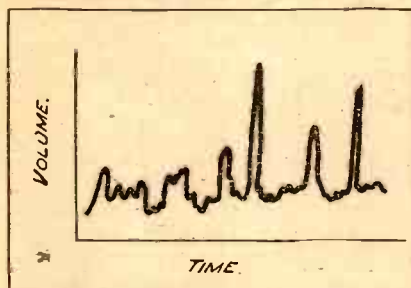
Battery set owners are admittedly badly placed as regards the use of valves having sufficient margins of safety, for big output valves take big H.T. Class B helps, of course, and where you have the slightest suspicion that these rough high notes and jarring bars passages are caused by overloading, you should try Class B if you cannot use a mains set, or a mains H.T. unit.

Detector Overloading

Detector overloading is due, usually, to people trying to get more volume out of their sets than they will provide, often because the L.F. amplification is too small.

Result; the H.F. side is pushed and the detector gets more than it can handle.

THOSE SHARP PEAKS



This diagram shows how the peaks, often caused by transients, greatly exceed the average level of music in your set. These peaks have to be "carried" by the valves without overloading if distortion is to be avoided.

Don't forget that only an average of about 30-40 per cent of the total input to the detector is L.F.—to be "used"

by the set. The rest is H.F., and this is what chokes up that oft maltreated valve.

That 30-40 per cent, however, is an average. Modulation usually varies between about 20 and 80 per cent. Thus, if you like a normal level of sound of, say, 500 milliwatts from your set (not very loud), you must be prepared for occasional spurts of at least 1,000-1,500 milliwatts.

The aim of every radio constructor is to improve his set—to get better and better results. Here are some practical paragraphs that will be of valuable assistance to all our readers.

By FREDERICK LEWIS.

The normal 30-40 per cent modulation, we said, goes up on loud passages to 80 or more. So your valve has to be able to deal with at least twice as much as you normally use. That is, twice the average. A safer rating is three to four times to give perfect safety from overloading.

Tune your set into the loudest passage of music you can find in the programme. Adjust the volume control to give undistorted reproduction of that loud music. Then reduce volume slightly.

You now have the set adjusted for no overloading; when the quieter passages come you will be surprised at the low volume of sound. But you will be listening correctly. You try it!

A Volume Control Tip

I recently had to alter the value of the volume control across a pick-up. The one fitted in the set was of too low a resistance and damped the high notes too much. The next "size" available had too high a resistance and allowed

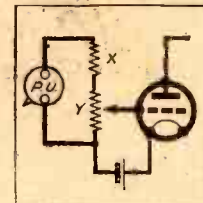
too much "brilliance." Results with it were far too shrill.

In such a case there is a simple remedy, as shown in the sketch. A fixed resistance of suitable value in series between the pick-up and one end of the volume control provides a ready means of adjustment. It can be placed at either end, according as whether one gets ample or not very much volume when the control is at "full volume."

If the "full volume" setting gives too much or easily ample volume, the resistance should be inserted at the non-earthed end of the volume control (X in diagram). If the volume is never too great the resistance can be inserted on the other side of Y—the main potentiometer resistance.

In the first case the control will have a somewhat reduced maximum volume, as can easily be understood, and in the other you will get an "increased" minimum.

HIGH NOTES



An extra resistance at "X" prevents "top" loss if the volume control has too low a value.

A Class B Problem

I was recently fixing a Class B stage, by the simple addition of a home-made "B" unit, to a friend's three-valver. The alteration was merely one that necessitated the adding of the unit to the loudspeaker terminals, and the connection of L.T. and H.T. to it, and I had carried out the alteration in a few minutes, and had the set going on its first test.

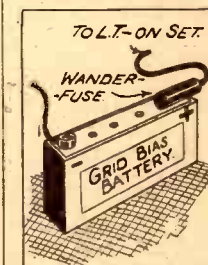
The results were poor. The quality was reedy, and thinking it was due to the nameless L.F. transformer in the set—between detector and L.F. valves—I proceeded to change this.

It took but a few minutes and the set was on test again. Silence! Further tests showed that with the exception of one valve that had

been removed during the operations all had been blown. And yet I had removed H.T.—from the battery.

I had forgotten the 16-volt bias battery. G.B.—had completed a path to G.B.—via the filament of the valves, for I had let the G.B.—lead from the transformer fall in the set.

SAFETY FIRST



A bias battery safety fuse may save your valves.



It is no use pretending that any ham-fisted, dithery-minded person can obtain as good results from one of my multi-control sets as the more experienced amateur.

By that I do not mean that an expert knowledge is required. But if results better than those obtainable with a single-control set are desired, it is clear that some intelligence is required, and if properly applied will result in astonishingly successful operation of the set.

Suitable for All

This applies to the S.T.300 Star, which is emphatically not designed to appeal to the lowest common factor of operating skill. In other words, if you possess any aptitude for working a wireless set, you will be able to capitalise it and draw handsome dividends in the form of dozens of additional stations received with greater strength and clarity.

If, on the other hand, you have no skill at all, the set may be still used, but without operating more than the absolutely essential controls.

Keeping Up to Date

You will, of course, always feel that you could get a lot more out of the set, and this might tempt you to build a simpler-looking receiver which would not continually be reminding you that there were unmined reefs of golden opportunity awaiting you! But I can assure you that you will be far better off building a set of my kind, even if you are unable to operate it with maximum skill.

The reason for this is that even if you never touch several of the controls which I shall mention later, you will still have an excellent receiver, and one or two of the controls may be

moved at odd periods, say every six months, as interference gets worse.

Moreover, even though you may think you have no operating skill, I have not the slightest doubt that sooner or later you will want to experiment with one or two of the additional knobs, and you will find such joy in noting the immediate effect of the controls that before long you will take a real pride and pleasure in getting that last ounce of performance which will place you streets ahead of friends who have so-called simpler sets.

There is, of course, no merit in mere complexity of control. Some of you probably feel that I take a real

joy in providing several knobs to turn. As a matter of fact, no one is more eager to provide simple operating control than myself.

Much Higher Performance

But I have been willing to put up with very considerable criticism and quite a good deal of sarcasm in order to give constructors a very much higher performance for their sets. The plain, but not always palatable, fact is that these controls are necessary unless you are prepared to be satisfied with a poorer performance.

Although I have come in for a certain amount of criticism, the truth remains that the wireless-constructing public has, during the last two years, not built the so-called simpler sets in preference to my own. If you who are reading this article should come across a critic of my sets, by all means ask him what receiver he would use in place of them.

I know the extent to which every published wireless design is built and all the figures prove that the wireless-constructing public has preferred performance to simplicity, and that those who prefer simplicity and who criticise my methods have no alternative to offer.

Positive Results

Those press designers who have attempted to popularise their sets by attacking my methods have experienced the worst failures. Positive results and performance are the only things which will give a designer a reputation and maintain it for him. And those very members of the constructing public who deplore my additional controls are, curiously enough, shy of building another designer's set which is much simpler.

JOHN SCOTT-TAGGART says—

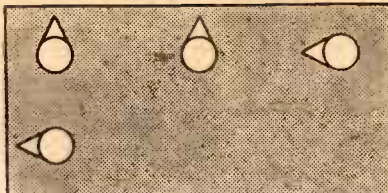
"If you can get a performance even approaching that of the S.T.300 Star with any other three-valve receiver, no one would be more keenly interested than myself!" And in this article he tells you how to obtain that amazing selectivity and sensitivity which distinguish this magnificent design from so-called simpler sets.



The selectivity range adjuster should be screwed up tight for the first tests. If any further adjustments are made, the hand should be removed each time when noting the effect.

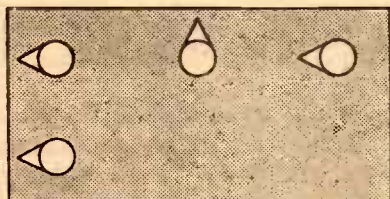
SIMPLE ADJUSTMENTS TO COPE WITH EVERY CONTINGENCY

★ Aerial Coupler.
★ Anode Coupler.
★ Anode Reaction.
★ Aerial Reaction.

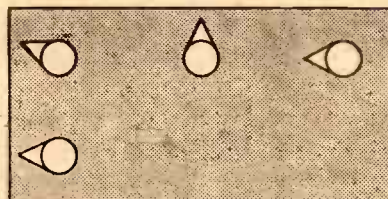


(1) All knobs at "normal." Loud signals; selectivity medium. Suitable for first tests, "local" reception and totally inexperienced users. Both reactions are at zero.

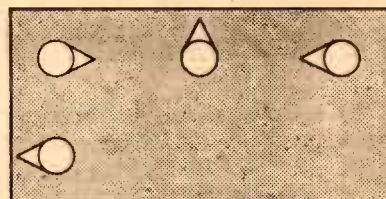
On the opposite side of this page are shown the names given to the controls. Wave-change switches are not given; they are pushed in for "Long" and pulled out for "Medium."



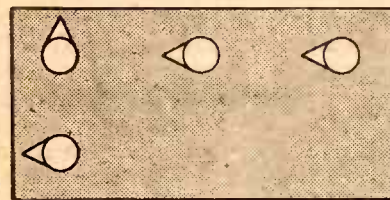
(2) Aerial selectivity is high, anode circuit selectivity medium. Signals weak. Aerial coupler has reduced volume. Both reactions are at zero.



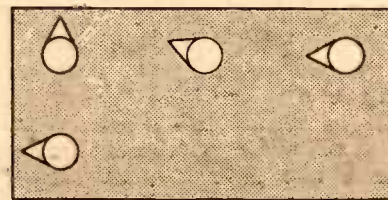
(3) As (2), but signal strength is greater because aerial coupler is increased; selectivity of aerial circuit slightly lower. Reactions still at zero.



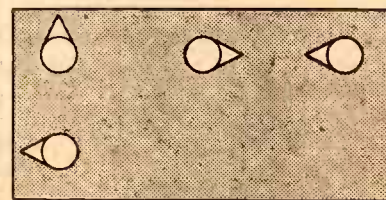
(4) Stronger signals than (3). Aerial selectivity poor. Suitable for daylight reception or very poor aerials. Reactions still at zero.



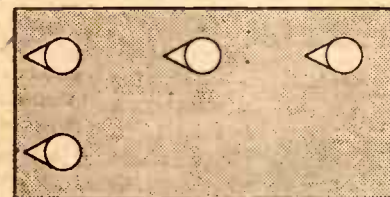
(5) Anode circuit selectivity good, but signals weak because anode coupler at zero. Rarely used. Extremely stable. No reaction used.



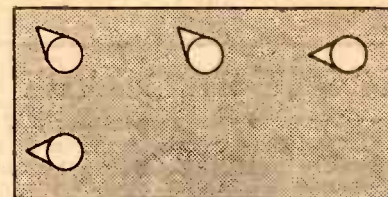
(6) As (5), signals louder but anode selectivity rather less. Very useful for preliminary tests, local reception and totally inexperienced users.



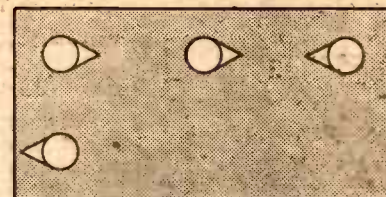
(7) As (6), but signals louder and anode selectivity at its worst. Set may be unstable with anode coupler at maximum. (Selectivity range adjuster may be reduced.)



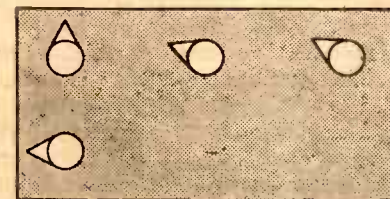
(8) Maximum selectivity (without reaction) and minimum signal strength.



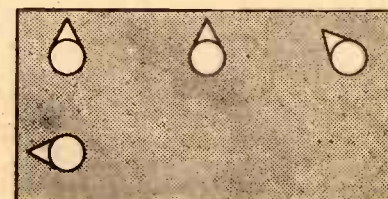
(9) Probably most usual best position of controls before applying reaction. Gives good selectivity and signal strength.



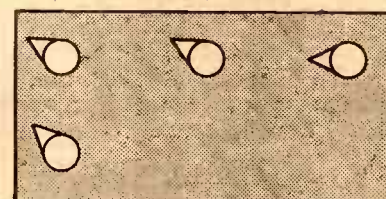
(10) Maximum signal strength before using reaction. Suitable for daylight reception, receiving long waves when little interference, poor aerials, etc. Set may be unstable owing to maximum position of anode coupler.



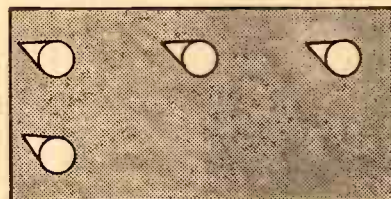
(11) Best arrangement for all-round work. High selectivity and signal strength. Anode reaction is in use. Control volume by aerial coupler.



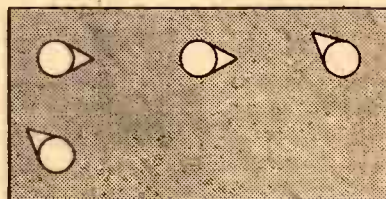
(12) As (11), but louder signals with slight reduction of anode selectivity.



(13) Best arrangement for demonstrating amazing effect on selectivity and signal strength of aerial reaction. Both couplers are kept partly to the left. Anode reaction is at zero.



(14) "S.T.300" Star, operating to give superlative results as regards signals and selectivity. Double reaction is in use. Coupler positions may be tried a little more to right. In daylight, aerial coupler may be full right.



(15) Theoretical maximum signal strength obtainable with set. Anode coupler too far to right may, in some cases, impair smoothness of reaction.

"Dozens of Stations with Greater Strength"

Even if I have not converted everyone to my own way of thinking, those who remain outside the fold have shown themselves wise in this respect: that they are unwilling to back their convictions by building other sets without the so-called defects of mine.

"A Fair Offer"

Perhaps some day they will be given a simpler set designed by myself and will have the confidence to build it. But that time is not yet and I ask those hesitators to accept my word that conditions to-day necessitate the additional controls which will be found on the S.T.300 Star.

If you can get a performance even approaching that of the S.T.300

5. Anode tuning condenser.

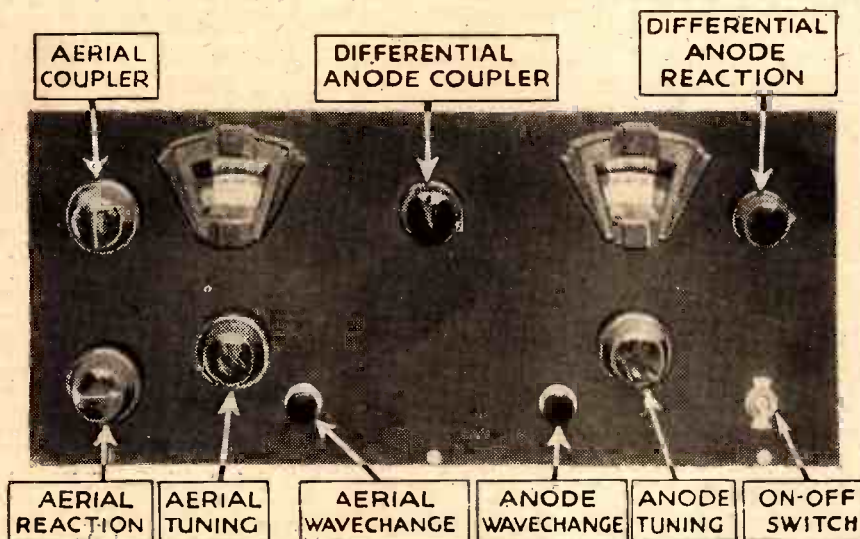
6. Anode reaction.

These six controls may be divided into aerial and anode circuit sections for the purpose of simple operation and explanation. There are two tuned circuits in the receiver called the *aerial circuit* and the *anode circuit*.

Each circuit is fed through a condenser, which I have called a coupler. The aerial circuit for example is fed from the aerial through an aerial coupler, which is controlled by the top left-hand knob on the panel.

Dual Reaction

Reaction is applied to the aerial circuit by means of the aerial reaction knob, which is the bottom left-hand



Star with any other three-valve receiver, no one would be more keenly interested than myself, and I should willingly travel miles to make a comparison. That is a fair offer.

The S.T.300 Star Controls

Before explaining how the controls on the S.T.300 Star should be worked to give the best results, let me say a few words about them. The wavechange switches need little comment; when pushed-in, the set is operating on the long waves, while when they are pulled out, the medium waveband is in use. Naturally you should never have one switch in and the other out.

The various tuning controls are;

1. Aerial coupler.
2. Aerial tuning condenser.
3. Aerial reaction.
4. Anode coupler.

one on the panel. You should think of the three controls together, since they all affect the same circuit.

We have an exactly similar set of controls on the anode circuit. We have an anode coupler, which governs the amount of high-frequency current fed to the tuned anode circuit; we have the anode tuning condenser, which is the right-hand dial of the set; and we have the anode reaction knob, which is at the top right-hand corner of the panel.

Different Combinations

The controls, it will thus be seen, are duplicated. The coupler in each case governs the amount of H.F. current fed to the circuit, the dial tunes the circuit to the incoming signals and the reaction knob serves as a means of increasing the signal strength and improving the selectivity of the circuit.

It is obvious that different combinations of effects may be obtained by operating the controls in a different way. For example, we may use the aerial circuit as a flat tuning adjustment and rely almost wholly on the

THE RECOMMENDED ACCESSORIES

LOUDSPEAKER: W.B. Celestion, Rola, R. & A., Blue Spot, Ferranti, H.M.V. Amplion, Marconiphone, G.E.C., Cossor.

(Note: If a speaker of the chassis type is chosen, the necessity of using a baffle board can be overcome by means of a Howe Box Baffle.)

BATTERIES: H.T. 120 volts: Siemens Full O' Power.

G.B. 9 volts: Pertrix, Drydex, Ever Ready, Siemens, Lissen, Marconiphone, L.T. 2 volts: Block, Lissen, Pertrix, G.E.C., Ediswan, Exide, Oldham.

AERIAL AND EARTH EQUIPMENT (if required): Electron "Superial" Goltone, "Akrite," British Radiophone "Receptu" down lead, Bulgin lighting switch, Graham Farish "Filt" earthing device.

anode circuit for selectivity. In this case we should not use the aerial reaction knob at all, but leave it at zero (full left).

The aerial coupler would be at a medium position, while the anode circuit control would be adjusted for maximum selectivity, i.e. the anode coupler would be near zero (towards the left), while the anode reaction knob would be employed to give reaction to the circuit.

Maximum Selectivity

To obtain the maximum results as regards selectivity, we should use aerial reaction as well as anode reaction and the aerial coupler would be adjusted to a small value near zero (full left).

The best way of explaining what the various knobs do is to illustrate different positions to give different results, and I have reproduced a whole page showing fifteen positions for the controls and what each one does.

SUGGESTIONS FOR MAINS UNITS

Make.	A.C. Mains.	D.C. Mains.
Atlas	A.2	D.C.15/25
Ekeo	A.C.18	D.C.15/25
Heayberd	D.129	H.D.C.150

NOTE.—These suggestions for mains units for use in conjunction with the S.T.300 Star are based upon the assumption that valves of the type actually specified, or valves with similar electrical characteristics, are used.

"S.T.300 Star Places You Streets Ahead of Your Friends"

Fig. 1, for example, shows all the knobs at "normal," the positions being those you would use when first testing out the set.

As regards the internal adjustables in the receiver, there are two, namely, the *phase reverser* condenser and the *selectivity range adjuster*. Both these are preset condensers, which must be of the type specified in the article (J.B., or Graham Farish baseboard presets).

Preliminary Adjustments

The selectivity range adjuster should be screwed up tight, i.e. adjusted to maximum capacity, while the phase reverser, which is a .00005-mfd. preset, is set at about one-sixth of the way in; its capacity is therefore only a fraction of the maximum obtainable, but the actual value is not at all critical; as long as there is a reverse reaction effect by its means, good results are obtainable.

Having set the controls as in Fig. 1, you should then carry out one or two experiments to show their effect on the receiver.

Fig. 2 shows the first experiment in which, by rotating the aerial coupler to the left, reduced signal strength and

aerial reaction will always require some slight readjustment on the aerial tuning condenser (i.e. the left-hand dial).

Likewise an alteration on the anode coupler or the anode reaction knob will require a slight retuning on the *anode* tuning condenser, i.e. the right-hand dial.

Fig. 4 shows the aerial coupler at maximum position. This will very rarely be used, but is sometimes desirable for daylight reception of the long waves.

to the left will at once stabilise the set, but those who like their anode couplers to be capable of being moved from full left to full right without a trace of oscillation should reduce the capacity of the selectivity range adjuster preset condenser.

Volume Control

The way to do this is to adjust the anode coupler till it is full right and then gradually reduce the capacity of the selectivity range adjuster till the set stops oscillating, removing the hand

WHAT TO PUT IN THE THREE VALVE HOLDERS

H.F. valve : Cossor S.G.220, or Mullard P.M.12A., Mazda S.215B., Marconi S.22, Osram S.22.
Detector : Mullard P.M.2D.X., or Cossor 210Det., Marconi H.L.2, Mazda L.2, Osram H.L.2, Tungram P.D.220.
Output : Mullard P.M.2A., or Cossor 220P.A., Mazda P.220, Osram L.P.2, Marconi L.P.2.

Having carried out these tests on the aerial coupler, set it once more to normal, i.e. vertical, and experiment with the anode coupler.

Extremely Stable

When turned full left, as in Fig. 5, the anode coupler is at zero and signals, even after retuning on the right-hand dial, will be much weaker

from the range adjuster after every few turns to note the effect accomplished.

The anode coupler will very rarely be used at the position to the right of its vertical normal one, owing to the great sensitivity of the receiver when reaction is employed. Fig. 9 is probably the commonest position for the controls before any reaction is employed, while Fig. 11 will probably be

THE COMPONENTS RECOMMENDED FOR THE S.T.300 STAR

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| <p>2 Polar No. 4 .0005-mfd. variable air condensers with disc drives, or British Radiophone, Ormond slow-motion type R.493, J.B., Telsen, British Radiogram.</p> <p>2 Telsen S.T.599 (or S.T.400) coils, or Colver, Wearite.</p> <p>1 Graham Farish Twin Screen H.F. choke, type L.M.S., or Telsen binocular, Lewcos, R.I. Dual Astatic, Bulgín, Amplion, Wearite.</p> <p>1 R.I. Hypermite L.F. transformer, or Lissen Hypernik, Varley, Ferranti, Multitone, Lewcos, L.F.T.6A, Bulgín "Senator".</p> <p>1 W.B. universal valve holder, horizontal mounting type.</p> <p>2 Benjamin 4-pin valve holders, "Vibrolder" type, or Lissen, Graham Farish, Telsen, W.B.</p> <p>1 Lissen Disc Type H.F. choke, type LN 5092, or Graham Farish, Telsen, Lewcos, Amplion, R.I. Quad Astatic.</p> <p>3 Graham Farish .0005-mfd. mid-log-line solid dielectric condensers, or Polar, Telsen, British Radiogram.</p> <p>1 British Radiogram .0003-mfd. differential condenser with insulated spindle, or Polar.</p> <p>1 Telsen .0001-mfd. differential condenser (latest type as illustrated), or Graham Farish, British Radiogram, J.B., Polar.</p> <p>2 Bulgín 2-point push-pull switches type S22, or Telsen, British Radiogram, Lissen, Benjamin, Wearite, W.B., Ormond.</p> <p>1 J.B. .00005-mfd. baseboard preset condenser, or Graham Farish.</p> <p>1 J.B. .0001-mfd. baseboard preset condenser, or Graham Farish.</p> | <p>1 Bulgín on/off toggle switch, type S.80, or British Radiophone, Claude Lyons.</p> <p>1 Dubilier 2-mfd. fixed condenser, type BB, or T.C.C., Graham Farish, Telsen, Ferranti.</p> <p>1 T.C.C. 1-mfd. fixed condenser, type 50, or Dubilier, Telsen, Graham Farish, Ferranti.</p> <p>1 Dubilier 20,000-ohm metallised resistance, 1-watt type, or Graham Farish, Varley, Watmel, Claude Lyons, Bulgín, Erie.</p> <p>1 Graham Farish 250-ohm "Ohmite" resistance, or Dubilier, Bulgín, Erie, Varley.</p> <p>1 Lissen .00005-mfd. fixed condenser, or Dubilier, T.C.C., Graham Farish.</p> <p>1 Graham Farish 1-meg. "Ohmite" resistance, or Dubilier, Varley, Erie, Claude Lyons, Bulgín.</p> <p>1 Peto-Scott panel, 16 in. × 7 in. × $\frac{3}{8}$ in., or Goltone, Permcol, Wearite.</p> <p>1 Peto-Scott cabinet and baseboard, 16 in. × 10 in. with Metaplex 6$\frac{1}{2}$ in. × 10 in. at one end.</p> <p>1 Peto-Scott S.T.300 Star screen.</p> <p>1 Peto-Scott tone control bracket.</p> <p>1 Peto-Scott terminal strip, 16 in. × 1$\frac{1}{2}$ in. × $\frac{3}{8}$ in.</p> <p>10 Belling Lee indicating terminals engraved as follows: "A," "E," "L.S. +," "L.S. -," "H.T. -," "H.T. + 1," "H.T. + 2," "H.T. + 3," "L.T. -" and "L.T. +," or Bulgín, Clix, Ealex.</p> <p>6 Clix Wander plugs, or Belling Lee, Ealex, Bulgín.</p> <p>2 Clix L.T. spade terminals. Screws, Glazite, etc.</p> |
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greater selectivity is obtained on the aerial circuit.

Note that both reaction controls remain at zero. When any of the controls are moved, there should be a slight retuning on the dial affected.

For example, if the aerial coupler is moved to the left you will have to turn the aerial tuning condenser dial a little more to the right, to bring the stations back to the in-tune position. An alteration of the aerial coupler or

than before, although selectivity will be better.

The set is extremely stable in this position and the operator should note that he always will have a means of stabilising his receiver by rotating the anode coupler a little to the left. Even with both reaction controls at zero, instability may arise when the anode coupler is over towards the right.

This is no disadvantage because a slight movement of the anode coupler

the commonest adjustment for the controls for general use.

It will be seen that a certain amount of anode reaction is employed, but the anode coupler is set to a fairly low value. Under these conditions the volume given by the set may be controlled by the aerial coupler, retuning, of course, on the left-hand tuning dial. The aerial coupler is unquestionably the most convenient method of controlling volume on the set.

"Reefs of Golden Opportunity Awaiting You"

When double reaction is to be used, as in Fig. 14, all the controls are moved to the right a little from their zero position. *It is emphatically urged that the aerial coupler and the anode coupler should be both at low values when reaction is to be used on both circuits.*

Signal strength from a station should always be very low before reaction is applied, as otherwise an increase of reaction will only result in distortion and no greater selectivity or signal strength. When, however, the input is weak, reaction will bring signals up to full loudspeaker volume, while giving very high selectivity on both tuned circuits.

Using Double Reaction

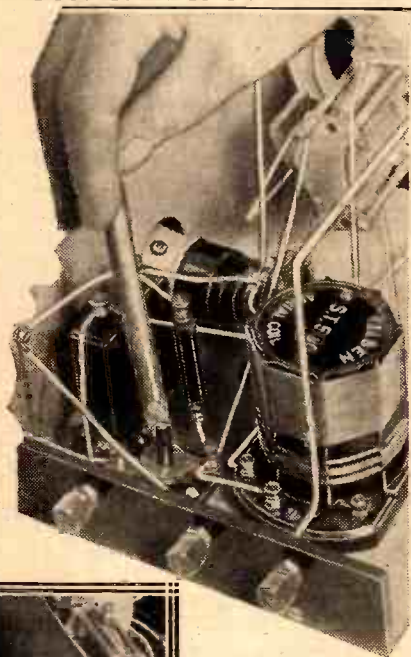
It is much better to have the signals too weak than too strong to begin with when double reaction is to be applied; the output from the speaker can then be increased by increasing the aerial coupler and readjusting the aerial reaction.

The valves used in this set are given on the preceding page of this article. It is important to note that the screen-grid valve should be of the more recent efficient type, as otherwise there will be insufficient reaction to

It is desirable when applying aerial reaction to have the anode coupler as far round to the left as possible consistent with signal strength. This improves the smoothness of the reaction.

As regards battery voltages, the last valve should be given 120 volts. In other words, the H.T.+3 terminal on the set (see blue print) should be connected to 120 volts.

CONTROL REFINEMENTS



You can increase this to 80 volts or reduce it very considerably, say, down to 50 volts; the lower the screen voltage the worse will be the amplification but the greater will be the saving of H.T. current on the screen-grid valve. This does not concern the user of a mains unit, with which the S.T.300 Star works excellently.

The tone control should normally be at zero, i.e. with the knob fully left looking at it from the back of the set, but, in actual practice, a certain amount of condenser will always be required to cut out heterodyne whistles and certain kinds of interference. The tone control will be found an extremely useful adjunct to the receiver.

Some General Rules

It only remains to remind you of one or two of the general rules regarding the fitting up of any set. For example, the aerial lead should be kept away from the loudspeaker side of the set, and the loudspeaker itself should be so arranged that the sound waves from it do not impinge directly on the valves of the receiver.

If this precaution is not taken a microphonic howl is possible. This applies, of course, to all receivers.

The various rules regarding the differential anode reaction and the differential anode coupler knobs apply only if the types of condensers used are



ALTERING GRID BIAS

feed both circuits when the anode coupler is at zero.

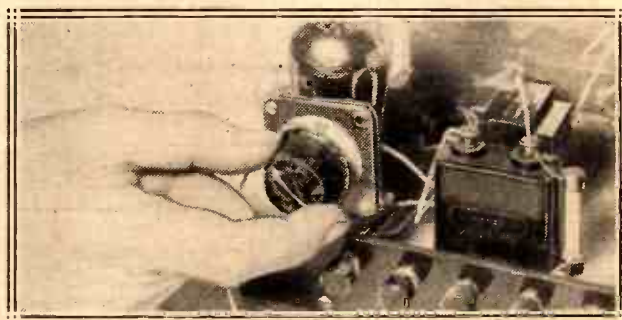
An old type screen-grid valve may be used, but it will be found necessary to have the anode coupler more to the right than with the later types of valve recommended.

The H.T.+2 terminal should be given about 80 volts, but this may be adjusted to different values if desired. The screen voltage of the first valve may be adjusted to different values, but usually H.T.+1 should be connected to 72 volts.

similar to those employed in the actual S.T.300 Star.

If different types of differential, or older models of the same make are used, it is possible that although the set will work just as well, you will

(Please turn to page 324.)



Once you have set the phase reverser (top) as described, no further adjustment of it is required.

The tone control (right) is an extremely useful adjunct to the receiver, a slight adjustment enabling you to cut out heterodyne whistles.

If you find it necessary to alter the grid bias voltage, the L.T. switch should always be turned to the "off" position before the G.B. — plug is moved.



ABOUT THIS MANUAL OF MODERN RADIO

More than 800,000 copies of Mr. Scott-Taggart's books have been sold. Here, the author of *THE MANUAL OF MODERN RADIO* urges you not to miss this unique opportunity of securing a guinea volume at a saving of eighteen shillings and threepence.

BY *John Scott-Taggart*
F. Inst. E. E. AMIEE

I HAVE been asked to say a few words to you about my latest and most important book—*THE MANUAL OF MODERN RADIO*.

Well, you have no doubt read two entirely separate sets of letters: those from the leaders of the profession and industry and those from readers who have also seen the *MANUAL*.

Some of the letters are concerned with the technical merits of the book, but readers' letters are equally gratifying, as they prove that the volume is acceptable to those who are, after all, the final judges.

Approximately fifty thousand amateurs have already obtained the book, but this number should be doubled or trebled if readers of *THE*

that, apart from being an engineer and author, I was head of the largest radio publishing concern in the world. Well, I must admit that I never conceived that any firm would have the public enterprise to give such astonishing value.

Needless to say, a book of this size and beauty of production is a big undertaking. It is issued not as an ordinary volume for profit but to increase the attraction of the magazine to readers and to encourage a technical interest in the hobby of wireless.

THE MANUAL OF MODERN RADIO, however, is free of any publicity matter. If sold in the ordinary way,

ordinarily cost what you are going to pay!

The paper and printing are perfect, and the standard edition is very handsomely bound in a rich shade of green cloth having a silken finish.

"It is Red-hot"

Coming back to my share in the book, I have written 100,000 words to go with the 541 drawings—and every word is newly written exclusively for this *MANUAL*. The book has been out only a few weeks and contains all the very latest developments. It is red-hot!

You may think you have read a good deal from my pen, but I have

THE PRINCIPAL CONTENTS OF THE MANUAL OF MODERN RADIO

A SIMPLE INTRODUCTION
AERIAL CIRCUITS
HOW THE VALVE WORKS
THE THREE-ELECTRODE VALVE
HIGH-FREQUENCY AMPLIFICATION
LOW-FREQUENCY AMPLIFICATION
MULTI-STAGE L.F. AMPLIFIERS
REACTION
RECTIFIERS AND DETECTORS
DECOUPLING, FILTERS AND SMOOTHING DEVICES
PARALLEL-FED L.F. TRANSFORMERS
THE SCREEN-GRID VALVE
THE VARIABLE-MU VALVE

THE PENTODE VALVE
PUSH-PULL AMPLIFICATION
QUIESCENT PUSH-PULL AMPLIFICATION
CLASS B AMPLIFICATION
NEUTRALISED CIRCUITS FOR H.F. AMPLIFICATION
MULTIPLE AMPLIFICATION WITH ONE VALVE
MULTIPLE REACTION CIRCUITS
MAINS UNITS AND THE RECTIFICATION OF A.C.
METAL RECTIFIERS
METAL RECTIFIERS AS DETECTORS

VOLUME-CONTROL METHODS
TONE-CONTROL SYSTEMS
PICK-UP CIRCUITS FOR GRAMOPHONES
AUTOMATIC VOLUME CONTROL
A.C. VALVES AND THEIR CIRCUITS
OPERATION OF D.C. MAINS VALVES
UNIVERSAL MAINS RECEIVERS
THE SUPERHETERODYNE
COMMERCIAL SUPERHETERODYNE RECEIVERS
ULTRA-SHORT-WAVE RECEPTION
IRON-CORE TUNING INDUCTANCES
THE METAL VALVE
ELECTROLYTIC CONDENSERS

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the standard edition would cost you a guinea. Your two coupons are therefore worth eighteen shillings and threepence. If you throw them away, I think you will regret it. You certainly cannot obtain the *MANUAL* in any other way.

It is not for me to comment on the merits of the book, but I can say something about its scope and production. Speaking as a book critic, I do not know of any other volume which covers the same ground or even a fraction of it. There are 541 diagrams and circuits, thirty-six chapters, forty pages of art plates and, as a make-weight at the end, you have a complete dictionary of wireless terms which alone would

never touched upon more than one-tenth of what I have put into this book.

I want *all* of you who are reading this to get the *MANUAL*. Although so comprehensive, it is easy to read and understand. I want your hand to go to it whenever you are in doubt or trouble or in search of one or other of the ten thousand facts in this book.

I hope you will study the letters about it. You will not be buying in the dark. But, speaking as impartially as I can, I can assure all my friends that the publishers are offering you an amazing bargain. I am certain you will want to seize it while the brief offer lasts.



Foreign Policy Talks More Competition Required Link with Radio Trade

SINCE the Postmaster-General has become a member of the Cabinet he has been fairly closely questioned about the control of the B.B.C., particularly in that part of its work that impinges on politics, national and international. If it was true that Sir Kingsley Wood was personally favourable to a public enquiry into the B.B.C. this year, he apparently has changed his mind, because it is now the policy of the Government to let the matter stand over for a twelve-month.

Meanwhile, however, there is evidence that the Post Office will have prepared a detailed report for the guidance of the Government and of any Committee that Parliament may set up. There is no doubt that restrictions will be imposed on broadcasts relating to foreign policy, whatever the B.B.C. may do to meet the situation in advance.

Another probable change will be the re-allotment of the Licence revenue, based on an arbitrary limitation of the money to be spent on capital account and on programmes. Sir Stephen Tallents, the newly appointed Public Relations Director of the Post Office, is taking special interest in the affairs of the B.B.C.

The Truth About Vernon Bartlett

When, just before Christmas, Mr. Bartlett decided to become the Foreign Correspondent of a newspaper, it was agreed between him and the B.B.C. that his contract with them would be modified at the end of March, when he would resume the status of contributor which had obtained while he was employed as the London representative of the League of Nations Secretariat. It was believed in December, however, that as a contributor on Foreign Affairs he would still be able to appear fairly frequently if not regularly at the microphone.

Parliamentary apprehensions about Continental misconstruction of Mr. Bartlett's commentaries were responsible for a further modification of the

BY OUR SPECIAL CORRESPONDENT

B.B.C. arrangement with Mr. Bartlett, who after March will appear only occasionally. In future there will be no regular Broadcasting Foreign Correspondent; various authorities will be engaged in turn and will be subject to careful censorship, in which the Foreign Office probably will be concerned.

ON SUNDAY NIGHTS



Leslie D. Jeffries, whose band replaces on the air that of Tom Jones, famous for his Eastbourne broadcasts on Sunday evenings.

The difficulty is no reflection either on Mr. Bartlett or his views; it is due simply to the impossibility of convincing people and governments abroad that the voice of the B.B.C. is not the same as the voice of His Majesty's Government.

A Search for Competition

In the days of the Broadcasting Company there were about half a dozen main stations of the B.B.C. system equally equipped in finance and artistic

New Retirement Plan Revision of B.B.C. Times Better Programmes Coming?

resources. The result was a healthy competition. But with the centralising on London, and the preponderance of "S.B." even in Regional programmes, the factor of competition has subsided. No doubt the programmes as a whole are better, but there is no denying that some spirit of competition would add a zest and quality. This is one of the chief subjects that will claim the attention of next year's Parliamentary enquiry.

One proposal will be that the B.B.C. should be authorised to operate a station working on the sponsored programme system. This would create competition within the B.B.C. and also would keep in the country most of the money now going abroad for sponsored programmes in English from Continental stations. Another proposal will be to give the Regional centres more independence of London, possibly restoring full-sized station orchestras and production units.

The B.B.C. and the Wireless Trade

The appointment by the Radio Manufacturers' Association of a full-time liaison officer with the B.B.C. marks a new era in the relations of the industry to broadcasting. The trade is determined to make its influence felt more decisively and continuously than in the past.

One of the duties of the liaison officer will be to keep in close touch with Parliament, and if desirable to set up a Parliamentary Committee. It can be taken for granted that the influence of the trade, however exercised, will be to extend broadcasting and generally to "lighten" the programmes, particularly on Sundays.

"What I Believe"

This is the title of an interesting series of talks which the B.B.C. will include in the summer programmes. The idea is to give a chance for the expression of four points of view on

B.B.C. Staff to Retire at Sixty

religion not normally included in B.B.C. services. The time allotted to each representative will be thirty minutes, the first twenty of which will be occupied in explanation of belief, and the last ten in debate between the representative and an anonymous questioner.

Then, at the conclusion of the series, the anonymous questioner is to sum up the series in a discussion with a representative of orthodox Christianity. The subjects of the series will be: Christian Science, Spiritualism, Theosophy, and Rationalism.

Sunday Biographies

Another new feature of summer programmes will be a series of six biographical talks on historical figures of various nationalities. It is likely that the speakers will be Mr. A. L. Rowse, of All Souls, Oxford, and Dr. G. B. Harrison, of the University of London.

Religious Broadcasts

The plans for regular religious broadcasts contain two interesting features. The first is the relay on London Regional on May 6th of a Quaker Meeting from the Friends' Meeting House, Euston Road, London. The second, also on London Regional, will be on June 3rd, when a special

service conducted by Gipsy Smith will be taken from Wesley's Chapel, City Road, London.

The Age for Retirement

It has now been decided by the Board of Governors of the B.B.C. that members of the staff will retire automatically at the age of sixty. There is a provision that in exceptional

creative staff; but there is a possibility that Admiral Sir Charles Cypendale, Controller of Administration, who will be sixty this year, will be urged to stay on for another year to look after the International Union, of which he has been President for the past six years.

A Twenty-Four Hour Clock

With the introduction of Summer Time this year, the B.B.C. will change over to the twenty-four hour clock system for all purposes. This method is already in use for international purposes by the Engineering Branch and the Outside Broadcast Department. It will be interesting to see whether the idea takes on with the public.

A POLICE MESSAGE



A Brighton police officer listening to a police message while on duty on the outskirts of the town. A miniature set is fitted inside the helmet.

circumstances the Board may invite members of the staff to continue from year to year until they reach the age of sixty-five, when retirement is compulsory.

This provision will not be exercised in the case of administrative or

important changes in the programmes for the next autumn and winter. They are going to be prepared without regard to precedent, the idea being to get out of as many ruts as possible. Most listeners will welcome a shake-up of this kind.

Autumn Programmes

LET us have a look this month at a few of the "romances of broadcasting." Pride of place to **Tommy Handley** and **Jean Allistone**. Tommy was born in Liverpool and apprenticed to a corn chandler. Started theatrical work in the chorus at Daly's as a stepping stone to joining the Navy. Went along to Savoy Hill full of bright ideas for better entertainment. Told to put them into practice. Did so—is still doing so. Into the studio came Jean Allistone, who had been all kinds of things, including principal girl in pantomime. Both liked gardening and dogs. Decided to share these likings. They now live in a flat near Hyde Park where Tommy engages in golf and criminology, while Jean swims and reads.

In Ladbroke Square, W., you will find **Maurice Cole** and **Winifred Small**, whose charming flat overlooks the quietest and most countrified square in London. Maurice Cole is one of the B.B.C.'s most popular classical pianists.

VOICES ON THE AIR

Interesting jottings about microphone personalities.

He won a scholarship at the age of nine—he is now thirty-two. Was one of the earliest people to broadcast. While in the studio met Winifred Small, who was playing the violin (she first broadcast from Marconi House in 1922). Together they went on several tours of the B.B.C. stations. Now they can indulge in a love of the sea (they keep a small launch of their own) and walking, at which Winifred can outdistance her husband.

Hermione Gingold includes "wife of **Eric Maschwitz**" among her many parts. Whenever you hear a lady with a name you do not know in the studio, it is probably Hermione. She is Mrs. Pullpleasure, P. H. Lennox, and Ann Gentry. When she wants

a quiet table in the B.B.C. canteen she orders one for herself and her three friends. Has English, Italian, Austrian and Turkish blood in her veins, and boasts of her grandmother, who scandalised the respectable inhabitants of St. John's Wood by sitting cross-legged on the floor. Eric, who is also, of course, **Holt Marvell**, is B.B.C. director of light entertainment. He has also been editor of the "Radio Times," commentator on the Boat Race, author, actor and producer.

Howard Rose, B.B.C. producer, wasn't too pleased with a dramatic audition by **Barbara Couper**. "Make me laugh," he demanded. She succeeded. Another "radio romance." Howard Rose is one of the most talented producers of "straight" plays which broadcasting possesses. Barbara Couper has played 300 parts in radio plays, and is still a firm favourite with listeners. They live in the country, where Barbara plays golf and Corinthian bagatelle.

PATRICK CAMPBELL.



SOME NOVEL

TELEVISION IDEAS

BY VICTOR KING

It is a very long time since I wrote anything about television, but my silence is far from being due to a lack of interest in the subject.

As a matter of fact, I consider television to be one of the most fascinating things in the whole world. And I find it the more so because it seems to remain in that curious, intriguing half-way position between theory and practice month after month and year after year.

All the work that has been done and is being done, and that is a great deal you can take it from me, appears to lie in this kind of no-man's land.

I myself have spent a considerable amount of time on television research

"I consider television to be one of the most fascinating things in the whole world," writes our popular contributor, who puts forward some interesting suggestions which will provide food for thought, and which may contain a valuable clue to some important future development.

One little shove and the door will swing open and the contents of the magic room are before your eyes. But you simply cannot apply that shove.

Just Round the Corner?

That is how we seem to be placed in regard to television. Research workers wander a little way away from the door and after a time come back with entirely different lines of attack. But the door resists their attempts to open it. It is still only a few inches open.

Of course, the analogy may be all wrong. It might be that it only appears that we are on the brink of success. Television may remain in the above-mentioned no-man's land for years.

But don't let me strike a pessimistic note. If we really can think of television as being "just round the corner" we shall be stimulated into attempts to discover solutions to the problems that bar the way to success.

In any case, television work is thunderingly interesting, and I can heartily commend it to all who desire a change from normal radio.

Plenty to be Done

At the least you will gain some mighty useful experience in optics and its allied sciences, and you will have the gratifying knowledge that, unlike practically everything else, all that has been done is miles from all that remains to be done.

Indeed, fame and fortune await the man who can discover the final links needed to make television a practical proposition. Obviously then, if you want either or both you should start right in!

Let me indicate some lines of

approach. My ideas may or may not all be entirely novel, but I think they will provide food for thought and may even give someone a real clue.

The problems of television as I see them divide themselves into two groups. First we have yet to devise a method whereby a sufficient number of impulses can be transmitted through the ether on ordinary wavelengths without creating interference and, secondly, a superior system of light control at the reception end.

I am going to take that second one first because I consider it to be of prime importance. Listeners might be prepared to look at small, dim pictures in a dark room as a novelty, provided they could get them easily and cheaply, but I do not believe such can have any lasting value.

The Question of Brightness

It is difficult to fix a minimum, but bearing in mind that the whole population has before it all the time the criterion of the talkies with their great, brilliantly illuminated screens, I fancy that we must take as our lowest acceptable level something in the nature of a ten-inch by ten-inch screen, carrying the same over-all

CONTROLS THE LIGHT



"In so far as light control itself is concerned, I plump for a line of attack along Kerr Cell lines," says Victor King. The photo above shows a modern Kerr Cell of the type in use to-day.

light as that which is given by a small home ciné apparatus.

This would enable pictures to be seen quite clearly in a room lighted by ordinary electric lighting, or even in

VARIABLE ILLUMINATION



Neon tubes are a popular source of light for television reproduction. The tube seen here is a high-powered one of the water-cooled type.

USES WATER FOR COOLING

and experiment, and unless you have done so you cannot fully appreciate the "on-edginess" of the experience.

"Door" Refuses to Open

How can I best explain it? Well, imagine that you know a certain room contains all kinds of delightful surprises and that you approach the door with the intention of opening it. You place your hand upon the handle, push the door open a few inches—and then some power holds you fixed in that position.

Two "Channels" on One Wavelength

daylight, so long as the screen was in shadow. I rule out a dark room absolutely, but others may hold different views.

To obtain a movie picture as above, we generally have to use a lamp in the projector of anything up to 250 watts. The light from the lamp is varied almost from total extinction up to full brilliancy.

Controlling the Light

In so far as television light control itself is concerned I plump for a line of attack along Kerr Cell lines. By this you will gather that I am rather ruling out the cathode ray.

I am afraid I am. A few months ago I should have backed the cathode ray against anything else, but it is on just this question of light that I, personally, consider that it may not provide the ultimate solution. A bright picture and an inexpensive cathode-ray system do not line up in my mind.

But I am afraid I cannot be constructive in regard to my criticism.

I am inclined to think that we need not do so. And it is at this point that I am going to bring some new ideas to your notice.

I suppose all of you know why we cannot obtain high definition on medium waves with present systems? Summarised, the reasons are that the picture to be televised has to be broken up into a number of spots and that these spots have to be sent through the ether as L.F. impulses modulated onto the carrier.

If you try to crowd in too many spots the sidebands of the transmission will spread and cause interference. In practice we are limited to about nine thousand per second and the resulting picture is, of course, very crude.

A Hopeful Suggestion

How can we multiply them by at least ten times without affecting side-band spread?

A somewhat hopeful suggestion has been brought forward by a Dutch

were going you would receive it as a series of starts and stops. Every little patch of programme would be followed by a patch of silence.

But because these "breaks" occurred perhaps sixty thousand times or more per second, you would not hear them and the programme would sound quite continuous and unbroken.

Automatic "Sorting"

Nevertheless, as you can see the second programme could occupy the spaces if some means could be devised enabling you to select which of the alternate patches of programmes you wanted to hear—as one continuous reception of course.

It does not seem difficult to arrange to do this and the inventor has indeed suggested what seems to be quite a practical method. And that is to arrange a valve oscillator in the receiver to oscillate at the frequency of the "patches" and choke out that series of patches not required.

Could the idea easily be extended? Perhaps I am looking too far ahead, for the original scheme has yet to be thoroughly tested in practice. But I cannot help feeling that here we have what might ultimately become a key-stone of the new television.

But let us go back a bit. Is it vital that we should be tied to frequencies pure and simple? For a long time I have had nurturing in my mind a vague idea (it is nothing more I must confess) that all of us are missing the wood for the trees in being so concerned about frequencies.

In impulses pure and simple we are certainly bound to definite frequency limits, but as well as frequency variation in any radio telephone system we have a limitless number of amplitude variations.

Further Suggestions

Could we divide our transmission, and reception, up into a number of amplitude levels each containing its quota of frequency modulations? Don't jump in and say that there would be summations and combinations impossible to disentangle.

Going still further back. What about harmonics? Are all you television fans sure that the harmonic has been studied as a possible television adjunct? Has the harmonic been considered at all except on conventional lines?

A CATHODE-RAY TELEVISION VIEWER



The cathode-ray tube has provided considerable advance in television technique, and this photograph illustrates the first outfit of this type for home construction. It was designed and described by our sister journal, "Popular Wireless."

Anyway, to get a picture at all is really the first step. At the present we are faced by two alternatives. Thirty-line pictures on medium waves or high-definition pictures on short waves.

At the time of writing the B.B.C. is toying with both systems without, apparently, being hopeful of either! I can sympathise, and so can most of my readers I expect. It isn't even as if there can be a compromise.

Not Yet Suitable

Now short waves may be quite all right for picking up telephony from distant continents, but it definitely is not yet suitable for ordinary broadcast purposes and may never be.

But need we abandon as entirely without the bounds of possibility high definition on medium wavelengths?

expert. His scheme is mainly directed at obtaining two broadcast programmes or telephony channels on one wavelength, but perhaps it could be extended.

It is a very ingenious idea, and the fact that I applied for a provisional patent on it a week or so before the said Dutch gentleman published details of his invention may or may not bias me in favour of it. I leave you to judge!

The scheme is in essence simplicity itself. The broadcast carrier is operated alternately by two different modulating systems.

First one, then the other is given "the line" as it were. Picked up by an ordinary wireless set the transmission would appear a hopeless jumble. If only the one programme



The MANUAL of MODERN RADIO

—MORE PRAISE FROM RADIO EXPERTS—

The letters published last month from radio personalities in praise of Mr. John Scott-Taggart's *MANUAL* are followed this month by further commendations from wireless firms, technical colleges and the Radio Correspondents of famous journals. In the face of such unanimous approval there can be no doubt that the *MANUAL* is more than adequately fulfilling a very long-felt want.

BARRY KAY

(Sales Promotion Manager,
Messrs. E. K. Cole, Ltd.)

"Some little while ago I received a copy of Mr. Scott-Taggart's 'The Manual of Modern Radio,' and although I sent a letter of congratulation at that time, I should like to amplify this by reiterating what an extremely useful book of reference I find this to be. It is a veritable mine of information on every radio subject and I am sure there are very few readers who would willingly do without it.



MR. BARRY KAY

"Page after page of detailed information must surely mark out this book as one of the finest Encyclopedias ever available to the wireless enthusiast."

J. M. G. REES

(Director, Varley)

"It is with great gratification that I accept the beautiful book which you have sent me written by Mr. Scott-Taggart.

"It is beautifully got up, a most acceptable gift and one which I shall treasure, partly because it is connected with radio, partly because it is written by Mr. Scott-Taggart. The 'get-up' and the illustrations are most attractive."

G. S. TAYLOR

(Whiteley Electrical Co., Ltd.)

"Very many thanks for the copy of Mr. John Scott-Taggart's new 'The Manual of Modern Radio.'"

"Naturally, I have not read it right through yet, but I am perfectly certain that I shall have done so in a few days' time, for those portions of it which I have examined are extraordinarily interesting.

"Mr. Scott-Taggart is to be heartily congratulated on the very clear manner in which he has dealt with modern radio problems and upon the completeness of the information conveyed. It is easy to see that this Manual will be in very great demand."

"DAILY TELEGRAPH"

The Radio Correspondent says:

"Mr. John Scott-Taggart has a happy way of anticipating the difficulties of the student. Consequently his work is shorn of bewildering irrelevancies and remains a lucid exposition of radio from fundamentals to the latest developments.

"Radio amateurs are indebted to the enterprise which places such a comprehensive production at their disposal. There must be exceedingly few who will not profit from its study."



MR. J. M. G. REES

"NEWS-CHRONICLE"

The Radio Correspondent says:

"I have read 'The Manual of Modern Radio' with the greatest interest. Mr. Scott-Taggart is to be congratulated upon the production of a book which will be of inestimable value to the wireless amateur."

"MURPHY NEWS"

"Perhaps it is best described as a complete guide to modern receiver

practice. We consider that there is a definite demand for a book of this class from those who wish to bring their knowledge up to date with the least possible trouble.

"We regard the publication as an exceedingly useful one and strongly recommend it."

"DAILY MAIL"

The Radio Editor says:

"To the amateur radio enthusiast who finds difficulty in coping with complicated technicalities, Mr. John Scott-Taggart's book, 'The Manual of Modern Radio,' will come as a godsend. For it is written in a clear, simple style that wins and holds the interest of the seeker after knowledge.

"I recommend any listener who is apt to boast, 'Oh, of course, I do not know anything at all about the technical side of broadcasting!' to get this generously filled handbook. He will soon voluntarily eat his words."

COLWYN BAY WIRELESS COLLEGE

The Principal says:

"I have had an opportunity of reading 'The Manual of Modern Radio' by Mr. Scott-Taggart, and must say that in placing such a work on the market you will be supplying a long-felt need. It will, obviously, interest and instruct many in the technicalities of radio who would normally not be either able or willing to devote the time and study to obtain an equivalent knowledge of the subject by the usual methods."



MR. G. S. TAYLOR



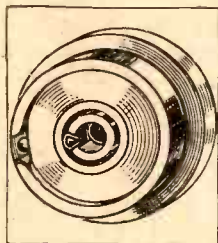
Practical and up-to-date hints that will help constructors and listeners.

IN introducing this new feature, it is opportune to tell you that I shall endeavour to make it as interesting and helpful to the ordinary listener as to the constructor who builds his own sets. The tips will appeal not merely to the enthusiast who is skilled with tools, but also those who only occasionally do "a spot of work" on their receivers.

And readers may rest assured that nothing in the nature of what one may call "practice on paper" will find its way into this page. Every hint will be the outcome of some difficulty or experience met with in real life, and as such will be both up to date and to the point.

Making Knobs "Stay Put"

Since makers are unable to agree about the size of spindles to use for components, we find that some of our parts need knobs with $\frac{3}{16}$ -in. holes, some with $\frac{1}{4}$ in., and so on. But this doesn't bother us until we come to match up the knobs on a set or, having lost the original knob, try to fit one off another component.



Then we bless (used in its true sense, too) the makers of those

knobs with bushes for varying the size of the hole. But sometimes no amount of force on the grub screw seems to prevent slipping, and the diagram will show you why.

The cut in the bush is probably dead adjacent to the grub screw, which either tends to force it open or, at least, prevents it closing round the spindle properly. The best place for the cut, I find, is about a quarter the way round from the grub screw.

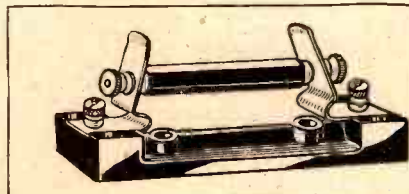
Old Holders—New Resistances

The fat, cartridge type of wire-wound resistances are not so popular

in receivers as they used to be, their place having been largely taken by smaller ones of composition, often provided with terminals at the ends.

Holders for the earlier type usually took the form of two metal clips, with a hole in each, fixed to a small piece of ebonite or other insulating material. These holders can often be employed to support the newer resistances.

The spring clips will require bending towards one another a trifle, after



which the resistance may be inserted, the terminals holding it securely in place.

Those Wire-Ended Components

What a lot of time and bother fixed condensers and resistances with wire ends can save! But I was caught napping by one the other day, when the simplest of precautions would have prevented what might have proved an expensive short.

The two points to be bridged by the condenser were quite close together. This allowed the wire on one side of the condenser (joined to an anode choke) to be inadvertently bent down

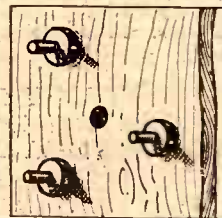


and to touch one of the valve holder filament terminals.

Cutting short the wire ends of these condensers and resistances is likely to restrict their future usefulness, so the best scheme is to slip on short pieces of systoflex.

Mounting a "Gramo" Motor

Even when the holes for the bolts holding a clockwork gramophone motor to the motor board are drilled largish to allow plenty of latitude, it is not such an easy matter getting the thread started. Nor is it too easy, having got one bolt in place, to slip in the rubber washers and start the other bolts.



Much of the difficulty is removed by first of all passing the bolts through the motor board, and holding them in place by screwing on the rubber washers, which should be a tight enough fit to "stay put."

With the three bolts thus held, it is comparatively easy to get the bolts started, slight movements of the motor bringing the holes dead opposite the bolts.

Negative to Positive

Most of us who do a little dabbling with television have at some time or the other been confronted by a procession of niggers, due to a negative instead of a positive image!

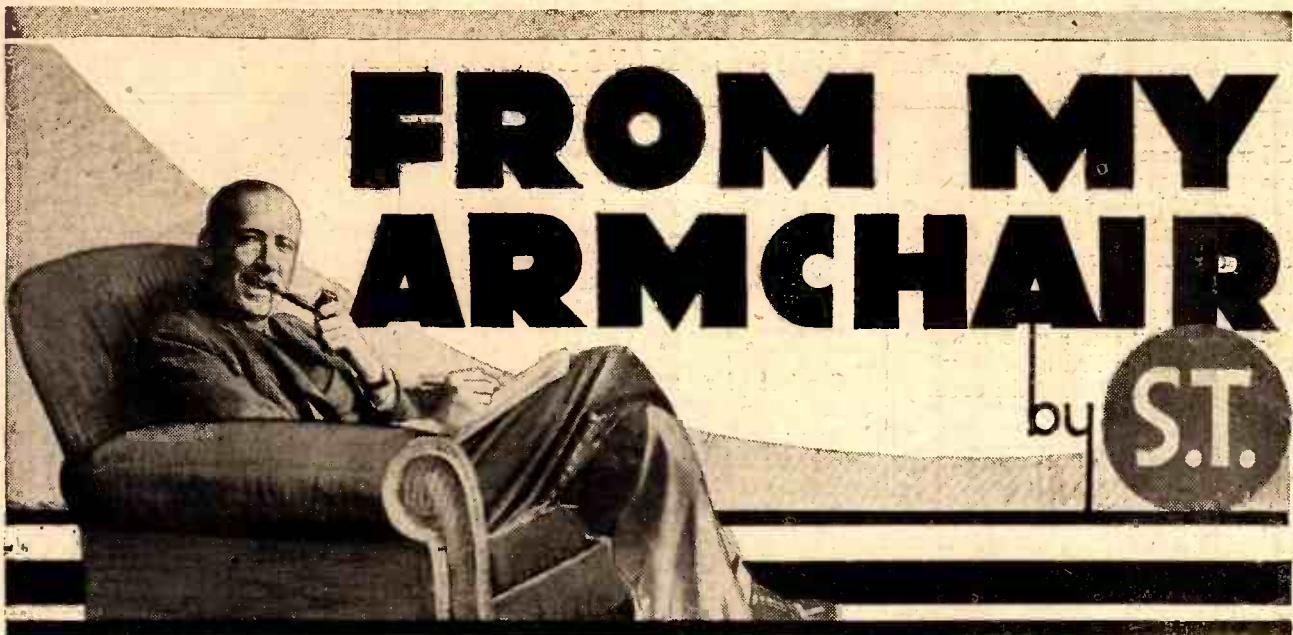
It's easy to put right, though, if there is a transformer in the set, even supposing it to be an output transformer. Just reverse the connections to the primary or the secondary; not both, or you will get a double phase reversal and be back where you started.

If you have no transformers, there are two ways of dealing with the trouble: either change the form of the detector from grid leak to anode bend, or vice versa, or put in an output transformer.

Next month I hope to include, among other items, a few suggestions concerning set controls and their adjustment.

A. S. C.

A safety-first tip for dealing with wire-ended fixed condensers and resistances.



I WONDER if you remember our old friend, Chan, of Hong Kong, the ship's surgeon who sailed the China seas? Not quite in the Carlos class for interest, but a very worthy S.T.-ite, and one who does much to prevent my reputation going on an increasing junk heap, as our Portuguese friend would say.

Here am I in my armchair, and what has T. K. Chan been doing? He writes:

"I am so fortunate to have life and chance to write again. As you know, our ship, An Tung, struck a rock and half-submerged last month off Mafa Point, at Hainam Island. This is the most dangerous part of the island in the east. There were over seventy souls perished and over four hundred rescued, and I am one of the rescuers. All my spare parts were lost."

Although he says so little about himself, you can imagine the work of a ship's doctor during such a terrible wreck. Our good friend Chan seems concerned about the loss of his spare parts. These, by the way, are of the wireless variety.

Dr. Chan's Circuit

Owing to this loss, he wants me to try out a circuit which, from the look of it, seems an effort to split the atom, turn lead into gold, and finally to solve the problem of perpetual motion.

If these chats suddenly stop, it will not be because *ah tank ah go home*;

it will simply be that I have stolen Chan's invention and made millions out of synthetic diamonds. ("All my girl friends admire them ever so much, and Lady — and the Duchess of — both say that they cannot tell the difference between my S.T. diamonds and their own.")

Or, by a very slight alteration of the circuit, it would make a very good sausage machine. But if I do decide to steal the invention, I think I should prefer pearls before swine.

Do you remember T. K. Chan, the ship's surgeon and radio fan? Do you remember Mr. Scott-Taggart's "S.T.400" tour of Britain? Do you remember—but of course you remember—Carlos? They are all in these Armchair Notes this month. And, as a special reward for patient readers, there is a real studio portrait of the Great Carlos himself.

A vast fortune would come to me. I should retire for the last time, and probably sell the circuit to the kipper-curing combine.

I have had a query on the "S.T. Super" addressed to Sir John Scott-Taggart. Is this a case of clairvoyance, or is my correspondent working on the principle that says it is good policy to call a constable "sergeant" and to address a sergeant as "inspector"?

It has never done me any good. And once I addressed an inspector as "sergeant." Yes, that was a bad bit of business. I now give twice as much to the Police Sports Fund.

I want to thank several of my readers for very earnest letters urging

me to join their religious communities. These are the result of my having stated in the August WIRELESS CONSTRUCTOR that I had no definite religious opinions and no politics.

What Are You Doing?

The friendly and sincere tones of these letters show me, at any rate, that, though I may be a sinner, I am a human being (and not just a couple of initials) to you who read these monthly jottings.

I also like to picture you reading these notes—swaying on straps in Tube trains, feet on mantelpieces, invalid readers in bed, Carlos up the pole, Empire-builders sitting under a rubber tree and Frenchmen up a gum tree.

Birmingham readers will be guzzling pork pies, St. Helens folk reading the issue quickly before the pages turn black, Papplewickians sniffing every line, Aberdonians reading this at the station bookstall.*

Why not tell me on a postcard exactly where you are and what you are doing while reading these words? I'll publish a summary next month. It ought to be amusing.

Probably you're no better than I am—sinful, conceited, selfish, ungrateful.

Did I ever tell you about the old lady at John o' Groats, the night of my arrival? It was about ten o'clock,

* You've heard the one about the Scotsman who bought an alarm clock and woke up every morning before it rang, to save the spring?

When Amateurs Showed the Scientists

and I was ushered into a stone-flagged, stone-walled room lit by a candle. A table on which was half a loaf and a plate of crowdie (a kind of cottage cheese), and in the room a great bed throwing a black shadow on the naked wall. She was about ninety-eight.

"My mother," said my host, whose letter of invitation had been accepted at random before I toured the country with the "S.T.400."

The Test by Candle-light

The set was put on a stool, the batteries on the floor. The aerial? I know nothing about it, except that I was given a bit of bared wire which I dutifully connected to the terminal called A.

After completing the test and dismantling the set, my host left me for half an hour alone with the old lady. It was one of the longest half-hours of my life. By the light of the flickering candle she exhorted me to turn over a new leaf, to change my mode of living, to give up drinking (the most she'd seen me drink was a cup of very strong tea, and she had taken twice as much herself—and without milk).

I was very hot round the collar within five minutes. After ten minutes, I almost decided to connect up the set again and let her hear Ljubljana, but I knew I couldn't do it. I was hypnotised. I could no more have found valve holder V2 filament positive + F (terminal nearest baseboard edge) than—well, you know what a bird feels like when a snake is proposing to provide a home for it.

You're Telling Me!

She was ninety-eight, and I was about 105 before long. You'd be surprised at the things she told me not

to do. The fact that she didn't know a thing about me was quite irrelevant.

And then her jovial son returned. "Been having a good time with Mother?" he asked with a grin. I was too stupefied even to reply: "You're telling me?"

* * *

Comfort for non-mathematicians. Here is an extract from a recent lecture:

"The story of the travel of wireless waves is, in the main, a story of the radiotelegraphist surprising himself and others by doing things which he was hardly expected to achieve, the physicist offering qualitative explanations of the achievements, and the mathematician bringing up the rear in

it all. By that time the practical man has gone ahead and discovered new facts which upset the physicist and mathematician, who contrive to explain everything once more.

This is all very unfortunate, but it seems true enough in radio. The technical development of radio owes very little to the scientific mind. Practically all the basic inventions have come from the brains of engineers on the job—often enough from men who could be called empiricists.

Practice Beats Theory

It happens to be one of my pre-occupations to know every wireless invention in practically every country in the world. The principal inventors I have met personally. Very few would call themselves scientists.

Maxwell forecast the production of wireless waves, and Hertz demonstrated their creation. To Lodge we owe a very great deal, but his interests were too wide to restrict him to radio development. Marconi was the practical man, and was the forerunner of many "practical men" inventors.

Fleming's brilliant application of the valve to radio detection came from a professor of electrical engineering, but since 1904 we hear little of Fleming as a radio inventor.

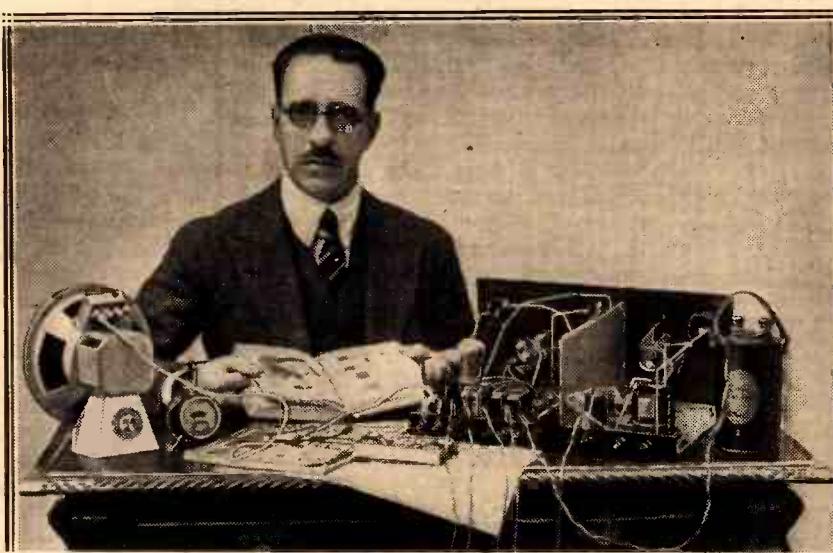
In Langmuir, who developed the high vacuum valve, the gas-

filled lamp, and other inventions, we have the ideal physicist-inventor, of whom we have had only too few.

One would have thought that, as radio communication advanced, the inventive work would drift into the hands of highly technical scientists, but it has not done so. The engineer as opposed to the scientist figures in the patent lists.

(Please turn to page 322)

CARLOS IS UP TO THE NECK IN IT



Here, at last, is a portrait of Carlos X of Portugal. Hero of many a gallant encounter with the fierce inkstrains of his native country, he is seen here pursued by hazards. Every known trouble in wireless has assailed him in connection with his "S.T.400" and he has discovered many new ones. Histles and barkles are a daily occurrence, while crockles and splitters would reduce a lesser man to tears. But Carlos, urged to greater efforts by his patron friend, says: "It is not yet the end." He sends this special photograph from Setubal with the inscription: "It's a prove of finite gratitude to the glory of John Scott-Taggart's friendship through the spiritual connection of his unprecedented works."

The book in his hand is **THE MANUAL OF MODERN RADIO**. If this does not help him out of his troubles, nothing will.

a constant effort to make his too-simple world of theory sufficiently complicated to agree with the experimental facts."

The above are the opening remarks to the 24th Kelvin Lecture, and are by Sir Frank E. Smith, K.C.B., C.B.E., D.Sc., LL.D., F.R.S.

Put bluntly, it means that the practical man does the work and the scientist toddles behind and explains



299

[illegible]

When the switch is in the other position, the L.F. valve is turned out, and the first two valves act as a superhet adaptor. This adaptor is used in conjunction with your broadcast receiver, the only stipulation being that the latter must have

The reason for the necessity of an H.F. stage (or two), is that this section has to act as the intermediate-frequency amplifier of the superhet. The detector on the

The S.G. valve still acts as an amplifier, and the L.F. valve is out of circuit and is inoperative. The detector in the broadcast set performs the

Short-Wave and Broadcast Reception at the Same Time

duties of second detector, while the broadcast set's output stage is employed.

Except in a few cases, perhaps, there is no reason why the "Adapto" Three should not be left permanently

you could not have anything much simpler. As a matter of fact, it is mainly a matter of common sense and not radio knowledge.

The whole of the wiring can be carried out without any soldering, and

utilised, the wire loop being clamped beneath a washer.

It is important that a metal panel be employed, and one side of the L.T. switch is earthed via it. If the two contacts of the on-off switch that you use are isolated from the fixing bush, you will have to take an extra connection from the second contact to the metal baseboard.

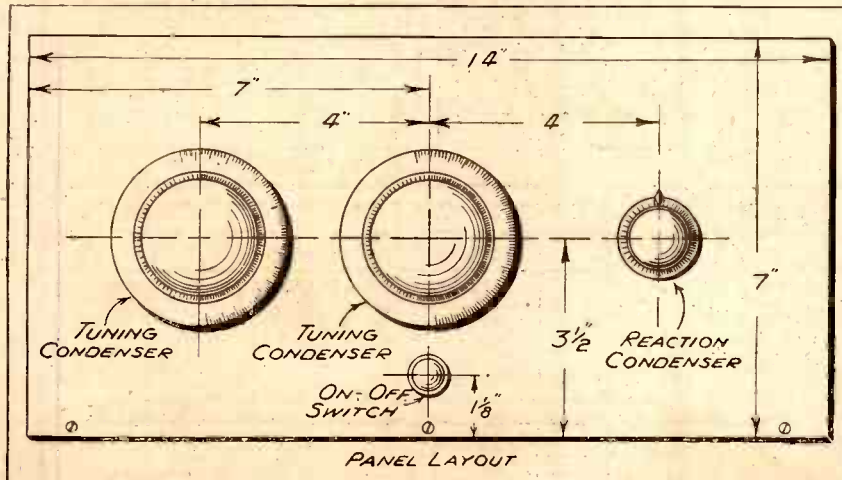
I do not think there are any other constructional points requiring special mention, and my remaining space will be best occupied by explaining how the set is connected up and operated.

Choosing the Coils

First of all, a word or two about the coils, and the remarks apply equally whether the set is used independently or as an adaptor. You will need two complete sets of plug-in short-wave coils, and whatever wavelength band you are on, the same sized coil should be plugged in the aerial coil holder as in the grid coil holder.

In the reaction coil holder you should place the next size smaller coil. The only exception to this may arise with the smallest sizes of coils in use, when a size larger coil may be required for reaction purposes.

THE CONTROLS ARE NOT CRITICAL IN ADJUSTMENT



There are only four simple controls apart from the changeover switch, which is mounted on the terminal strip at the back of the set, and can be seen in the photograph below.

connected to the broadcast receiver. The only change then to be made for the reception of short-waves is to remove the aerial from the broadcast set and attach it to the short-wave receiver's aerial terminal.

As a matter of fact, there is no reason why both short-wave and broadcast reception should not be carried out at the same time if two separate aeriels are available. In such circumstances, of course, the short-wave superhet scheme would not be employed. Also, it would be necessary to disconnect the second aerial from the broadcast set before going over to short-wave superhet conditions, otherwise you would have broadcast-wave stations coming in on top of the short-wave reception.

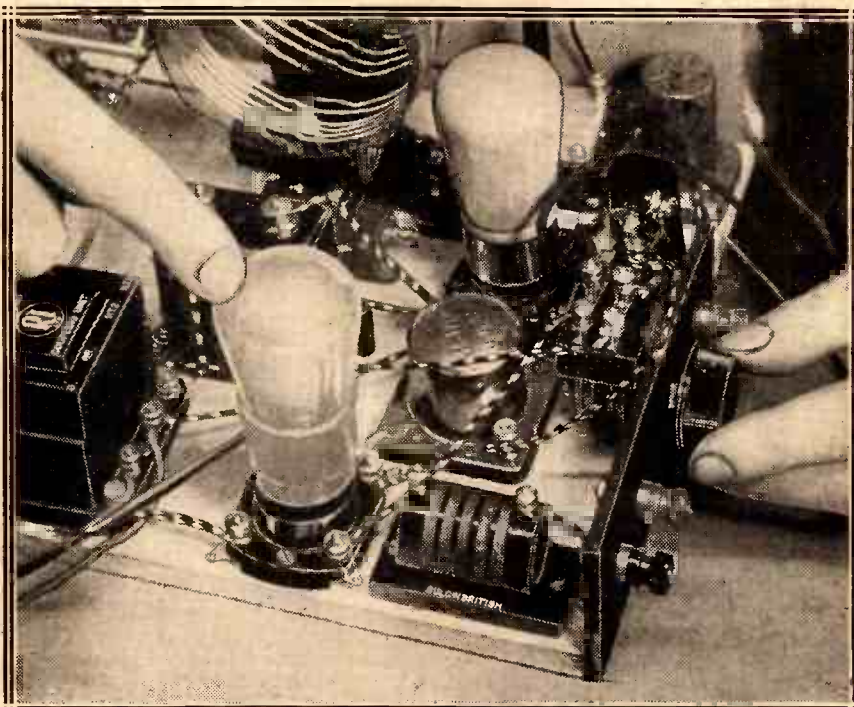
Extremely Easy Construction

The "Adapto" Three is battery driven, but there is no specific reason why it should not be employed in front of a mains-driven broadcast receiver. Similarly, there is no reason theoretically why the broadcast receiver should not be a superhet itself, but it would be asking rather a lot for such a double-super arrangement to be quite snag-free in practice.

So far as construction is concerned,

all the connections are perfectly clear from the wiring diagram. Where a connection has to be made to the metal baseboard, an ordinary wood screw is

ALTERNATIVE OUTPUTS ARE AVAILABLE



When the change-over switch (on the right of this photo) is turned anti-clockwise the L.F. valve is put out of circuit, and the set is adjusted for use as a superhet adaptor.

"In Practice the Reaction Control Will Need Very Little Alteration"

Try the set first as an ordinary short-waver. The maximum H.T. voltage is placed on H.T. plus 2 and 60 to 80 volts on plus 1. The grid bias applied to the last valve will depend upon this valve itself. 'Phones or loudspeaker may be connected to the output terminals, probably it is better to start with telephones.

Ordinary Reception

The best settings for the two neutralising condensers are found by trial with the set working. But as a rough guide, the bigger the aerial used, the smaller the setting of the neutralising condenser joined to the aerial terminal may be; and the greater any difficulties experienced with reaction, the smaller the setting of the other one.

The changeover switch should be turned anti-clockwise to use the set as an ordinary receiver. The tuning is perfectly normal, the two tuning dials being kept approximately in step, although the setting of the left-hand one will not be critical, and searching can often be entirely done on the other one.

When going over to superhet connections turn the switch clockwise and leave all the adjustments at the position proved best for ordinary use, but make the following extra connections. Join the terminal marked "Output" to the aerial terminal on the broadcast set, and connect the "Earth" terminal on the short-wave set only to the earth terminal on the other set, leaving all other connections to this latter terminal as before.

The Superhet Method

There are several ways in which the combination of the two receivers may be used, and we will deal with what may be termed the normal first. For this, the wavechange switch on the broadcast set is put to the long-wave position, the tuning dials adjusted to be exactly in step if there are more than one, at the top of the long-wave band. Reaction is set to zero.

The short-wave stations are now tuned in on the "Adapto" Three tuning dials, the reaction condenser on this receiver being set so that it just produces continuous oscillation, which will generally be indicated by a rushing background noise. In practice the reaction control will need little alteration from one end of the tuning dials to the other.

Two variations in the method of operation consist in using the broadcast set adjusted for medium-wave

reception instead of long, and the use of the broadcast set's tuning instead of the tuning on the short-wave set. The advantage of the latter scheme is that it often makes exact tuning easier.

The Wavelengths Covered

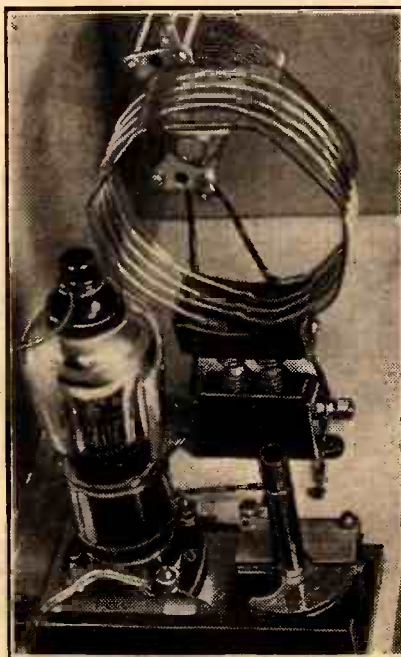
However, the normal is usually the better method, with the broadcast set's tuning used more or less for final adjustments for maximum results.

The wavelength bands covered by

USE THESE VALVES FOR THE BEST RESULTS

Make	S.G.	Detector	Output	
Cossor	220S.G.	210 H.F.	220P.A.	It is not necessary to use valves all of the same make so long as the correct types are chosen in the makes employed.
Mullard	P.M.12A.	P.M.1H.L.	P.M.2A.	
Mazda	215S.G.	H.I.2	P.220	
Marconi	S.22	H.L.2	L.P.2	
Osram	S.22	H.L.2	L.P.2	
Tungsram	S.210	H.R.210	—	
Hivac	S.G. 210	H.210	—	

THE H.F. STAGE



Simple though the H.F. end of the set is, it has considerable effect on the sensitivity of the receiver and on the ease with which the short-wave programmes can be tuned in.

the various sized coils varies with their diameter and the spacing of turns, but the following guide will give you some idea of the ranges covered: 2-turn, 15 to 25 metres; 4-turn, 20 to 40 metres; 6-turn, 30 to 50 metres; 9-turn, 40 to 75 metres. The special list of short-wave stations on another page of this number will enable you to get the best results from the "Adapto" Three by telling you just when to listen for the various transmissions.

Even if you do not succeed in getting many stations at the first attempt, do not feel disheartened. Once you have got the "hang" of the receiver you will be surprised at the power with which stations come in on the superhet arrangement.

Searching for Stations

One of the beauties of the scheme is that you can have the "Adapto" Three connected to the broadcast set and search for stations with the straight circuit arrangement and using telephones. Then, once you have found a powerful one, all you have to do is to turn the changeover switch, adjust the reaction and there is your station at full loudspeaker strength on the broadcast receiver.

But whatever you do don't forget to set the tuning of the broadcast receiver so that all dials are in step before attempting to use it in conjunction with the "Adapto" Three as a superhet.

THESE ACCESSORIES ARE STRONGLY RECOMMENDED

BATTERIES.—H.T. 120-volt: Siemens Full O'Power, Pertrix, Drydex, Marconiphone, Ever-Ready, G.E.C., Ediswan, Hellesens, or Block H.T. accumulators.

G.B.: 9-volts: Drydex, Pertrix, Ever Ready, Siemens, Lissen, Marconiphone.

L.T.: 2-volts: Block, Ediswan, Lissen, Oldham, Exide, Pertrix, G.E.C.

COILS.—Two sets of Clarke's "Atlas" plug-in short-wave type or Igranio.

HEADPHONES.—Lissen, Ericsson.

LOUDSPEAKERS (if desired).—W.B., Celestion, Blue Spot, Roja, R. & A., Ferranti, H.M.V., Amplion, Marconiphone, G.E.C., Cossor.

QUESTIONS I AM ASKED



by
JOHN SCOTT-TAGGART

Q. 73. When are you going to give us the promised cheap mains set?

A. When some manufacturer will offer to provide the ingredients at a price competitive with the factory-built job. At present mains components are too dear to appeal to the constructor. A vast market lies before the far-seeing manufacturer.

Sooner or later, all constructors will, or should, turn to A.C., and home-construction will receive a great fillip, but only if mains components prices to constructors are brought more in line with the prices to manufacturers. Component makers would not be losing profits on an existing market, they would be opening a new channel of the trade.

Q. 74. What are the merits of indirectly heated A.C. rectifier valves over the directly heated types?

A. The anode circuits of the receiver's ordinary valves provide a "load" for the rectifier unit, but this load only exists when current is passing from the cathodes to the anodes in the valves.

It takes some time for the indirectly heated cathodes of the ordinary valves to heat up. Hence at first there is little anode current and so little "load."

If the rectifier unit is working and there is no load, its voltage output is considerably higher than it is normally. The rectifier unit should preferably not supply its output until the cathodes of the ordinary valves have "warmed up."

If the rectifier valve has an indirectly heated cathode, its output voltage rises gradually after switching on the set, and by the time the voltage is fully "up," the cathodes of the receiver's valves are warmed up and a proper load is provided.

If this did not occur, unduly high H.T. voltages would be applied to the receiver and condenser break-down might occur when a set is first switched

on. Sometimes when indirectly heated rectifiers are not used, a delay switch is employed. It automatically switches on the H.T. some little while after the set is switched. This gives time for the receiver's valves to "get going."

Q. 75. Two years ago I built up a superhet from a kit of parts, but I find reception spoilt by a Morse continuous wave station which appears on every station. Can I stop this?

A. Probably not. You are no doubt obtaining break-through of a Morse station working on a wavelength

Once again, in his monthly page devoted to a selection of readers' queries, our brilliant contributor explains in his popular and lucid style many of the puzzles that harass constructors. The questions chosen for treatment on this page are picked for their wide appeal to radio enthusiasts in general.

close to that to which your intermediate frequency circuits are tuned (probably equivalent to 110 kilocycles).

It is difficult to prevent the effect, which should be avoided in the design of the set. The I.F. circuits should be screened to avoid direct pick-up and the input signal-frequency circuits should be very highly selective.

This latter condition is not satisfied by most band-pass air-core assemblies, and the Morse drifts through, especially on the long waves.

Some amelioration is possible by tuning the I.F. circuits (assuming this is possible by means of trimmers) to a frequency to one side of that of the Morse station. Some recently designed I.F. coils are provided with variable coupling. By reducing this coupling better I.F. selectivity is obtained and less risk of Morse C.W. (continuous wave) interference.

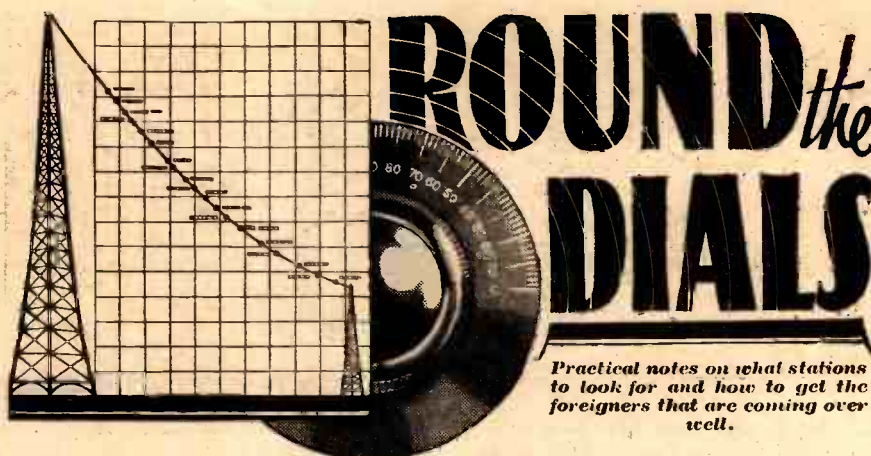
A big reduction in Morse C.W. interference is possible on all superhets by connecting a wave-trap between aerial and set. This is a series rejector, and consists simply of a coil tuned by a condenser to the same frequency as the I.F. circuits (say, 110 kc.). You can use for this purpose one winding of an I.F. transformer, leaving the other winding unused. An iron-core type of coil will give best results for this wave-trap.

Q. 76. I live quite near the Scottish Regional stations and experience considerable interference on the long-wave band from the local. How can I stop this without altering the design of the set? Why does the interference become less as one approaches the top end of the long-wave dial?

A. This is break-through. The circuits are not sufficiently selective and act to some extent like chokes. E.m.f.s are established across the circuits, even though considerably off tune. As one tunes to higher wavelengths the set is more off-tune and the larger capacity of the condenser provides a partial short-circuit to the break-through currents, hence less interference.

An almost certain remedy costing about half-a-crown is to insert a choke of the reaction type between the aerial lead-in and the aerial terminal of the set. This choke should be shorted when listening to the medium waves. If break-through is not bad a smaller choke is advisable.

A further drastic remedy which will probably never be necessary is to connect a small condenser (variable, if you like) across aerial lead-in and earth. This condenser may have a capacity of about .00005 mfd., and is used in addition to the choke. It should be taken out of circuit when receiving the medium waves.



Practical notes on what stations to look for and how to get the foreigners that are coming over well.

IF reception conditions this year follow the usual trend, we may soon expect the annual fall-off in long-distance results which commences in the spring and generally lasts till September. At the time of writing there is no sign of diminished range, but those who have not bagged a programme from the other side of the Atlantic should remember that to miss the chance now may mean that it will not occur again till after the summer.

For the benefit of the many who still have doubts upon the possible range of a good receiving set, it is emphasised that no special short-wave coils or gadgets of any kind are used by many listeners who hear American broadcasting direct with fair regularity.

The only thing they do on such occasions is to sit up late, until the European broadcasters have switched

off at midnight or after, and then tune in to ascertain if America is "coming through."

Some nights they draw a blank. At other times a programme is picked up, and the announcement shows it to be from one of the transatlantic stations.

Often such programmes are as loud as those from, say, Rome or Paris or other popular continental stations. And there is no trick about the tuning—you simply have to "nurse" any weak sounds that come through, delicately touching up reaction, etc., to make sure that the set is in its most sensitive condition.

If you do this, listening with extra care at each exact quarter of an hour (because the U.S.A. stations give their calls exactly at 12, 12.15, 12.30 a.m., etc.), you now stand quite a good chance of success.

For those who prefer to do their listening before midnight, Europe is offering a magnificent choice. The top of the medium waveband is especially prolific, and Prague (470.2 m.), Vienna (506.8 m.), Athlone (531 m.) and Beromünster (539.6 m.) are all capable of giving good results for long periods.

Near the middle of the medium waveband Berlin has blossomed out on 356.7 metres, with a new transmitter and fine volume. Brussels No. 2 (321.9 m.) is also worth watching closely: whilst Bordeaux, after a rather weak period, has staged a convincing come back on 278.6 metres.

The bottom-of-the-dial medium-wavers have not shown up too favourably, by comparison, though most nights will disclose four or five fine stations to choose from between 200 and 300 metres.

On long waves the failure to implement the Lucerne Plan has resulted in heterodynes and disappointment. Luxembourg is still in the limelight there, and Warsaw remains on 1,415 metres—both good programme providers, but thorns in the flesh of the ether police, who vainly wait for them to appear on their right wavelengths.

In a few months the new Daventry will be working with increased power on 1,500 metres, and it is to be hoped that the situation between 1,000 and 2,000 metres will have been clarified by then.

P.R.B.

Focused Tuning

"VARLEYS" have just provided the public with something completely new to talk about—focused tuning!

It is a particularly happy name, borne out by the binocular shape of the coil unit, and exactly describing the effect of clear definition and "sharpness" which results when the new coil-unit is adjusted.

A very large demand is anticipated for such a device expressly designed to meet the present-day selectivity requirements, and full particulars of the "Bifocal" Tuning Unit will gladly be forwarded on application to Varley Ltd., Kingsway House, 103, Kingsway, London, W.C.2.

Going Over to the Mains

Readers who desire to convert battery sets to mains operation do not seem to realise that often many of the "difficulties" they find are imaginary, and that the manufacturers are always

POINTS FOR PURCHASERS
Some jottings on recent trade activities and developments.

willing and able to assist in the choice of the most suitable unit.

For instance, H. Clarke and Co. (M/c.), Ltd., of "Atlas" Works, Patricroft, Manchester, will send a free booklet to any WIRELESS CONSTRUCTOR reader, telling all about the famous "Atlas" Mains Units.

Hayberd and Co., of 10, Finsbury Street, E.C.2, produce a 36-page booklet packed with circuit diagrams and blue prints for three penny stamps.

Clearly set out information and full particulars of costs, etc., are thus available to all interested. And, remember that the manufacturers feel that it is in their interest that you should get the exact unit that best serves your purpose, so the free advice of their experts is at your disposal.

A Super Unit

Sharp-tuning enthusiasts who want extreme selectivity without recourse to a superhet circuit will be delighted with the new band-pass tuning unit produced by Jackson Bros. It has all the characteristics of "J.B." workmanship and design applied to an assembly of the latest type of iron-core coils to make a super tuner.

Its timely appearance, at the moment when station separation is the great question of the day, is backed up by practical suggestions for immediately putting the new unit into use. For Jackson Bros. have published a blue print, free to every reader of this journal who applies to 72, St. Thomas's Street, London, S.E.1.

All the necessary switching, together with reaction and volume controls, is incorporated in the one assembly, which thus combines precision ganged condenser technique with the newly introduced iron-core coils.

BIG POWER *at* BISAMBERG

The construction of our own B.B.C. Regional transmitters is serving as a model for much similar work in other countries. That is why Bisamberg, the 120-kilowatt station which serves Austrian listeners on a wavelength of 506.8 metres, is the acme of modernity, and strongly reminiscent of British design.

THE first impression you get on coming to the new Bisamberg station is that it is a much grown up edition of a B.B.C. Regional station!

It is a large white double-storey building on the side of a hill slope at Bisamberg, just seven miles out of Vienna. It is a little over twice the size of a B.B.C. Regional station, and is on the same plan. Being a double height building, however, it looks much more impressive.

Let me describe the outside of the station first of all. The aerial arrangement is as striking as the building, as it is of the mast "sausage" type, being widest at the middle and tapering off to the top and bottom.

It is painted red and white as a warning to adventurous aviators, and there is a rotating light on the top. At present there is only one aerial mast, itself constituting a specially arranged aerial system, but an engineer said that it may be necessary to fix up a reflector mast aerial system so that, although the Bisamberg transmitter is on the Eastern Frontier of Austria, there will be a good radiation over the whole country.

British in Character

Not only is Bisamberg reminiscent of B.B.C. design, but the engineering details are similar. Bisamberg, unlike most continental broadcasters, generates its own power by Diesel engines and does not work off the local power mains. So this huge station has its own Diesel plant, arranged on somewhat similar lines to that recommended by B.B.C. engineers.

But there is this vital difference. The B.B.C. uses Diesel engines to generate direct current at 230 volts, this being used to charge storage

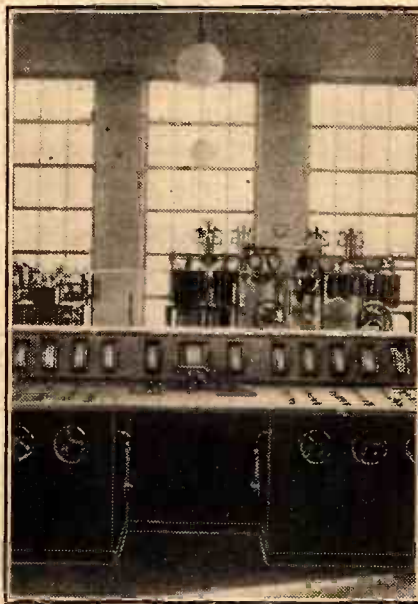
batteries and is converted by rotary machines to the 12,000 volts D.C. needed for the valve anodes. It is all D.C., you see. At Bisamberg, however, the more general continental idea has been followed. There are three 500-horse-power Diesel engines coupled to huge three-phase A.C. generators.

Huge Vapour Rectifiers

This A.C. supply is rectified by some of the largest mercury vapour rectifiers I have ever seen. They give 13,000 volts for the high tension on the water-cooled valves.

The engineers are proud of this section of the Bisamberg broadcaster.

MODERNITY ITSELF



A part of the control room of Vienna's new high-power station. Not only is the apparatus the last word in radio design, but, as the photograph shows, the large, light and strictly utilitarian building is typical of modern commercial architecture.



They have startling statistics at their fingertips. Total of 1,400 horsepower, concrete engine bases weighing 600 tons, reserve supply of oil for a month's running, and so on.

The big tanks holding the fuel oil are underneath the foundations of the engine room and the "juice" is sucked up by pumps and distributed to each engine, whence it is pumped into the Diesels by the injectors.

A huge switchboard on one side of the engine room controls the supply to the machine room next door. This room is as fascinating to watch as the engine room is noisy.

The mercury vapour rectifiers, larger even than the Brown-Boveri mercury vapour gear at Beromünster, have silica tops, so that the actual "striking" can be seen. Special evacuating pumps work continuously at the side of each mercury vapour rectifier, while safety netting is put round each rectifier and wiring junction.

The H.F. Section

I have devoted a considerable amount of space to describing these home-made power details of Bisamberg as they are a triumph of radio engineering. But, of course, it is not until you leave the rest of the gear, water-cooling pumps and so on, on the ground floor, and go up to the main transmitter room on the second storey, that you see the H.F. side of Bisamberg.

Except that it is all very much larger, the transmitter hall apparatus of Bisamberg resembles that of Leipzig, Munich and the other new German stations, all well known doubtless from the photographs frequently

(Please turn to page 323)



WHEN TO LISTEN FOR The WORLD'S SHORT-WAVE BROADCASTERS

By G6QB

If you want to be really successful with your short-wave listening, here is the way. An expert tells you how to make the most of the stations that are usually easy to receive.

THE accompanying list of the world's short-wave telephony stations is, I think, rather a novelty. Most tables of the kind are drawn up with a view to enabling one to identify a station, after one has heard it. This one, on the other hand, is intended to help you to find the station—to give you some idea of what to listen for, and when.

As a matter of convenience it has been divided into four main sections—60-40 metres, 40-30 metres, 30-20 metres, and below 20 metres. Each of these sections has been subdivided into the six continents—counting South America as a separate continent on account of the great difference in the behaviour of the North and South American stations.

The suggested times (given in the respective brackets) have no bearing on whether the stations are definitely active or not. They are merely quoted from long experience as the only times at which one has a really good chance of hearing that particular station, if he is on the air.

Stations You Ought To Get.

Most of the stations definitely are transmitting during the times I have quoted for them, but there are exceptions. In order not to make the list too complicated, these times have been drawn up in broad groups, and a good deal of latitude may be allowed.

They hold good from the date of publication until probably the end of April or the middle

of May, and the list is, as far as humanly possible, complete and up to date at the time of writing. Every single station quoted has been checked up. On the other hand, several stations that have been heard, erratically, have been purposely omitted.

The key to the lettering, next to the name of the station, is given at the bottom of the table. It is based upon the general experience of listeners who periodically send me their logs, together with my own. The "A" stations may be taken as "easy bags"—stations that anyone ought to receive with a reasonably efficient short-wave receiver.

I shall be pleased to receive, from readers, particulars of any stations that they receive regularly, which are not included in this list.

60-40 Metres.			40-30 Metres.			30-20 Metres.			Below 20 Metres.		
NORTH AMERICA. (Mostly best between 11 p.m. and 4 a.m. Sometimes audible as early as 7 or 8 p.m.)			NORTH AMERICA. (8.30 p.m.—midnight).			NORTH AMERICA. (5-10 p.m.)			EUROPE. (2-4 p.m.)		
53-55 VER	Ottawa		33-52 W2XBJ	Rocky Point, N.Y. (B)		25-6 VE9JR	Winnipeg, Canada (B)		19-84 HVJ	Vatican City (B)	
49-96 VE9DR	Montreal (B)		32-1 CGA	Drummondville, Canada (B)		25-5 XDM	Mexico City (X)		19-81 GSF	Daventry (A)	
49-67 W1XAL	Boston, Mass. (B)		31-48 W2XAF	Schenectady, N.Y. (A)		25-45 W1XAL	Boston, Mass. (B)		19-73 DJB	Zeesen (A)	
49-67 W4XB	Miami, Florida. (B)		31-35 W1XAF	Boston, Mass. (A)		25-36 W2XE	Wayne, N.J. (B)		19-68 FYA	Pontoise (A)	
49-5 W3XAU	Philadelphia (A)		31-28 W3XAU	Philadelphia (B)		25-36 W9XAA	Chicago (B)		16-89 DJE	Zeesen (B)	
49-5 W3XAL	Mason, Ohio (A)		31-25 XETE	Mexico City (X)		25-27 W8KK	Pittsburgh (A)		16-88 PHI	Eindhoven (B)	
49-43 VE9DS	Vancouver, B.C. (X)								16-86 GSG	Daventry (A)	
49-34 W9XAA	Chicago (B)								13-97 GSH	Daventry (B)	
49-26 VE9BT	St. John's										
49-22 VE9GW	Bowmanville (A)										
49-18 W3XAL	Bound Brook (A)										
49-18 W9XF	Chicago (B)										
49-18 W2XE	Wayne, N.J. (A)										
48-86 W8KK	Pittsburgh (A)										
46-69 W3XL	Bound Brook (A)										
CENTRAL AND SOUTH AMERICA. (As above).			AFRICA. (Evenings).			AFRICA. (Noon-5 p.m.)			AFRICA. (Noon-5 p.m.)		
51-20 H14ABE	Medellin, Colombia (B)		37-33 CNR	Rabat, Morocco (A)		29-83 SUV	Cairo (B)		29-83 SUV	Cairo (B)	
50-5 TGX	Guatemala City										
50-4 HIX	San Domingo (Dominican Republic) (B)										
49-3 CP5	La Paz, Bolivia (X)										
49-08 YV1BC	Caracas, Venezuela (B)										
48-5 TGW	Guatemala City										
48-34 YV3BC	Caracas, Venezuela (B)										
48 HJ3ABF	Bogota, Colombia (A)										
47 HJ5ABD	Cali, Colombia										
46-77 HJ43	Barranquilla										
45-6 HJ1ABB	Barranquilla										
45-31 PRADO	Rioabamba, Ecuador (B)										
45 HC2RL	Ecuador										
44-96 YVQ	Maracao, Venezuela (B)										
42 YV2AM	Maracaibo, Venezuela (B)										
41-55 HKE	Bogota, Colombia										
40-55 HJ3ABD	Bogota, Colombia										
AFRICA. (4.30-7.30 p.m.)			AFRICA. (Evenings).			AFRICA. (Evenings).			AFRICA. (Evenings).		
49-5 VQ7LO	Nairobi, Kenya Colony (A)		37-33 CNR	Rabat, Morocco (A)		37-33 CNR	Rabat, Morocco (A)		37-33 CNR	Rabat, Morocco (A)	
49 ZTJ	Johannesburg (B)										
45 FM3KR	Constantine, Algeria (B)										
AUSTRALASIA. (6-8 p.m.)			AUSTRALASIA. (6-9 a.m. and 7-9 p.m.)			AUSTRALASIA. (6-9 a.m. and 7-9 p.m.)			AUSTRALASIA. (6-9 a.m. and 7-9 p.m.)		
52-8 VK3LR	Melbourne, Australia (X)		31-55 VK3ME	Melbourne, Australia (B)		31-55 VK3ME	Melbourne, Australia (B)		31-55 VK3ME	Melbourne, Australia (B)	
40-6 ZLT	Wellington, N.Z. (X)		31-28 VK2ME	Sydney, Australia (A)		31-28 VK2ME	Sydney, Australia (A)		31-28 VK2ME	Sydney, Australia (A)	
ASIA. (3-6.30 p.m.)			ASIA. (3-8 p.m.)			ASIA. (3-8 p.m.)			ASIA. (3-8 p.m.)		
49-1 VUC	Calcutta, India (X)		38-1 J1AA	Tokio, Japan		38-1 J1AA	Tokio, Japan		38-1 J1AA	Tokio, Japan	
49-02 PK1WK	Bandoeng, Java		34-19 PNI	Macassar (Dutch East Indies)		34-19 PNI	Macassar (Dutch East Indies)		34-19 PNI	Macassar (Dutch East Indies)	
48-90 ZGE	Kuala Lumpur, F.M.S. (X)										
41-7 VS1AB	Singapore (X)										
EUROPE. (Practically any time after 1 p.m.)			EUROPE. (Any time after 1 p.m.)			EUROPE. (Any time after 1 p.m.)			EUROPE. (Any time after 1 p.m.)		
50-26 HVJ	Vatican City (A)		38-47 HBP	Radio Nations (A)		38-47 HBP	Radio Nations (A)		38-47 HBP	Radio Nations (A)	
50 RW59	Moscow (A)		31-80 SRI	Poznan, Poland (B)		31-80 SRI	Poznan, Poland (B)		31-80 SRI	Poznan, Poland (B)	
50 EAR25	Barcelona (B)		31-55 GSB	Daventry (A)		31-55 GSB	Daventry (A)		31-55 GSB	Daventry (A)	
49-83 DJC	Zeesen (A)		31-38 DJA	Zeesen (A)		31-38 DJA	Zeesen (A)		31-38 DJA	Zeesen (A)	
49-59 GSA	Daventry (A)		31-3 GSC	Daventry (A)		31-3 GSC	Daventry (A)		31-3 GSC	Daventry (A)	
49-4 OXY	Skamlebaek, Denmark (A)		31-27 HBL	Radio Nations (A)		31-27 HBL	Radio Nations (A)		31-27 HBL	Radio Nations (A)	
			31-25 CT1AA	Lisbon (A)		31-25 CT1AA	Lisbon (A)		31-25 CT1AA	Lisbon (A)	
			30 FAQ	Madrid (B)		30 FAQ	Madrid (B)		30 FAQ	Madrid (B)	

KEY TO LETTERING:

"A"—Very frequently heard.

"B"—Heard quite often.

"X"—Only heard on exceptional occasions.

No letter.—Erratic, but has been logged in this country.

SOME WIRELESS CABINET WOODS

FOR nearly two hundred years mahogany grew in popularity with the people of this country, and was usually associated with all high-class furniture. During the last ten years or so it has suffered a partial eclipse, for walnut has seriously challenged its position and has become, to-day, as popular as mahogany used to be.

But even to-day, people associate good furniture with that made from mahogany, and there is a vast amount of good furniture in old-fashioned homes made with this wood.

Walnut is a showy wood, and if we take the best figured panels, we find that its attraction is "immediate"; it is loved by those who look for beauty in an object when they first glance at it. The beauties of mahogany are more of a hidden character; it is like an old-established business house

Mahogany is extensively employed in cabinet work for radio receivers, and its characteristics, together with details of the countries from which it is obtained are covered by our contributor in this article. He also deals with the use of satinwood.

that carries on quietly, steadily and efficiently, all the time. Its patrons may go elsewhere for a time, but eventually they return to their old love, mahogany.

It would be an error to suppose that there is a plentiful supply of the best mahoganies of the old-fashioned type; supplies of Cuban and Honduras choice pieces are scarce; this was noted last year particularly.

Those Specks of Chalk

Cuban or Spanish mahogany is exported from Cuba, Jamaica and Santo Domingo—and a few other parts of the West Indies—and is reckoned the best for all high-class cabinet work. The logs are from 18 to 30 feet long, and 12 to 24 inches in diameter.

It is a heavy, close-textured wood of a brownish-red colour which darkens with age, and because of its density, it requires to be allowed a fair amount of time in order to become well seasoned. In most samples, small specks of chalk, or of a chalky compound are visible in the pores of the



By
C. J. ELLIOTT.

wood, and this chalk is said to be due to the fact that, in some districts, the trees grow in a limestone soil.

Some samples are attractively "figured" and the wood, in general, can be given a clean, fine finish, which gives the french polisher a chance to show off his craftsmanship to perfection.

Where It Is Grown

Honduras mahogany is the name given to the wood exported from the Central American States, bordering on the Panama Canal, and to the north we get Mexican mahogany, which varies a little in character, but that

BUILT FROM SATINWOOD



A particularly attractive piece of cabinet work executed mainly in satinwood, which is normally obtainable only in smallish sized pieces.

grown in Tobasco and surrounding districts is often equal to the choice logs from Cuba.

Honduras wood is from a light to a rich reddish-brown colour; it is tough

and close, and has a straight, uniform grain. It is easy to work and takes the glue well, and the best grades are used for panels and veneer work, while the small pieces are in good demand for high-class cabinet making.

The botanical name for the mahogany tree is *Swietenia mahogani*; its leaves resemble those of the ash and its fruit is a pear-shaped woody capsule. It grows to the height of 45 feet, or thereabouts, and it may attain a girth of 12 feet in exceptional cases.

It has been stated to take two hundred years to reach maturity. In Honduras, the trees are cut down in the dry season and are dragged to the banks of the river and floated from various points to the mills.

Supplies from Africa

The furniture trade in general depends upon shipments of mahogany

This is the fourth article of a unique and absorbing series on the woods that are commonly used for the construction of wireless cabinets. The previous contributions by Mr. Elliott dealt in an eminently practical manner with oak, walnut and rosewood.

from the West African coastlands surrounding the Gulf of Guinea, for the forests of the hinterland, which may stretch roughly from the mouth of the river Gambia to the Congo, contain vast reserves of this wood. Before the war, we were importing nearly 80,000 tons per annum of African mahogany.

Mahogany "Figure"

In our earlier articles, we mentioned the characteristic "figuring" of oak and of walnut; the silver grain in the oak is a property of normal growth. But the figuring in mahogany is produced largely by an abnormal growth in the fibres of the wood.

The natural growth of the fibres of the wood tends to produce a straight and uniform grain, but where any abnormal development should supervene, the fibres twist and give many types of figuring, which we shall attempt to classify under three headings, as:

(1) "Fiddle Mottle." This is a ripple effect in the wood, and is seen best when the light falls on it at a

Pleasing Finishes Obtainable with Mahogany

certain angle. Some choice samples of sycamore wood also show this ripple and are esteemed for making violins.

When this mottle effect is associated with other figurings about to be described, a pleasing appearance is given to the finish of the wood. Honduras mahogany shows much of this "fiddle mottle," and it is also present in some African logs.

(2) "Curl" or the "Fan" figuring is to be found in those parts of the wood where the lower large branches spring from the trunk of the tree.

Light and Shade Effects

This "curl" figuring is sometimes associated with a wave ripple as mentioned above, the combined effect giving a most pleasing appearance for drawer-fronts and sideboard work, and for panels in cabinets.

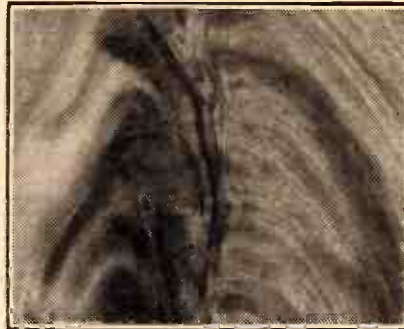
(3) "Roe" is the name given to a figuring which is much more common than the two named above. It is said to be produced by the twisting of the wood fibres, and this produces the characteristic light and shade effect, according to the angle from which the light falls on the wood.

The figuring is common in Mexican mahogany and may be seen in some of

the more open-textured logs from certain areas of the West African forests.

Often, these bands of light and shade are broken by a "cross mottle" which produces a figure of rare beauty, but difficult to describe.

A FINE VENEER



Typical of the attractive grain effects obtainable in mahogany is this veneer supplied by The Austin Veneer and Panel Co., Ltd.

French polishing is the usual method of producing a finish to the surface of mahogany, and Cuban, Honduras, Mexican and some Nigerian mahoganies are the best surfaces to work upon.

This type of polishing consists in

making light and very frequent applications of a solution of white or orange shellac in methylated spirit to the prepared surface of the wood, using a rubber and employing much friction in the process. It is really a method of varnishing, but the ordinary varnishing is done by coating the wood with one or two coats of varnish, using no friction, to secure the desired effect.

Satinwood

The least we can say of satinwood is that it is the most beautiful of all woods for some requirements, but it is rather too expensive except for the very highest class of cabinets—usually of small dimensions. To-day, we find most of it used for the backs of the highest class of hair-brushes, and in the making of veneers.

The two varieties of this wood are :

East Indian : A yellowish-brown colour with some figuring.

West Indian : A light, yellowish colour.

Both varieties are close and dense woods that take a high polish, but although satinwood can be easily worked, difficulties are usually experienced when it comes to gluing operations.

FEW things are more exasperating than the nut, screw, or other small part that falls down into the inside of the set and makes its way into some particularly awkward corner. Fingers will not reach it; sometimes a pair of pliers can be used, but often their jaws are too big to go where they are required.

A handy little contrivance which I



* **HOW TO MAKE USEFUL** *
* **"FINGERS"** *
* *An instrument of value to all con-* *
* *structors.* *

call a "picker-up" is illustrated in Fig. 1. This is made in a few minutes from a couple of pieces of No. 14 or No. 16 gauge copper wire.

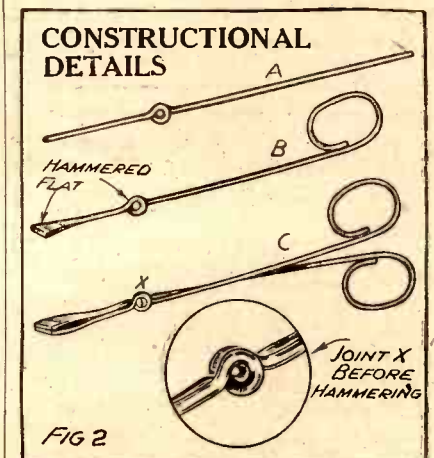
The stages of its construction are illustrated in Fig. 2. Begin by making a loop of the shape illustrated at A. Then lay the loop on the jaws of the vice and beat it quite flat by hammering. Flatten also the short end beyond the loop to make one of the jaws. This flat will, of course, be parallel to the axis of the loop.

Lastly, bend the long end with a pair of round-nosed pliers so as to form a scissor handle. The completed part is seen at B. Make another exactly the same and fix them together by means of a 4 B.A. or 6 B.A. screw according to the size of the loop. Put a washer over the shank of the screw and use two thin nuts, locking one under the other. Bend the jaws if necessary, then

close them and trim the ends of both off square with a file.

Fig. 1 shows the "fingers" in use. They are, of course, intended only for the lightest work, and for this they are quite strong enough, though made only of copper wire. Besides picking up, they can be used for starting small nuts on screws in difficult places.

R. W. H.



The three steps in the making of the instrument are illustrated here.



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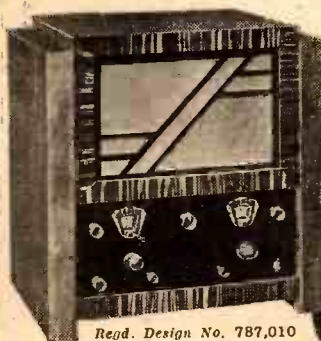
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1 Telsen .0001-mfd. differential condenser	2	6	
2 Bulgin 2 pt. push-pull switches	1	9	
1 J.B. .00005-mfd. B/bd. pre-set condenser	1	0	
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1 Bulgin on-off toggle switch	1	6	
1 Dubilier 2-mfd. fixed condenser, type BB.	3	6	
1 T.O.C. 1-mfd. fixed condenser, type 50	2	6	
1 Dubilier 20,000-ohms resistance, 1-watt type	1	0	
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1 Peto-Scott ready drilled panel, 16" x 7" X 3/16"	3	3	
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1 Peto-Scott "S.T.300" Star screen	1	9	
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1 Peto-Scott tone control bracket	3		
10 Belling-Lee indicating terminals	2	6	
wire, screws, etc.	2	2	

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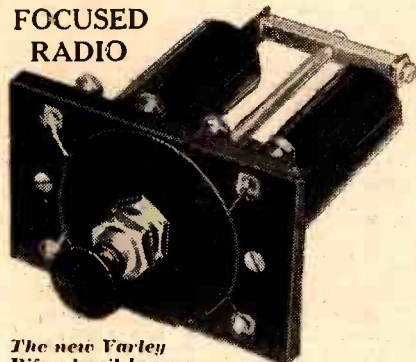
NEW
APPARATUS
TESTED

The Bifocal Coil

THE Varley Bifocal coil is the latest development in iron core inductances. It is an outstanding and praiseworthy attempt to find a simple solution to the ether congestion problem.

The Bifocal coil has two main windings, one for the medium waveband and one for the long.

FOCUSED RADIO



The new Varley Bifocal coil has an adjustable iron core and is a component of the highest efficiency.

The iron core is movable and can be adjusted in relation to the coil windings by the movement of a control knob on the panel. In this way the proportion of the coil's inductance above or below a fixed tapping point on the winding can be varied at will and is in effect the same as moving the tapping up or down the coil.

But the total inductance of the coil remains substantially constant irrespective of the position of the iron core.

It is therefore clear that by connecting an aerial lead to the tapping on the winding the energy input from the aerial is continuously variable within wide limits.

This is a very definite advantage over the more usual method of altering the coupling in large steps by shifting the position of the aerial lead to an alternative tapping on the coil winding.

With the Varley coil the tuning procedure is the easiest thing in the world. All that you have to do is

Interesting reviews of the latest apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

to rotate the tuning condenser dial until you hear the desired programme. And then you adjust the degree of selectivity merely by moving the knob which controls the position of the iron core.

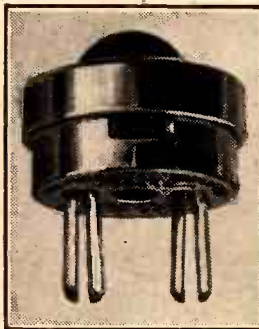
The scheme is both ingenious and highly effective and our tests with two of the coils (aerial and H.F.) in a three-valve S.G. det. and L.F. design were, to say the least, eminently satisfactory.

The makers' statement that the coil provides a ready means of bringing a station into focus is an apt one. For this is what the Bifocal coil does, since it enables the listener to receive the programme he wants free from interference from unwanted stations on nearby wavelengths.

Those who wish to know more about the Bifocal coil should get into

FITS ALL SIZES

This ingenious Clix plug is designed to fit 5 amp wall sockets of varying sizes. Only one screw has to be removed to give access to the connections.



touch with Messrs. Varley, Kingsway House, 103, Kingsway, London, W.C.2, who will be pleased to send them full particulars.

Hydra Condensers

Readers will be interested to learn that the well-known Hydra condensers are now being manufactured in this country. They are being produced by the Telephone Manufacturing Co., Ltd., Hollingsworth Works, West Dulwich, London, S.E.21.

Our experience of Hydra condensers extends over a considerable period, and we have at all times found them to be thoroughly reliable, not only in regard

to capacity rating and charge holding capabilities, but also in standing up to reasonable overloads without distress. T.M.C. Hydra condensers are available in capacities ranging from .1 to 10 mfd. and in the following working voltages: 250, 300, 400, 500, and 750 D.C.

Every condenser undergoes stringent tests and the makers' test voltages are interesting. In the case of the type No. 25 condenser, working voltage 250 D.C., the test voltage is 500. The type No. 30, working voltage 300, has a test voltage of 700, while with the type No. 75, working voltage 750 D.C., the test voltage increases to 2,000 D.C.

The two intermediate sizes (types 40 and 50) have test voltages of 1,000 and 1,500 respectively.

Our tests covered all the normal uses to which the condensers would be put in practice, and in every instance the various samples submitted passed these tests with flying colours.

All T.M.C. Hydra condensers carry a 12 months' guarantee and their capacities are within plus or minus 10 per cent of the rated value. Tinned soldering tags or screw terminals are optional and either may be had without extra charge. We can thoroughly recommend them.

(Please turn to page 325)

COMPACT EFFICIENCY



Hydra condensers are now made in this country by the Telephone Manufacturing Company and carry with them a twelve months' guarantee.



IN LIGHTER VEIN

By "Wayfarer"

"It seems to me," remarked our Chairman, Sir K. N. Pepper, "that we want a little more variety in the proceedings of the Mudbury Wallow Wireless Club. Now we've had lecture after lecture and talk after talk, week in, week out for months past."

"Too much like a broadcast programme," grunted Captain Buckett.

"Yes, and you can't switch our talkers off," snapped Miss Worple. A quaint remark, coming from a woman, but it was recalled that by some oversight on the part of the Secretary she had not been called upon to lecture all the season.

"And what are we going to do about it?" queried Tootle. "Who's got a suggestion to make?"

The chairman put the question to all of us in turn and, though we did our best, nobody seemed to have the right inspiration. Suddenly it came to me. I sprang to my feet and then, with a loud cry, went waltzing round the room on one foot, holding the other with both hands.

No Trick Dancing

"I think that's a rotten idea," snarled Pimpleson, "I'm sure nobody wants an exhibition of trick dancing by Wayfarer."

"Shut up, you ass," I bellowed, "and pull that drawing-pin out of the sole of my foot."

I had been wearing a new pair of shoes, and finding them somewhat tight I had slipped them off under the table to obtain temporary relief. Instead, I found temporary anguish. And what was almost worse, there happened to me what always does happen if you take off your shoes in public. You know how those shattering and unsuspected holes develop. I seemed to be exhibiting every one of my ten toes and both my heels to the assembled company.

Miss Worple immediately offered to give a little lecture on "Simple Hints On Darning For Men," but

this was negatived and I was able at last to give birth to my big idea.

"Look here," I cried, "there is one thing we've never had and that's a debate. It will be awfully popular, for it gives everyone a chance of talking, and we can thrash out one of the burning questions of the day. Now,

In a worthy effort to instil a little variety into the proceedings of the Mudbury Wallow Wireless Club, our friend "Wayfarer" rashly suggests a debate—Superhets *versus* Straights. That the debate should degenerate into a free fight is only to be expected by those who regularly follow the misfortunes of "Wayfarer"—but, as usual, our contributor wins the day!

which do you consider is the question which most needs decision?"

All sorts of silly proposals were made, but it was at long last agreed that the subject for the debate should be Superhets *versus* Straights, the Professor leading the Superhet party, whilst I would fling my glove into the ring as champion of the Straights.

I always believe in going to a debate thoroughly prepared. Hence, knowing the Mudbury Wallow Wireless Club as I do, I wore a chain mail shirt under my waistcoat and carried a pair of knuckledusters in my pocket. We

EXHIBITION OF WALTZING



"I sprang to my feet and then, with a loud cry, went waltzing round the room on one foot, holding the other with both hands—"

are normally a peaceful crowd, but it is always as well to be on the safe side on such occasions for one never knows what is going to happen when strong men (and strong women, too, for that matter) become worked up over vital questions of wireless.

At eight o'clock all of us were

assembled but the Professor, whose duty it was to propose the motion,

"That in the opinion of this house the superheterodyne receiving set is in every way superior to the straight." The clock ticked on. There were no signs of the Professor. Tootle and Pimpleson were sent out as a search party. They returned wiping their moustaches and saying that they couldn't find him anywhere.

Everyone else immediately volunteered to become a member of another search party. The chairman was still calling us to order when the

telephone bell rang.

I leapt to answer it.

"Is that the Mudbury Wallow Wireless Club?" bleated a squeaky voice.

I intimated that it was.

"This is Mr. Algernon Miffles speaking, the secretary of the Musical Society. We've got Sir Dollford Wavis lecturing on 'The Hideous Beauty of Modern Music,' and your Professor Goop insists that he was asked to have a debate with him. For heaven's sake, remove him. Whenever Sir Dollford sings a note the Professor jumps up and cries that it's a second-channel heterodyne."

The Professor's Escort

Captain Buckett and I were told off not as search party, but as escort. I don't wear a moustache, but the Captain was wiping his when we entered the Musical Society's abode.

We soon removed the Professor, who seemed to have been somewhat absent-minded whilst dressing for the debate. He was wearing a tennis shirt, with a souvenir of the local hospital's flag day doing duty as both tie and stud. A fancy waistcoat, an evening coat, a pair of pyjama trousers, one gum boot and one sandal completed his tasty and original ensemble.

"I say," I said to Captain Buckett, "we had better hurry. What do you think is the quickest way back to the clubhouse?"

"Why, there's a short cut through

Inkpots Help to Drive Home a Point

the Dog and Partridge. You go in through the front door, then down the passage and out of the back door and there you are."

"Are you sure that it's a quick one?" I asked.

"Three," replied the Captain with feeling.

We conveyed the Professor safely to the clubhouse, where we found all the rest impatiently champing.

"Without further delay," vociferated Sir K. N. Pepper, "I call upon Professor Goop to propose the motion."

The Professor rose to his feet and looked blandly round him.

"Whole Thing Self-Evident"

"I feel," he said, "that I hardly need waste words on proposing this motion. The whole thing is so self-evident. The superhet wins in a canter with the rest nowhere, and only the most complete ass could think of defending the straight."

"Look here," I bellowed, struggling to my feet.

"Order! Order!" cried the chairman, and I was pulled down by my coat tails.

"I very much doubt," continued the Professor, "if the Honourable Opposer even knows how the superhet works."

This was too much. "On a point of order, sir," I said, rising and discouraging the clutching hands by a nifty right and left to the mark.

Third-Channel "Brimbulation"

"Well, Mr. Wayfarer?"

"Of course I understand how the superhet works. You just turn the knob and the noise comes out of the loudspeaker."

"And with the straight," cooed the Professor, "you just turn the knob

NEWS AT LAST!



"I leapt to answer the 'phone. 'Is that the Mudbury Wallow Wireless Club?' bleated a squeaky voice. I intimated that it was."

and howls and squeals come out of the loudspeaker."

"And with the superhet," I roared,

"you get secondhand squeals and probably third-channel brimbulation."

"Third-channel what?"

"Brimbulation."

"What on earth do you mean?"

I Score Heavily

I turned to the chairman. "I think, sir," I remarked, "that I have shown that the Honourable Proposer does not know the first thing about superheterodynes. Everybody else present, I'm sure, that is to say, everyone who supports the straight set, has the fullest knowledge of both brimbulation and pseudo-brimbulation which, with the possible exception of demodulative cataclinoses, are the two greatest drawbacks to reception on the superheterodyne principle."

There was a loud cheer from those who had come prepared to defend the straight set.

The Professor began to look somewhat shaken. But gallantly he blathered on. He even went to the

A TASTEFUL ENSEMBLE



The professor was wearing a tennis shirt, a fancy waistcoat, an evening coat, a pair of pyjama trousers, one gum boot, and one sandal.

blackboard to draw circuit diagrams, but as before the meeting began I had taken care to substitute a piece of lard for the stick of chalk provided, these were not very successful.

The "Oh-ohs" for our side drowned the "Hear-hears" from his, as he waded through his speech. Dagger-like glances were exchanged at frequent intervals across the table. It was abundantly clear ere long that before it had finished this was going to be something out of the ordinary in the way of debates.

Plenty of Reaction

"Your miserable straight set," sneered the Professor, "has to rely largely upon reaction."

"And why not?" I cried. "Why shouldn't we make full use of reaction, which fortunately provides something for nothing?"

"You can't get something for nothing," snapped the Professor.

"Well, you're always trying."

HIT IN THE MIDRIF



Pottleson was caught round the ankles and hurled into the air, hitting the chairman in the midriff.

In a moment there was considerable interaction between the Superhets and the Straights. Inkpots well aimed and well flung are invaluable as aids to driving home a point. We had exhausted inkpots and got on to the high-tension batteries which form a permanent exhibit in the clubroom, when the Professor stooped down, peeled off his single gum boot and, wielding it like a battle-axe, sallied into the fray.

Meantime, the President was furiously ringing his bell and begging the meeting to remember who and where they were. The meeting was remembering this well enough without any aid from him. Sir K. N. Pepper subsided eventually when Pottleson, caught round the ankles by Withersfield and hurled into the air, hit him in the midriff and carried him beneath the table.

As I was the only member of the Club sufficiently conscious to be able to record his vote when the division was called, the "straight" won the day by an overwhelming majority.

A READER'S APPRECIATION

"THE WIRELESS CONSTRUCTOR."

THE EDITOR,

SIR,

Just before Xmas I wrote you about the "Constructor's Two" for working in Devonport.

I should like to say that it is going splendidly, and no interference in spite of electric trams, buses and a full stream of motors in the same street. It's a lovely present for anyone near a local station.

Yours faithfully,

T. Ball,

Ince Castle,

Saltash, Cornwall.



By

J. E. WATSON, A.I.R.E.

A very practical article which deals with the best and most expeditious methods of tracing faults in radio receivers. The easy-to-build multi-reading meter described will prove of immense value to service engineer and home constructor alike.

UNLESS the radio engineer possesses suitable equipment when making a service call, he is faced with the alternative of taking the set away with him—which should not be necessary in most cases—or digging down in the wiring in a “hit or miss” fashion, and trusting to luck in finding the fault.

In a well-ordered home there can be nothing more annoying to the owner than to be compelled to look on helplessly, while his drawing-room is converted into a temporary workshop. And this is so unnecessary.

Try Voltages First

If the engineer will provide himself with the proper equipment, and inject a little system into his method of attack, he will become increasingly competent, and will complete his job in half the time.

In nine cases out of ten the trouble encountered in a radio set will be evidenced by an incorrect voltage (or current) reading appearing at some point in the circuit.

One of the first things to do, then, in diagnosing a fault, is to make a complete survey of voltages throughout the set.

Having found all voltages correct at each valve holder, we have automatically removed suspicion from a large portion of the set. In fact, although this test is a simple one, it is usually the most fruitful of any in the matter of fault-finding.

A Simple Instrument

In order to carry out this test efficiently, it is necessary to possess a good multi-range voltmeter and multi-range milliammeter. It is the purpose of this article to describe an inexpensive instrument capable of measuring from 1 to 1,000 volts, and from 1 to 100 milliamperes, or more.

The instrument may be used as an output meter and, in addition, provides a ready means of testing for circuit continuity. The circuit diagram is

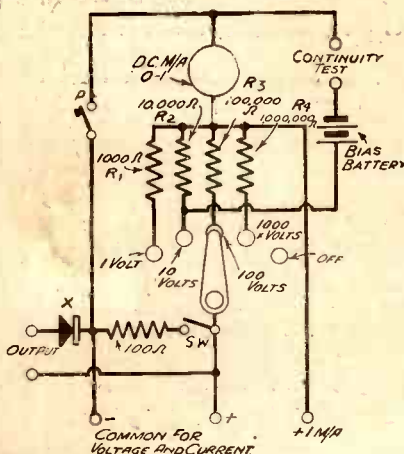
shown in Fig. 1. The meter required is a 0-1 D.C. milliammeter.

Voltage maxima of 1, 10, 100 and 1,000 volts are available, and are obtained by means of the series resistors R_1 , of 1,000 ohms; R_2 , 10,000 ohms; R_3 , 100,000 ohms; and R_4 , 1,000,000 ohms. A suitable tap switch is provided for the selection of the desired range.

The push-button contact P, shown in the negative lead to the meter, is suggested by the writer as a means of protection against burning out the instrument.

The necessity of having to press the button before any reading can be obtained, offers a reminder to the user to make doubly sure the selector switch is set for the correct range.

FOR ALL PURPOSES



This circuit will enable you to make all the measurements necessary—including checking up the output of a set—to test for any fault.

The current readings, with the exception of the 0-1 ma. range, are obtained by measuring the voltage drop across a 100-ohm resistor. A little study of Ohm's Law shows us that for each milliamp. flowing through a resistance of 100 ohms, the voltage drop will be 0.1 volt.

Therefore the current will become ten times the voltage reading. In

other words, the 1-volt scale becomes the 10-milliamp. scale, and the 10-volt scale will read 100 milliamps. and so on. This method of measuring current, while not offering laboratory precision, is quite suitable for the purpose, and eliminates the necessity of calculating for several shunt resistors.

A separate terminal is used for the 0-1 milliamp. range. The switch S.W. is open for voltage readings and closed for current readings. The maximum current range possible will depend to a large extent upon the quality and power rating of the 100-ohm resistor.

Checking the Output

Output measurement is made possible by use of the half-wave copper oxide rectifier X.

This rectifier simply consists of two copper oxide discs which may be taken from an old, dry rectifier such as found on the early type of A.C. moving-coil speaker.

Continuity test is made from two terminals, one of which is connected directly to the meter, and the other joined in series with a small bias battery to the 10-volt stud of the selector switch.

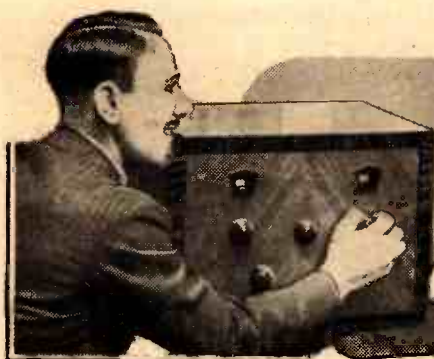
To make voltage readings, open the switch S.W., and choose the desired range by means of the selector switch. Connect the voltage to be measured to the correct terminals, and press the button P.

Measuring Current

Current measurements are made in exactly the same way, but with the switch S.W. closed. Multiplying the voltage readings now obtained by 10 gives the current flow in milliamps.

To use the instrument as an output meter, connect to the terminals marked “output,” and select a suitable range according to the signal strength available. When used in this manner the instrument will be found very useful in trimming a powerful set.

In a further article I hope to discuss the measurement of capacities.



READERS' RESULTS

WITH THE S.T. SUPER

A small selection of the letters which have reached us from readers who have built the "S.T. Super" and given it a thorough and critical "try out" under their own home conditions. The complete satisfaction of readers is the most convincing proof of the success of yet another of Mr. Scott-Taggart's designs.

WORKING MAGNIFICENTLY

From Percy Davison, Green Wood, Grouville, Jersey.

"I want to thank you most sincerely for your goodness to wireless fans, for your wonderful 'S.T. Super.' You will hardly believe me when I write and let you know that I have had several wireless sets but have never constructed one before. A friend of mine lent me the 'Constructor' for December, and I read your article and such wonderful faith had I in it that I sent for a standard kit.

"To my great joy it is working magnificently. I should hate myself immensely if I forgot the courtesy owing to your good self for the joy and pleasure you have given me and mine in being able to wander around the world with the satisfaction of knowing also that I can get what I want."

I AM MORE THAN SATISFIED

From James Drummond, Barnegates Inn, Ambleside, Westmorland.

"I have recently made up the 'S.T. Super' and I am glad to be able to say that I am more than satisfied with results.

"Stations hitherto unobtainable on quite powerful straight sets now come in with extraordinary clearness and volume, in spite of the fact that reception here is notoriously bad."

QUALITY IS SPLENDID !

From J. R. Bigney, 7, Ramsey St., Scarborough.

"Thanks. That seems a bald statement but I want to express my appreciation for the 'S.T. Super.'

"Here it is not a question of getting a lot of stations—it is getting one at a time. Your 'Super' does that ; I

have got all those mentioned in your log—and others as well.

"But this is the main point to me : with a Blue Spot speaker the quality is splendid. Your log is exactly right, and I can get each station without trouble."

THE LOG IS FAR MORE THAN YOU CLAIM . . . A BEAUTY !

From J. T. Jacobs, 38, Wolverhampton Rd., Willenhall, Staffs.

"I feel I must write and thank you for the 'S.T. Super' ; it is a beauty.

THE CLAIM

When introducing the "S.T. SUPER" to the public, Mr. John Scott-Taggart said :—

"I believe I have produced a set which in performance will rank higher than any battery-super-heterodyne, home-constructed or factory-built, in this country."

THE TEST

Apart from its tests in the hands of readers all over the country, the set was specially tried-out for selectivity by the designer *within five miles* of the London twin-wave high-power station.

THE VERDICT

A chorus of praise from all over the country ! See what readers are saying about their own results with the

"S.T. SUPER"

"I can safely say it is the best set I have yet had the pleasure to handle, and as my first set was made from a 'Wireless Constructor' design in 1925, you can see I have had a few different models.

"The log of stations is far more than you claim, and quality is fine."

FOR SELECTIVITY AND QUALITY I THINK IT SUPERB

From D. C. Stevenson, 274, New Church Rd., West Hove, Brighton.

"I have taken the plunge and have built your 'S.T. Super.' Needless to say, after a thorough test, I find it to be all you claim it to be.

"In this town we need a really selective receiver to be able to enjoy radio. Your 'S.T. Super' has filled the bill. For selectivity and quality I think it superb.

"I am a great follower of your sets. Previously I built your 'S.T.300,' 'S.T.400,' and 'S.T.500.' They are all top-notchers. I built nine 'S.T.300's' for friends !

"Nevertheless, your latest 'S.T. Super' is my choice. It will be a long time before I am tempted to change."

60 STATIONS AT WEMBLEY

From Walter E. Wills, 53, Monks Park, Wembley, Middlessex.

"Although I am afraid I am rather late in doing so, I wish to congratulate you on designing such a fine set as the 'S.T. Super.' You will observe from my address that I require a good receiver, and now I have it.

"I have logged over 60 stations, which I can get at any time, though the remainder of the family find it difficult to obtain some of them as the set is so selective. There are, of course, lots of others in addition to the 60, but I do not like those you have to force to get.

"My previous set was an A.C. 'S.T.400,' which gave me excellent service, and now is in the proud possession of a friend.

"In conclusion, I thank you for bringing out such a splendid set as the 'S.T. Super,' all your claims being amply justified."



THE NEW POWER VALVES

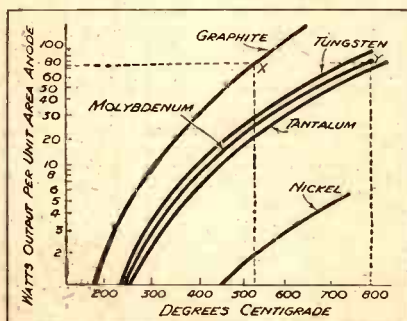
Some notable advances have recently been made in the design of large valves, and are here described.

By K. D. ROGERS.

With valves of the 50 or more watts dissipation type the heat generated by the electrons striking the metal anode is such that this electrode often becomes red-hot. In many transmitting valves water-cooling has to be adopted to keep down the anode temperature.

With ordinary big power valves, however, it is not convenient to water-cool, so the anodes are made very big, and we rely on the radiation of the heat (heat dissipation) to keep the plate sufficiently cool.

WATTAGE AND HEAT



How anode temperature varies with wattage dissipation. The point X denotes the temperature at which graphite changes colour, while Y shows the temperature reached by molybdenum as compared with that of graphite for a given wattage.

Taking as an example two well-known Ediswan valves—E.S.75H. and E.S.75—we find that with molybdenum anodes a temperature of 800 or more is reached when the full wattage dissipation of 75 is obtained.

Advantages of Graphite

With graphite anodes, however, the valves give the same wattage output with a temperature rise on the anode of only about 500 degrees, and instead of the material going bright red-hot it remains almost unchanged in colour.

This is due to the greater heat dissipation properties of graphite over the metals.

Another advantage accruing from the use of graphite for an anode is it

allows a more homogeneous structure and thus does away with warping during manufacturing processes.

Also it is cheaper than the metal, and has the useful property of absorbing gases during the evacuation process, thus aiding the gettering.

Uniform Characteristics

There are "snags" of course, but these do not outweigh the advantages and they are rapidly being overcome. The fact that the efficient cooling of the graphite anode allows greater power dissipation to be obtained for a valve of a given size than is possible with a metal electrode is of the utmost importance.

The mounting trouble is overcome by an ingenious method of clamping, and the uniformity with which the graphite anodes can be made enables the nominal characteristics of batches of valves to be much more closely achieved than heretofore.

WITH CARBON ANODE



One of the new "graphite valves"—a 250 watts dissipation type. In the heading are also shown a larger type and the E.S.75H. mentioned in the article.

IN January at an exhibition in London were shown the first British valves to use graphite anodes. Not a particularly exciting statement at first sight, perhaps, but it is one which means more than it appears to do.

So far the new graphite-anode is being used only in large power valves and in transmitting "tubes," and therefore has no immediate value to the home constructor. But ere long probably all largish power valves (with 10 watts or more anode classification) will employ the new non-metal anodes.

The Usual Metals

To understand why the new material is such an advance as to make legitimate my last statement we must consider properties and disadvantages of the normal power valve anode.

This is made of either nickel, tantalum, tungsten, or molybdenum—usually the latter, and it has to be carbonised in big valves to prevent proton emission being set up by the electron bombardment. This emission causes great havoc with the filament, the protons rushing into it and literally smashing great lumps off in the cases of high voltage valves.

A carbonised anode is not prone to that sort of trouble, though with large power address valves there is danger of the carbonising disintegrating and falling down on to the filament, causing cool spots on it, and thus reducing the emission.

Water Cooling

But the metal anode has another snag. It gets very hot, and heat is bad not only for the anode, in that it tends to cause it to alter shape, but also for the electrodes (grid and filament) that lie inside the anode.

WHAT READERS SAY



ABOUT OUR GREAT GIFT BOOK

Ever since *THE MANUAL OF MODERN RADIO* was first issued a few weeks ago, letters of congratulation and enthusiastic praise have been pouring into the office. There is not space to print more than a very small proportion of the correspondence, but the extracts which appear this month may be taken as representative of hundreds of others which have been received in a similar strain.

IT IS MAGNIFICENT

"May I take this opportunity of thanking you for the *MANUAL* by John Scott-Taggart. It is magnificent, and ought to be in the hands of everyone interested in wireless."—*W. R. Jones, 142, Victoria Street, Mansfield.*

VERY PLEASED INDEED

"I wish to thank you for the copy of *THE MANUAL OF MODERN RADIO* which I received about a fortnight ago. I am very pleased indeed with the book; it certainly does come up to your claim of 'worth £1 1s.', and I regard it as one of the best books on wireless that I have come across for some time."—*J. Bissett, 2, Stuart Villas, Charles Street, St. Helier, Jersey.*

A WORTHY ASSET

"I have received *THE MANUAL OF MODERN RADIO*. Allow me to express my thanks for the book, which is a worthy asset to any wireless fan, be he a novice or expert."—*S. A. Milliken, 217, Second Street, Trafford Park, Manchester.*

THANKS, S.T.!

"Many thanks for my copy of *THE MANUAL OF MODERN RADIO*. I expected something like a 1s. magazine; imagine my surprise and joy at receipt of such a beautiful book. Thanks, S.T.!"—*F. Dow, 61, Neville Road, Forest Gate, E.7.*

A CROWNING ACHIEVEMENT

"I am in receipt of my copy of *THE MANUAL OF MODERN RADIO*, for which I thank you. This book has exceeded my highest expectations, and is worthy of such a genius as Mr. Scott-Taggart. A crowning achievement. Again I thank you."—*H. C. Youles, 12a, East Gardens, Robinson Road, Colliers Wood, S.W.17.*

SUCH A SPLENDID BOOK

"I received *THE MANUAL OF MODERN RADIO* this afternoon, and I have hardly been able to tear myself away from it since. I must write and thank you for giving me

the opportunity of obtaining it so cheaply and easily.

"I would also like to congratulate Mr. John Scott-Taggart on writing such a splendid book."—*S. A. Morrish, 38, Bushey Park Road, Teddington.*

INTERESTING IN EVERY CHAPTER

"I herein acknowledge the safe arrival of the wonderfully interesting book I received yesterday, for which please accept my many thanks.

"It is interesting for both beginners or those advanced in the knowledge of wireless. It is a book that can be picked up at any

THE MANUAL ARRIVES!



Once you open your S.T. Manual and start reading Mr. Scott-Taggart's lucid and brightly written explanations, you will find it as difficult as this reader did to stop before the last page. Never before has radio been so clearly explained.

time for referring to any matter, and interesting in every chapter; a book that should be in a prominent place on the bookshelf of every wireless enthusiast."—*A. S. Hilling, Wissett Hall Lodge, Speshall Road, near Halesworth.*

MORE THAN DELIGHTED

"I am more than delighted with *THE MANUAL OF MODERN RADIO*; it far exceeds my expectations, and is a very useful

book."—*A. Ingram, 5-16, Guildford Street, Lozells, Birmingham.*

A BOOK THAT WILL HELP ME

"I wish to thank you for *THE MANUAL OF MODERN RADIO* which I received quite safe. I am quite sure that I have got a book that with careful study will help me in improving my reception.

"Once again my thanks to Mr. Scott-Taggart."—*W. H. Lemon, 43a, Shanklin Road, Brighton.*

BEYOND MY EXPECTATIONS

"I feel that I ought to congratulate you on your excellent service in the delivery of *THE MANUAL OF MODERN RADIO*. I am only fifteen, but I take a deep interest in wireless. The book is beyond all my expectations."—*John R. Metcalfe, 20, Leigh Road, Hale, Altrincham.*

GOLD MINE OF INFORMATION

"I received the de luxe edition of *THE MANUAL OF MODERN RADIO* safely, and thank you for sending it.

"The *MANUAL* is a gold mine of information, and is certainly 'the goods'."—*J. F. Tysall, 8, Stanley Road, Wakefield.*

A DISTINGUISHED BOOK

"I must at once pay tribute to your efficient service. My *MANUAL OF MODERN RADIO* was in my hands in 36 hours.

"As regards the *MANUAL* itself. Its advantages can be summed up as follows: A finely bound, modern, comprehensive, and distinguished book."—*A. C. Draper, 94, Shakespeare Road, Acton, W.3.*

I AM DELIGHTED

"I am delighted with my *MANUAL OF MODERN RADIO*, just received. I can see it will be a most useful book of reference for anyone interested in 'the innards'."—*Henry J. Tapping, 14, Ashley Road, Boscombe.*

WORTH THREE TIMES THE MONEY

"Very many thanks for *THE MANUAL OF MODERN RADIO*. It is easily worth three times the amount paid. Although only an amateur, I am quite able to follow what Mr. Scott-Taggart has written."—*E. Kilby, 70, Hainault Road, Leytonstone, E.11.*

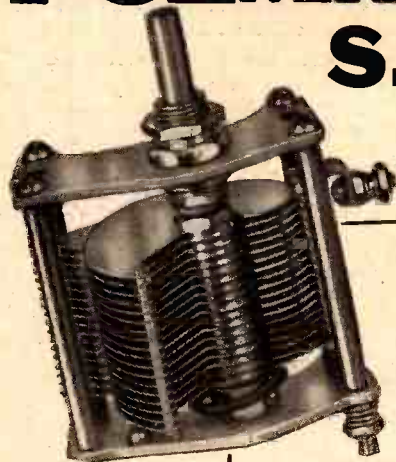
EVERYTHING YOU CLAIM

"Having just received *THE MANUAL OF MODERN RADIO* I feel that it is up to me to thank you for the prompt attention I received. It looks as if it's everything you claim it to be."—*A. Linggood, 359, Fairfax Drive, Westcliff-on-Sea.*

A WONDERFUL ACCOMPLISHMENT

"I would like to join in thanking Mr. John Scott-Taggart for the presentation gift of *THE MANUAL OF MODERN RADIO*. It is a wonderful accomplishment of Mr. Scott-Taggart's, and, as so many readers have already said, a veritable store of information for the amateur and expert alike."—*L. J. Silvester, Paseo Reding 35, Ent. Der., Malaga.*

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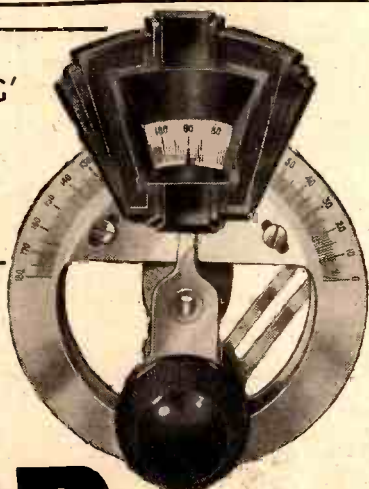
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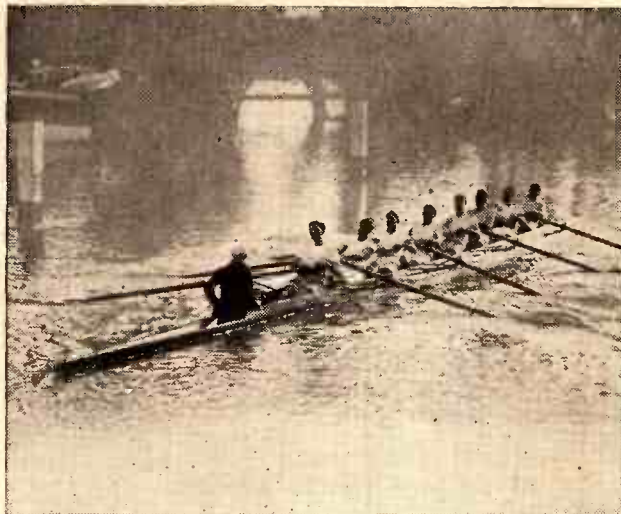
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UNIQUE IN ITS SIMPLICITY

"Just a line to thank you for the finest gift any wireless paper has yet presented. It is the ideal book for the radio amateur and a gold mine for the novice. Mr. Scott-Taggart's method of explaining all the new and intriguing developments in wireless is unique in its simplicity."—*F. N. Bedwell, Rosemont, Evesham Road, Stratford-on-Avon.*

INTERESTING AND USEFUL

"I beg to acknowledge, with many thanks, the receipt of my copy of THE MANUAL OF MODERN RADIO.

"The book is handsomely bound, and the letterpress and illustrations are clear and distinct. I feel sure that, when I have time to read it all, I shall find it both interesting and very useful."—*Miss B. O'Rourke, The Old Vicarage, Fordington Hill, Dorchester.*

HEARTFELT THANKS

"May I offer my heartfelt thanks to all concerned in giving readers THE MANUAL OF MODERN RADIO.

"I received mine to-day, a matter of only two days between sending vouchers and receiving book. Thanks. I take off my hat to J. S.T."—*J. Nichols, 69, Grange Road, King's Heath, Birmingham.*

MY MONEY'S WORTH

"Just a few lines acknowledging receipt of John Scott-Taggart's masterpiece, THE MANUAL OF MODERN RADIO, which arrived at my home in good time and in perfect condition.

"What I have seen of it has satisfied me, and I consider I have got my money's worth.

"I feel it my bounden duty to inform you as to my extreme satisfaction with the deal."—*B. Airey, 27, Two Trees Lane, Denton, near Manchester.*

WORDS ARE INADEQUATE

"I am afraid mere words are totally inadequate to express my pleasure at owning such a book as THE MANUAL OF MODERN RADIO, and I can only wonder what magic made it obtainable at such a low price."—*William F. Stanton, 10, Kinnear Road, Shepherd's Bush, W.12.*

I HAVE LEARNT A LOT

"I should like to thank you for THE MANUAL OF MODERN RADIO, which I received safely.

"It is a mine of information, and I have learnt quite a lot already. The binding, too, justifies a proud position on anyone's shelves.

"Also congratulations and thanks to J. S.T. himself, who, I know, will be thanked by many other of your readers."—*Leonard Cockell, 31, West Street, Trowbridge.*

A CHILD COULD UNDERSTAND

"Never have I come across a book which has excelled THE MANUAL OF MODERN RADIO for the plain, straight way it has been written. Even a child could understand it."—*W. G. Booker, 6, Southdown Road, Carshalton, Surrey.*

SOMETHING REALLY GREAT

"In acknowledging the receipt of THE MANUAL OF MODERN RADIO, by John Scott-

READ THESE OPINIONS!

Last month we published two or three pages of enthusiastic praise from the leading authorities on radio in this country.

Never has there been such weighty and authoritative support given to any volume since radio began. Mr. John Scott-Taggart's work receives the public endorsement of such learned authorities as Dr. W. H. Eccles, F.R.S. (who has been President of the Institution of Electrical Engineers and of the Institute of Physics), and Professor E. V. Appleton, F.R.S.

On the research side there is C. C. Patterson, O.B.E., M.Inst.C.E., M.I.E.E., F.Inst.P. (Past President of the I.E.E. and Inst.P. and head of the great research laboratories of the G.E.C., the leading electrical concern in the country), and Capt. H. J. Round, M.C., M.I.E.E., former Chief of Research of the Marconi Company.

The radio industry is represented by Mr. W. W. Burnham, Past Chairman of the Radio Manufacturers' Association, by Capt. S. R. Mullard, M.I.E.E., of valve fame, and by others.

Before you send for the MANUAL, read these extracts, which form a remarkable national tribute to John Scott-Taggart, from the leaders of every section of the art of radio :

"I have looked through it with the greatest interest . . . a remarkable collection of all the technical developments . . . right up to the moment . . . written in clear and concise language. . . . A valuable instructor and safe guide."—*Dr. W. H. ECCLES, F.R.S.*

"Admirably suited . . . attractively written . . . illustrated by most excellent diagrams . . . thoroughly up to date."—*Prof. E. V. APPLETON, F.R.S.*

"A wonderful piece of work."—*Capt. S. R. MULLARD, M.I.E.E.*

"Mr. Scott-Taggart has a truly encyclopaedic knowledge. The Manual is unique in its own field, and I can confidently urge readers to grasp this opportunity."—*P. P. ECKERSLEY, M.I.E.E.*

"Mr. Scott-Taggart should be congratulated on his fine effort."—*Capt. H. J. ROUND, M.C., M.I.E.E.*

"This book will come as a god-send."—*C. C. PATTERSON, O.B.E., M.Inst.C.E., M.I.E.E., etc.*

"He has not lost his fluent style and knack of explaining radio problems in a manner which makes them easily understood by the average radio listener. . . . Right up to date. . . . This book is perhaps the best of its class."—*W. W. BURNHAM.*

"Right up to date. I have not seen a more complete text-book in years."—*Capt. DE A. DONISTHORPE.*

"Such a Manual was badly wanted by the vast radio public, and no one was better fitted to provide it. . . . I am amazed at the quantity of his energy and the quality of his work."—*Dr. J. H. T. ROBERTS.*

800,000 COPIES OF JOHN SCOTT-TAGGART'S BOOKS HAVE BEEN SOLD!

Taggart, may I express how delighted I am with it.

"You are to be thanked for, and congratulated upon, placing such a splendid book in the hands of readers. What an amazing knowledge 'S.T.' has, and how entertainingly has he written this volume.

"Your descriptions of the work led us to expect something really great. We have not been disappointed."—*P. W. Evans, 30, Weston Park Road, Pevensey, Plymouth.*

I AM DELIGHTED

"I received my copy of THE MANUAL OF MODERN RADIO last week, and I am delighted with the binding, and the quality and quantity of information contained between its covers.

"I hope you and Mr. Scott-Taggart will accept my thanks for making it possible for constructors to obtain such an excellent work."—*L. Skelton, 15, Escombe Road, Bishop Auckland.*

A GREAT GIFT

"THE MANUAL OF MODERN RADIO is indeed a great gift of Mr. Scott-Taggart's.

"I gave it to my son as a birthday surprise, and by the look on his face it could not have been a more delightful surprise. 'Just what I wanted. Everything complete, and made so simple for all to understand. I am more than pleased to have such a book.'"—*A. Randall, 27, Curtis Way, Berkhamsted.*

A PLACE OF HONOUR

"Although by no means a beginner in wireless, every page of THE MANUAL OF MODERN RADIO is interesting to me, and in my opinion it is the finest technical book on wireless yet published.

"Already I have made improvements in my set by following Mr. Scott-Taggart's lucid instructions, and the MANUAL holds a place of honour in my wireless 'reference library.'

"Congratulations again to John Scott-Taggart on his masterpiece."—*C. Henderson, 8, Mulliner Street, Liverpool.*

THANK YOU VERY MUCH

"Thank you very much for sending THE MANUAL OF MODERN RADIO so promptly.

"It is a book that no beginner or amateur should be without."—*E. Laurence, 21, Wickham Lane, Plumstead, S.E.18.*

MORE THAN DELIGHTED

"I beg to acknowledge receipt of THE MANUAL OF MODERN RADIO, with which I am more than delighted. It far exceeds all expectations.

"Thanks for the prompt delivery."—*L. Witherington, 16, Railway Terrace, Caerphilly, Glamorgan.*

PASSED ALL MY EXPECTATIONS

"It is a most comprehensive work, and has surpassed all my expectations. It's a book all should own."—*W. Reeder, Kings Road, Fakenham.*

PROUD TO POSSESS

"It is the most comprehensive treatise on present-day wireless practice I have yet seen, and you are to be commended upon such a production.

"It is an ideal text-book or book of reference, and one which every reader should be proud to possess."—*C. D. Davies, 11 Wyndham Street, Ton Pentre, Rhondda.*



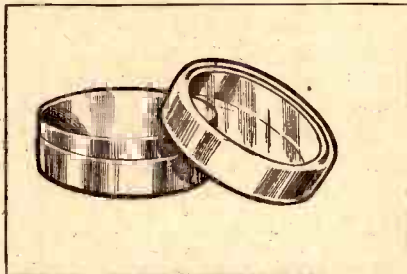
PRACTICAL SUGGESTIONS

Two tips which all constructors, and other radio enthusiasts, will find really useful.

Boxes for Small Parts

In wireless construction we use a large variety of small bits and pieces. There are bolts and hexagon nuts of various B.A. sizes, terminal nuts, washers, flat, spring and

WITH GLASS LIDS



Small boxes with glass lids are useful for small screws, nuts, etc.

locking, wood screws, grub screws, rivets, escutcheon pins, and many others.

The cigarette tin is all very well in its way as a container, but something far handier is the little metal box with

glass lid illustrated. A dozen or more of these boxes can be kept in a large size cigarette tin, and through the transparent lid you can see at a glance what each contains.

These very convenient boxes are obtainable quite cheaply from tool shops, and if they are used as containers of small parts a great deal of trouble is saved when constructional work is in progress. Celluloid lids would be even better owing to their non-liability to breakage, but though I have made inquiries I cannot at the moment hear of any firm from which boxes with such lids can be obtained.

Should any reader have discovered such boxes perhaps he will write and say where.

R. W. H.

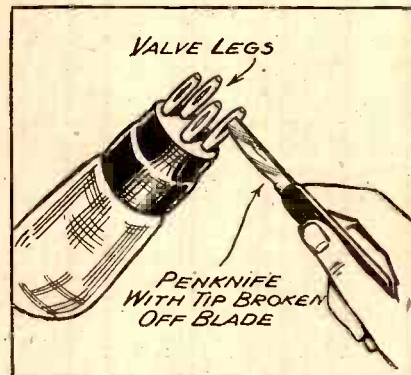
Opening Valve Legs

With the old-type of valve legs which were split like an ordinary wander plug, it was a simple matter to open them up a bit to ensure good contact. But this is not so easy with modern valves.

It is true that the legs on valves these days do not require opening out so often, but occasionally it becomes desirable with a valve that has been in use some time. Great care has to be taken in doing it to avoid breaking the thin wire which runs down inside the leg.

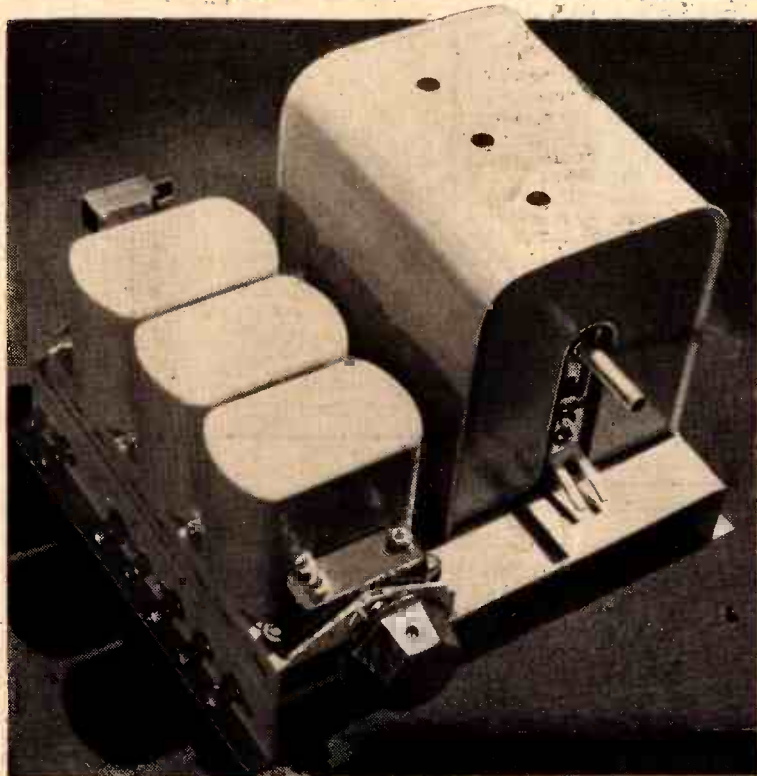
The best implement for the job is the small blade of a penknife, the tip of the blade of which has been snapped off (a quite frequent occurrence). The blade is thin enough to fit into the slits in the valve legs, but having no point it will not go in far enough to damage the internal wire. A. S. C.

THE BEST METHOD



How the contact of modern valve pins may be improved.

The most efficient tuning unit of all



- The ideal tuning unit for Amateur and Expert Constructors alike. Saves endless time, trouble and money.
- Built of the finest components only, carefully tested and perfectly matched.
- As it incorporates Ferrocart coils, the most advanced coils yet made, the highest degree of selectivity and sensitivity is ensured.
- Make certain of the best results—get a Colpak for your next set. The type illustrated is "Colpak" Type H. at 57/6

Made under licence from patentee, Hans Vogt.

COLVERN

Colpak Ferrocart tuning unit

COLVERN LTD., ROMFORD, ESSEX
London Office: 150, KING'S CROSS ROAD, W.C.1

REDUCTION IN PRICE OF VARIABLE COLVERSTAT

Type S.T. 5.C. Protected Windings.
Rating, 5 watts. Standard values,
250 to 25,000 ohms.

Reduced from 5/3 to **3/6**

SOUND OR VISION WITH ONE RECEIVER

By H. PRATT.

Details of a simple scheme which enables one receiver to be used for television announcements as well as for the reception of the vision "modulations."

EVEN to the fortunate owner of two receiving sets, with their separate aerials required for 100 per cent reception of television broadcasts, a simple gadget such as that described hereunder will prove very useful, and for the enthusiast with only one good receiving set who is entering the field of television and experimenting with apparatus already fully described, to receive either vision signals from London National or sound on the loudspeaker from Midland Regional at the turn of a switch, enables the programme to be followed completely from start to finish.

Very Little Required

The few items required for converting an average receiver having two tuned circuits such as the "S.T.300" or "S.T.400" are:

2 Preset condensers, .0001 mfd. max. (Telsen).

1 Four-point two-pole switch, No. 153 (Telsen).

1 Two-point switch, No. W.107 (Telsen).

Where the receiver has three tuned circuits—i.e. band-pass tuned aerial or two stages of tuned H.F.—a third preset condenser and a six-point three-pole switch instead of a four-point are required, and should the receiver be tuned by ganged condensers, care should be taken in connecting up the presets to prevent stray capacities as far as possible, which would affect the ganged tuning of the receiver.

How It Works

The presets and switches are shown mounted on a small baseboard with suitable terminal strip for connections, but if desired the few components can be incorporated in any average home-constructed set with the switches mounted conveniently on the front panel.

As will be seen, the presets are connected across each variable tuning condenser in the receiving set (just like the small trimmers incorporated in ganged condensers) and are thrown in or out of circuit simultaneously by

operation of the two-pole switch A. The two-point switch B is connected in series with one of the loudspeaker leads, the television apparatus being permanently connected to the output circuit of the receiver, and this enables the loudspeaker to be cut out when operating on vision signals.

Now, with regard to the actual setting of this attachment, after connecting up, with the ganged switch A in the "off" position and the loudspeaker switch B "on," the

presets being left screwed "out" as far as possible, tune in London National to the loudest signal with reaction adjusted as required, carefully noting the dial readings for future reference.

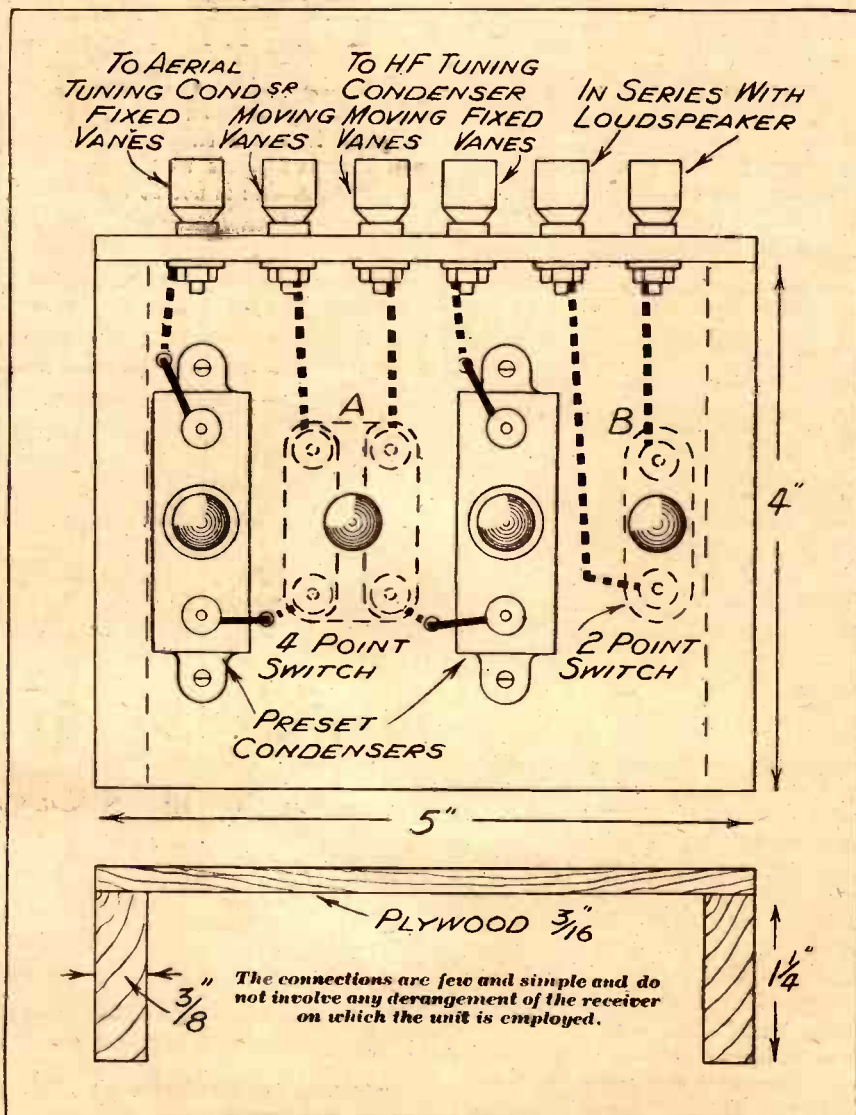
Then throw switch A to the "on" position and adjust up the presets until Midland Regional is brought in (do not alter the main tuning condenser settings in any way), and this should present no great difficulty if a time has been chosen when this station is giving out a different and easily recognisable programme, this being frequently the case.

Rapid Change-over

Reaction should not require any further adjustment, in practice it being found that a "compromise" setting for this gives ample volume on either station. It is then possible

(Continued on next page)

THE UNIT FOR CONVERTING AN EXISTING SET



SOUND OR VISION WITH ONE RECEIVER

—continued from previous page

to have either of the programmes on the loudspeaker with the flick of the switch, and, provided that London National dial readings have been recorded and the preset condensers locked in position, this happy state of affairs can be returned to every evening that television is "on the air."

"We Have Television"

The writer starts up a few minutes before 11 p.m., the switches set to Midland Regional, with loudspeaker on, the televiewer "turning over" at approximately 750 r.p.m. and the neon lamp glowing nicely. We hear the announcer on Midland Regional introducing the artistes, and the moment he finishes, "click" goes the switch and we have television.

If desired, the loudspeaker can be cut out, but is sometimes left on as a guide to signal strength or fading. At the end of each "turn" the switch is thrown to catch any further announcements, or should the picture fade or vision prove uninteresting, back we go to Midland Regional to hear what is going on.

KEEPING FREQUENCY CONSTANT

WITH the recent adoption of the Lucerne Wavelength Plan, we have heard a good deal about the keeping of transmitters dead on their right wavelengths. But the achievement of this is by no means so easy as you might imagine.

Did you know, for instance, that the capacity of an air-dielectric condenser varies with changes in the barometer reading? When the barometer reading alters it indicates a change in the pressure of the air, and this has an effect on the dielectric constant.

A Real Survey

This is just one of the interesting things revealed in a new report recently published by His Majesty's Stationery Office at one shilling. The full title of the work is "Valve Oscillators of Stable Frequency," and its sub-title, "A Critical Survey of Present Knowledge."

And you can take it that its 56 pages represent a real survey in compact form. Ask for "Radio Research Special Report No. 13." A.S.C.

AGAIN this Leading Designer CHOOSES A 'MICROLODE'



A "Microlode" was Mr. John Scott-Taggart's first choice for the S.T. Super. For his new S.T.300 Star his first choice is again a "MICROLODE."

● There are solid reasons for these consistent recommendations by leading radio technicians.

● The unique "MICROLODE" feature, with its 17 ratios for accurate matching to power or pentode valves and 4 for Class B, brings balance of tone and crisp top notes otherwise unobtainable. The famous Mansfield magnetic system, giving 30% stronger flux density than a good ordinary cobalt steel magnet of equal weight, produces greater sensitivity and better "attack."

● The innumerable small refinements in technique developed in seven years of moving coil speaker specialisation complete a brilliant and advanced design.

● To appreciate the improvement in results you must hear one on your set. Ask your dealer to arrange it. You will be amazed.

'MICROLODE'

(Regd. Trade Mark)

MOVING-COIL SPEAKERS

PM 6	-	-	-	32'6
PM 4A	-	-	-	42'
PM 2A	-	-	-	79'6
PM 1A	-	-	-	120'

Handsome cabinets are also available.

Write for the W.B. folder.



Whiteley Electrical Radio Co., Ltd., Dept. C., Radio Works, Mansfield, Notts.

Sole Agents in Scotland: Radiovision Ltd., 233 St. Vincent St., Glasgow, C.2. Sole Agents in I.F.S. Kelly and Shiell, Ltd., 47 Fleet Street, Dublin.

FROM MY ARMCHAIR

—continued from page 298

In certain branches of radio—for example, in beam and short-wave aerial design—the theorist has found a profitable field for constructive work.

The short-wave transmitting amateur receives recognition from Sir Frank Smith in his lecture:

"The biggest shock to the theoretical worker was provided, however, by results obtained by amateurs operating with very short waves. Amateurs were allowed to transmit and receive waves less than 100 metres long in the belief that the small power used and the rapid absorption of short waves by the earth would prevent serious interference with commercial wireless services. The story is well known of how one day, with no more energy than is represented by a 200-watt incandescent lamp, signals from America and New Zealand were received in England."

Short-Wave Surprise

I suppose that the failure of the scientists and mathematicians to suggest or forecast the value of these short waves is the most incomprehensible and reprehensible feature of

the history of radio. They missed their one stupendous chance. They urged the use of waves ten miles long where to-day we make them thirty yards in length.

My scheme for referring readers who have had any trouble with my sets to local experts—amateur or professional—is in force.

But for the service to be complete I want a lot more letters from those with the ability to diagnose faults and repair them.

Only really experienced, efficient men should apply, sending in details of their experience.

More Service Facilities

This service is only for my own sets. Applicants to be put on my "list" should be wireless dealers with a real interest in home-construction or else very good amateurs who can put sets right.

Anyone who has experienced trouble with one of my receivers will be sent the list of local "radio doctors" by the Query Dept. The constructor then approaches his local man, whom he pays by arrangement between themselves.

No one need apply who is not willing to repair sets on a "payment by results" basis. But I shall welcome

scores of good men for my list, which I should like to cover every hamlet in the country.

The scheme is already working on a small scale, but I want to expand it gradually, putting all those who are in trouble in touch with those on the spot who can, for a small fee, put matters right.

Such a vast number of my sets is built that this will be an added and valuable service.

But only really competent men should apply.

An Illustrious Inventor

I was astonished the other week to read in a rather obscure West of England newspaper the following amazing definition:

Eddy Currents.—*Currents set up in a metal by fluctuating currents through a winding; so called from the name of their discoverer.*

During a long career, I have heard at different times of Dr. Amp, Signor Volt, and other truncated geniuses whose main claim to perpetual fame lay not so much in watching frogs' legs twitch or stroking tomcats' backs in the dark, but in the brevity of their names.

But of the illustrious Eddy I had never heard. In my folly I had imagined that eddy currents were so called because they swirled about. I have, however, since got together all the known data regarding the discoverer of eddy currents.

It has involved much research, but here it is:

Heinrich Aloysius Nebuchadnezzar Edelweishunter† was the youngest of the thirteen children of a charcoal burner in the Black Forest and of the daughter of a Thuringian watchmaker. His mother—like all the daughters of Thuringian watchmakers—was a woman of singular beauty, and Heinrich Aloysius Nebuchadnezzar inherited none of it. This caused his father much disappointment because he had always said, "Gretchen†, lieb-ling, our thirteenth will be our most beautiful."

It is said that the plainness of his youngest child broke his heart, and was the cause of his death. But other authorities point out that the charcoal burner was 93 years old when he died, and that the cause of death was carbon monoxide.

The loyal mother, however, would always reply to any criticism of her son by saying, "My piccaninny

(Continued on next page)

MAKE YOUR HOBBY PAY

You can qualify for well-paid employment

Thousands of men who started radio as a hobby are now in well-paid regular employment. Research and Laboratory work, Designing, Testing, Servicing, Installing, Demonstrating and Selling, Technical Correspondence, and many other interesting jobs at good pay are available for trained men, whilst many other industries outside radio also require men with radio knowledge. We train students of all ages. We can train you and give you the sort of training that employers demand. Every student is guaranteed introductions to leading employers, and is given valuable assistance in obtaining the sort of work he wants.

EARN £5 A WEEK
IN YOUR SPARE TIME

One of our students has just informed us that he is now averaging £5 from spare time servicing and set building. As a result of his work he has been offered two full-time jobs at good pay.

PROMOTION AND BIGGER
PAY

Another student, after studying for only five weeks, has just been promoted, with an increase in salary, as a direct result of our training.

What others are doing, you can do. We can give you the sort of training which will enable you to earn good money.

We specialise in radio, and the College is conducted by well-known radio experts. (Chief Technical Contributor: G. P. Kendall, B.Sc., Principal: R. H. Bradley.) We do not use foreign text books, or waste your time with obsolete theory. T.C.R.C. Correspondence Training is thorough, up-to-date and individual. Every modern development is clearly explained. The inclusive fees are very reasonable, and can be paid by easy instalments if desired.

ACT NOW, SUCCESS AWAITS YOU. Post coupon now for our Prospectus. It is free for your asking. It will place you under no obligation. You will not be pestered to enrol.

RECOMMENDED BY
LEADING RADIO MEN

W. S. Verrella, Esq., Managing Director of EKCO Radio, writes: "There is a great future in radio, and the men who take the trouble to study and specialise will find their progress assured. I know that those who complete the thorough Course will be well equipped with the valuable knowledge so essential to the modern radio craftsman."

Leslie McMichael, Esq., of McMichael Radio Ltd., writes: "The need for good and well-trained service men is a very urgent one, and jobs are undoubtedly available for this class of man."

Special Courses for Service men are now available, giving thorough training in servicing of all modern sets. Send for full details.

TECHNICAL & COMMERCIAL RADIO COLLEGE
CROMWELL HOUSE, HIGH HOLBORN, LONDON, W.C.1

To Technical & Commercial Radio College, Cromwell House, High Holborn, London, W.C.1. Please send me full details of T.C.R.C. Correspondence Training.

(Add stamp if posted in unsealed envelope.)

Name.....

Address.....

Con 1.

† He changed his name later by deed poll.
‡ This was the name of the Thuringian watchmaker's daughter.

FROM MY ARMCHAIR

—continued from previous page

doesn't look much, but some day he will discover eddy currents and marry a rich transformer-maker's daughter."

The villagers, however, shook their heads and murmured "Schwartzkopf" behind his back. The first sign of Heinrich's genius was when he was caught experimenting by his father. He had just placed a piece of his father's charcoal and one of his mother's zinc watches in a bowl of salt water. For this his father gave him a good thrashing, but his mother defended him, and said, "I don't know what the child has been doing, but if he is prevented he will never discover eddy currents and marry a rich transformer-maker's daughter."

It had become an obsession that her young son should marry well. But within three years Heinrich Aloysius Nebuchadnezzar had electro-plated one of his mother's zinc watches and given it to the goose-girl Gridda, who lived in the neighbouring village of Schmutzlewetter.

(The continuation will follow next month.)—J.S.T.

BIG POWER AT BISAMBERG

—continued from page 305

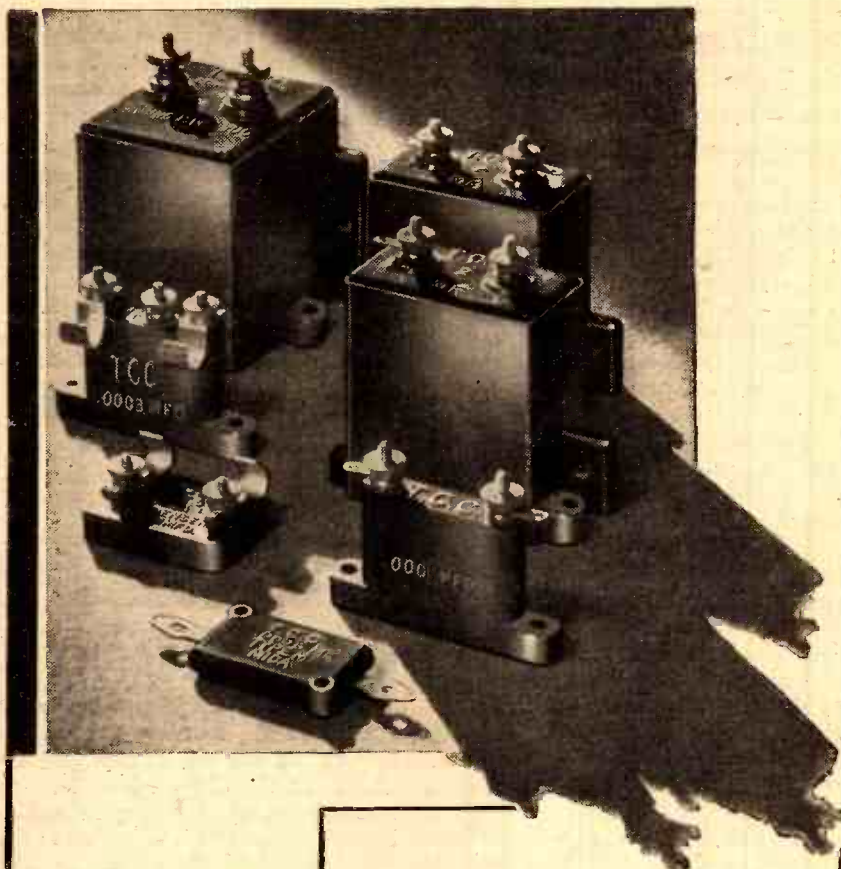
published in THE WIRELESS CONSTRUCTOR. There is a control desk with thirteen meters on a sloping panel, and with over a hundred shielded cables going to remote controls on the flat part of the desk.

The extraordinary thing about Bisamberg is that there are no transmitter panels. In spite of the high power (each valve in the final stage can carry 300 kilowatts!) the tuning circuits and valve racks are each stood out in the transmitter hall on ebonite and porcelain stands, and only a safety rope round the two sides of this section of the transmitter hall prevents blasé broadcasting engineers from testing out the effectiveness of electrocution!

Rapid Accessibility

When I inquired about this, I was told that the men who built Bisamberg were convinced of the advantage of being able to get at every part of the transmitter in a hurry.

There is an ingenious relay system, so that flashing lights on the desk signal immediately if a fault develops in any high-tension circuit or water-cooling supply.—A. A. S.



T.C.C.

ALL-BRITISH
CONDENSERS

are

PEDIGREE CONDENSERS

Thoroughbred—of sound stock—a line that goes back twenty-seven years . . . more than a quarter of a century's research—unmixed by other activities—always condensers. And so . . . development, year by year keeping just ahead of radio's needs.

That is what T.C.C. stands for—what backs each and every T.C.C. Condenser you buy. Any of the group of popular T.C.C. Condensers illustrated—or the latest electrolytic, or a block condenser, they are reliable—dependable.

Insist on T.C.C. and be sure.

The Telegraph Condenser Co., Ltd.,
Wales Farm Road, N. Acton, W.3.

S.T.300 STAR

Your Guide to Success

— continued from page 289

have to turn the knob the opposite way to the one recommended to produce the desired results. I strongly advise all but experienced wireless amateurs to adhere to the actual differentials used in the set.

It is quite in order to use any of the alternative recommended parts, as these have been carefully checked. For example, the coils and condensers if of approved types need not adhere to the original specification in the set, and those who have variable condensers of .0005-mfd. capacity in, say, their original S.T.300 receivers can continue to use them.

It is probably advisable to purchase a new aerial coil, but the anode coil of an S.T.300 type may be retained as no alteration has been made to this. The anode coils for S.T.300, S.T.400 and S.T.500 are all identical, while S.T.400 and S.T.500 aerial coils are the same.

Those who desire to convert the S.T.300 to the S.T.300 Star can do so at quite a negligible cost if they

compare my list of components and alternatives with those which they already have in their set. It is quite unnecessary to purchase a completely new set of parts for the conversion.

And now I will leave the operating of the set to yourselves, confident that after an hour or so's experience you will be enthusiastic over the fact that such high performance is obtainable from only three valves.

J. S.-T.

IN PRAISE OF THE S.T.300 STAR

Appreciations from some of the first readers to build this fine receiver.

HIGHLY PLEASED

From David Watson, England Cottage, Pilcople.

"I have put aerial reaction on my S.T.300 and I may tell you it fairly gives the set a 'kick' right up and down the dial on both long and medium waves, bringing in stations in daylight every bit as strong as they were at night before aerial reaction was fitted."

BETTER THAN ALL-MAINS SUPERHETS

From Philip E. Brown, 119, Hinckley Road, Walsgrove, Coventry.

"On Saturday evening I experienced the thrill which I have had only twice before: first when I switched on my first home-constructed receiver, and then when I twiddled my good old S.T.300's knobs for the first time.

"By now you will have probably realised that you are reading a letter from a builder of the S.T.300 Star. Well, I am very pleased and more than satisfied with this lusty juvenile—the S.T.300 Star. I can only say that if any designer is capable of obtaining a quart out of a pint-pot—then you are the man!

"Using a 50-ft. indoor aerial, a Blue Spot 66R unit and an eliminator, I am now getting reception such as I have heard only from all-mains superhets, but with much better quality—real high stuff and real bass, not cabinet resonance!

"Station getting is a habit of this set. On Sunday morning I received two South American and twelve United States stations on the medium waves. I only need Australia to complete my bag of five continents on the medium waveband."

VOLUME AMAZING

From Claude Roberts, 4, Hibernia Terrace, Weston Mill Estate, Devonport.

"I hope I am the first from Plymouth. Have just finished the Star. Volume amazing. Never dreamt I could get the sound from my power valve that I am listening to now.

"I also built your S.T.300 and S.T.400 and more than satisfied with both.

"By the way, the 'Manual' which I possess is one of my proudest possessions. It is teeming with information from cover to cover and easy to follow.

"Thanking you for a fine set, a fine book and a finer outlook in the future."

CONGRATULATIONS—A REALLY FINE JOB

From F. H. Tye, 8, Capel Gardens, Seven Kings, Essex.

"Congratulations! S.T.300 Star is a really fine job. I think great credit is due to you for the care and attention given to your designs, both from an explanatory and practical standpoint, and if only constructors will keep to your component specifications, satisfaction is definitely assured."



Matched and Tested Kits for all

SCOTT-TAGGART'S

STAR CIRCUITS

S.T. 500 DE LUXE	£5 12 6	S.T. SUPER STANDARD ..	£9 7 6
4 Valves	£2 5 3	6 Valves	£3 12 6
S.T. 300 STAR DE LUXE ..	£4 2 6		
3 Valves	£1 11 3	S.T. SUPER DE LUXE WITH	
S.T. 300 STAR STANDARD ..	£3 0 0	CLASS B OUTPUT ..	£12 0 0
3 Valves	£1 11 3	7 Valves including Class B ..	£4 3 3
S.T. 300 STAR CONVERSION		S.T. SUPER (A.C. MAINS) ..	£18 0 0
KIT	15 6	6 Mains Valves	£4 18 0
S.T. 300 STAR (A.C. or D.C.		S.T. SUPER (D.C. MAINS) ..	£15 10 0
MAINS)	£6 17 6	6 D.C. Mains Valves ..	£4 18 0
3 Mains Valves	£2 8 6		

Full constructional details supplied with each kit. Any set constructed to order.

ADAPTO 3 KIT	£3 5 0		
3 Valves	£1 11 3		
ECKERSLEY NATIONAL DE			
LUXE	£5 17 6		
3 Valves	£1 19 0		
ECKERSLEY NATIONAL DE			
LUXE (A.C. MAINS) ..	£9 12 0		
3 Valves and Rectifier ..	£3 2 0		

EVERYMAN FOUR

Dual-Range Litz-Wound Coils, the most efficient coils ever designed.

Aerial and Anode Coils, per pair 27/6

Any Radio or Electrical Material supplied. Mains and Battery Receivers and Amplifiers constructed, best workmanship and material. Write for quotations, our advice is free and unbiased.

MARCUS, OVERTON RADIO LIMITED, 62 Borough High Street, London Bridge, S.E.1.

TRADE SUPPLIED. (One minute from London Bridge and Borough Market.) 'Phone: HOP 4431

VIBRATION AND SOLDERING

Dear Sir,—I note you would welcome readers' opinions upon the question of soldering, and am pleased to express my own conclusions. I was a solder fan, having acquired, shall we say, the "knack" at an early age, and the nice eye-pleasing arrangement of tinned wire and soldered joints looked a good mechanical job. But it had its snags.

Apart from the bother when an alteration was required in a set so constructed, I found in several household sets trouble from bad connections after about six months of use. Not dry joints, but loosened terminals wherever stiff wire was so bonded.

An Immediate Clue

I re-wired a set with ordinary rubber-covered small flex, single, of course, turned the conductors tightly together before making the eye ends to suit the binder posts, and the result was (1) no more bother with bad connections; (2) alterations to the set only needed a pair of pliers and screwdriver, and could be done very often in the time taken to heat and most probably re-tin the soldering bit; (3) the rubber-covered flex was sufficiently firm to make a neat wiring job, without the fear of a short circuit.

The above, of course, was several years back, in the days of S.T.100, and some of the wiring so made has been perfect after three years without attention, although generally one to one and a half years is about all that's required for permanent wiring in a set prior to alterations, etc.

To solder flex to permanent tags on components would be the quickest way in building a set, but should appeal more to the manufacturer of a standardised set than to a home constructor.

Therefore, I consider, and have satisfied myself, the best method of set construction is with flexible wiring to terminals direct, without tags or soldering.

Yours sincerely, G. THROWER.
The Bridge,
Wroxham, Norfolk.

AS WE FIND THEM

—continued from page 310

A New Clix Plug

The name Clix is always associated with ingenious and highly efficient connecting devices. The latest product bearing this trade mark is a particularly attractive wall plug which, the makers claim, will fit any 5-pin socket.

This desirable feature is achieved by using two split pins of a very resilient nature, thus enabling perfect connection to be made with wall sockets of varying sizes.

Another good point is the extreme ease with which the plug can be dismantled. Only one screw is employed to hold the cap and body of the plug together. Moreover, there is a complete absence of small grub screws such as are frequently met with in fittings of this type.

The ends of the flexible lead are simply passed through holes in the ends of the split pins after the wire has been threaded over a support to take any direct strain. Replacing the cap holds the wire firmly in position.

Eminently practical and effective, this Clix plug is a product of Messrs. Lectro-Linx, 254, Vauxhall Bridge Road, London, S.W.1.

ELIMINATING BACKGROUND NOISES

FOR long-distance reception it is most important that all background noises should be cut down to the absolute minimum. Few people realise how much of the background noise that occurs when sets are used in towns, at any rate, is due to electrical machinery, flashing signs, faults in electric lighting circuits, and so on. At short range such things may cause very loud noises; at some little distance they produce a mushy background, which is brought up when the set is in a sensitive condition.

An enormous improvement can often be made by using a metal-screened down lead for the aerial. These are made nowadays by several firms, and having tried them out with my own long-distance sets I can speak highly of their effectiveness.—R. W. H.



TELEVISION IN THE NEW HEAYBERD HANDBOOK

The third edition of the Heayberd 1934 Handbook is just published.

Have you got your copy?—if not, get it NOW. Contains a SPECIAL TELEVISION SUPPLEMENT with blueprints of Kits of Parts for various television uses. Fifteen blueprints showing how to build your own Mains Unit, Battery Charger, etc. Two pages of technical hints and tips for all amateurs. Cut out this advt. and send with 3d. in stamps for your copy.

F. C. HEAYBERD & CO.
10, Finsbury Street, London, E.C.2.
W.C.

RADIO GRAM CABINETS
65/- RADIO GRAM CABINET FOR 35/-
No Middle Profits! Finest Radio Furniture as supplied to B.B.C.

PICKETT'S
Cabinet (R.C.) Works, Boxleyheath, nr. London.

HAVE YOU HAD?
particulars of the famous "Magnum" Short Wave Adaptor, which is now available for every type of receiver?
Full particulars with a list of short wave stations and free trial offer, on request.
BURNE-JONES & Co. Ltd. (Dept. C),
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THE MODERN VALVE
Literature and prices on request.
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Terminus 6255.

PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

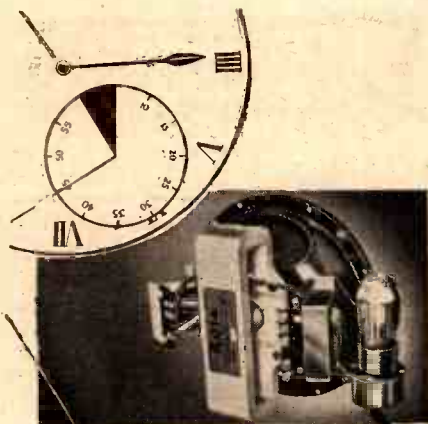
Write for Illustrated Catalogue of RADIO-GRAM-PHONE CABINETS of exclusive modern design, made by craftsmen in highly figured Oak, Walnut, or Mahogany, post free. REMARKABLE VALUE Cabinets made to order a speciality. Maker, under licence of the HOWE BOX BAFFLE Recommended by the B.B.C. Full details on request. **GILBERT SWINDON** Cabinet Maker, Estimates Free. Estd. 1866.

THE ADVANTAGES OF THE NATIONAL INSTITUTE OF RADIO ENGINEERING which is devoted solely to the training of Radio Engineers, are now offered to ambitious Students in a comprehensive and fascinating Home Study Course.

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THE NATIONAL INSTITUTE OF RADIO ENGINEERING, Guildhall Street, PRESTON.
Please send me your booklet "Wireless as a Career"

Name _____ Address _____



In 5 Seconds
5 Times the Volume
 from your Battery Set
 with a
ROLA CLASS B
Speaker Amplifier Unit

Five seconds is all the time you require to connect a Rola Class "B" Speaker Amplifier Unit to your battery receiver and volume and sensitivity are increased at least five times. Give your battery set the power and realism of an All-Mains receiver by getting one of these remarkable units to-day.

Model A.—For Mullard PM2B, B.T.H. P.D.220.
 Cossor 220B, Hivac B220, Marconiphone B21.
 G.E.C. B21, Clarion B22.
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***** MAKING CONDENSERS ***** A few notes written after a visit to a British condenser factory. *****

CONDENSER manufacture is a most exacting job. Let us look at the ganged condensers and follow their construction and testing.

Well, first of all you see a huge press stamping out the condenser plates. You just examine any one of those plates. No burred edges, you see.

If you took that plate to the laboratory and asked the engineer to place it on his original drawing, you would not be able to detect the slightest error. Then here is another machine. It is cutting slots into condenser plates. These are eventually the "split end plates."

Then we come to the largest press of all, and we see the framework of the ganged condenser being stamped out.

The Assembly "Jigs."

And now to the "jigs," where we see the condenser being assembled; such precision is a delight to the eye. The nimble fingers of the girls are carefully removing the "rotor" and "stator," and it is now ready for assembly in the frame.

The manufacture of ganged condensers is just one complicated mass of "mechanical tricks," and after them we come to "electrical tricks." The ganged condenser now requires matching electrically. There is no doubt that, mechanically, it is assembled to the finest possible limits, therefore electrical matching is a very fine process. Here you see a "capacitance bridge," and at six points of the scale the condenser is matched up to this standard.

The split end plates are very carefully adjusted, and only experts should interfere with them once the condenser has left the works. Naturally, the "insulation test" must be applied, and there we finish with a perfect ganged-condenser. R. E. B.

***** LOOKING-GLASS TUNING ***** By E. ELLIOTT. ***** A method of making dial readings easily visible. *****

A LITTLE mirror held against the dial escutcheon, face tilted slightly upward, will reflect an image that can very comfortably be seen.

For the attachment, a rough frame of wire will do; or you can go to the

refinement of a hinge, so that the glass folds out of the way when not required. I preferred to make a clip as a matter of fact, as shown in the inset. The screw of the escutcheon plate has been passed through a hole in the back of this, the clip being bent to a suitable angle after fixture.

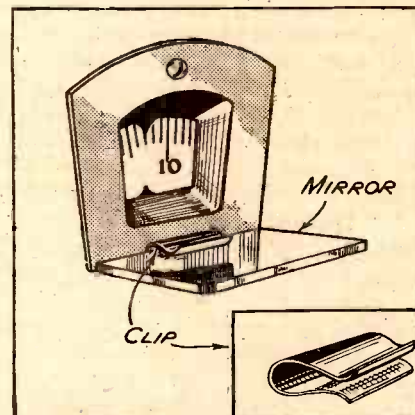
Avoiding Inversion

The dial numbers are naturally inverted, although personally I can read them just as easily. Nevertheless, they might be papered or enamelled over and fresh numbers inscribed with allowance for reflection.

Otherwise, a second mirror can be placed at the top of the escutcheon, faced parallel with the glass below, and both tilted at an angle slightly downward. The figures will then be truly rendered after inversion by the mirror.

Incidentally, either method gives scope for novel "sighting" devices. If a division is marked across the

FOR EASY VIEWING



This scheme is particularly useful for sets whose dials are normally below eye level.

middle of the mirror, corresponding with the existing hairline or index at the window, it follows that the coincidence of these two markings establishes a constant viewpoint for the eye. For calibration purposes the mirror must keep to one unaltered position of alignment.

Elaborate Possibilities

With a needle, rule a line on the back surface of the glass, afterwards smearing in paint or ink. This makes a beautiful hairline for guidance when making tuning adjustments.

If drawn on the face of the mirror, the line will duplicate from its own reflection, which is rather disconcerting. On the other hand, this very effect might conceivably be utilised for sighting; and if you have the two mirrors instead of one, the principle has complicated possibilities!

OUR NEWS BULLETIN



LISTENERS to London broadcast programmes recently were surprised to hear, instead of the familiar "death-watch beetle" interval signal, a cheerful peal of bells.

The B.B.C. has been trying out as an experiment a new interval signal. At least, it is new to the English listener, although it is thoroughly familiar to the Empire listener. It is a gramophone record of Bow Bells.

The B.B.C. requests listeners not to read into this any dissatisfaction with the interval signal which has been in use for the past few months. The use of the bells is purely an experiment.

"Treasury Extortion"

"Lex," in the "Financial News," recently published some pertinent remarks about the pirates of the Treasury. Here is a particularly apt extract:

"The report of the B.B.C. contains an amazing example of Treasury extortion. It shows that the gross amount paid by the public in licences last year was £2,968,000. The amount ultimately available to the B.B.C. for its programmes, etc., was £1,460,352. In other words, out of every 10s. paid by John Citizen to listen to Brahms, Bartok and Henry Hall, 5s. 1d. was not devoted to radio purposes at all, but disappeared immediately into the State's capacious maw.

* * *

"What other public utility company is compelled to hand back 51 per cent of its revenue to the State? The B.B.C., incidentally, pays income-tax on its own profits. This required £121,000 last year.

"The B.B.C. itself has ventured a mild protest against this banditry. Its report declares that the development of its programmes has been retarded by the emergency contribution of £225,000 it is required to make to the Treasury each year. Perhaps the Chan-

cellor will take the hint. If he cannot spare a million and a half, despite his forthcoming Budget surplus, he may perhaps make a start by removing the £225,000 emergency contribution."

The above "gives one furiously to think," as the French put it. Fifty-one per cent! When will listeners get together and refuse to knuckle under to this "banditry"?

And the Sequel!

And the Prime Minister states, in a written Parliamentary reply, that he cannot hold out any hope of time being found for discussion of a motion asking for an inquiry into the position and finances of the British Broadcasting Corporation and "its monopolist position."

Station Reduces Power

The Eiffel Tower broadcasting station in Paris is to be "muzzled" till it can be transformed from a long-wave into a short-wave station in accordance with the Lucerne plan.

The power of the station—which, some time ago, was jamming the Daventry National station—has been reduced by 50 per cent.

Facts and Figures

Wireless licences increased from 5,262,953 on December 31st, 1932, to 5,973,759 at the end of December, 1933, according to the B.B.C. report. Increased revenue from licences enabled the Corporation to spend £786,345 on programmes, an increase of £122,921 over the 1932 figure, in spite of emergency contributions to the Treasury. No fewer than 744 new schools were added to the register for school broadcasting.

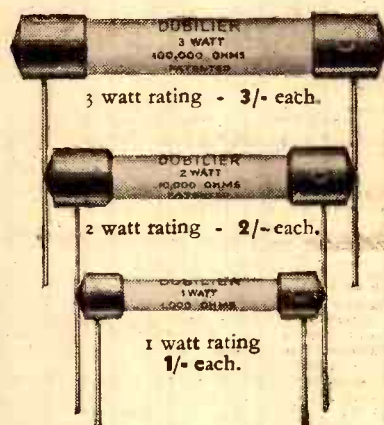
They Are Not Professionals

According to the "Sunday Dispatch," Broadcasting House is seething with discontent.

(Continued on next page)

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OUR NEWS BULLETIN

—continued from previous page

Changes are almost certain to take place, particularly if, as is generally believed, Sir John Reith receives an important new appointment.

In that event, possible successors would be: Colonel Alan Dawnay, director of programmes; Vice-Admiral Sir Charles Carpendale, director of internal economy; and Major W. E. Gladstone Murray, director of public relations.

It is said that Sir John Reith is being criticised by important young men of the B.B.C., and the main trouble is that the people at B.B.C. H.Q. are not professionals.

The "Sunday Dispatch" also states that the B.B.C. employs married women and even mothers, but no girl employee can say "Yes" to a marriage proposal and fix the day without first receiving the permission of an executive official.

The announcers, probably the hardest worked of all the officials at the B.B.C., are poorly paid.

The average announcer gets less than £500.

It is doubtful if even the chief announcer gets more than £650, if he gets that.

The Licences of the World

The International Broadcasting Union recently produced figures showing the number of licensed listeners in various countries.

Britain now leads Europe in the actual number of listeners, but it is believed that some of the Scandinavian countries are still ahead of us in the proportion of listeners to population. In the next column are the figures at the end of last year.

Algeria	9,249
Austria	507,479
Belgium	465,791
Britain	5,973,759
Czechoslovakia	573,109
Denmark	532,992
Danzig	20,909
Estonia	14,758
Finland	121,014
Germany	5,052,607
Greece	3,318
Guatemala	1,488
Ireland	45,008
Italy	365,000
Japan	1,608,724
Kenya	591
Latvia	50,808

Mr. Vernon Bartlett

The B.B.C. recently issued the following statement:

"Last December, Mr. Vernon Bartlett, who had been broadcasting regularly on foreign affairs since January, 1928 (under full-time contract since October 1st, 1932), decided to accept an appointment elsewhere.

"For Mr. Bartlett's full-time contract there was substituted an arrangement enabling his weekly talks to be continued, at any rate, until March 31st, 1934.

"The B.B.C. having come to the conclusion that the difficulties and responsibilities attaching to these

GREAT NEWS

is promised by John Scott-Taggart in our next number. Last month you read about the S.T.300 Star, the three-valver designed to succeed the S.T.300. And now S.T. has written an article especially

FOR S.T.300 OWNERS

in which he explains in detail just how your present S.T.300 receiver can be converted to give the vastly superior results of the S.T.300 Star. No listener who has an S.T.300—indeed no constructor of any kind—can afford to miss this fine feature, which appears in THE WIRELESS CONSTRUCTOR

NEXT MONTH

Levantine States	785
Morocco	11,218
Netherlands	648,275
Newfoundland	1,166
New Zealand	112,581
Norway	137,968
Philippines	15,693
Poland	311,287
Sweden	666,368
Switzerland	300,051
Tunis	4,192
Turkey	5,404
Yugoslavia	58,896

regular talks must be increased by Mr. Bartlett's work in other fields, this arrangement will not be renewed after March 31st.

"The B.B.C. is grateful to Mr. Bartlett for the consistent ability and judgment with which he has discharged a difficult task, and hopes that he will be available for occasional broadcasts in the future.

"Plans for the regular talks on foreign affairs after March 31st will be announced in due course."

INDEX TO ADVERTISERS

	PAGE
British Rola Co., Ltd.	326
Bulgin, A. F., & Co., Ltd.	282
Burne-Jones, & Co., Ltd.	325
Colvern, Ltd.	319
Clarke, H., & Co. (M/cr.), Ltd.	Cover ii
Chums	282
Dubilier Condenser Co. (1925), Ltd.	327
Gilbert, J. C. (Cabinets)	325

	PAGE
Heyberd, F. C., & Co.	325
Marcus, Overton Radio, Ltd.	324
Manual of Modern Radio	281 & Cover iii
National Institute of Radio Engineering	325
Peto-Scott Co., Ltd.	309
Pickett Bros. (Cabinets)	325
"Popular Wireless" Radio Atlas and Wavelength Guide	Cover iv
Standard Telephones & Cables, Ltd.	325

	PAGE
Telegraph Condenser Co., Ltd.	323
Telephone Manfg. Co., Ltd.	317
Technical & Commercial Radio College	322
Varley Products	282
Westinghouse Brake & Saxby Signal Co., Ltd.	Cover ii
Whiteley Electrical Radio Co., Ltd.	321
Wingrove & Rogers, Ltd.	317

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pictorial form to help the beginner, and it has been assumed that the reader knows nothing whatever about electricity or science. All one needs is the ability to read.

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