

The Wireless Constructor

Vol. XIII.

MARCH, 1932.

No. 65.

MORE ABOUT THE S.T. 300

by
**JOHN
SCOTT-
TAGGART**

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SELECTED
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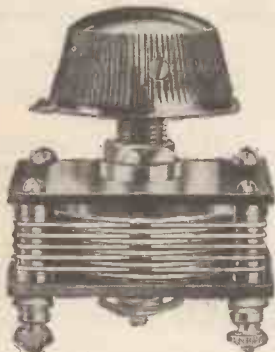
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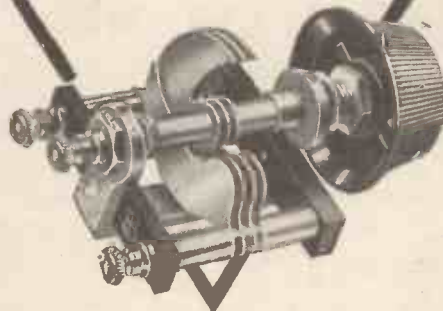
	Page		Page
The Editor's Chat	257	B.B.C. News	275
The Month on Short Waves	258	Making Radio Readable	277
"On the Grid"	258	The "Vi-King" Band-Pass Four	279
More About the "S.T.300"	259	Operating the "Kelsey" Adaptor	286
With Pick-up and Speaker	263	As We Find Them	288
British Constructors' Verdict on the "S.T.300"	264	Queer Queries	292
Round the Dials	266	The Heart of the Modern Set	293
Points for Purchasers	266	The Man Behind the Vaudeville	299
Three Selected Units	267	A Practical Man's Corner	302
Pick-up Hints and Tips	272	In Lighter Vein	306
Single-Choke Smoothing	273	Our News Bulletin	310

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 the permission of the patentees to use the patents before doing so.

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See page 312

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The WIRELESS CONSTRUCTOR

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

THE EDITORS' CHAT



The Editor comments on the overwhelming success of the "S.T.300," and has a few words to say regarding future issues of "The Wireless Constructor."

THE "return" of Mr. Scott-Taggart to radio journalism has proved an even greater success than we had anticipated, and it is now plainly evident that his "S.T.300" set is destined to create entirely new records in popularity.

The "S.T.300"

Already whole manufacturers' stocks of components have been absorbed in attempts to meet the colossal and nation-wide demands for "S.T.300" components, and the trade has received a filip for which it is no doubt extremely grateful.

The circulation of THE WIRELESS CONSTRUCTOR has risen to most gratifying new heights, and our mail-bag is swelling to enormous dimensions. And, remember, this is all success piled upon success, for even before the memorable February issue THE WIRELESS CONSTRUCTOR had again proved how firmly held was its position of pre-eminence as the home-constructor's "guide, philosopher and friend."

But it must not be thought that we are not fully cognisant of the fact that much of all this is due to the loyal support given to us by regular readers, that corps of stalwarts which forms the backbone of every journal.

Indeed, it is the recognition of this which spurs us on in the endeavour to provide better and better numbers, and we are confident that new readers will be doing themselves good service by becoming regular ones.

Always Advancing

This month Mr. Scott-Taggart contributes a further long article concerning his already famous "S.T.300," and there is a selection of letters from readers who have heard this notable receiver in action.

You will see from these that the "S.T.300" is not only a set bearing the initials of a designer of world-wide repute, but that its own intrinsic

merits tower above conventional "high-class" standards. And we should add in passing that, being designed with an eye to the future, it need not be feared that it is destined soon to be superseded by another equivalent "S.T." Three. We are able to say that Mr. Scott-Taggart has, at this stage, definitely ruled out such a step.

Full of Interest

Another article from the pen of Mr. Scott-Taggart is "The Heart of the Modern Set," and this deals in a very readable manner with the S.G. valve. The author shows that the "S.G." is not a mysterious accessory the action of which can be understood only by the physicist, but that it is a very interesting development of the ordinary "three-electrode" valve,

A RECORD RECEIVER



Claimed to be the largest set in the world, this huge receiver was recently on show at a London store.

and, in effect, is actually a "three-electrode" valve of a fascinating type!

Another important feature is a full description of the "Vi-King" Band-Pass Four, contributed by Victor King. This set employs the latest type of band-pass coils and a special scheme of ganged tuning.

It is a powerful receiver capable of giving full loud-speaker results, at optimum quality, from a large number of broadcasting stations. And if you glance at the photos of it you will see that it makes a particularly neat and workmanlike job—the hall-mark of scientific design as opposed to haphazard component assembly.

"Three Selected Units"

Under the title of "Three Selected Units" you will find the full constructional details of three circuits carefully chosen from our immensely popular book: "Seventy-seven Selected Circuits."

A wave-trap, an L.F. amplifier and a mains unit are dealt with, and the article should prove of vital interest to all readers.

There will be many who have been waiting for just that information that is given, while others will have an opportunity of seeing exactly how theoretical diagrams are "translated" into practical articles.

And now for a few words regarding our future plans. We do not intend to tell you much about these, for, after all, it is the element of surprise which adds piquancy to life!

But you should know, because none of you will want to miss the opening article in the series, that we are going to present a monthly "Scott-Taggart Causerie" (that may not be the exact title, by the way), in which that great technician will informally discuss various topics of interest, questions from readers, etc.

We hope to include this in our next issue.

THE MONTH ON SHORT-WAVES



All the latest news about this interesting band.

MY post-bag during the last month contained a long letter from W. H. H., of Willesden, N.W.10, in which I am severely taken to task for referring to W 2 X A D as a "punch-merchant." W. H. H. says that from October until well into March W 2 X A D is one of the hardest stations to log, and that our old friend, W 2 X A F, to whom, alas, I have also referred as a "punch-merchant," is not reliable until well after midnight.

Welcome Letters

As a matter of fact, I'm always glad to have letters of a controversial nature, but, unfortunately, W. H. H. seems to be under the impression that short-wave stations are received all over the country with the same degree of consistency as ordinary broadcast transmissions, and in

consequence just gently hints that perhaps we are not quite so up to date with information as we might be.

I am thinking that it is fortunate that most of you fellows are familiar with the vagaries of this short-wave game, as otherwise "freakishness" might be responsible for earning us a bad reputation!

But that is hardly likely.

Leading the Way

For when you come to think about it, which was the first radio journal in the world to organise, in the interests of short-wave reception, a special inter-Imperial broadcast from Nairobi? And is W. H. H. aware that, in the interests of the man-in-the-street, most of the THE WIRELESS CONSTRUCTOR research fellows haven't seen the sheets on the right side of midnight for years past?

Then about this "punch-merchant" business, are my results so very freakish, or is there something "dead-spotty" about N.W.10? Come, come, W. H. H.! Are we to believe that your results reflect the state of affairs all over the country? Or shall we take steps to find out what is happening elsewhere? Good idea?

The Next "H.M." Test

Right! Then we will hold the next WIRELESS CONSTRUCTOR "H.M." test around W 2 X A D and W 2 X A F, and I'm going to ask every one of you who receives either of these two stations (particularly W 2 X A F before midnight) between now and March 1st to send in a report, and to the writer of what, in my opinion, is the best report received I'm going to hand over the original "Kelsey" short-wave adaptor free, and gratis!

Just send me a line saying what you heard, when you heard it, and some observations concerning strength of reception and apparatus used.

While on the subject of "H.M." tests, I am glad to be able to add the name of Mr. B. M. Jensen, of Wallasey, Cheshire, to THE WIRELESS CONSTRUCTOR "H.M." list.

Mr. Jensen becomes an "H.M." on the strength of his reception of CT 1 A A, and his report on the programme which he received at R6 is, I think, undoubtedly the best of those received regarding this particular test.

RAZOR blades, I should imagine, are the very articles for which the saying: "A good servant but a bad master" was introduced.

Unfortunately, they are none too safe when out of the razor, as I know only too well, having just removed the bandage from my finger! Perhaps you wonder what all this is about. I'll tell you.

Most of we constructors know how useful a razor blade can be when making a set, for cutting off insulation from wire, and for all manner of trimming operations. I used to keep one handy in a box of odd drills, bradawls, and other small implements—until the other day.

"Once Bitten—!"

Now it has a special place all to itself, for while poking around in said box for a certain drill the blade turned on me and bit me! Or, rather, to be more precise, cut me badly.

Take my advice. Always keep that handy blade in its wrapping, and give it a special home where nothing else lives.

 * "ON THE GRID" *
 * A safety-first tip—Daventry's *
 * quality—Using fibre needles— *
 * Why do valves oscillate? *

Do you think you could tell without seeing a set whether the National programme was coming from Daventry or the medium-wave local? I reckon I could, but, then, it may only be imagination.

Knowing that the apparatus at what once was 5 X X is not particularly modern, and that the B.B.C. is going to rebuild it, it is easy to kid oneself that it is noticeably inferior to the more recent stations in the matter of quality. Still, I'm not so sure it isn't; otherwise, why should the experts consider it needs rebuilding?

Fibre Needles

Writing of quality reminds me of a little chat I had the other day with Mr. Boswell, who writes the "Pick-up Hints and Tips" each month. We

were discussing the use of fibre needles, and he pointed out that they could not be tried with needle-arm-type pick-ups. (I believe he has something to say about it this month.)

It has since occurred to me that there may be a way out. It is possible to buy converters which take the triangular type of fibre needles and have a shank that is equivalent to an ordinary needle.

"So This Is Radio!"

Why—oh, why—oh, why? If you want a valve to oscillate, it won't! Yet at other times it will oscillate for no reason whatever.

Take this instance. A four-valve set of the S.G., H.F. type with two L.F. stages, the first R.C. coupled and the second transformer.

Everything is connected, but no valves are in place. I insert the power valve alone, and switch on.

A loud, piercing howl immediately starts! Yes, the grid bias is on and the grid circuit intact. As soon as the first L.F. valve is inserted, all in the garden is lovely. Well, well! Such is radio!
 A. S. C.

MORE ABOUT THE S.T. 300



by
**JOHN
SCOTT—
TAGGART**

The immediate and overwhelming success of the "S.T.300" has added another triumph to John Scott-Taggart's list of famous sets. Above you see "S.-T." finally checking his master drawing from which readers' blue-prints were prepared. Every minute detail of this set has been personally planned by our distinguished contributor, who in the article below gives further details of the "S.T.300." This receiver he has standardised as his S.G. three, and readers can proceed to build it knowing that it will not soon be superseded or rendered out of date even if the ether becomes far more crowded than it is to-day.

THIS article should be read not only by those who have constructed the set, but by those who are considering doing so. For in it I have outlined some facts of great importance to everyone interested in radio reception.

Assuming you have just finished building the set, the next step is to fit the valves in their holders, connect the flexible lead to the anode terminal of the S.G. valve, join up the batteries, loud speaker, aerial and earth—and then "listen." The valves used in my first tests were Mullard P.M.12 for the screened-grid valve, a P.M.2D.X. for the detector, and a Marconi L.P.2—or Osram L.P.2—for the last valve.

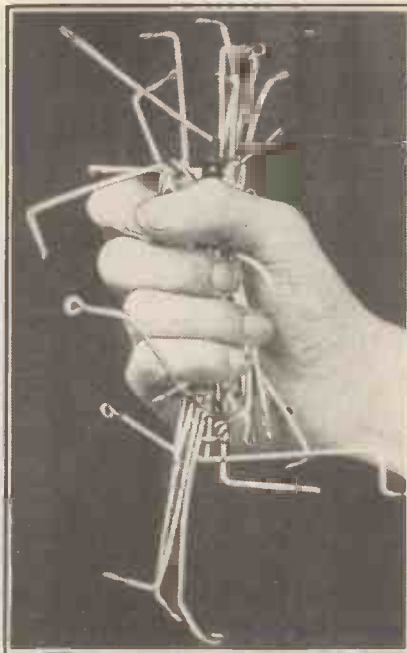
Voltages to Use

In a separate table are alternative makes of valves; as long as you use good valves, I don't mind what brand you employ. British valve manufacturers have reached such a high standard that it is difficult to choose between different types.

Now about battery voltages. I use the standard voltage battery—120 volts. The H.T.— terminal of the set is, of course, connected to the negative end of the battery; the H.T.+1 (which inside the set is connected to the screen of the S.G. valve) is connected to 72 volts on the battery, as is usual with S.G. valves; H.T.+2

(detector valve anode voltage) is adjustable by the user—personally, I demonstrate with 48 volts on the detector, signals being strong and

A MERE HANDFUL!



Here is every wire used in the "S.T.300"—even to the grid-bias leads! This photograph alone is striking testimony to the "clean" compactness and efficiency of the wiring. Every connection was planned in detail, and even the terminals on the special coils were positioned to increase the simplicity of construction.

reaction excellent; H.T.+3 (both S.G. anode and anode of last valve) is 120 volts.

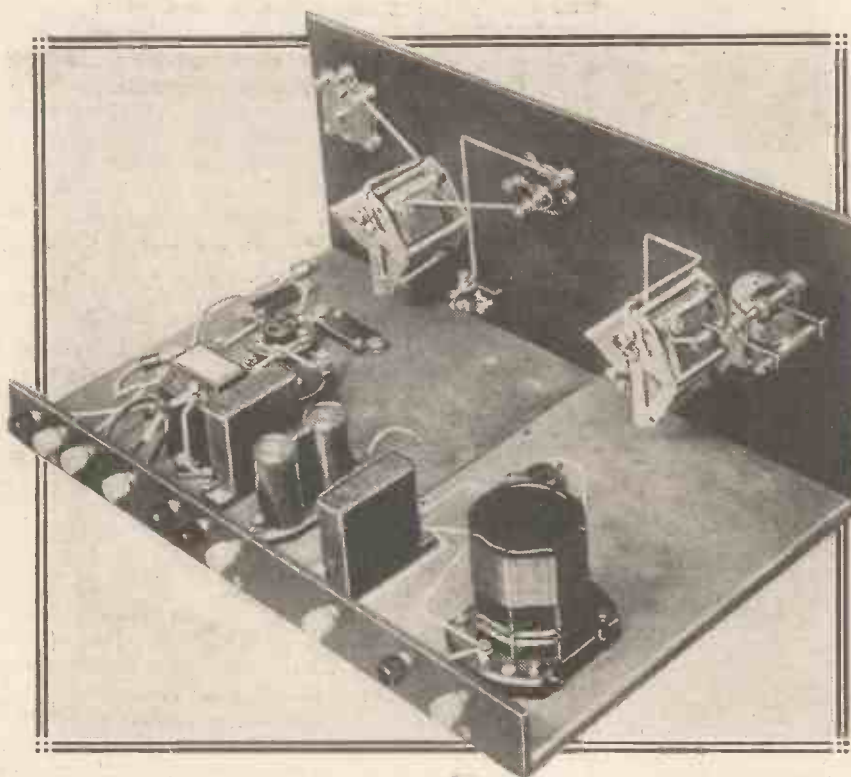
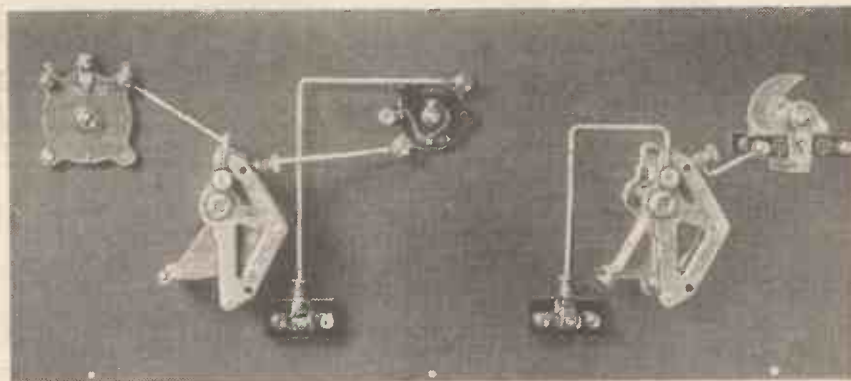
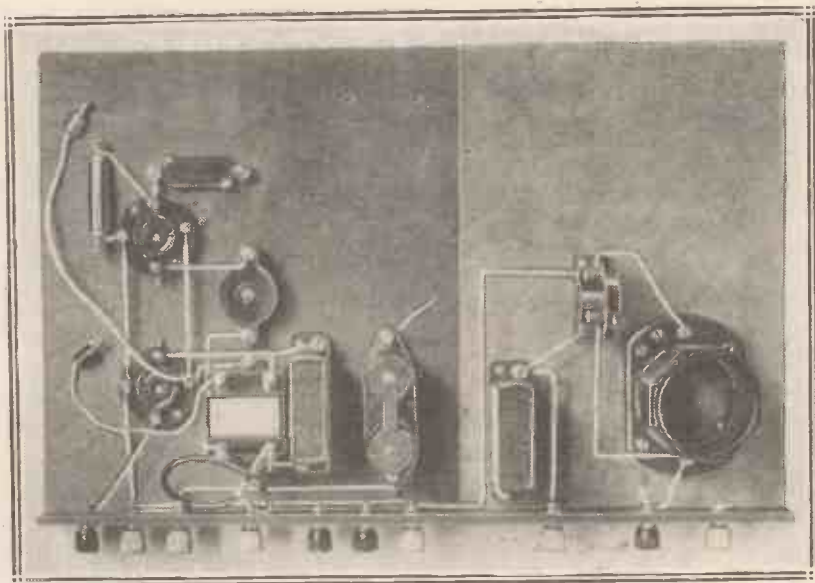
All these voltages are quite normal for all S.G. three-valve sets—except that perhaps I am inclined to use a lower detector anode voltage, although you can use up to 120 volts in the detector if you like. The only thing is that your reaction will become less nicely controllable. (In the preliminary operating notes of last month the H.T.+1 voltage was printed as 48, and the H.T.+2 as 72; it should have been the other way round. The screen of the S.G. valve, of course, is the one that requires 72 volts.)

Operating Hints

The grid-bias voltage I am using in demonstrations is -3 volts, but -4½ may be tried; this is a simple adjustment for the constructor to make, but do not change your plug position on your grid-bias battery without first switching off your set.

As regards the loud speaker and its leads, these should—as in all sets—be kept away from the aerial side of the set. Or looking at it from the other end, do not wind your aerial or earth leads round your loud speaker!

Another hint—which is applicable to all sets—do not turn your loud speaker so that it faces the set; otherwise the



MORE ABOUT THE "S.T.300"—*continued*

detector valve may vibrate, causing "booming."

You are now ready to listen. Set the aerial coupler (upper left knob) pointing to vertical, and do the same to the anode coupler. These are their normal positions.

The reaction knob may be left at zero (round to the left). Set the two tuning dials to readings of a local station as given in last month's table (remembering, of course, that each *division* on a 180° dial is equal to two "degrees"). Pull out the right-hand bottom switch, and—as I assume you want to test the medium-wave band—pull out the left-hand switch.

The Dial Readings

The station you desire will come in. An adjustment of each dial may be necessary to give you the loudest results, as it is unlikely that every set will read *exactly* the same as mine.

FIRST THREE STEPS

1. (Upper left).—Shows baseboard with copper foil and components mounted and wired.
2. (Middle left).—Panel components are mounted and wired.
3. (Lower left).—Panel is now screwed to baseboard by three screws along bottom edge of panel.

N.B.—The photographs on this and the next page illustrate last month's rapid construction guide, which gave every step so that the absolute novice can make the set.

In fact, if you use different condensers than those I employed the readings may vary considerably. The fact that the two sets of dial readings in my table differ is no disadvantage.

The first thing you want to do, of course, is to "know where you are" on the dials. This applies to any new set you build, and there are two ways of doing the job. One is to start with the left-hand condenser at zero and to move it round a degree (i.e. half a division) at a time, tuning back and forth slowly on the right-hand dial until you hear some station.

Logging the Stations

Then write down the readings of the two dials. Reaction may be used for this purpose, but take care to avoid oscillating.

This method is the most systematic one, and probably saves time in the end. You will log more stations this way than any other.

**MORE ABOUT THE
"S.T.300"—continued**

The second principal way to log stations systematically is to pick out the principal stations and work up or down from these. The B.B.C. "regionals" are very good identification points, viz. (going up the dials): London National, North National, London Regional, Midland Regional and North Regional.

Easily Identified

These are by no means the strongest stations you may receive, but they speak English. But Rome (says "Radio Romarna'eh Narpolly" in a charming, clear feminine voice), Radio Toulouse (French, of course, and sounds a gong whenever he can), Radio Trieste (a feminine "Radio Triestay") all love telling us who they are at every possible opportunity, which is very convenient to a listener without much experience of the foreigners.

THE FINAL STEPS

4. (Upper right).—Three panel-to-baseboard wires are now added.
5. (Middle right).—The anode coil is mounted horizontally, as shown.
6. (Lower right).—Further panel-to-baseboard wires are added. Note that practically the whole set has been made and wired without the inconvenience of the screen being in position.
7. See photos of finished set in last month's issue. The screen is slipped into position and screwed down. A few final wires are added to complete the set.

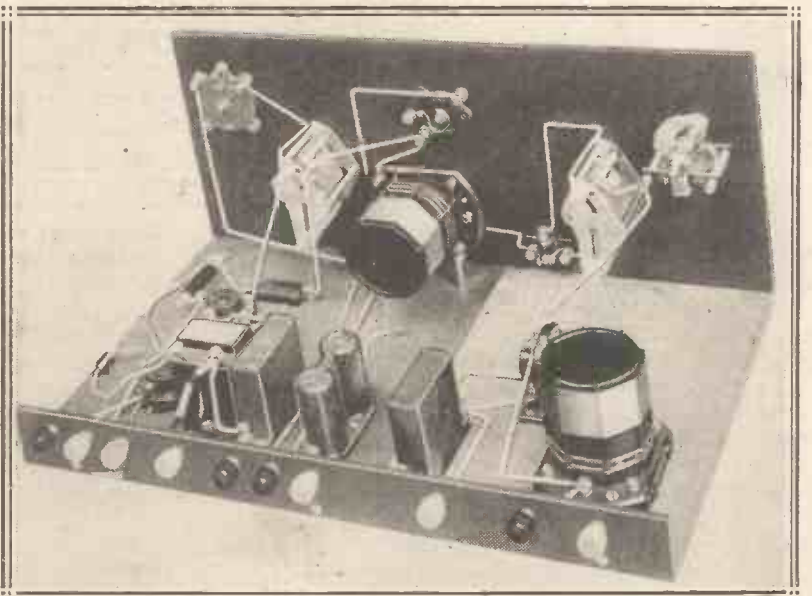
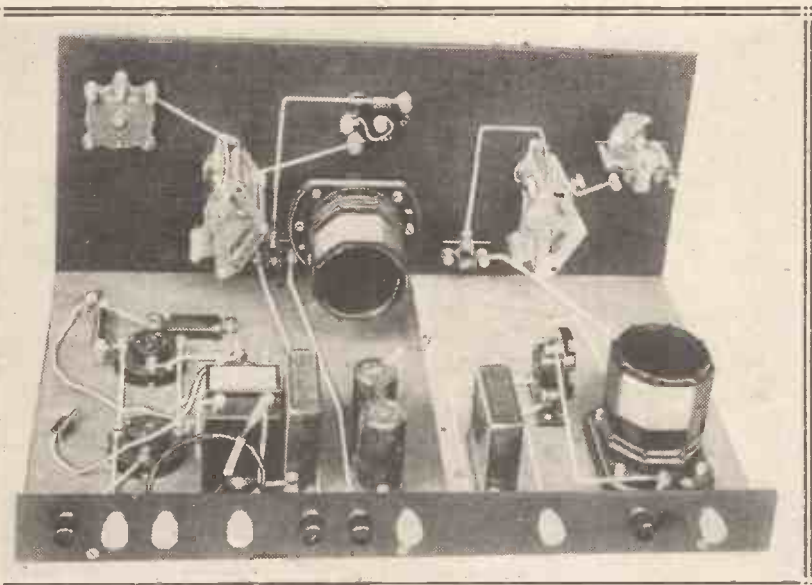
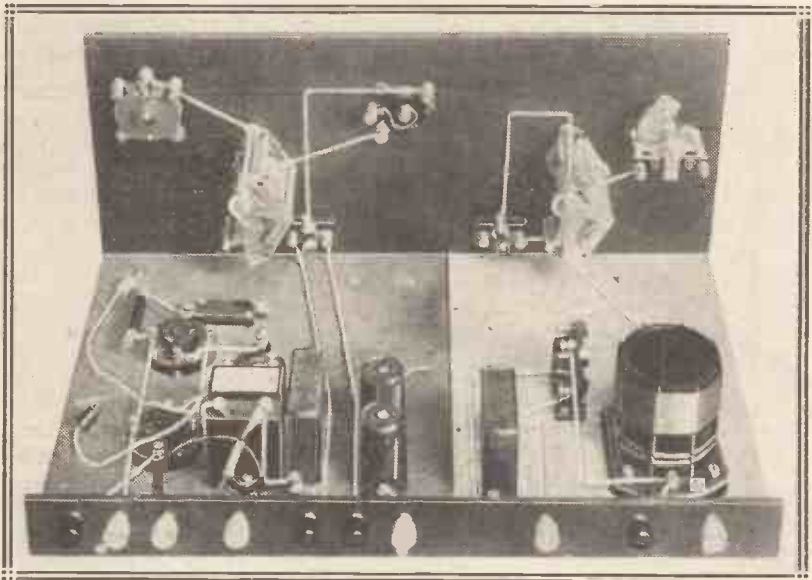
The process of identifying the others is very easy once you have a few key stations. Take a Londoner, say, working an "S.T.300." He gets Northern Regional.

Just above he will hear Prague very loudly. Just above that he will hear a loud French-speaking station; this is Brussels. And so on up to Budapest. Then he may go back to North Regional.

Round About Rome

Just below N.R. he gets Langenberg (Germany); Lyons he may miss at first, but Beromünster (Switzerland) he cannot fail to get resounding through his room in German. Then below this comes Rome; then 9 k.c. below he will hear Stockholm.

Hilversum he will find just below North National. Trieste, Nurnberg and the Cologne group he could



More About the "S.T. 300"—continued

tune in blindfold. By this time he will know where the stations are coming.

Obviously, at this stage the user in Central London will not log Mühlacker, but the man in Manchester will probably start by getting the stations which are landmarks to him, and Mühlacker will be one. For long-wave work the wave-change switch is pushed in, and tuning is as before.

Adjustable Selectivity

The constructor who lives, say, thirty or more miles from a B.B.C. regional will require less selectivity on his "S.T.300" than one who lives five miles away. He will probably be able to cover all the stations with the selectivity controls at "normal" (vertical).

For him the "S.T.300" will prove a godsend, because he will be able to operate the set to give the utmost signal strength; whereas if he builds a set designed for average use (as sets are these days), he is losing, so that those who live near a B.B.C. station can get some degree of selectivity. On the other hand, the man who lives *really* close to a B.B.C. station cannot get *enough* selectivity.

Now, I want to have an argument with you! Why is it necessary? Simply because I want you to understand really fully why I have introduced two selectivity controls on the panel, and if you understand this you will build the set, or, if you have built it already, you will know how to get the most out of it.

Some Pertinent Points

Will you answer these questions, please?

(1) Are all aerials more or less different in height, shape, size, etc.?

(2) Do we all live at different distances from a B.B.C. station, some a mile, some a hundred miles?

(3) Do we find it easier to pick up some stations when the B.B.C. (or other stations) are not working?

(4) Do we find more "jamming" on some parts of the dial than others, due to a B.B.C. station or a powerful foreign station?

(5) Do we anticipate more and more "regionals," more and more foreigners, and more and more power; in other words, are other conditions going to get worse?

(6) Do you agree that a set which is designed to give a 9-kilocycle separation will prove unsatisfactory if an attempt is made to separate stations such as Eiffel Tower and Warsaw or Kaunas and Huizen (both 5 kilocycles apart)?

Do You Agree?

If you say "yes" to these questions, the next one I shall ask you is this: "Do you agree that the designer of a set bears in mind all these different conditions and designs his set to suit *average* conditions?"

How can a single set be designed to operate under all these conditions equally well? It can't—unless it departs from standard conventions and provides a means of making the most out of *your* conditions.

CHOOSE YOUR METHOD!

Here are three ways you can use the "S.T.300."

1. AS A COMPROMISE SET. Adjust the aerial and anode couplers to "vertical." The set then works as an excellent set of ordinary type. The coupler knobs need never be touched again.
2. AS AN IMPROVED SET. Adjust the aerial and anode couplers to suit your aerial and district. You need never touch the coupler knobs again. But as interference gets worse you can increase selectivity every few months by a movement of the knobs to the left.
3. AS THE IDEAL SET. In this case you adjust the couplers to give the special selectivity on some stations or increased strength on others. A full-sized aerial is recommended where possible, because you can arrange for selectivity on the set.

VALVES TO USE.

	1st Valve	2nd Valve	3rd Valve
Cossor	S.G.220	210 Det.	220 P.A.
Marconi	S.22	L.2/B.	L.P.2
Mazda	S.G.215	L.210	P.220
Mullard	P.M.12	P.M.2D.X.	P.M.2A.
Osram	S.22	L.2/B.	L.P.2

The fitting of a pick-up to the "S.T.300" will be described in next month's issue. This need prevent no reader from working the set as it is. I apologise to readers who expected a description this month.—J. S.—

PROOF OF THE PUDDING!

From a reader's letter: "I have just constructed your wonderful set, the 'S.T.300.' Its performance from the start was amazing."—J. F. Haddleton, "Resthaven," Cirencester.

This is what I have done on the "S.T.300." It will make the most out of *your* locality and the most out of *your* aerial. The "aerial coupler" will look after aerial compensation, and the "anode coupler" may also be set to give excellent reception in your district and on your aerial.

You need never touch these two knobs again unless you want to. You will have something far better than an "average" set—or a "compromise" set, as I call it.

A very experienced engineer to whom I was demonstrating the "S.T.300" said to me: "Yes, it works excellently. It appeals to me as an engineer, but will the home-creator like the adjustable selectivity knobs?" I replied at once: "If he doesn't he needn't move them."

"If he leaves the pointers vertical, and never touches them in his life, he will have a highly sensitive, selective set. He can forget all about those two couplers. The set will still hold its own against any S.G.3 of the compromise type."

There If It's Wanted

"But if he wants to go farther he can, in a minute or so, adjust the couplers to suit both his aerial and his district; he then gets a still better set for his own individual circumstances. He need never touch the couplers again."

But this selectivity problem is not a stationary one. Remember the new "regionals" going up! Remember that Mühlacker went up from 4 kw. to 75 kw. in a night. Look what Radio-Paris did—from 13.5 kw. to 75 kw. These stations are—on many sets—interfering with our own huge-powered stations—our "local" programmes!

The whole broadcasting system of France and Italy is being reorganised—with more power, of course! Prague—at the time of writing—is on 120 kw., and our own North Regional (11 kilocycles away—a division and a half on the dial) is only 50 kw. Milan is going up from 7 kw. to 50 kw. Moscow-Stalin, on 100 kw., is a bolt out of the blue, and is going up to 300 kw.—and forty more members of the Russian "steam-roller" are to be erected!

Blood-Curdling!

Does this make your blood curdle? Mine was curdled before I developed the "S.T.300." That's why I introduced "full-range" selectivity on all circuits and adopted the battle-cry, "NO COMPROMISE!"

I am championing not only the "S.T.300," but the principle I have laid down for any future set I design. And I ask for and cannot do without your help and co-operation.

I have replied to the objection of extra "knobs" by saying they may be left at normal or adjusted to your

(Continued on page 314.)

WITH PICK-UP AND SPEAKER



by
A.
JOHNSON-
RANDALL

The cause of record scratch and some suggestions for reducing it.

ONE of the questions that I am often asked is: "How can I cut out record scratch?"

Now, this is a matter that requires some thought, because the scratch that we all hear is not composed of just one frequency. If it were, then there would be no difficulty in evolving a filter to eliminate this frequency—once the particular frequency had been determined.

Cutting the "High Stuff"

Unfortunately it is not a question of a single frequency, but a number, and in consequence if we cut out all the scratch we must impair the high notes. And, after all, is the amount of scratch we get so very terrible? My experience is that scratch is not worth worrying about unless it is over-emphasised, and this only occurs if the pick-up is a bit "peaky" on the higher frequencies.

A pick-up of this type is not difficult to deal with, because it is an easy matter to connect a resistance across its terminals and so cut out the scratch by flattening the peak.

It is not possible for me to give any definite value, because obviously this must depend upon the characteristics of the pick-up itself.

A Suitable Resistance

Neither do I think it desirable to eliminate all of the surface noise. The resistance value should be adjusted until the degree of scratch is decreased to an amount when it is no longer unpleasant. A good value to try is 100,000 ohms, and if this does not do the trick, then 50,000 ohms probably will.

The point is sometimes dealt with by the makers, who mention suitable values on their instruction leaflet.

This scratch trouble may become rather prominent when the output valve is a pentode, because a pentode tends to over-amplify the high notes unless some form of tone control is fitted.

But there is no reason why the tone control should not serve both for radio and gramophone, provided it is borne in mind that it must be variable.

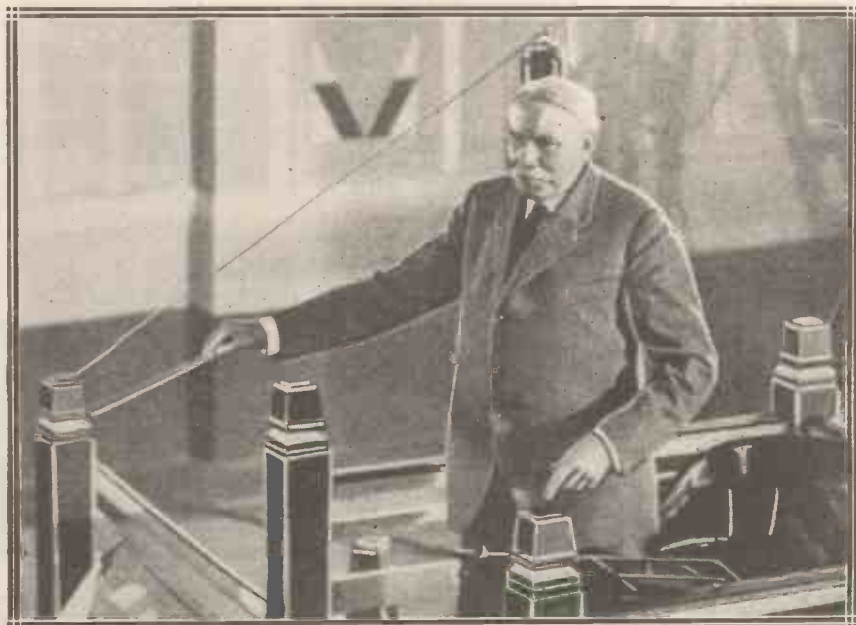
You see, one of the advantages of a pentode is that it balances up any loss of high notes due to sharply tuned H.F. circuits. In many cases it is absolutely essential to cut off side-bands pretty badly in order to obtain the necessary degree of selectivity.

Now when we employ a pentode we usually connect a resistance and condenser in series across the output transformer or choke. When the values are suitably chosen the correct tone balance is obtained. This brings us back to question of scratch.

Variable Control

When the tone control is adjusted for radio it is probable that it will still allow the scratch to come through fairly prominently, and so to overcome this difficulty the resistance which is in series with the condenser across the pentode choke or transformer can be made variable, say, from zero to 10,000 ohms maximum.

OPENING OF NEW RECORD STUDIO



This is Sir Edward Elgar conducting the London Symphony Orchestra at the opening of the new H.M.V. recording studio at St. John's Wood.

BRITISH CONSTRUCTORS'

Moycroft,
Castledon Road,
Wickford, Essex.

Sir,—I must thank you very much for the opportunity which you gave me of hearing and seeing a demonstration of your new receiver, the "S.T.300." Needless to say, I was greatly impressed with the success of the demonstration—more especially in what appeared to me a bad spot for good results.

The original manner in which you have approached the problem of designing a receiver suitable for use on any aerial and in any locality or under peculiar circumstances will, to my mind, solve the problems of thousands of the listening public; added to this is the fact that the variable aerial coupling device, together with the variable intervalve coupling, obviously means that any builder of your "S.T.300" will be in possession of a receiver which will be able to deal with problems of the future as regards selectivity when all the new high-power stations come on the air.

At the same time, volume was entirely adequate at all times, even when it became necessary to make the full use of the selectivity of which the set is capable.

Another agreeably surprising thing was to find the set performed as well on long waves as on the medium. So often one hears sets which give reasonably good results on the latter, but which give poor performance on the long waves.

I am afraid I have written at considerable length, but the merits of such an original set as you have produced deserve more praise than I can transmit into words.

May I be permitted to add that I think all your old readers were expecting something good when they read of your return, and I personally am quite con-

vinced that in the "S.T.300" they will not be disappointed.

Yours faithfully,
N. W. LORNE.

25, King's Road,
Richmond, Surrey.

Sir,—I must say how pleased I was to be present at the demonstration of your new set, "S.T.300," and I was more than surprised to see the ease with which it brought in station after station at full volume, so that

This selection of letters provides convincing testimony of the magnificent performance of the "S.T.300." Read these opinions carefully. They were written by people in varied walks of life, but they reveal a very striking unanimity about the remarkable results given by the "S.T.300."

one could sit down and really enjoy all the Continental stations as each came through with such purity and freedom from interference from nearby stations, and quite clear of both the London National and Regional. This, I think, shows a very high degree of selectivity, and as a further test of its remarkable powers you showed that Mühlacker could be brought in at full volume whilst the London Regional was working.

This, for a three-valve set, shows

"DEALS WITH PROBLEMS OF THE FUTURE!"



HIDDEN RESERVES
of selectivity, capable of dealing with even worse overcrowding of the ether than is experienced to-day, are contained in the design of the "S.T.300."

exceptional merit of a very high standard.

The long-wave stations also came through with wonderful strength and purity, especially as you were only using a very short, low aerial, and badly screened.

The total cost of the set to make is, I believe, about 70s. only, which should enable thousands to make it up, with full confidence that they will have an outstanding set which meets all the present and future problems of broadcasting, and I firmly believe it will achieve a greater success than the "S.T.100," if possible.

Yours faithfully,
A. E. OWEN.

121, Sutton Dwellings,
Upper Street,
Islington, N.1.

Sir,—I wish to thank you for your kind invitation. I consider myself very fortunate to be one of the first to see and hear your "S.T.300" demonstrated by yourself. In my opinion, it is far ahead of any three-valve set I have heard—factory- or amateur-made. Although you were not working under ideal conditions, the reception was perfect, and after going over the stations as you did on both long and short waves, I marvelled at the volume at which they came in.

A distant station is often a trouble to get up to full strength, but you have made this so easy.

Mühlacker came in without London, by way of a change, although there was a band playing at London at the same time. I consider this a test for a much bigger set.

This set appears to be easy to handle, and it certainly claims to be a "super," both in action and as regards low price. I would like to say that

VERDICT ON THE "S.T.300"!

—ABOUT THIS WONDERFUL NEW SET

had you produced a new publication the set would have established it.

Yours faithfully,
P. H. V. LUDLOW.

20, Smeaton Road,
Woodford Bridge,
Essex.

Sir,—I feel I must express to you my pleasant experience of the performance of your new "S.T.300" receiver at your recent demonstration. My expectations of something exceptional and original from the designer of the famous "S.T.100" were fully realised when I witnessed the high degree of selectivity on both wave-bands, without loss of sensitivity, and with remarkable good quality on so many stations. Its distinct and clear separation of two stations on the long waves at 5 k.c. is a test of its exceptional efficiency on this wave-band.

But perhaps the feature that impressed me most was the original and quite easy method of obtaining this high degree of selectivity when required, making it a very "flexible" receiver, adaptable to different aeri-als and localities, and, incidentally, providing in advance for the coming congestion of the ether.

I am waiting anxiously for the publication of this new circuit, and I shall be ever interested in future "S.T." designs.

Yours faithfully,
C. R. SCOTT.

30, Loveridge Road,
Hampstead,
N.W.6.

Sir,—Many thanks for the opportunity and privilege of being present at a demonstration of the "S.T.300." It is a truly remarkable

set that, during two hours, received forty stations, all good loud-speaker strength.

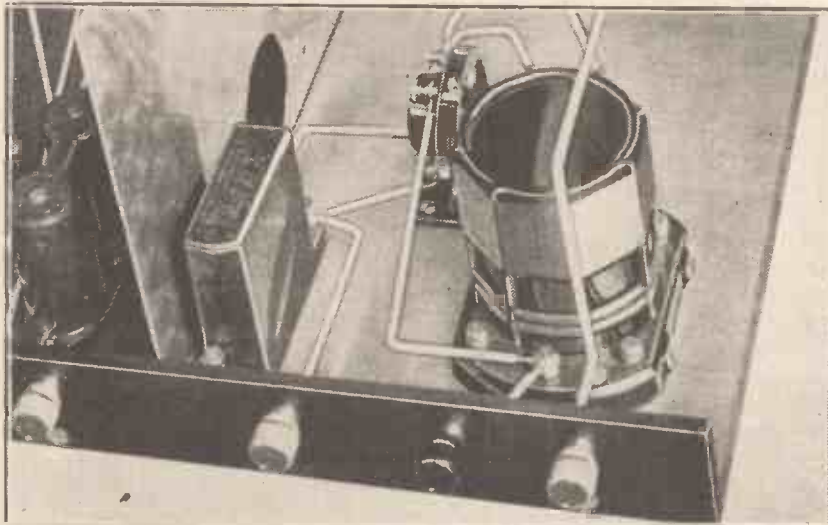
The quality was all that could be desired, and selectivity and sensitivity phenomenal.

I have told many of my friends of the receiver, and I am certain they are looking forward to the current issue of THE WIRELESS CONSTRUCTOR for details of the "S.T.300."

Offering my congratulations and wishing you success for the future.

I remain,
Yours faithfully,
JAMES H. NEWBY.

"PHENOMENAL SELECTIVITY AND SENSITIVITY"



Much of the set's success in station-separation is due to its special coils, designed expressly for the "S.T.300" by Mr. John Scott-Taggart. The one shown here is the aerial coil.

"Resthaven,"

S. Cirney, Cirencester.

Sir,—I have just constructed your wonderful set, the "S.T.300." Its performance from the start was amazing.

I am now wishing to attach a pick-up and would be much obliged if you would send me your circuit for same.

Yours faithfully,
J. F. HUDDLETON.

(Mr. Scott-Taggart is dealing with this matter next month.—Ed.)

10, Kingsmead Avenue,
Lower Edmonton

Sir,—I feel I must write at once and tell you how delighted I am with your "S.T.300."

I have been a reader of THE WIRELESS CONSTRUCTOR from its first number, and I have made up quite a number of the various sets published, but not one has come near the perfection of "S.T.300."

I had a deal of difficulty in obtaining the coils, but eventually obtained them on Tuesday last (yesterday). This evening (Jan. 20th) I had the set finished, and after checking up and testing the valve holders to ensure only L.T. was there, I inserted the valves—knobs were all upright—switched on, and immediately an orchestra came through—I think it was Sottens—but as I have not had time to log stations I did not note it. I find, though, the dial settings do not agree with your list.

(If other components than those used in the original set are employed, especially variable condensers, the readings will vary, but otherwise there should only be small deviations.—Ed.)

The performance is far away above any other set I have built. The tone and purity is wonderful, and I have tested it on four different speaker units, including the Blue Spot 66R., the Wufa 60-Pole, and the M.C. Amplion speaker.

Again let me say how delighted I am with the performance of the "S.T.300."

Yours faithfully,
J. W. SCARR.

9, Edenvale Road,
Mitcham, Surrey.

Sir,—... what a set! It certainly does everything claimed for it, and then some. Stations that had positively refused to come in on 2 S.G. simply tumbled in... I am not forwarding a list of stations logged, as I cannot get them all on my log!

Yours truly,
H. ODAM.



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

APPARENTLY we have now arrived at the very peak of good reception conditions, and certainly we shall have something to look back on when the summer days make distance-getting difficult. A great many people have succeeded in picking up America direct on medium waves, and apparently the only reason this is not quite a common practice is the fact that reception conditions are seldom good enough until the small hours, and are best about 2 a.m.

There is certainly a great thrill in this transatlantic transmission-hunting; and no one who has a set that he really fancies should fail to take a quick turn round the dials if he returns from a dance or a how-do-you-do at 2 a.m. or thereabouts in the morning.

Sitting-Up Late

Contrary to what is often believed, there is no need for superlatively skilful handling of the dials in such circumstances. Usually the Americans come in quite as well as some of the Continental stations, although they are more liable to fading.

Actually the degree of skill re-

quired to tune in, say, Atlantic City, WPG, when he happens to be coming over well about 2 a.m. is less than that required to pull in Prague earlier in the evening. For Prague may be "trodden on" by the Northern Regional and other stations, whereas at 2.30 a.m. what few stations there are to be heard will be pretty sure to be Americans, as even the most festively-inclined Spaniards tend to find their way home about 1 a.m.

Daylight Reception

At the risk of emphasising the obvious, mention must again be made of the remarkable daylight reception which has been possible during the past few weeks. If you have not tried this particular pastime, it is certainly likely to prove an eye-opener, and you are recommended to have a run round the dials anywhere from six in the morning till six at night.

Hilversum, Radio-Normandie, and similar geographically close stations, might be expected to come in with a thump, but when places like Trieste, Heilsberg, Genoa, and Stockholm crowd in as well, the daylight dials become really interesting.

On the long waves things have also been looking extremely rosy for some time, the only weak spot being 5 X X, which seems to be badly left behind all his competitors.

An impression is gaining ground that signals from this station have been weaker of late, and I have heard this opinion voiced by many people who tune-in that station more as a matter of interest than from necessity. What do the regular listeners to 5 X X think about this point?

Have You Heard Them?

A rather unexpected feature of the past few weeks has been the return of the Irish Free State stations, Dublin, coming back in fine style, and Cork, which I generally find to be better than his big brother, is developing quite a Carnera-like kick. The Spanish stations seem to be recovering from revolutionary effects, and quite a number of good Spanish programmes can now be heard in quite the old style.

My own aerial is somewhere about fifty miles from the nearest coast-line, and it seems to be that I have had far more than my share lately of spark interference. At the lower end of the dial, in particular round about 250 metres, the nuisance has been more or less continuous, and apparently many other listeners are faring badly in this respect.

"Spark" Interference

The trouble is not confined to the very bottom of the dial either, for on several occasions I have had "break through" from ships when tuned to the London National, 261 metres, and just below this wavelength interference is often heard.

A Terminal Tip

APPARENTLY there has been a little difficulty sometimes in obtaining the type D Belling & Lee indicator terminals. These are the "posh" variety, retailing at 6d. each.

I hear that a special campaign recently inaugurated to improve stocks up and down the country has been completely successful, and constructors should now find no difficulty at all in obtaining these terminals locally.

"Atlas" Accessories

The success of H. Clarke & Co., Ltd., Manchester (makers of the "Atlas" apparatus), in the mains unit line is well known, and readers will be interested to know that two

 * **POINTS FOR** *
 * **PURCHASERS** *
 * *Interesting details from manufac-* *
 * *turers about recent trade activities.* *

new A.C. models are now being marketed. One of them incorporates a trickle charger with a charging rate of .3 amp., and, like other "Atlas" lines, they both can be obtained on the hire-purchase instalment plan.

Valve Efficiencies

Remarkable figures have recently been published concerning the Osram valves M.S.4 and M.S.4B., recently tested at the National Physical Laboratory at Teddington. Half a dozen valves of these types were

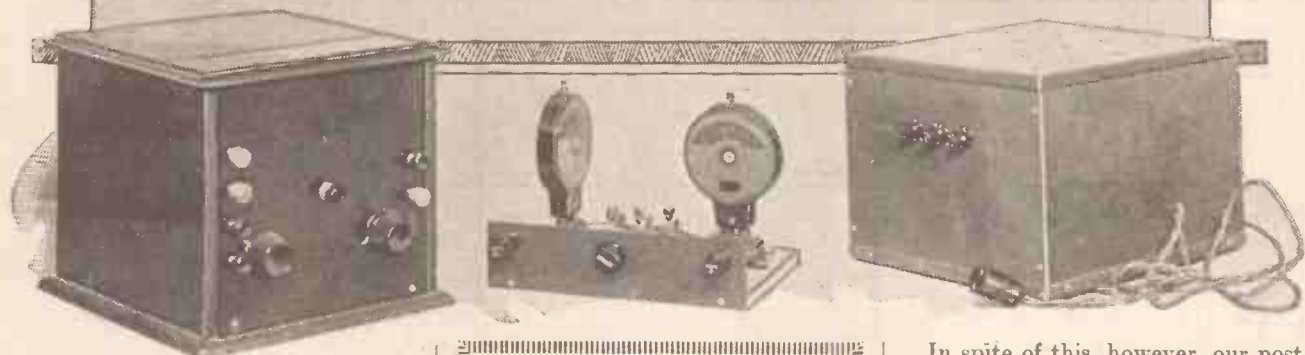
taken at random from stock, and a phenomenal consistency of inter-electrode capacity was found to have been achieved, the average leakage capacity between the control grid and anode of the valves in question coming out at about .000000026 mfd.

Consistency in such circumstances is a remarkable achievement, and invaluable where duplication is so necessary, as in the case of sets produced on mass-production lines.

Igranic Publications

From 149, Queen Victoria Street, London, we have received an abridged catalogue of the Igranic Electric Co.'s range of radio components, and also a new leaflet dealing with their permanent magnet moving-coil loud speaker. This retails at £3 (or £3 7s. 6d. with input transformer).

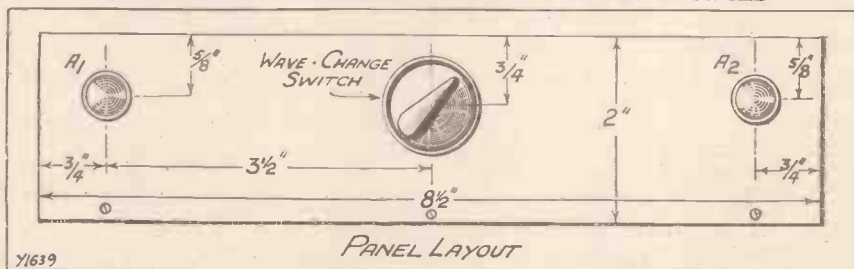
THREE SELECTED UNITS



Not long ago, in response to numerous requests, we described the construction of three sets whose circuits appeared in our booklet, "77 Selected Circuits." As we

Full how-to-make details for
A FIRST-CLASS REJECTOR
A TWO-VALVE L.F. AMPLIFIER
 and
AN H.T. UNIT FOR A.C. MAINS

ONLY ONE CONTROL AND TWO TERMINALS



The terminals enable the unit to be easily connected between aerial and set, and the switch control "knocks out" either one of two interfering stations.

pointed out at that time, it was not possible to take each of the seventy-seven circuits in turn and to give the necessary details for building them.

Owing to limitations of space we were therefore compelled to deal only with the three set circuits which, judging from correspondence, exercised the biggest appeal to the majority.

THE PARTS YOU NEED TO BUILD CIRCUIT 75.

- 1 Baseboard, size $8\frac{1}{2}$ in. \times $5\frac{1}{2}$ in. deep.
- 1 Terminal strip, size $8\frac{1}{2}$ in. \times 2 in.
- 2 Coil holders (Igranic, Wearite, Lissen).
- 1 Single-pole two-way switch (Ready Radio Snap, Igranic, Bulgin, B.A.T. ; or push-pull variety, Telsen, Goltone, Wearite, Graham Farish, Colvern, Lotus, Lissen).
- 3 .001-mfd. (max.) compression condenser (Sovereign and Formo, Igranic, Colvern, Lewcos, R.I., Polar, Graham Farish).
- 2 Terminals (Belling-Lee type R., Igranic, Eelex, Goltone, Bulgin, Clix).

In spite of this, however, our post-bag showed no signs of decreasing, because the unit enthusiasts would persist in having their "say."

Along they came—requests by the hundred—yes, literally—some voluminous and others just two or three lines on a postcard.

Letters Galore!

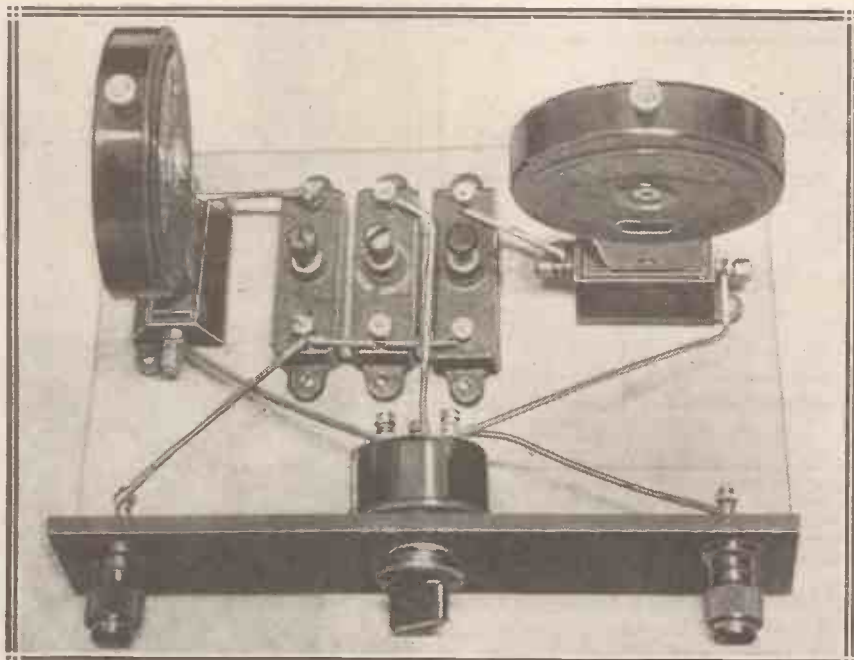
"Why don't you give full details of the rejector on page 32 of the booklet?"

"Will you please publish a description of the two-valve L.F. amplifier?" etc., etc.

So we went very carefully through all these letters, sorting them into groups each representing a particular circuit in the booklet.

And what a task! Surely every

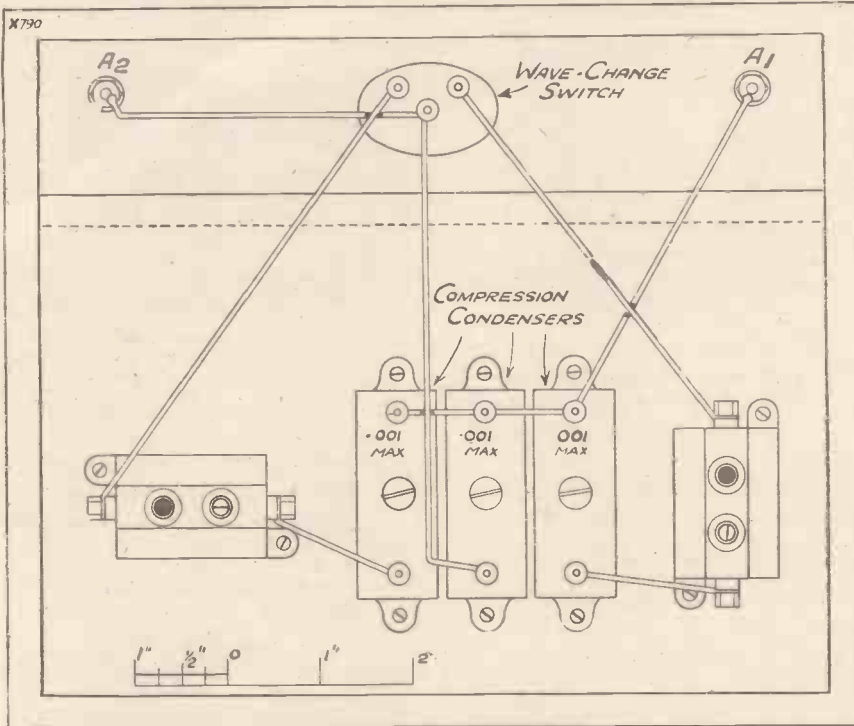
FOR LONG AND MEDIUM WAVES



Ordinary plug-in coils are used for this remarkable rejector, and are wired as shown here and in the diagram overleaf.

Three Selected Units—continued

FEW COMPONENTS AND EASY WIRING

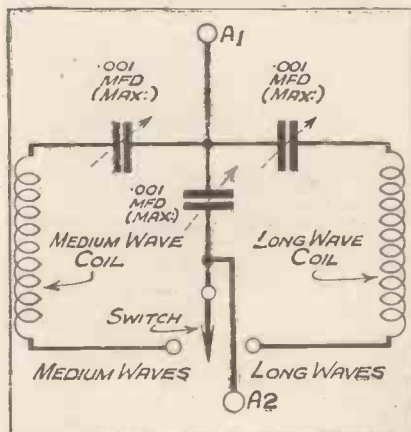


It will be seen that the actual connections are amazingly easy to carry out, and yet the unit confers a complete wipe-out of the unwanted programme.

home constructor in the country must have acquired a copy of "77 Selected Circuits"!

Well, finally we chose the three units described in this article. These

THE CONDENSER CROSS-ROADS



The special virtue of this remarkably successful rejector lies in the novel condenser-coupled aerial feed. The switch throws the wanted coil into circuit and simultaneously disconnects the other coil.

are Circuit No. 26—a two-valve amplifier; Circuit No. 61—a simple A.C. H.T. unit, and Circuit No. 75—a very useful rejector unit.

First of all we shall deal with the

rejector. This is a handy unit designed to cut out interfering transmissions on both medium and long waves.

The circuit has been used on many occasions in rejectors of various types, and has proved to be extremely satisfactory in every way.

At the outset we should like to point out that this rejector will not necessarily be effective with any aerial circuit.

For instance, if the aerial circuit of the receiver employs a form of direct aerial coupling—that is to say, a tuned aerial inductance directly in series with the aerial and earth—then it is probable that it will fail to "reject" effectively.

Suitable Circuits

Most rejectors are only successful when the aerial is loosely coupled to the tuned grid circuit.

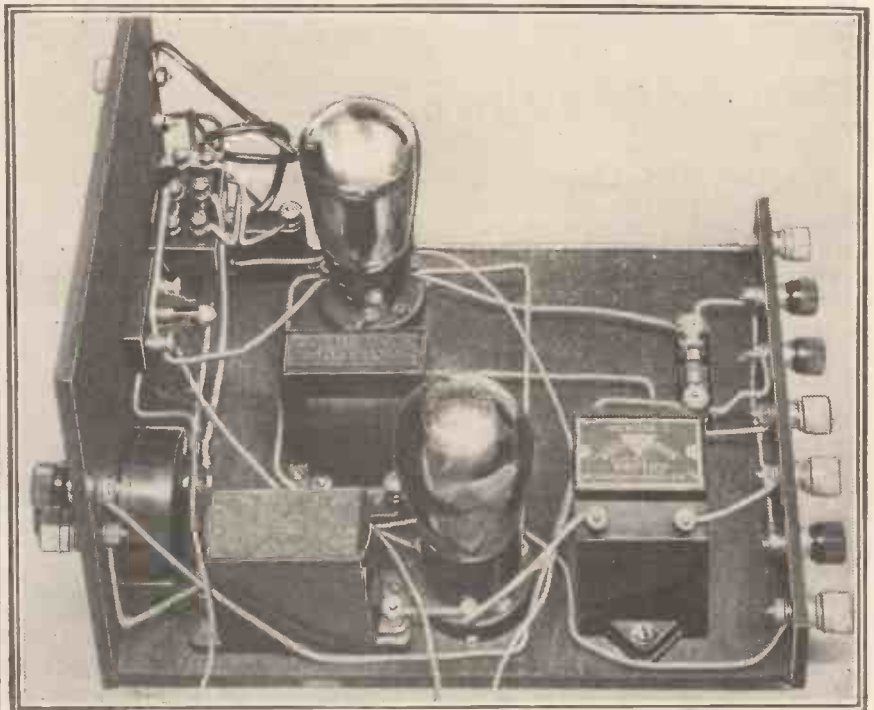
Circuits of this type are those having the aerial lead connected to a tapping on the aerial-grid coil, or those in which the aerial is coupled "aperiodically" to the grid circuit.

It was for circuits such as these that Circuit No. 75 was designed.

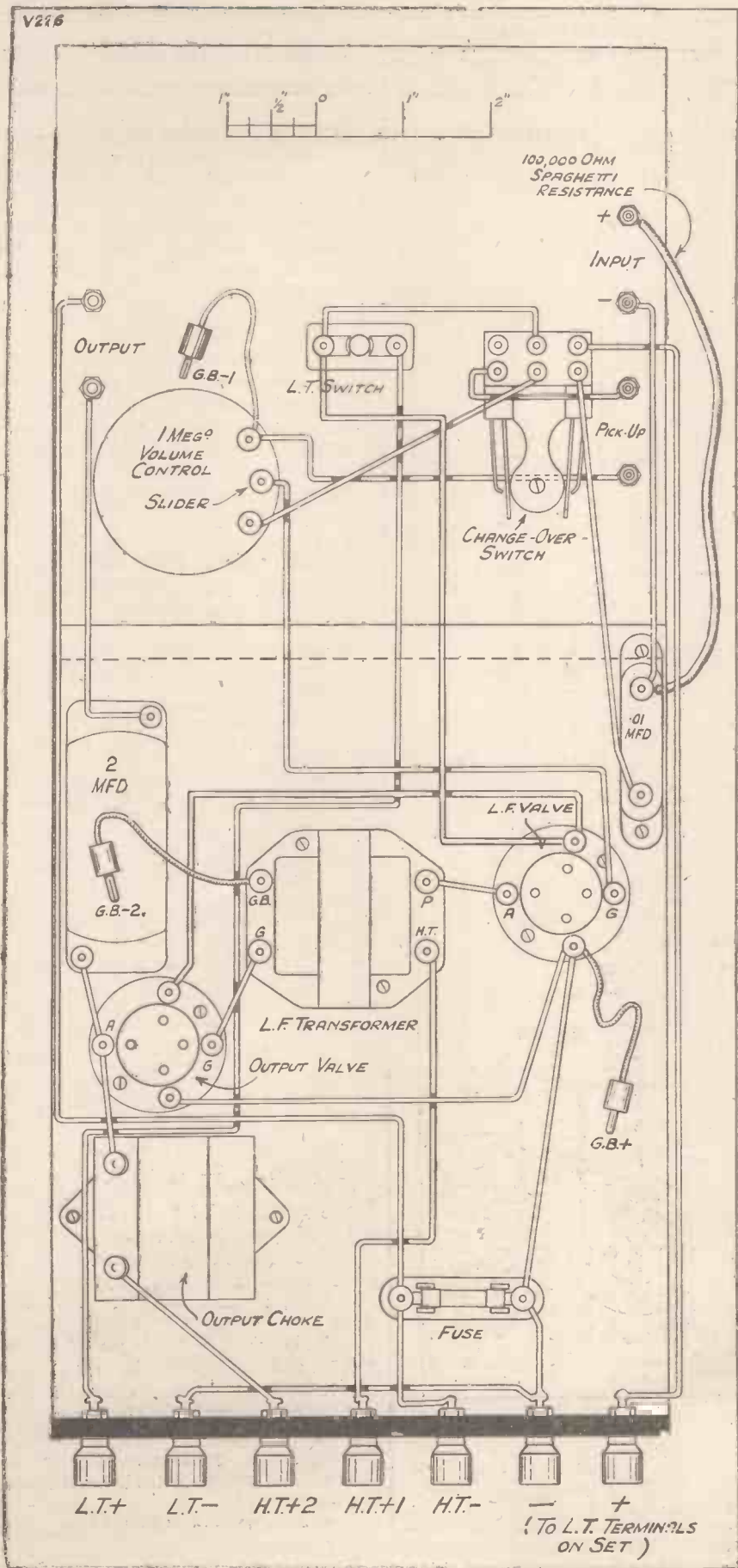
With these arrangements it gives the most effective "cut off" of any rejector schemes we have ever tried.

A good rejector is a boon to those listeners who reside fairly close to one of the powerful Regionals. "Swamping" by the "local" is all too

A FIRST-CLASS TWO-VALVE AMPLIFIER

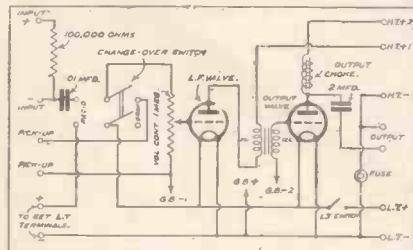


Among the advantages of the No. 26 Circuit are volume control, radio-gram switching, safety fuse, and filtered output to the loud speaker.



THREE SELECTED UNITS—continued

RESISTANCE-TRANSFORMER COUPLING



The first stage is resistance-coupled, and the next uses an L.F. transformer, a combination that has proved particularly effective for clear and powerful loud-speaker reproduction.

COMPONENTS AND ACCESSORIES FOR CIRCUIT 26

- 1 Panel, size 7 in. x 7 in. (Permeol, Beol, Peto-Scott, Ready Radio, Goltone, Wearite).
- 1 Baseboard, size 7 in. x 9 in. deep.
- 1 Cabinet to suit (Camco, Pickett, Peto-Scott, Ready Radio, Osborn, Gilbert).
- 1 Volume control, 1 meg. (Ready Radio, Igranic, Clarostat, Wearite, Varley, Sovereign).
- 1 Two-way double-pole rotary switch, with terminals (Wearite).
- 1 Medium-ratio L.F. transformer (Lotus, R.I., Telsen, Igranic, Varley, Goltone, Graham Farish, Ferranti, Leweos, Formo, Climax).
- 1 L.F. choke (Varley Nichoke II, Igranic, R.I., Telsen, small Ferranti, Lotus).
- 1 Fuse and holder (Belling Lee, Bulgin).
- 2 Valve holders (Telsen, Graham Farish, Lotus, Igranic, W.B., Formo, Clix).
- 1 .01-mfd. mica fixed condenser (T.C.C., Mullard, Igranic, Graham Farish, Dubilier).
- 1 2-mfd. condenser (Telsen, Helsby, T.C.C., Dubilier, Igranic, Formo).
- 1 100,000-ohm Spaghetti resistance (Leweos, Telsen, Sovereign, Varley, Igranic, Bulgin, Ready Radio, Peto-Scott).
- 1 On-off switch (Ready Radio, Telsen, Goltone, Colvern).
- 1 Terminal strip, 7 in. x 2 in.
- 13 Terminals (Bulgin, Eelex, Belling & Lee, Igranic, Clix).

ACCESSORIES

Loud Speaker.—(Celestion, Amplion, R. & A., H.M.V., Marconiphone, Blue Spot, W.B., B.T.-H., Undy.)
 Valves.—1 L.F. and 1 power (Mullard P.M.1.L.F., and P.M.202 or 252, Mazda, Osram, Marconi, Eta, Cossor, Tungstam, Six-Sixty).

For such a powerful amplifier the wiring is remarkably easy to tackle and should give no trouble at all if the diagram on the left is followed with reasonable care.

FOR THE MAN WITH A.C. MAINS

THREE SELECTED UNITS—continued

common, and frequently prevents the reception of other stations.

This spreading over the dial business can be stopped very easily by attaching the rejector to the set. It is extremely simple in construction; in fact, the actual building should only take an hour or so.

Easy to Make

There is no need to describe this in detail, since all that is required are a piece of ebonite strip for the switch and two terminals, together with a small baseboard for the three compression-type condensers and the two coil-holders.

THE PARTS FOR THE A.C. H.T. UNIT (SELECTED CIRCUIT 61)

- 1 Metal box, internal dimensions 9½ in. × 7½ in. × 6½ in. (Wearite).
- 1 Baseboard, to fit.
- 1 Mains transformer (R.I. EY14).
- 1 Valve holder (Lotus, W.B., Telsen, Graham Farish, Igranic, Wearite, Clix).
- 1 Smoothing choke (R.I. Pentomite).
- 2 4-mfd. condensers (T.C.C., Formo, Dubilier, Telsen, Igranic, Helsby, Hydra, Sovereign).
- 1 20,000-ohm potential divider (Igranic, with sockets for wander plugs).
- 1 Mains adaptor.
- 3 Terminals (Clix, or insulated Belling & Lee, Igranic, etc.).
- 1 Rectifying valve, half-wave type (Cossor 412S.U., Mazda U.30/250, Mullard D.U.10).

Just place the parts and connect up as shown in the wiring diagram.

Then, having completed this part of the job, you will want to know something about the method of operating the unit.

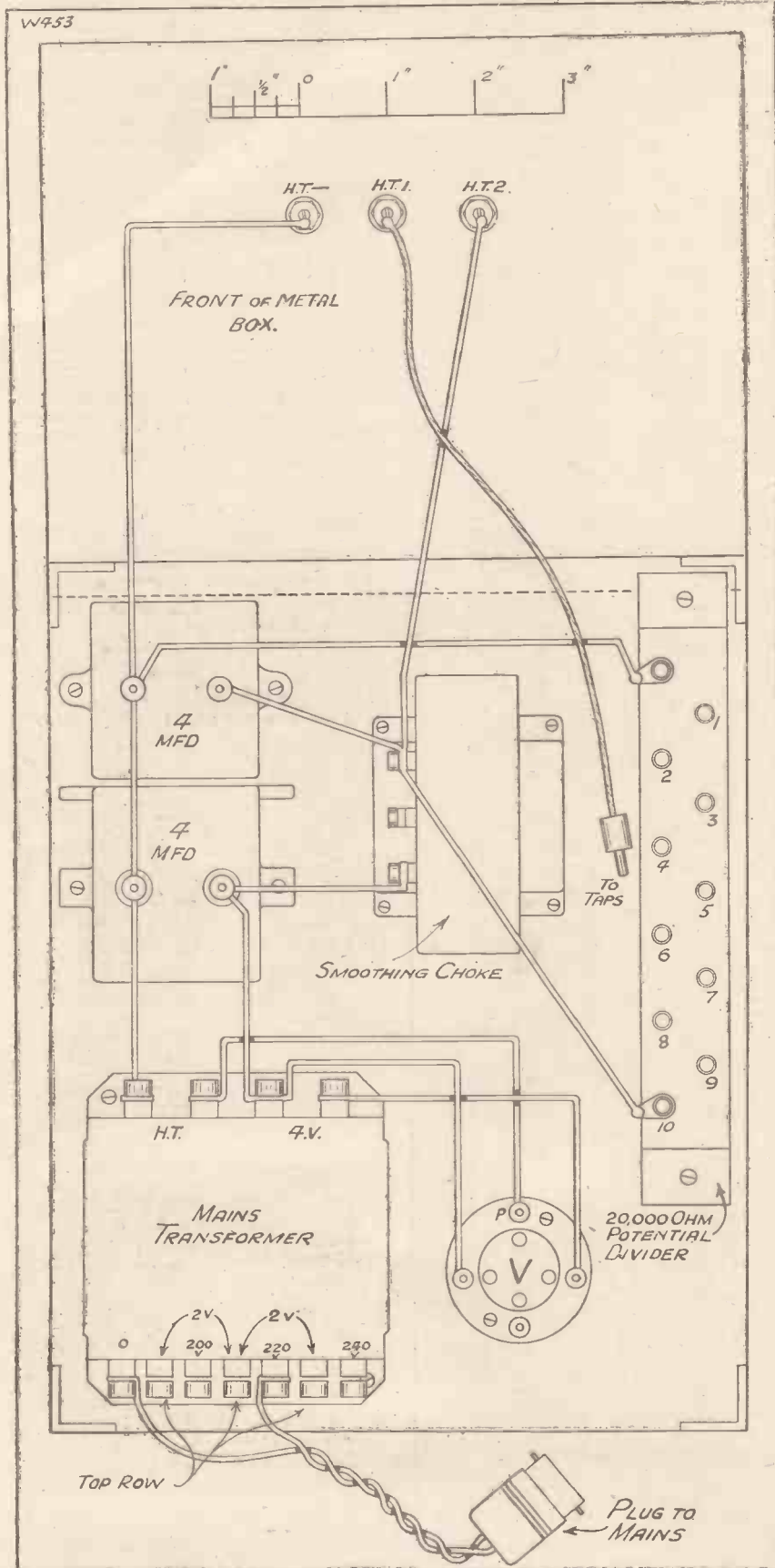
Now on the terminal strip there are two terminals, A₁ and A₂. A₁ is on the left and is joined to the aerial lead. A₂ is connected to the aerial terminal on the set.

The Coils Required

A No. 50 or 60 coil is placed in the left-hand coil holder (the one nearest terminal A₁) and a No. 200 in the other coil holder.

The adjusting knob on the middle compression condenser is screwed about half-way towards maximum capacity.

The switch can then be turned to the medium-wave position, and the left-hand compression condenser



This extremely useful H.T. unit, which employs a valve rectifier, is easily wired, and then enclosed in a metal box—after which it will give years of service.

Three Selected Units—continued

adjusted to cut out the interfering transmission.

One method is to tune in the interfering station on the set to full volume and then to adjust the compression condenser until the desired elimination occurs. A second method is to tune in the desired transmission on the set and to adjust the rejector until the interfering station is cut out.

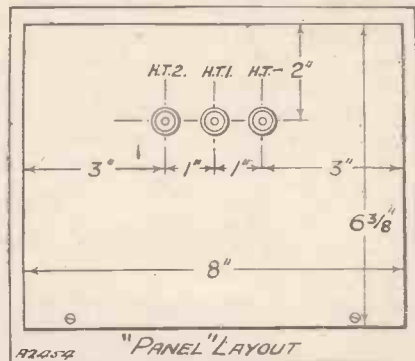
The Best Adjustment

A little practice in manipulation is necessary in handling any rejector, and the final setting can be obtained by adjusting the middle condenser. Remember, however, that this particular condenser has to serve both wave-bands, and therefore must be left "set" to some adjustment, which is best found by trial.

Very drastic elimination is possible by unscrewing the middle condenser and operating mainly on the two outside condensers, according to the wave-band upon which you are working.

Less drastic effects will be given when the knob on the middle condenser is screwed down, and this setting gives the best signal strength on the desired transmission.

HOW TO DRILL IT



Here are the necessary dimensions for drilling the little "panel" for the H.T. unit.

For the long waves the switch knob is turned to the other extreme position, and the right-hand compression condenser is adjusted to cut out the interfering station.

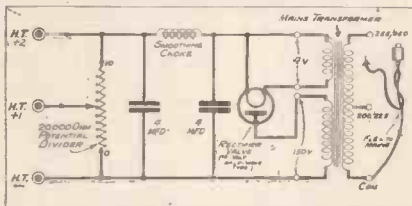
On the medium waves a No. 50 coil is about right for eliminating interference on wave-lengths up to 400 metres. Above 400 metres a No. 60 coil is usually preferable.

And now for the L.F. amplifier.

This is a first-rate little unit employing two valves and is suitable

for use with practically any battery-operated receiver not already incorporating a stage of low-frequency amplification. For instance, it is ideal for such designs as H.F. and

H.T. FROM THE MAINS



This is the scheme of connections for Circuit 61, the variable H.T. adjustment of which is accomplished by a potentiometer arrangement.

detector units, and straightforward single-valve receivers.

Not only is it a thoroughly up-to-date radio L.F. amplifier, but it is also equally satisfactory for pick-up work.

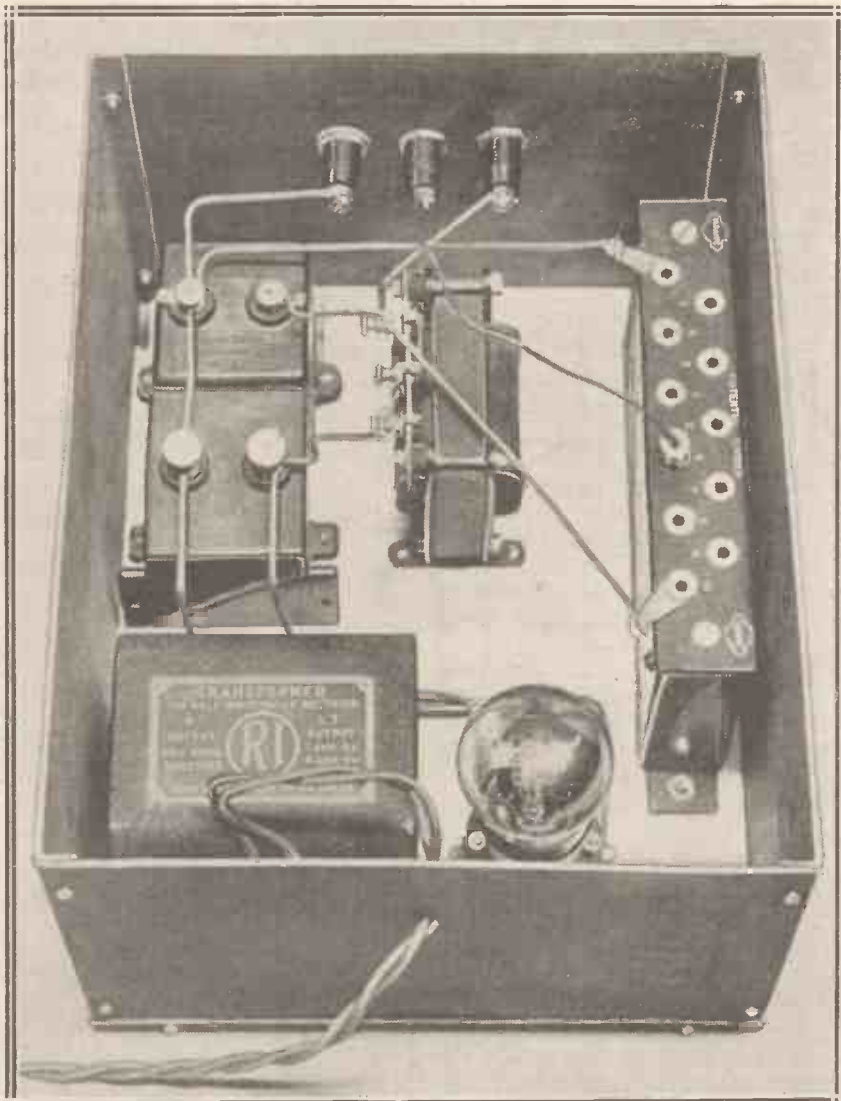
A Fine Amplifier

A switch enables the unit to be instantly changed over from radio to gramophone, and the constructor can thus convert his existing set straight away into a full-fledged radio-gram.

It is a refined amplifier; for example, a volume control is provided in the grid circuit of the first valve, and is effective both on radio and gramophone.

(Please turn to page 312).

ADJUSTING THE DETECTOR'S HIGH-TENSION



The flex lead with plug that fits into the potential divider enables any required intermediate voltage to be obtained at the H.T. +1 tapping. Once set it need not be adjusted again.



PICK-UP HINTS AND TIPS

Some interesting notes on various practical aspects of radio-gram reproduction.

By A. BOSWELL.

Increasing the Input—About Needles—Large Amplifiers—Pick-Up Noise.

WITH some receivers it is difficult to obtain sufficient low-frequency amplification for gramophone reproduction.

It is true that in the majority of sets there is plenty of mag. available, but I am thinking of the type of circuits in which two low-amplification R.C. stages are used or, alternatively, where there is only one low-ratio transformer followed by a super-power output, and when the pick-up itself is rather insensitive.

It is often possible to boost up the input from the pick-up by inserting a step-up transformer between the pick-up and the input terminals or sockets on the set.

Worth Trying

For the best results to be obtained the transformer should really be matched up with the pick-up, but, by way of experiment, I recently connected an inexpensive 1-4 ratio L.F. transformer between a pick-up and the first L.F. stage of the amplifier.

The primary was joined across the pick-up, and the secondary went to the grid and grid bias negative of the L.F. valve.

The increase in magnification using this scheme was marked, and the tone did not suffer appreciably. Although it is probable that the response curve did suffer, the effect was not apparent to my ear.

Needle Armatures

By the way, when I spoke about fibre needles in last month's issue I should have warned my readers that needles of this type cannot be employed with needle-armature pick-ups.

In these pick-ups the needle also forms the armature, and it is actually the needle itself which vibrates between the pole-pieces, and so induces voltages in the "speech" coil. Obvi-

ously, in pick-ups of this type the needle must be a steel one.

The needle I am using at present in my own pick-up is the "Tungstyle." For convenience it takes a lot of beating, because you can play about 100 records without worrying about needle changing.

If the reproduction commences to sound harsh, the needle should be changed immediately.

HEARD THESE?

RECORDS FOR YOUR PICK-UP		
	Descriptive.	
Cavalcade		H.M.V.
	Banjo.	
Eddie Peabody	St. Louis Blues.	Columbia
	Dance.	
Jack Payne	My Song.	Columbia
	I Don't Know Why.	
Savoy Hotel Orpheans ..		Columbia
	Vaudeville.	
Mabel Constanduros ..	The Buggines at the Pantomime.	Broadcast Nine
	Rhymes.	
Bobbie Comber		Broadcast Nine
	Orchestral.	
Berlin Philharmonic Orchestra	The Ride of the Valkyries.	
	Fair Ballet.	
Bournemouth Municipal Orchestra		Broadcast Twelve
	Organ.	
Reginald Foort	By the Blue Hawaiian Waters.	Columbia

A number of readers have written to me asking what kind of amplifier is needed to provide sufficient volume for dancing in a large room or small hall.

Now this type of amplifier requires skilled treatment. You can't use valves of the ordinary "super-power" type; they will not give more than about 4-watt undistorted power.

To fill a small hall with sufficient power for dancing a far greater output than this is necessary. Everything depends upon the size of the room or

hall, and the number of people who are dancing.

A Big Output

A P.X.4 valve will give approximately 2.5 watts undistorted output with about 250 volts applied to its anode. When it is fully loaded such a valve will probably be adequate for dances in the home, but in a small hall something bigger still is required. For instance, two of these valves in push-pull with sufficient punch behind them to load them properly.

For the ordinary listener to design and construct an amplifier of this type is I am afraid rather an ambitious task.

Plenty of H.T. Needed

Quite apart from the L.F. side itself, it will be seen that a pretty hefty H.T. supply is needed. The mains are essential, and the H.T. unit will be called upon to supply about 60 m.a. in the case of the smaller amplifier, and over 100 m.a. for the push-pull version.

These big amplifiers are really commercial jobs.

For parties where there is a certain amount of dancing in an ordinary-sized room any decent gramo-amplifier will, of course, usually do the trick.

My correspondents were readers who desired to arrange small dances, and who thought that they might be able to "hook-up" a suitable equipment and so dispense with the need for a dance band.

I don't wish to damp their enthusiasm, but only to point out that when it comes to outputs of this order there is more in it than meets the eye.

Cutting Out Noise

With home-made radio-grams and converted mechanical gramophones there is sometimes a background of "dithering" and "chattering" which makes itself heard when a record is being played.

This noise emanates from the pick-up as it traverses the record grooves.

The trouble can be remedied very easily. It is merely a matter of making the lid of the cabinet sound-proof.

Lining the edges of the lid with a good thickness of felt usually suffices.

I recently adapted a table-grand gramophone for pick-up work, and the noise was at times obtrusive enough to take one's attention off the item being played.

I tried the felt-lining scheme, and this was highly satisfactory.

SINGLE-CHOKE SMOOTHING



By Victor King.

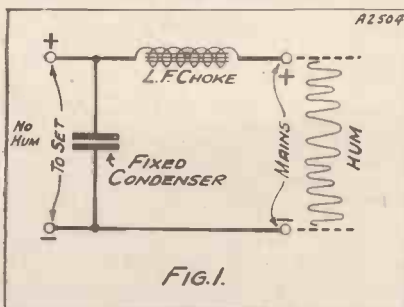
ONE choke and one fixed condenser can provide all the smoothing necessary in a mains unit or receiver so long as the choke is good enough and the condenser has sufficient capacity.

An Old Belief

At one time it was apparently almost universally believed that it was essential that there should be at least one smoothing choke connected in series with each of the mains leads. And even to-day I find that many of my correspondents have the idea that hum can wander in through either of the two leads irrespective of the other.

They apparently view mains leads as two separate supplies of different kinds of electricity, and think, as in the case of the Fig. 1. circuit, that a

IT CAN BE PERFECT



It is theoretically possible to obtain efficient H.T. smoothing with one choke and one condenser, though in practice such simplicity is not always a success!

wire, such as the negative lead, which goes direct to the set without the insertion of a choke must inevitably carry interfering current variations through.

But what exactly is this mains hum? It is due to irregularities in the mains

A popular "Constructor" contributor has something to say concerning an interesting aspect of mains working.

supply. You can compare them with the ripples you see on the surface of the sea or a lake. Smooth off these ripples by spreading oil on the surface, and a deep body of water of unchanging depth is left.

That is the sort of thing we have to do with the mains supply before it can be used successfully for supplying H.T. to a set—smooth off the surface ripples.

The irregularities are present in the "raw" supply as voltage variations. The voltage of the supply is varying in voltage between certain limits (it may be, in the case of D.C., of course, as much as two or three per cent). And these variations will occur at various frequencies or, in other words, the voltage will be swinging up and down so many times per second.

As you will all no doubt know, it will be the frequency, of at least the L.F. variations, which decide the pitch of the hum. For instance, if there is a pronounced 100-cycle variation a low hum will be heard.

What Smoothing Does

The object of "smoothing circuits" is to reduce the voltage of the irregularities to the lowest possible level. An L.F. choke offers great resistance to such variations owing to the inductance it possesses, for inductance is a quality which tends to oppose any change in a current.

The fixed condenser, on the other hand, offers comparatively easy going

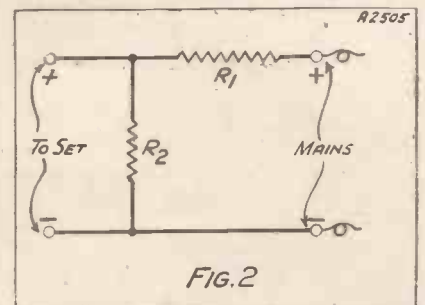
to current fluctuations, and the bigger its capacity the less its opposition.

So we can redraw the Fig. 1 circuit as at Fig. 2, showing the L.F. choke as a big resistance, and the fixed condenser as a small resistance. By the way, it is not usual for diagrams to show the relative sizes of resistances in this way, but for our present purpose it makes it easier to visualise what happens. But remember that, in practice, the effective resistance of the choke may be sixty or seventy times that of the condenser—a difference it would be difficult to illustrate adequately in a drawing. (More advanced readers should note that I am purposely avoiding the use of such terms as reactance and impedance, as these would only confuse the constructor not acquainted with or desirous of learning "vectoral" theory!)

Potentiometer Effect

It is permissible again to redraw the diagram as at Fig. 3, for this is only a "paper" re-arrangement—the actual circuit is still exactly the same.

JUST AN ILLUSTRATION



This diagram enables you to gain something of an idea as to how the smoothing takes place, although it must not be interpreted too literally.

Single-Choke Smoothing—continued

But from Fig. 3 you will see that, in effect, the choke and condenser make a complete circuit across the mains supply, and the leads which go on to feed the set with H.T. are tapped across only a small part in terms of resistance of this circuit. That means to say, you tap off only a small proportion of the voltage variations. And the greater the capacity of the condenser, and/or the more effective the choke, the less you tap off. It is, in short, a potentiometer.

If you know Ohm's law you can apply this, at least in principle. The current which flows through the circuit $R_1 R_2$ will equal the voltage variations on the mains divided by the resistance of R_1 plus R_2 .

Keeping Down Current

The first desideratum is to make this current as small as possible, and you do this by increasing the resistance as much as you can by employing an efficient choke.

The "hum voltage" across the two leads which go to the set will be the resistance of R_2 (the fixed condenser) multiplied by the current. Having made the current as small as possible, you reduce the resistance of R_2 to its lowest level by using as high a capacity fixed condenser as is practical.

In the meantime, the main body of the mains current, which is unvarying in nature, flows uninterruptedly through the choke; for this will offer but a low resistance to current of that

And in such circumstances it will be that unchoked mains lead (marked negative in the diagrams) through which hum certainly will creep. Nevertheless, it does not do this without the assistance of the positive wire. Two connections are always quite essential to complete a battery or dynamo circuit.

Earth-Leak Hum

One or other of the mains leads will be earthed by the supply authorities. Generally it is the negative, but quite often it is the positive, and it is in this latter case that we meet the conditions about which I am talking.

Now glance at Fig. 4. We will suppose that the positive mains wire is earthed and that it is the negative lead which must be carefully insulated from earth in order to prevent a short-circuiting of the mains.

The insulation in the set may be adequate to prevent this happening, but a fault may be present which enables a small current to leak away from the negative lead back to earth, and so to the positive mains lead. I have shown this "leak" as a resistance in Fig. 4 and the simplified version, Fig. 5.

As you will note from this Fig. 5, it is exactly as though you had connected a grid leak across the mains supply terminals, although before getting to the actual leak (which might be faulty insulation in a fixed condenser, which is supposed to protect the set

leaks do not exist, for a leak may mean the beginning of a "torrent"—the complete short-circuiting of the supply.

I have been presuming that all smoothing chokes are efficient opposers of current variations. But this is not in fact the case. The majority of smoothing chokes sold are efficient so far as low-frequency

COMPLETING THE CIRCUIT

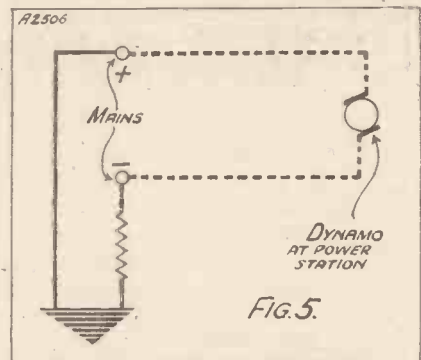


FIG. 5.

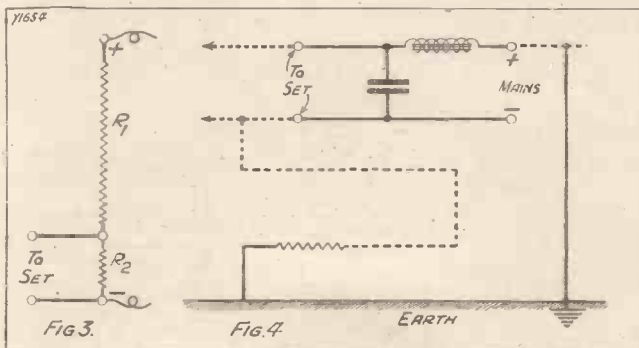
How the circuit is completed through the leak to earth.

voltage variations are concerned. But it is a fact that quite a lot of interference gets through from the mains in the form of high-frequency variations.

A New Choke

And the self-capacity of the ordinary smoothing choke is such that it is impotent against H.F. Therefore, it is very often necessary to employ H.F. chokes in addition; though, as I write, I hear rumours that one of our well-known British manufacturers is about to introduce an inexpensive smoothing choke which is able to "choke" at both high and low frequencies.

If this is true the manufacturers concerned will be public benefactors, and they will reap their reward in immense sales. There is a place waiting for such a choke in practically every mains unit and set in the land, and it is difficult to see how any other kind could be used. But perhaps it is only a rumour!



AN IRREGULAR ROUTE

It is possible for "hum" to creep in via a leak to earth, as is diagrammatically illustrated in Fig. 4.

kind, while the fixed condenser does not offer an alternative path to it, as this is a complete "stopper" to "D.C."

But even if there were such a thing as a perfect choke, and one used a fixed condenser of colossal capacity, it would still be possible for hum to creep through if the insulation of certain parts of the set were faulty.

from a main's short-circuit) the leaking current might wander through all kinds of components in the set.

And thus your hum. Another choke connected in the negative mains lead would certainly stop it, but when the negative mains lead is "up in the air," or, in other words, alive, and the positive lead earthed, then it is wise to make sure that possibilities of such

By the way, I have received some two hundred letters from readers pointing out certain slips in my last article. I thank all my correspondents, but I do hope "W.M." of Belfast will not pull me up for my cavalier treatment of "resistance" in the above article!



B.B.C NEWS

Topical notes regarding British Broadcasting Stations and Programmes.

**By Our
Special Correspondent.**

Foreign Artistes and Conductors

THERE is keen controversy in musical circles about the degree to which foreign artistes and conductors should be excluded by the B.B.C. The problem about the ordinary artistes has been solved by the Government, which, through the Ministry of Labour, has gone so far in refusing licences as to call into being severe measures of reprisal on the part of both France and Germany. Conductors and star artistes, however, are in a somewhat different category.

A case in point is that of Hindemith, who has world-wide eminence as a viola player and composer as well as a conductor. It is still being debated whether he will be invited in one or other of his capacities to participate in the first performance of his own choral work, "Das Unzufhorliche," which the B.B.C. is including in its series next winter.

Meanwhile, it is interesting to note the cancellation of the engagement of the Spanish conductor, Falla, who was to have taken the Queen's Hall Concert on April 27th. I do not know who took the initiative, but the result is on the same general lines as the nationalist policy being cultivated by the B.B.C.

The Moscow Radio Theatre

We are familiar in this country with the limited opportunities provided for listeners to be present at studio performances. The B.B.C. has a long waiting list of applicants, which it works off as rapidly as possible.

A friend of mine, just returned from Russia, tells me that the Russians make a very big thing of audiences at studio performances. They have gone so far, indeed, as to create a

Moscow Radio Theatre staffed by four hundred artistes and eighty-five recording technicians, using eight studios.

Their performances are cast and equipped as for the stage. A small charge is made, and an audience of over a thousand can be present at each performance, this being the only opportunity for most of them to know anything of dramatic art of any kind.

Mr. Harold Brown of the B.B.C.

Mr. Harold Brown, the new Governor of the B.B.C., and the only one that

has the certain prospect of five years in office, has jumped into his job with characteristic keenness and energy. He is believed to be the nominee of Mr. Neville Chamberlain, acting for the Conservative Party, although the Prime Minister made no objection to the appointment.

It was felt that Mr. Brown's wide business experience, his vigorous personality, and his conservative attitude, would be continuously useful during the considerable changes which the next five years may witness in

(Please turn to next page.)

HESTON HAILS OUR AMATEUR AIRMEN



The Automobile Association (more generally known as the A.A.) has developed a weather report service for private owners of aircraft. The photograph shows the radio transmitter used for the broadcasting of the reports which are sent out at regular intervals on a wave-length slightly above 800 metres. This station is the first of a series to be erected throughout the country.

LEAVING WELL ALONE

A most appropriate title for an amusing article which we feel sure our readers will enjoy.

EVERYONE has come across the man whose car is seldom or never on the road. He runs it out of the garage, the engine ticking over beautifully.

Two minutes later his head goes forward and a strained look steals over his face. He grabs you by the arm.

A Motoring Parallel

"Say, old man, do you hear that?"

For politeness sake you murmur something unintelligible.

"Piston slap; I'll have to run her back in, I'm afraid."

Ten minutes later, surrounded by the dismantled engine, he is whistling merrily, happy as a skylark.

progress, and before 7 the table is spread over with components and lengths of wire.

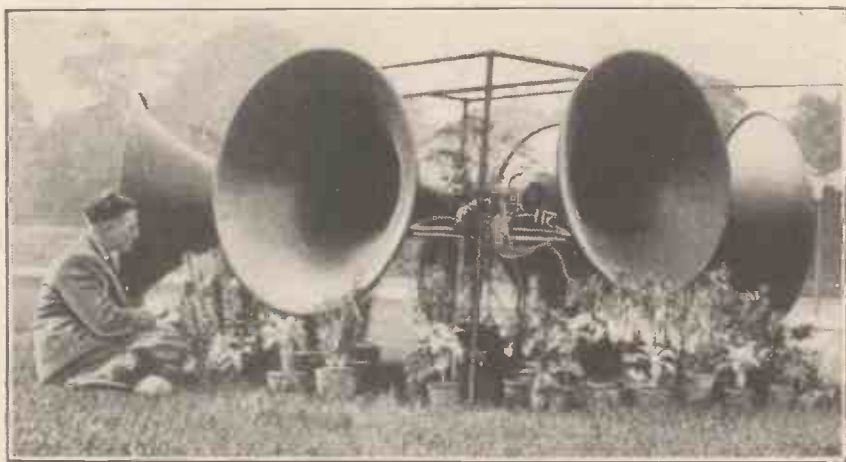
About this time enthusiasm begins to wane. He looks at the mass of gear around him and mutters:

"Don't think I'll bother to hook it up to night; I'll just run round to Stimson's and see how he's getting on with his 'Picnic' Seven. There's nothing much on, anyhow."

At this announcement the family atmosphere touches zero level; well they know it will be days before the set is in commission again.

It is not that he means to be wilfully selfish, but simply doesn't know when to leave well alone. If your set develops some trifling irregularity,

SPREADING THE NEWS ON THE SPEEDWAY



A battery of six giant moving-coil loud speakers installed at the Crystal Palace Speedway. With their aid the track authorities are able to broadcast the results of the various races to the watching crowds.

In the same category is the wireless terror, whose set is seldom or never in a condition for reception. His programme is usually as follows: 6 p.m., News Bulletin coming through at excellent strength and first-rate quality. Half-way through he begins to fidget in his chair. At 6.15 he is listening intently, but not to the news.

"Hear that crackle, old chap? I'll swear it wasn't there last night!"

The Rush to Repair

You suggest atmospherics; he repeats the word with such withering scorn that an icy trickle runs down your spine. By 6.30 dismantling is in

don't jump to the conclusion that it needs taking to bits.

Quite likely the trouble will vanish of its own accord. A bad attack of fading may be due to corroded accumulator terminals, the volume varying with the amount of current which can force its way through to the valves.

Perhaps the best plan of all is to have a stand-by set in readiness. It need only be a straight det. and L.F., but it will enable you to carry out the overhaul without interfering for more than a moment with your family's enjoyment of the broadcast programmes.

B.B.C. NEWS

—continued from previous page

the general state of affairs in the country as well as in the organisation of the B.B.C.

There is no doubt that Mr. Brown is of the "strong" type of personality, accustomed to absolute control. Query—what will happen when the irresistible meets the immovable?

Complaints About the Empire Station

Both in Wales and in Scotland growing resentment is being expressed that the B.B.C. has decided to go on with the construction of the permanent Empire station and the creation of an expensive "All round the clock" series of services to the Overseas Dominions and Colonies before anything has been done to meet the grievances of the large number of listeners in these islands still outside service areas.

The Nationalist movement in Wales has threatened to take Parliamentary action.

Sunday Programme Possibilities

Although no special Committee has been set up to review the Sunday Programme Policy of the B.B.C., there is no doubt that Savoy Hill is becoming aware of growing impatience with the slimness of its Sunday diet.

There is no question, of course, of the withdrawal of any of the existing religious facilities, or even of widening the range of what is now regarded as programme material appropriate for Sunday.

The effective demand is for an extension of good musical programmes, so that in its hours of broadcasting Sunday shall not be inferior to any other day of the week. Incidentally, it should have occurred to the B.B.C. that to accede to this request would not only meet a legitimate grievance of listeners, but would also be a great discouragement to the development of the competitive sponsored programmes from the Continent.

I have already indicated that if Talks get more divorced from entertainment there will be a serious danger to the B.B.C. The situation about Sunday programmes is just as acute. To say that not many letters of protest are received by the B.B.C. leaves me cold.

The protestors about Sunday programmes have long since realised the futility of direct complaint.

MAKING RADIO READ-ABLE

By HERBERT K. SIMPSON

This is the first of an informal series of chats on the "How and Why" of broadcasting. It will prove very readable, not only to the many thousands of new readers who with this issue are taking up radio as a hobby, but also to old hands.



PERSONALLY I hate being lectured. I had too many years of it! So please don't imagine that I intend, or would presume, to write this series of articles in a professor-ish manner.

No subject, as a matter of fact, could be more interesting to talk about or more profitable to understand. But you had better stop reading at once if you expect a learned treatise! I intend to sift the subject so that only those essentials remain which will really help you to get the most out of the set you already have or which, no doubt, you will shortly construct.

Our Starting Point

It will simplify matters for me a great deal if I assume that you know nothing—about radio, of course! I am writing primarily for newcomers, so I shall first talk briefly about the links in the chain between the microphone at the broadcasting station and the loud speaker at the receiving end.

The logical starting point is the studio, and here we have the microphone, which is like an electrical car. The microphone has a diaphragm which is usually a thin metal disc which will vibrate in response to sounds in the studio.

A Simple Experiment

Suppose that an announcer is speaking and vibrating the air by means of his vocal cords, or suppose that a drum is struck. Let us consider for a few moments why the microphone diaphragm is affected by these sounds.

The process can be demonstrated by a very simple experiment in your

own home—provided the family do not object! If you open the door of the room suddenly, the windows will rattle—at least mine do!

Now the link between the door and the windows is the air in the room, and as the door moves forward it crowds up the air in front of it, the pressure being passed on through the air as a *wave*, which on arrival at the windows gives them, so to speak, a push.

A Pressure Wave

Another way of looking at this is to compare the air in the room to people standing in a crowded bus. If a new passenger gets in, whoever is nearest the door must move farther

up, and in doing this will cause the next person to move up also, the process repeating itself until the "human sardine" at the far end will press more heavily against the end of the bus.

Here we have had what is known as a *pressure wave* in passengers instead of in air, but the push has been sent along in a similar way. It is interesting to note that the people were not all moving at the same time, and this is also true of the air.

Watch that Window

Coming back to our room experiment, we can obtain, by suddenly shutting the door, a *wave of low pressure* which, on arrival at the windows, sucks them in momentarily. (This effect can be compared to what happens in the bus when the passenger nearest the door gets off.)

WHERE THE PROGRAMMES START



This is a view of the new Broadcasting House, London, W.1, which is equipped with twenty-two studios. How the programmes start and how they reach your aerial is told with concise clarity in the article that begins on this page.

Making Radio Readable—continued

By moving the door rapidly to and fro you could set up a series of air waves which would keep the windows rattling for as long as you liked. (I might mention that my own tests were made while the more important members of the household were out!)

Returning to the studio, let us consider what happens when a drum is struck. The stretched vellum of the drum sets up air waves which travel to the microphone and vibrate its diaphragm. The process is thus similar to that in the window-rattling experiment.

How Loud Speakers Work

The movement of the diaphragm of the microphone causes an electric current to vary, and the increases and decreases of this current are electrical reproductions of the sound waves from the drum. These varying currents can be turned back into sound by passing them through a loud speaker, which is comparable to a large edition of a Post-Office telephone earpiece, and likewise possesses a diaphragm.

When the current passing through a loud speaker rises and falls its diaphragm is caused to move in and out, and by this means waves are set up in the air which we hear as sound.

The object of broadcasting is to get the programme from the studio into hundreds of thousands of homes. This could be done by connecting all our loud speakers by wires to the microphone, but it would all be very costly and obviously impracticable. Pirates would lead a more difficult life, of course! The rest of us would be literally tied to the B.B.C. programmes.

The Link Between

If we are to avoid using wires we must look round for some other means of getting the microphone currents into our homes. This is done by using wireless waves; but let us first see how these waves are produced, and then how they are used.

By sending electrical currents up and down an aerial, wireless waves are set up in the ether. These wireless waves travel out in all directions, and as they pass our aerial they set up tiny currents in it. These currents are feeble reproductions of the currents in the transmitting aerial.

We have now got a link between the broadcasting station and our aerial,

and if the currents used were the microphone currents we might think that the whole problem had been solved. However, there are two main reasons why the microphone currents are not used to produce the wireless waves.

The first is that these current pulses, although they may number from 50 to 5,000 per second, are too slow to produce wireless waves efficiently.

The second reason is that if we had currents in our receiving aerial corresponding to the combined microphone currents of even two stations, we should not be able to separate the two programmes; they would be all mixed up.

SETTING UP SOUND WAVES



A microphone can be seen suspended on a light framework that stands on the table in the foreground. Its job is to convert the sound waves into electrical currents.

Both problems are solved by using very much more rapid pulses of electricity which produce wireless waves more efficiently. These very rapidly pulsating currents are known as *high-frequency currents*, the frequency being the number of times per second that they repeat their pulsations.

From now on we can forget about the wireless waves themselves and only remember that in our receiving aerial we shall have currents which are reproductions of the aerial currents

at such broadcasting stations as are sufficiently powerful.

We will now see how the currents from all the stations differ, and thus how our set is able to select one programme at a time. Each station is given a different frequency; for instance, the frequency used for the Northern National programme is 995,000, or—as it is usually stated—995 kilocycles per second.

In Every Aerial

Now when the Northern National transmitter is working, almost every aerial in England will have tiny currents in it which pulsate 995,000 times per second, and we can use apparatus which will respond to this frequency and leave the frequencies due to other stations unused.

So far, so good; but we still haven't any of the slowly pulsating microphone currents at our disposal. We have picked out the high-frequency currents produced by one station only, but if the microphone currents at this station are made to vary the strength of the high-frequency currents in its aerial we shall get similar variations in the high-frequency currents which we have selected.

The work of the receiving apparatus is now to recapture, as it were, the microphone currents, and the part that does this is known as the detector.

Journey's End

All that we have to do now is to strengthen these reproductions of the microphone currents, and to pass them on to the loud speaker, which will, as previously described, give back to us the sounds which the microphone "heard."

Our next month's chat will deal with the subject in more detail, and opportunities will occur, as we go along, to discuss how the knowledge gained may be used to get out of radio the maximum of enjoyment and satisfaction.

Mr. Scott-Taggart has asked us to thank all those thousands of readers who have extended to him the opportunity of demonstrating the "S.T.300" in their homes.

He cannot write to them all, but he will communicate in due course with a selection of his correspondents with view to making definite arrangements for visits.

Will other correspondents please note that the "S.T." postbag is enormous and that some slight delay in dealing with it is inevitable?

The "VI-KING" BAND-PASS FOUR



Employing the latest type of band-pass coils, and a special scheme of ganged tuning, this powerful receiver will bring in foreigners in a manner and with a volume that will amaze you.

By
VICTOR KING

TIME was when the results obtainable from distant stations had no programme value whatever, in fact it was difficult enough to get such stations, let alone enjoy them when they were received. But nowadays distant reception can be worth while from an entertainment point of view.

Getting "the Goods"

I say "can be," because not every set is capable of receiving them in a satisfactory manner. Before I go any farther let me tell you just what I think constitutes a "satisfactory manner."

Of course, the ideal would be to be able to listen to, say, Radio-Paris, Rome, or Berlin, coming through as though they were local stations. I know many people claim that they have heard such-and-such a station and thought it was the local, or remark: "You couldn't tell the difference between them and the local." But, really, they must be just a little bit optimistic!

Nevertheless, although I will not go all the way with them, I will go a long way; it is surprising what a lot can be done with a set of the right kind. But it *must* be of the right kind!

"That Local Station Feeling"

For instance, take the question of volume. How is one going to get that local-station feeling when Warsaw talks in English unless he comes through with real pep backed up with ample punch?"

Nothing is worse than the once accepted idea of "Came through on

the loud speaker." A man with his head almost buried down the spout of a loud-speaker horn while other

occupants of the room hold their breath and clutch tight all pins that might fall to the ground!

AN UNUSUAL BUT EFFICIENT SCREEN ARRANGEMENT



The special shaped vertical screen prevents all howls and other forms of H.F. instability. The metal cover has been removed from the coil in the foreground.

The "Vi-King" Band-Pass Four—continued

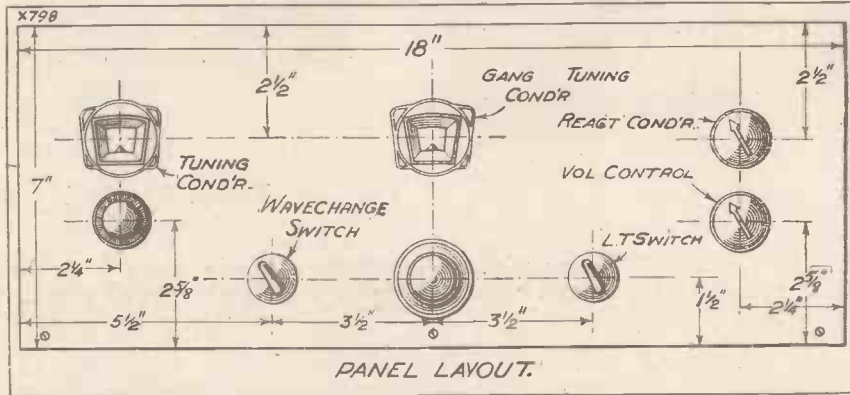
But, seriously, it is marvellous how meagre a volume some people will put up with so long as a "Vous venez d'entendre" or "Hier—" issues from the speaker. With a four-valve set that has an efficient S.G. high-frequency stage and two L.F. stages doing their full bit it is not a flight of the imagination that volume control-

to come to. And I agree with you, what is the good of power without purity? Easily answered. None at all!

This is another reason why you must have the right kind of set. You want a receiver that will not need too much gingering up with reaction, for heavy-handed use of the reaction

That is why I have chosen band-pass tuning for my long-distance four. I know there are two schools of thought about this method of obtaining selectivity, but no matter how strong the arguments which may wax over it, we do know that it doesn't cut off the high notes, and it does give a high degree of selectivity.

NOTE THE NEATLY GROUPED CONTROLS



On the right are the reaction and volume controls, both of which are "loudness" adjusters, while the switches are on either side of the ganged condenser control.

ling may be necessary on some continentals as well as the locals.

As a matter of fact, if I may be permitted to divert for a minute, the intelligent use of the volume control on a powerful set can add greatly to the pleasures of listening. If you are waiting for some item to come on that you want, or, alternatively, waiting for some item to finish that you do not want, it is much better to turn the volume down to a whisper instead of trying to ignore the radio. Besides, it is much better from the conversational point of view, and if you switch right off you may miss one of your favourite tit-bits.

Variable Volume

Then, again, one can enjoy much more volume when a brass band is performing some lively march than when the "correct-toned" announcer is delivering the "latest" news and one is itching for him to get along to the football results. And when there is a lot of you listening to dance music you want much more punch than if you are by yourself, quietly enjoying your favourite numbers. But enough of that!

Perhaps you will say: "This talk about volume from foreigners is all very well, but what is the good of power without purity?"

That is the very next point I want

knob is a very quick cut to spoilt reception, to reception of a tone that lacks that desirable crispness.

Preserving the "High Stuff"

But reaction is not the only thing that can kill brightness. A high degree of selectivity is a *sine qua non* of the modern receiver, but some methods

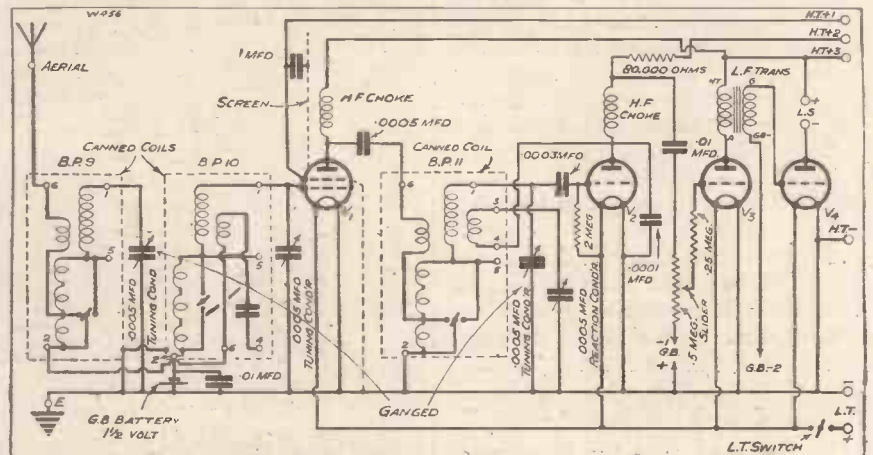
Selectivity Essential

Everyone needs really first-class selectivity nowadays, no matter where they are situated. Those who are near powerful locals must have it if they are to receive continental stations while the nearby giants are at work, and those farther away from colossal power must have it to separate the foreigner that they will be able to bring in so much more easily, because they must naturally be farther away from large town centres.

We have already decided that we must have volume, but, unfortunately, as every designer admits, volume and selectivity tend to constitute a "vicious circle." As one goes up the other goes down.

And in that last short sentence you have another of my reasons for choosing band-pass tuning. Different methods of obtaining selectivity require different sacrifices of sensitivity for a given degree of station separation. There is far less loss of sensitivity when one obtains it by band-

STRAIGHTFORWARD EFFICIENCY—NO STUNTS



Results—loud and clear; that was the keynote from beginning to end when working out the design of this receiver.

of obtaining the necessary selectivity are inclined to produce an effect very similar to that produced by too great a dependence on reaction to boost up volume.

passing than by most of the other forms of straight-set selectivity.

I know that the reply of anti-band-pass merchants to that is in effect this. If one does not want extra

The "Vi-King" Band-Pass Four—continued

THE PARTS YOU REQUIRE FOR THIS FINE SET

- | | | |
|---|---|---|
| <p>1 Panel, 18 in. x 7 in. (Permeol, Peto-Scott, Goltone, Wearite, Becol, Ready Radio).</p> <p>1 Cabinet, with baseboard 10 in. deep to fit (Gilbert, Pickett, Camco, Peto-Scott, Ready Radio, "Morco," Osborn).</p> <p>1 .0005-mfd. tuning condenser, with slow-motion disc drive (Polar Aperture, Cyldon, Lotus, J.B., Utility). (See text.)</p> <p>1 Double-gang .0005-mfd. tuning condenser, with slow-motion disc drive (Polar Uniknob).</p> <p>1 Filament switch, snap type (Ready Radio, Bulgin, B.A.T.).</p> <p>1 .0005-mfd. solid-dielectric condenser (Telsen, Ready Radio).</p> <p>1 ½-meg. volume control (Graham Farish, Ready Radio, R.I., Wearite, Colvern, Magnum, Clarostat, Varley, Igranie).</p> | <p>1 Set of Square Peak canned coils (Varley type B.P.13).</p> <p>3 4-pin valve holders (Lotus, Telsen, Graham Farish, W.B., Clix, Wearite, Lissen, Bulgin).</p> <p>1 Horizontal type mounting valve holder (Parex, W.B.).</p> <p>2 .01-mfd. fixed condensers (T.C.C., Telsen, Dubilier, Ferranti, Lissen, Graham Farish, Sovereign).</p> <p>1 .0003-mfd. fixed condenser (Telsen, etc.).</p> <p>1 .0005-mfd. fixed condenser (Dubilier type 670, etc.).</p> <p>1 .0001-mfd. fixed condenser (Sovereign, etc.).</p> <p>1 1-mfd. fixed condenser (T.C.C., Dubilier, Telsen, Peto-Scott, Sovereign, Hellsby, Hydra, Ferranti, Lissen).</p> <p>1 80,000-ohm Spaghetti resistance (Bulgin, Telsen, Lewcos, Graham</p> | <p>Farish, Varley, Igranie, Ready Radio, Peto-Scott, Sovereign, Magnum).</p> <p>2 H.F. chokes (Telsen Binocular and Lewcos, Varley, Wearite, Ready Radio, R.I., Peto-Scott, Magnum, Climax, Lotus, Graham Farish).</p> <p>1 L.F. transformer (R.I. Hypermu, Telsen, Varley, Igranie, Ferranti, Climax, Lotus, Lewcos, Formo, Goltone).</p> <p>1 2-meg. grid leak and holder (Telsen, Dubilier, Ready Radio, Igranie, Loewe, Graham Farish, Ferranti).</p> <p>1 ½-meg. grid leak and holder (Telsen, etc.).</p> <p>1 Terminal strip, 18 in. x 2 in.</p> <p>10 Terminals (Bulgin, Eelex, Belling & Lee, Igranie, Clix).</p> <p>For screen see text.
Glazite, Lacoline, Quickwyre, Jiffilnx. Screws, flex, battery plugs, copper foil.</p> |
|---|---|---|

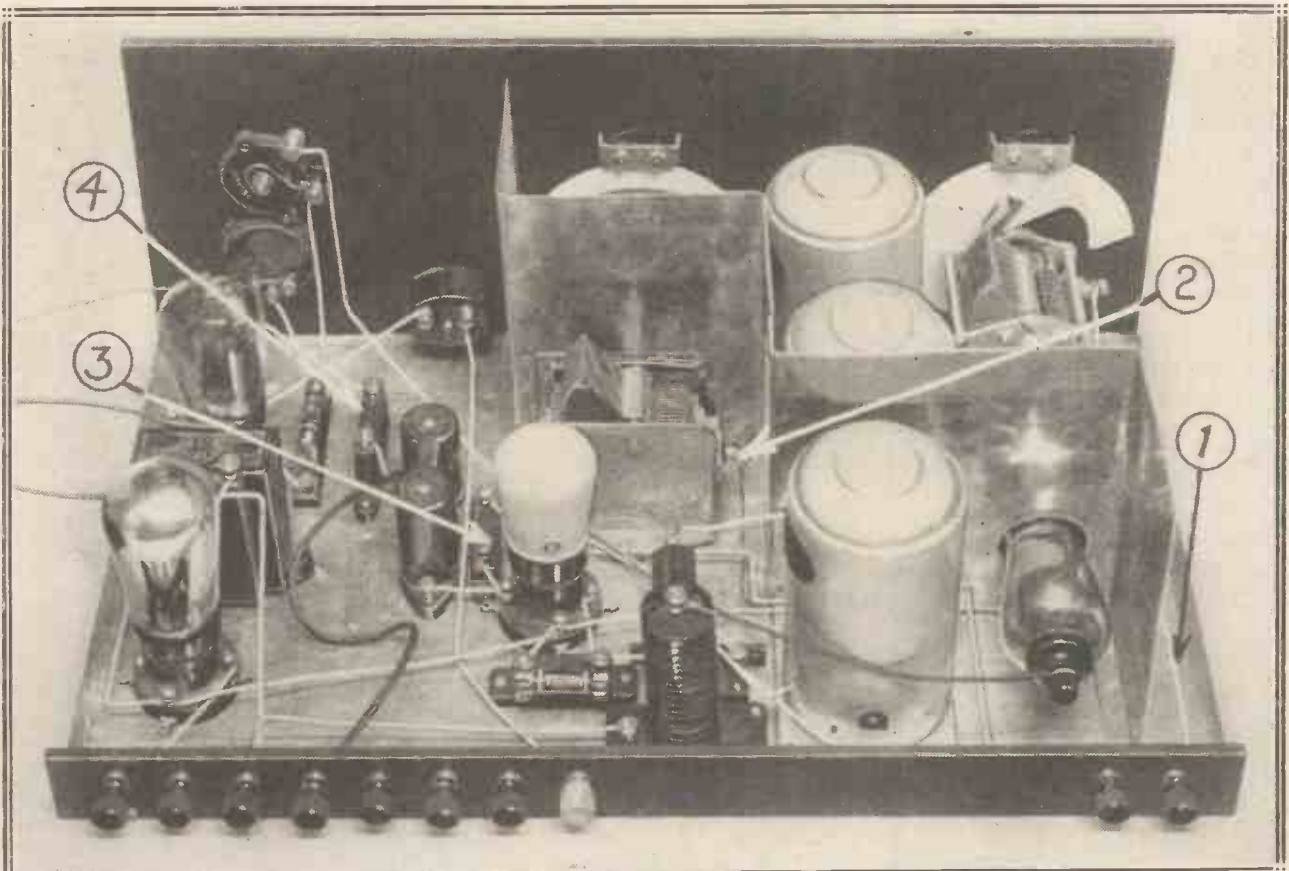
tuning controls, then the band-pass circuits must be ganged, and since ganging cannot be dead in step for the whole of the condenser range,

volume must suffer; so what have we gained in the end?

But, then, there would not have been the special method by which

ganging is carried out in my four. It is quite a new system, so I think I will go over it with you before I bang out another single sentence.

FOUR VITAL LINKS IN THE CHAIN OF RECEPTION



The items to which prominence is given in the above photograph are (1) the lead from the aerial terminal, which is carefully screened from the S.G. valve by the vertical shield; (2) the balancing capacity that brings the ganged condensers into step; (3) the H.F. coupling condenser, an important component; and (4) the L.F. coupling condenser which should be insulated with mica.

The "Vi-King" Band-Pass Four—continued

Have a good look at the circuit diagram, you'll find it on one of these pages. Done that? Right, then off we go!

Down to Business!

Now, first of all, we don't want to compromise, so we must provide some scheme by which we can ensure that the ganging will be just right for both wave-bands, and also for all wave-lengths on either band. An ordinary trimmer controlled from the

panel can be nearly as much trouble as another complete tuning control.

The trouble with such trimmers is that they are made to do two jobs, which ought to be carried out separately. First, they have to equalise the two circuits that are to be gang-controlled; that is to say, they have to make up for differences in the coil characteristics and capacities due to wiring.

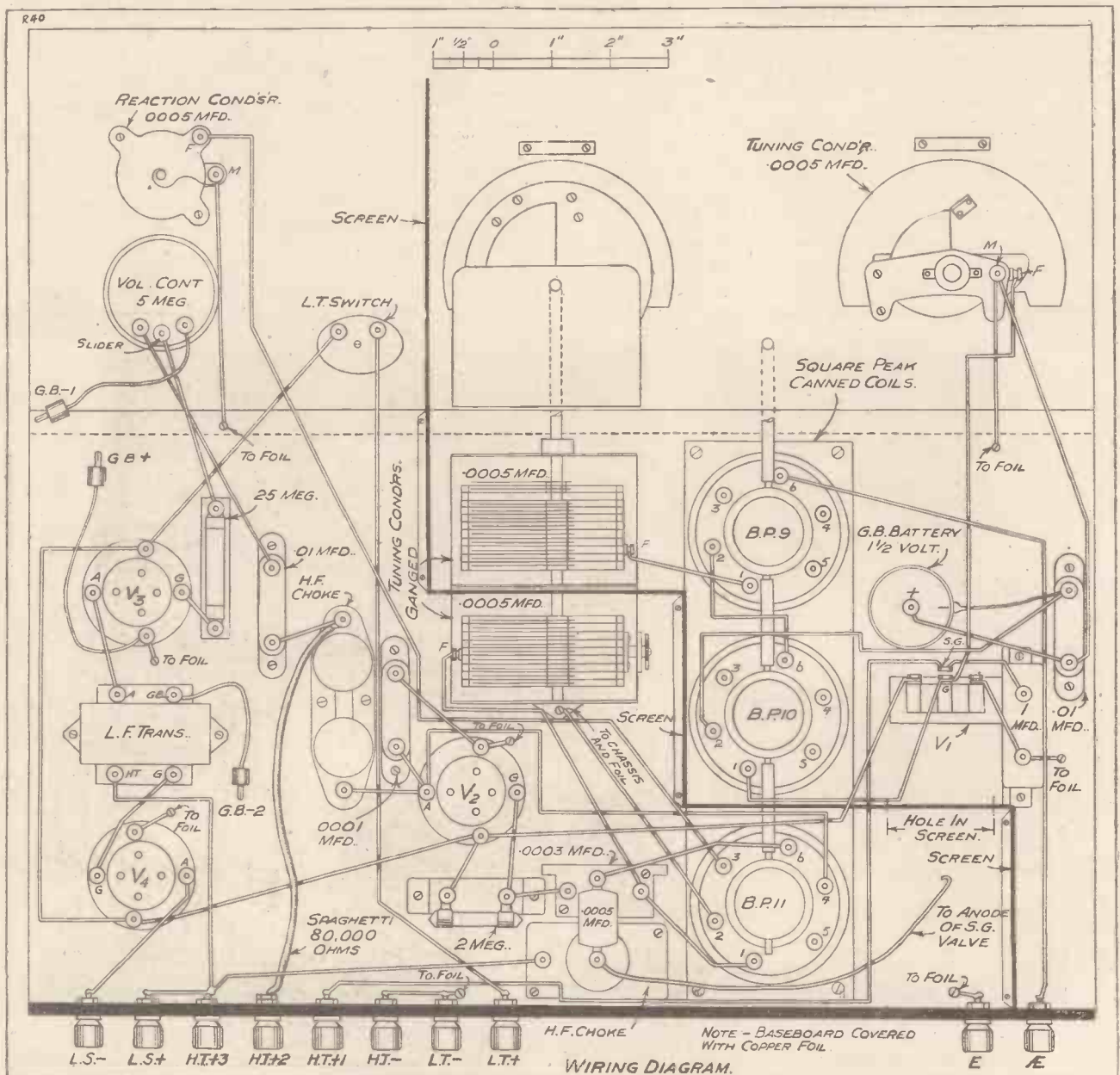
On the top of that they have to make up for the differences between

the necessary equalising capacities for different parts of the tuning dials. The first job should be done with a separate capacity across one of the condenser sections, which capacity, once it is set, is never altered.

Setting the Trimmer

Then the trimmer on the panel can be set at, say, half-way and left there and the set tuned as an ordinary ganged receiver if desired. The extra trimmer simply makes up for the

THE WIRING HAS BEEN KEPT DOWN TO AN ABSOLUTE MINIMUM



By taking many of the connections direct to the copper foil, the wiring is considerably simplified; and as there are only two leads passing through the "zig-zag" screen, connecting up is really simple.

The "Vi-King" Band-Pass Four—continued

The "Wireless Constructor" "Vi-King" Band-Pass Four Receiver

Circuit: Band-Pass S.G., H.F. Det. and 2 L.F. (R.C. and Trans.).

VALVES.

- 1st (through screen): S.G.
- 2nd (near gang condenser): H.L. or special detector type.
- 3rd (next to panel): L. type.
- 4th: Small power with battery H.T.; super-power if H.T. mains unit is employed. (2-, 4-, or 6-volt valves are suitable.)

VOLTAGES.

- L.T.: 2, 4, or 6, according to rating of valves that you choose.
- H.T. + 1: 70 to 90 volts for screening grid of S.G. valve.
- H.T. + 2: 100 to 120 for detector and first L.F.
- H.T. + 3: 120 to 150 for power valve.
- G.B. - 1: 1½ or 3 volts negative.
- G.B. - 2: Negative voltage in accordance with maker's figures for power valve.

CONTROLS.

- SWITCHING.**—Turn left-hand bottom knob anti-clockwise for long waves and clockwise for medium.
Turn right-hand bottom knob anti-clockwise for "set off" and clockwise for "set on."
- TUNING.**—Move left knob and centre main knob together, turning centre small knob after receiving station to see whether improvement is thereby effected.
- REACTION.**—Top right knob. Turn clockwise to increase.
- VOLUME.**—Knob immediately below reaction control. Turn anti-clockwise to reduce volume. On powerful local station, detune first knob to obtain pre-H.F. volume control and prevent detector overloading.

ADJUSTMENTS.

- There is only one adjustment to be made. That is the setting of the balancing condenser fitted to the side of the back portion of the gang condenser. Adjust with piece of wood with weak station tuned in somewhere near centre dial readings and with reaction at zero. With the panel trimmer set at about half value, turn wheel until loudest reception is obtained.

sharper, because when receiving stations that require dead setting of both circuits, reaction is bound to be in use, which will greatly sharpen up the third tuning circuit.

A Perfect Balance

If, therefore, the detector's circuit is even slightly out of tune we shall notice it. So all we have to do is to put the trimmer on to the other one and we can ensure having all three circuits dead in tune, giving us maximum power and selectivity.

And that is just how I have arranged the tuning of this band-pass four. The remainder of the circuit does not contain a lot of starting features, being built on sound and well-tried lines. But the practical conception of the circuit is rather unusual, and is worthy of a few special comments.

differences just mentioned, when extra fine tuning is desired.

That is only the beginning of the story of my special ganging scheme. The main part lies in the question of which of our three tuned circuits we shall gang. At first sight you might say the first two, following the conventional scheme.

"Ganging" the Circuits

But is that necessarily right? Let's reason it out. One of the ganged circuits should naturally be the one which tunes flattest, and therefore we must have the aerial circuit for one.

The choice of the other is not quite so straightforward. Suppose we make it the second. Then both the ganged circuits will tune about as sharply as one another, although the aerial circuit will be a little flatter.

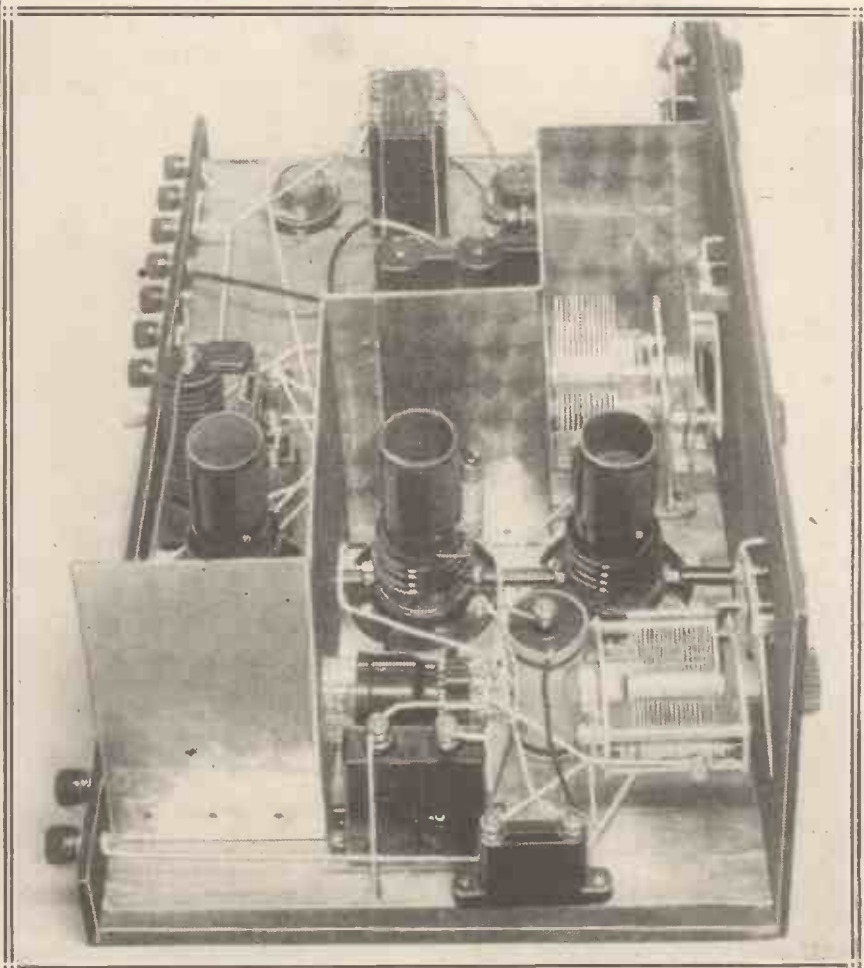
Remembering we are to employ trimming, suppose we tune in a station. If the circuits are not quite balanced we can have either the aerial circuit or, alternately, the second circuit dead in tune.

The Better Method

But more than likely the one that is dead in tune will be the one that has the trimmer on it. Consequently no amount of trimming will bring the other into tune. Also it is possible neither will be dead in tune, when much of the same conditions will exist.

But take the case of ganging the aerial circuit with the detector's circuit. The latter will be definitely

COMPLETELY DIVIDED INTO TWO PARTS



The vertical screen, which is in zig-zag form with four right-angle bends, separates the H.F. part of the set entirely from the det. and L.F. stages.

The "Vi-King" Band-Pass Four—continued

Careful attention has been paid to screening so that there shall be no possibility of H.F. instability in any circumstances. The baseboard is completely covered with a sheet of copper foil, and all earth points which it is permissible to take via this foil are soldered or screwed direct to it. This greatly simplifies the wiring, which you can see is carried out by taking leads as direct as possible from one point to another so long as sufficient spacing is obtained.

The zig-zag vertical screen is made up from two standard type screens. You will be able to buy these already prepared, but it is quite an easy matter to shape them yourself.

You can get the dimensions from the wiring diagram by measuring up in accordance with the scale shown thereon. You will note that the bent-over part at the bottom of the screens is cut away along the portions that run parallel with the panel.

Fitting the Screen

A piece must be cut out of the bottom of one screen where it passes over the base of the coil assembly, and a piece out of the other where it fits round the plate that separates the two sections of the ganged condenser. The zig-zag screen separates the band-pass part of the set from the detector and L.F. end.

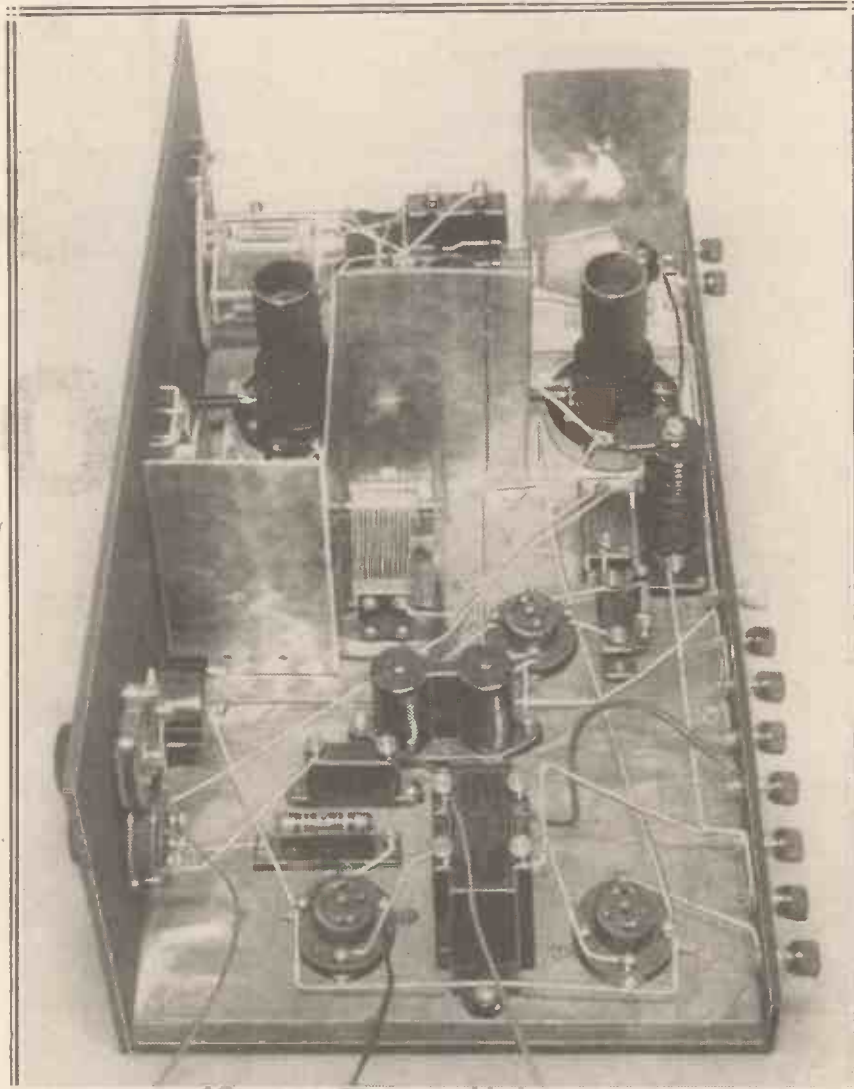
The two coils that form the band-pass filter are screened from one another by their own metal pots. And one of these, the one nearest to the panel, serves to screen the two condensers that tune these two coils.

Coupling between the two band-pass coils is obtained by connecting two windings, one on each, in series. The familiar scheme of combined inductance and capacity coupling is not utilised.

The Coil Assembly

So far as the coil assembly is concerned there is no alternative make, and it is advisable not to try and employ other makes of ganged con-

PLENTY OF ROOM FOR SPACING THE PARTS



Considerable low-frequency magnification is available, as well as tremendous high-frequency amplification. Provision is therefore made for controlling volume before and after the detector valve. Note the well-spaced L.F. section.

SUITABLE ACCESSORIES

Loud Speakers. (Marconiphone, Celestion, Amphon, B.T.H., H.M.V., R. & A., Undy, Blue Spot, W.B., Graham Farish, Lissen, Epoch.)

Valves. 1 S.G. (Marconi S.22, or Mullard, Mazda, Cossor, Osram, Tung-ram, Eta, Six-Sixty).

1 Det. (Cossor 210H.L., etc.).

1 L.F. (Mazda L.210, etc.).

1 Output (Mazda P.240, etc.).

Batteries. H.T., 120-150 volts, super-capacity (Pertrix, Ever Ready, Drydex, Lissen, Columbia, Magnet, Ediswan).

G.B., 1½-volt cell for S.G. valve (Ever Ready, etc.).

16½-volt for L.F. valves (Pertrix, etc.).

Accumulator. 2-volt (Exide, Ediswan, Lissen, Pertrix, G.E.C.).

Mains Units. To give 25 milliamps. at 120 volts (Heayberd, Lotus, Formó, Ekco, Tannoy, Regentone, Atlas, R.I., Tunewell).

denser. Apart from these two, however, the usual suitable alternatives are mentioned in the list of components.

The construction is really simple, for apart from the vertical screen there is ample room to fit everything in place and also to wire up. There are only two wires that pass through this screen, one for the positive filament of the H.F. valve and the other for the screening grid of this valve.

Provision for Panel Lights

Leave these two wires until the last and then the set can be completed before the screens are put in place. The condensers are provided with holders for panel lights. These are not shown in the wiring diagram, but they may be fitted if desired.

(Please turn to page 296.)

Thousands of discriminating constructors have built the S.T.300 with READY RADIO KITS

Mr. Scott-Taggart's final message was : " I confidently leave this set to the verdict of the wireless constructors of this country."

The verdict has been unanimous. Ready Radio have dispatched thousands of " S.T.300 ", Kits to all parts of the country, and from thousands of constructors has come the reply : " The ' S.T.300 ' is the finest screened-grid three ever designed."

They tell us that every claim made by the designer has been justified, because they used Ready Radio Kits. Every Ready Radio " S.T.300 " Kit consists of specially chosen components which are matched in order to extract the utmost efficiency from the circuit.

The " S.T.300 " is the set you MUST build for really good Radio reception. Thousands of letters prove that you MUST build it with a Ready Radio Kit in order to get the results the designer claims for it.

Send off the Coupon on page 287 now !

FREE..

Full-size official " Wireless Constructor " Blue Print is given free to every purchaser of a Ready Radio " S.T.300 " Kit.

If you also enclose four 1½d. stamps we will send you Mr. Kendall's book, " 10 Hows for Modern Radio Constructors." Invaluable to every constructor.

Kit " A " (less valves and cabinet) £3:18:6

OR BY EASY PAYMENTS

7/3 down, and 11 monthly payments of 7/3

Kit " B " (with valves less cabinet) £5:17:6

OR BY EASY PAYMENTS

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Kit " C " (with valves and cabinet) £6:16:0

OR BY EASY PAYMENTS

12/6 down, and 11 monthly payments of 12/6

See also page 287, for complete list, order forms, etc.

IMMEDIATE DESPATCH

Head Office and Works : EAST-NOR HOUSE, BLACKHEATH, S.E.3.
'Phone : Lee Green 5678.
'Grams : Readirat, Blackvil.

Ready Radio

Showrooms : 150, Borough High Street, London Bridge, S.E.1.
'Phone : Hop 3000.

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THE "KELSEY" ADAPTOR IN USE

NOTE.—At the conclusion of the constructional article in the January issue of "The Wireless Constructor" reference was made to the fact that some further operating details were to be given in the next issue. On account of extreme pressure on our space, it is regretted that these further notes were unavoidably held over from the last issue. Preliminary details were, however, given in the constructional article, so that those readers who have made the new adaptor will have had ample opportunities for giving it a good try out and will, therefore, be all the more at home with the various points discussed below.

A FORTUNATE feature of this article being held over is that in the time that has elapsed a large number of readers have taken the trouble to write to me, and I am now in the position of being able to deal with the most important points raised, whereas had this article appeared last month I should not have been able to do that.

One reader, for instance, writes to point out that it isn't possible to make a tapping with the standard type of crocodile clip on a particular make of coil because the turns are too close together, and in consequence the head of the clip shorts a section of the winding.

Simply Effected

I must confess that I thought the method of overcoming this apparent "snag" was so well known that with the photograph appearing on page 142 of the January issue, in which the method can be seen, it was quite unnecessary again to refer to it. As a matter of fact, all that it is necessary to do in order to obtain contact with only one particular turn is to insert a matchstick under the turn to which it is desired to fix the clip, as shown.

From the correspondence I have received it is apparent that one or two readers have experienced difficulty in making the adaptor oscillate. In almost every single instance the trouble has been due to the use of an "outside" in aerials.

Aerial Coupling

There are, as a matter of fact, two very simple ways of overcoming aerial coupling difficulties without going to the trouble of altering the aerial itself. You can either use a neutralising type series aerial condenser between the aerial lead-in and the aerial connection on the adaptor, or else—and this is probably the simpler way—the degree of coupling between the two coils can be made variable.

To do this you need only remove one of the fixing screws on the coil holder nearest the back of the base-board, and replace the present stiff wire connection to this particular coil

holder with a flexible connection, and you will then find it possible to vary the coupling quite appreciably.

By the way, while on the subject of obtaining satisfactory reaction—which is really half the battle in successful short-wave searching—one reader who experienced difficulty wrote to ask whether the adaptor could be used in a set in which resistance coupling was used in the first L.F. stage.

I have experimented with the adaptor in conjunction with all manner of resistance-coupled arrangements, and I have always found the

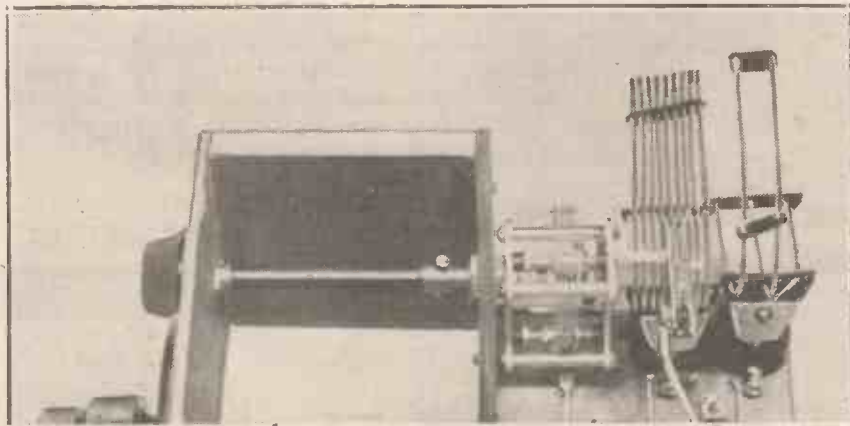
In the last article I mentioned that for preliminary testing the crocodile clip should be attached to a point about midway on the 9-turn coil.

The position for this clip to obtain the most satisfactory results is, as a matter of fact, best found by experiment. In general, I anticipate that the most satisfactory position will be, as in the original, at a point somewhere about midway, but if you should experience any difficulty due either to too much or to too little reaction, then variation of this clip position will no doubt enable you to overcome the trouble.

An Interesting Point

I want, finally, to make just a brief reference to an appreciated letter from a reader who made up the 1931 adaptor and who scrapped it in favour of the new model, only to find when he had done so that the former one gave the better results! At least, that was his impression! As a matter of fact, from my own observations, and

A MATCHSTICK DOES THE TRICK!



In some makes of short-wave coils difficulty is experienced in getting an ordinary crocodile clip between the turns to make the necessary lapping. The trouble can be very easily overcome by fixing a matchstick under the particular turn concerned.

combination entirely satisfactory.

But it does sometimes happen, as in the case of this particular reader, that the value of the resistance in the anode circuit of the detector valve, although possibly perfectly O.K. on normal broadcast waves, is too high for short-wave work. As a general rule, I do not advise the use of an anode resistance greater than 100,000 ohms in a case like that.

Position of Clip

Personally, I never use anything higher than 100,000 ohms for ordinary broadcast work, so if you do have to replace an anode resistance in order to obtain satisfactory short-wave reaction, I should be inclined to leave it in for broadcast waves as well.

from conversations I have had with other short-wave enthusiasts, I can quite see that there was some justification for that remark.

Due to Conditions

The only thing is that it doesn't happen to be anything to do with the adaptor! There is absolutely no question at all but that the latest version is a great improvement on the one published last year, but it so happens that the one published last year appeared at a time when short-wave conditions were exceptionally good, whereas—very unfortunately—the latest model has made its appearance when conditions for long-distance telephony are about the worst that they have been for two years. G. F. K.

READY RADIO KITS make the S.T.300 a world-beater!

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1 Sheet copper foil, 10 in. x 7 in.	1	0	
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The READY RADIO A.C. ELIMINATOR with trickle charger Type B.S. is especially suitable for this receiver.

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1 Pertrix Accumulator, P.A.C.3	11	0

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See Page 285 for Kit Prices, etc.

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AS WE FIND THEM NEW APPARATUS TESTED



Under this heading we publish reviews of apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

The "Meteor" Three

THERE is no doubt that for all-round work a straight three takes a lot of beating.

The designer of the "Meteor" Three is evidently of this opinion, since he has chosen as a basis a well-tried circuit arrangement consisting of detector and two low-frequency stages.

AN ATTRACTIVE SET



The "Meteor" 3 is an efficient three-valver designed to work on three wave-bands; viz., short, medium and long. The tuning and reaction condensers are both fitted with slow-motion drives.

To this he has added certain valuable refinements which raise it above the level of the ordinary conventional three-valver, and the finished product is unquestionably a thoroughly sound design.

Dealing with the circuit in greater detail, first of all we have the aerial tuning inductance, which is a six-pin wave-change coil covering the medium and long broadcast wave-bands, the wave-changing being carried out by means of a three-point switch on the panel.

On the top of the broadcast coil there are four sockets providing

different degrees of aerial coupling, and thus enabling the selectivity to be varied according to conditions.

The receiver is also designed for use on the short waves, so that the constructor is enabled to cover all broadcast wave-bands with one set. To go over to the short waves the special short-wave inductance is inserted in the six-pin base in place of the wave-change coil.

The short-wave aerial turns are arranged on a swinging former so that the coupling can be adjusted for maximum results.

Readers will remember this scheme of using wave-change and short-wave coils mounted on six-pin formers—thus making the receiver suitable both for normal broadcast and short-wave reception—was employed with great success in THE WIRELESS CONSTRUCTOR'S "Explorer" series. The detector is followed by an R.C. stage, the output from the first L.F. valve being then passed to a transformer-coupled output valve.

The tuning and reaction condensers have excellent slow-motion drives, the reaction condenser being placed well away from the panel (approx. 6 in.) and being provided with an insulated coupling on the extension spindle.

This is particularly useful in short-wave work.

Radio-gram Switching

On the terminal strip are a radio-gram switch and two pick-up sockets, the pick-up being switched into the grid circuit of the detector, which then functions as an L.F. amplifier in the usual way.

On test on a good average outdoor aerial the "Meteor" showed excellent sensitivity on both medium and long waves, and the selectivity was well up to the standard expected from this type of set.

Smooth Reaction

The reaction control was progressively smooth and the slow-motion drive provided the necessary fine adjustments for the reception of distant stations.

In the tests we intentionally used dry H.T. batteries which were by no means new, with the object of determining whether or not the set was perfectly stable on the L.F. side.

We are pleased to say that there were no signs of any trouble in this

"ONE OF THE BEST"



This is the Amplion M.C.D moving-coil loud speaker. Its response over a very wide range of frequencies is excellent and its sensitivity well above the average.

As We Find Them—continued

direction. The tone quality was good.

Altogether the "Meteor" Three is a highly satisfactory design, attractive in appearance and simple and efficient in operation.

Amplion "Moving Coil"

Since the earliest days of broadcasting the name of "Amplion" has always been coupled with high-grade loud speakers.

FOR A.C. MAINS



The Ekco K.25 A.C. mains unit is designed to give a high-tension output of 25 m.a., and is also provided with a switch for trickle-charging the L.T. battery.

We have recently had the opportunity of testing the M.C.9 moving-coil instrument made by this firm.

It is a permanent-magnet speaker having a 10-in. corrugated diaphragm. The cone angle is fairly sharp and a cloth surround is employed instead of the conventional thin leather.

We tried the instrument on both transformer and resistance-coupled amplifiers and we can say without hesitation that it is a remarkably fine speaker.

Its sensitivity is well above the average, while the reproduction is excellent. Speech is crisp and natural, and there are no objectional sibilants.

Music comes through with its full brilliance at the upper end of the scale and the bass is there in its proper proportions without any "boominess."

Owing to its high sensitivity the M.C.9 can be used with small sets as well as large ones.

An output transformer having three ratios is supplied by the makers, and these ratios have been chosen so as to match up with power, super-power or pentode output valves.

The price of this moving-coil loud speaker is £6 and it is a splendid example of its type.

The makers are Graham Amplion, Ltd., 26, Savile Row, London, W.1.

Ekco A.C. Mains Unit

Messrs. E. K. Cole, Ltd., of Southend, have sent us one of their latest K.25 mains units for test.

This unit, in common with the other models made by this firm, employs a Westinghouse dry rectifier, and embodies the very attractive finish which the makers have standardised for the 1932 season.

The metal parts are cadmium-plated to prevent rusting, and bakelite bobbins are used for chokes and transformers. The H.T. output is designed to give the following voltages:

S.G. Tapping: 80-90 volts at up to 3 m.a.; 70-80 volts at up to 1½ m.a.; or 60-70 volts at up to 1½ m.a. Any one of these three tapings can be employed at will.

A tapping providing 50-80 volts at up to 3 m.a., and a power tap giving 120-150 volts, according to the current taken; 21 m.a. approx. is available at 120 volts, while at 150 volts the maximum current is about 11 m.a.

A trickle charger suitable for 2-, 4- or 6-volt accumulators, at a charging

rate of ½ ampere, is also incorporated.

The whole unit is exceedingly neat and compact. There is no need to say that it works as well as it looks. "Ekco" mains units are known to all listeners, and the K.25 ranks among the best.

Lissen Components

Messrs. Lissen, Ltd., recently sent us some samples of various components they are marketing. Among them was an attractive little speaker unit called the "Solenoid," retailing

A GOOD CHOKE

The R.I. Quad-Astatic H.F. choke is specially wound so as to have a small external magnetic field. It is thus particularly suitable for use in high-frequency amplifiers which are parallel-fed.



at 5s. 6d. Those who prefer to make up their own loud speakers should bear this unit in mind.

Then there is a compact H.F. choke of the disc type selling at 2s., and a very moderately priced rigid valve holder (4½d.). It is not generally known that certain valves in the set do not require non-microphonic sprung mountings. Such valves are those on the L.F. side, viz., the first L.F. and output stages.

(Please turn to page 312.)

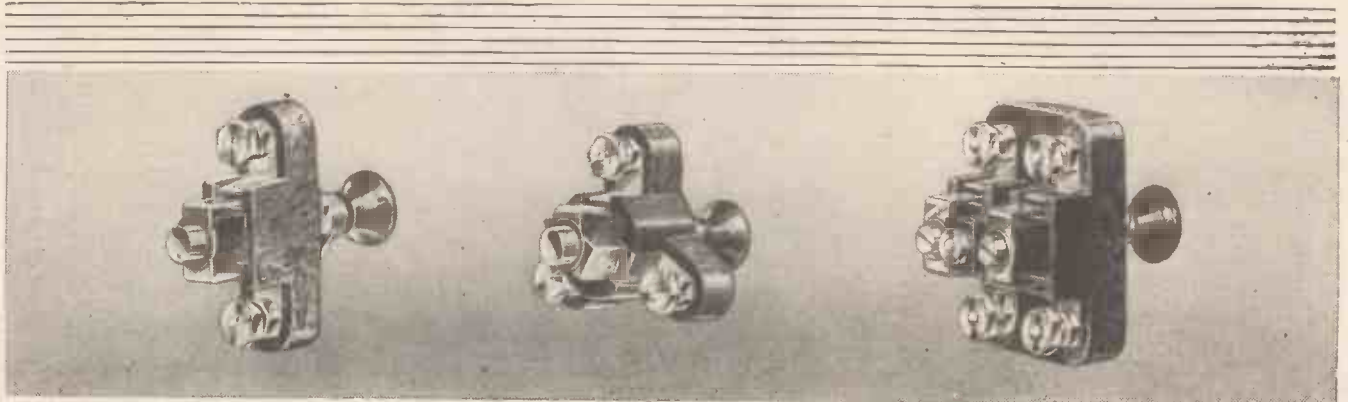
SOME WELL-KNOWN COMPONENTS



The components shown in this group are of Lissen manufacture, and in the centre is a slow-motion illuminated vernier drive. The disc type H.F. chokes are on the left, and the rigid valve holders and speaker unit on the right.

NEARER CLEARER

MORE LIVELY THAN BEFORE

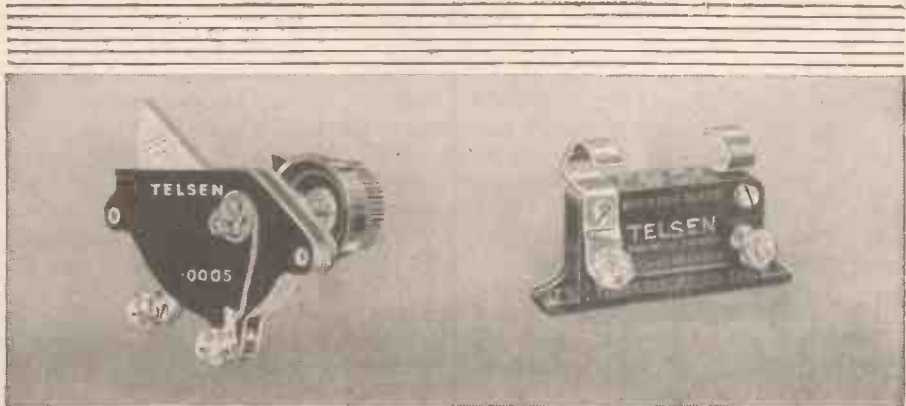
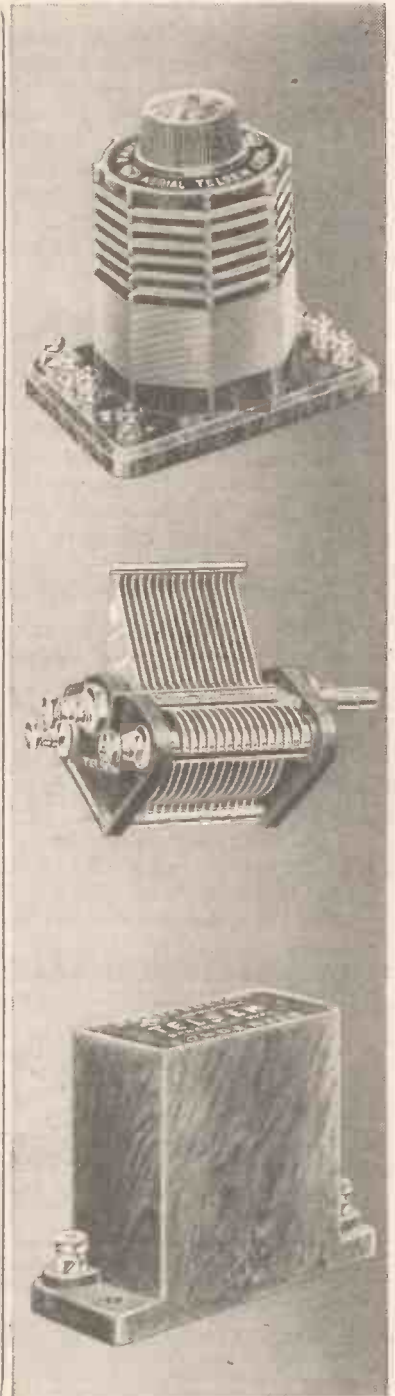


"CHANGING over to Telsen is like taking the wool out of your ears"—that is the verdict of an enthusiastic Telsen constructor which inspired the illustration on the opposite page. Telsen Components in your set give you a realism which is astonishing—they enable you to sit back and **hear**, without straining forward to listen—they bring every item on the programme 'nearer, clearer, more lively than before.'

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100% BRITISH
RADIO COMPONENTS



Adv of The Telsen Electric Co., Ltd., Aston, Birmingham.

'Ware the Dud Condenser

A GOOD instance of the many troubles that can arise from one faulty component is afforded by the sad case of a Shropshire reader.

His set was a detector and two L.F. resistance-transformer coupled. Being a keen experimenter who had already built up several sets, he had quite a little stock of apparatus on hand, including L.F. transformers, fixed condensers, resistances, etc.

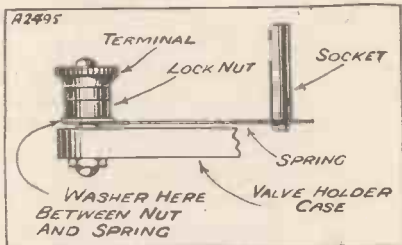
With only a theoretical diagram to work from, he tried shunt-feeding his L.F. transformer stage, instead of having the primary connected direct in the plate circuit of the L.F. valve. The resistance used was of approximately the correct value, so was the condenser, but the results were very poor. Very poor indeed.

Abnormal Plate Current

While pondering over these, he noticed that the plate consumption of the set had risen to almost double its normal! Hastily switching off to try to account for this, he had to give it up eventually as a bad job, leaving the set connected in the new fashion, but switched off.

Unfortunately, he forgot to warn his people not to switch it on before leaving for business next day; and when he came home in the evening

THE MYSTERIOUS WASHER



This sketch illustrates the position of the insulating washer that was found incorporated in a new valve holder by a reader of "The Wireless Constructor," as described on this page. It cut off the L.T. supply and rendered reception impossible, but it was so thin and so neatly fitted that even an experienced eye failed for a long time to see it.

found that it had been going for an hour or so, but with such terrible distortion that eventually they had gladly switched it off.

So he reverted as quickly as possible to his original circuit, only to find that results on that were now very poor indeed. And, to cut a long story short, he discovered that the output valve had been ruined, and only by replacing it with a new one could he get his former quality and strength.



Some details about unusual radio faults and some suggestions that may help you to better radio reception.

By P. R. BIRD

Determined to see why this happened, he carefully tested the resistance and condenser he had used, to find that the latter was faulty and would pass several milliamps when connected in series with the H.T. battery! Its faulty insulation had, of course, been responsible for the trouble by allowing the H.T. applied to the preceding valve to reach the grid of the detector valve, thus neutralising the effect of its grid bias and allowing an enormous anode current to flow.

This would have been harmful enough even for a few minutes, but owing to the accidental leaving on of the set for a considerable time in his absence the ill-effects were greatly intensified and ruined the valve's emission. A very good illustration of what a single dud component can do.

A Valve-Holder Surprise

Most of us know, only too well, how a new but "dud" component can provide a puzzling fault. And now a Gloucestershire reader quotes a very queer case that will be hard to beat.

He says:

"For some time I have been intending to write and tell you about a 'Queer Query' which came my way a year or two ago.

"I am in the wireless business, and I sold, amongst other things, to a customer who was building a set three cheap pattern valve holders.

"The following day he brought one back and complained that it was a 'dud.' I looked it over, could see nothing wrong, but exchanged it in order to save argument.

"I forgot the incident until a few weeks later when I was making some alterations to a set, and built this particular holder into it. The set refused to work; it was only the work of a few minutes to discover that this holder was the cause.

"Yet I could not find the fault, except that the low-tension supply was not reaching the valve. I had no time just then to really get down to it, so took another from the shelf. This one also was 'dud'!

"Thoroughly aroused, I put them both aside, and that evening after closing hours decided to fathom the mystery.

No Connection

"With meter and testing prods I soon found that one filament leg of each holder was all right, but the other leg of each was dead, yet the current was actually reaching the bolt holding the spring to the rigid part of the holder!

HOW IS YOUR SET BEHAVING NOW?

If you are troubled by a radio problem, remember that the "Wireless Constructor" Technical Queries Department is fully equipped to help you.

Full details of the service, including scale of charges, can be obtained on application to the Technical Queries Department, "Wireless Constructor," Fleetway House, Farringdon Street, London, E.C.4.

SEND A POSTCARD, on receipt of which the necessary application form will be sent by return.

LONDON READERS, PLEASE NOTE. Applications should not be made by telephone, or in person at Fleetway House or Tallis House.

"I could get no reading when testing between this bolt and the valve socket. Then I found that there was no connection between the bolt and the spring, although they were apparently touching! I can assure you that it needed a very close inspection indeed to reveal that a very thin ebonite washer of exactly the same diameter as the lock-nut of the terminal had been placed beneath it, as shown in the sketch.

"As the hole in the spring was larger than the bolt, the bolt did not make contact and the washer prevented the lock-nut from doing so. The terminal was 'live,' yet the spring which was apparently connected to it was 'dead.'"

Apparently the washers had been inadvertently inserted during manufacture!

The HEART of the MODERN SET

BY JOHN SCOTT-TAGGART

The action of the screened-grid valve forms the subject of the author's second article for those unversed in the new technique.

IF I were asked: "In what respect have broadcast receivers advanced in recent years?" I should reply "as regards the valves they use." This would tell the story of greater selectivity, greater sensitivity and, to some extent, better quality. I am not forgetting the developments in circuits or in loud speakers, but the heart of the radio set is—as ever—the valve.

The First Stage

The most casual glance at a modern receiver reveals that the very first "tube" is of the screened-grid type. To the uninitiated, of course, it will simply appear as a longer valve with a terminal at the end of the bulb.

The other valves in the set are

detector valve. Before getting to the detector, however, they require sifting so that only those from the desired station produce an ultimate effect on the loud speaker.

Colossal Amplification

The sifting circuits, of course, are the tuned circuits of the set and four or five have often been used. In addition to the necessity of obtaining "selectivity," there is sometimes the need for amplifying the currents several times. It is possible to amplify the "input" high-frequency voltage *two million* times and more, but such magnification requires elaborate apparatus.

Every "old hand" at wireless will recall the early difficulties of making

which I speak is an objectionable feature of the ordinary three-electrode valve when used for high-frequency amplification. It is due to the "coupling" which takes place between the grid and anode circuits. Just as reaction oscillation is due to feeding some of the amplified currents back to the grid circuit, so unintentional oscillation of an H.F. valve is caused by "feed-back." This feed-back in the ordinary valve was due chiefly to the small condenser formed by the closely-placed anode and grid inside the valve itself.

A Difficult Problem

The history of high-frequency amplification is almost the history of wireless reception—since 1913. And ever since then, when connecting valves in cascade (i.e. end-to-end to increase magnification) really began to be seriously considered, this problem of unwanted but inherent tendency to oscillate has faced us.

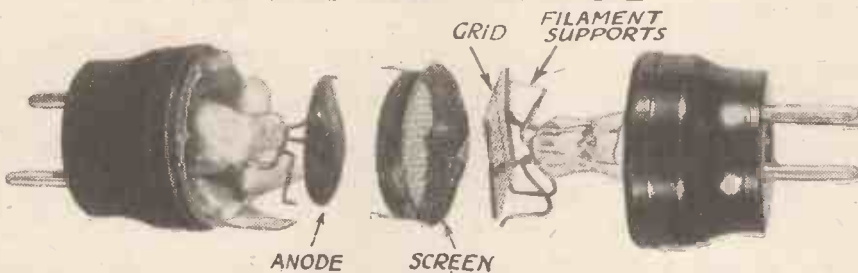
The first solution was to introduce "damping" into the circuits, e.g. by the use of resistances or by working the H.F. valve or valves inefficiently. This, of course, was no cure in the proper sense of the word, and it held up improvement in valves, because if you made a better valve it only tended all the more to oscillate!

Reducing Internal Capacity

The French army authorities, in 1915, began to use valves in which the grid-to-anode capacity (i.e. condenser effect) was reduced by taking the leads through the glass bulb; and, later, Capt. Round, of the Marconi Co., introduced the neatest valve ever made—the V.24 tubular one.

These efforts did not reduce the actual capacity between grid and anode, but between the supports and

A VERY EARLY S.G. VALVE



Would you recognise this as an "S.G." valve? It is one of the original double-ended type. The glass has been broken away to show the internal construction.

probably three-electrode valves of old types, but with improved "characteristics," i.e. they are better valves, although the last valve *may* be a pentode. This "pentode" will require a whole article to itself; for the present, I shall deal with the S.G. (screened-grid) valve because it forms such an essential feature of the up-to-date set.

This valve was developed as a means of amplifying the high-frequency currents produced in the aerial circuit by incoming signals. These currents, after magnification, are applied to the

even one valve amplify high-frequency currents properly. The trouble is the tendency of the ordinary valve to oscillate if it has a tuned-grid circuit and a tuned-anode circuit. (H.F. transformers with tuned secondaries are classed here as tuned-anode circuits.) This tendency to oscillate must not be confused with "oscillation" produced by reaction; this latter form is produced normally by an aperiodic (untuned) reaction winding and is under the complete control of the user of the set.

The "tendency to oscillate" of

The Heart of the Modern Set—continued

connecting wires; nevertheless, these were the early steps which led to the ultimate development of the S.G. valve.

Unfortunately, really effective H.F. amplification took a long time to get going. We dabbled and fooled about with resistance amplifiers, multi-valve semi-aperiodic amplifiers, and tuned circuit amplifiers in which each valve was "damped down" to produce inefficiency. In 1923 a real step forward was made with the "neutralising" system introduced by Professor Hazeltine, in America, and by myself in this country. My British Patent 217,971, of Jan. 2, 1923, was the first "neutrodyne" patent granted to a British radio engineer.

The Neutrodyne Patent

My own work on the neutrodyne was independent of Hazeltine's; he did not, in fact, publish details until later. But our work was on very similar lines, and as my British patent was earlier than his own British patents, Hazeltine Corporation acquired it; my American patent was also acquired, and formed one of the group under which two-thirds of America's sets were licensed.

The "neutrodyne" fared better in the States than here and gave that country a big lead for several years in highly-selective multi-valve sets. The

and opposing currents, the grid circuit will be unaffected. In other words, we have "neutralised" the feed-back. Each H.F. valve can be thus neutralised.

This system has proved very effective and became extremely popular amongst home-constructors in this country. In 1926, however, there began to grow up a new school who said: "Rather than neutralise the bad effect of grid-to-anode capacity in the valve, let us cut out the capacity."

British Genius

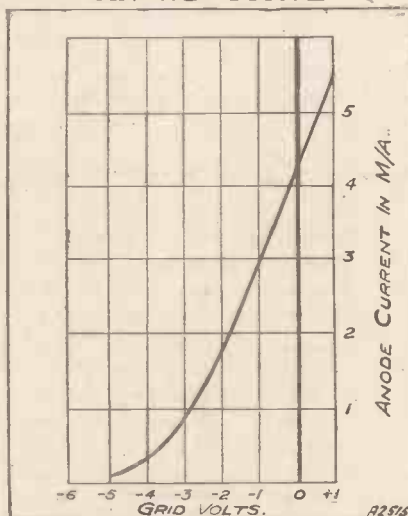
At the head of this school was Capt. Round, and his advocacy of the screened-grid valve in its early days has been amply justified. All his predictions have come true, although the S.G. valve in its primitive form made slow headway. To-day it is the driving force in every modern set.

How has this grid-to-anode capacity been reduced (for it has not been entirely cut out)? By a very simple means: one of those "obvious" ways that are so often treated with contempt until the patent infringer finds he has to pay thousands of pounds in "damages"!

If we place a sheet of metal between the grid and anode of a three-electrode valve and connect it to the filament, no anode potential variations can be communicated to the grid. The sheet

"screen") does not act in any way like an ordinary grid in a three-electrode valve. No varying potentials are applied to it. It is essentially a means of preventing any potential variations in the anode circuit of the valve being communicated through

AN S.G. CURVE



You will see from this how the anode current of an S.G. valve varies with changing grid potential, while the anode and screen voltages are fixed.

the valve to the normal "control" grid circuit.

Its action is very similar to the electrostatic shielding which is part of the function of the vertical screen and base-plate in, say, the "S.T.300" set. It "short-circuits" the electrostatic lines of force between anode and grid

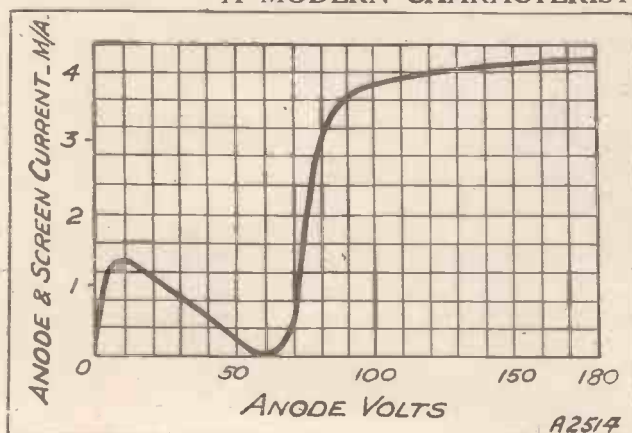
A "Screening" Electrode

I have considered the screen as consisting of a perforated metal sheet, but it may be a coil of wire or a sheet (or cylinder) of wire gauge. The bigger the "holes" in the screening-grid the more readily will electrons pass through, but the poorer will be the screening action. A very open-work screening grid would not be of much use.

The screening grid puts up the resistance of the valve, and in the ordinary way we should have to apply much higher potentials to the anode than normally to get the electrons to pass through. Putting it another way, we can say that if the screen is connected to the filament, it will partially screen the filament from the positive voltage of the anode.

(Please turn to page 296.)

A MODERN CHARACTERISTIC



The relationship between anode volts and anode and screen current in a modern S.G. valve is clearly shown by this curve.

idea behind the neutrodyne is briefly this: There is, as I have explained, a "condenser" formed by the anode and grid of the valve, and through this condenser the anode circuit "feeds back" currents to the grid circuit; if, however, by a suitable circuit we can make the anode circuit "feed back" another set of equal

acts as an electrostatic "shield," but such a sheet would act as a complete obstruction to the passage of electrons. What is done, therefore, is to use a sheet with many holes in it, i.e. a "grid."

This "grid" (which is called the "screening grid," the "screen-grid," the "shielding grid," or simply the

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The Exide "D" Type Low Tension Battery for slow discharge will save you in first cost and save you in recharging. Size for size it costs less to buy than any battery made.

Being an Exide Battery its life is longer. Its special "Mass" type plates will stand for months between charges without taking harm. You can therefore use a larger size of battery and thus reduce recharging. Then look at the convenience of its design. The sensible carrier. The non-

interchangeable terminals, differently coloured and shaped. The name slot for easy identification. The large screwed filler cap. You will find the Exide "D" Type Low Tension Battery a pleasure to handle and an economy to use.

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N 80

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THE HEART OF THE MODERN SET

—continued from page 294

If, however, we give the screen a high positive potential, say, 75 volts, the electrons reach *there* all right, and the anode voltage, say, 120 volts, continues to attract them to the anode. (The screen itself will "collect" some electrons, say, half a milliampere-worth, but this screen current is not used; the screen potential is kept constant at 75 volts.)

"Screen" Voltage

In practice the 75 volts is obtained from a tapping on the ordinary H.T. supply, and a condenser is usually connected between screen and "earth" to prevent any potential variations occurring on the screen.

The ordinary grid of the valve works as usual; it controls the electron stream to the anode. The lead to this anode is taken out at the top of the bulb to avoid the capacity effects which would occur if the leads all came out at one end.

The screened-grid valve is therefore merely a specialised three-electrode valve. If you have any doubt about this, just look at the S.G. curve which shows the effect of varying control grid potentials on the anode current. Quite normal, innocent and simple, is it not?

This curve is taken with 80 volts on the screen, and 100 volts on the anode. So when you see an S-shaped curve showing anode current as varied by anode volts, remain impressed (as I always am), but remember that the S.G. is in reality a harmless 3-electrode valve.

In actual use as an H.F. amplifier, the S curve of the S.G. valve does not come into operation at all except on the gentle slope on the right. But if you lower the anode voltage below the screen voltage, peculiar negative resistance effects are obtained.

Tremendous "Mag."

Secondary electrons are emitted by the anode as a result of electron bombardment and these are attracted to the screen. But as a user of an S.G. valve as an H.F. amplifier, you are no more concerned with negative resistance than with the fact that if you make the grid of an ordinary valve more positive than the anode you will get "secondary emission" from the anode.

An important characteristic of an S.G. valve is that it has a high amplification factor (e.g. 350) and a high A.C. resistance (e.g. 200,000 ohms). Compare these with, say, 15 and 4,000 of a small power valve! Yet each valve has its special duty.

A Useful "Tube"

A practical result of the high impedance of the S.G. anode-filament path is that a high-impedance output circuit is necessary. Thus tuned-anode circuits are usually used (the choke-coupled tuned anode is basically the same arrangement). "Tapping down" for "selectivity" results in loss of H.F. amplification; there is a reduction in the output impedance.

The S.G. valve may be used for detection and even L.F. amplification, but these uses are outside the scope of this article. The novice, while appreciating the effectiveness of the "S.G.," will, I hope, now treat it more as a useful friend than a fearsome animal possessing horrible curves!

* **CONDENSER CAPACITIES** *

Sir,—I feel I cannot let the article by Mr. Victor King in your current issue of THE WIRELESS CONSTRUCTOR go unchallenged. The heading of the article is "Concerning Condenser Capacities," and he states that a 4-mfd. condenser in a 50-cycle single-phase 250-v. circuit would consume 50 watts. Actually it would take 0.2 amp.; the volt amperes would be 50, but the watts $50 \times \cos \phi$, where $\cos \phi$ = the cosine of the angle of lead of the current vector. This is, for all practical purposes = 0; therefore, the watts consumed is practically nil (neglecting very small losses and assuming a sinusoidal wave-form). However, if the consumer is paying for power on a K.V.A. basis, the charge would, of course, be made for wattless as well as wattful power.

Wishing every success to the "S.T.300" circuit. I hope to construct it.

Yours faithfully,

W. ACTON.

Strand, W.C.2.

[When shown this and several other letters regarding the same point, Mr. Victor King contritely said: "I ought to know better. 'Watt' a nasty little slip." However, it in no way affects the main argument in Mr. King's article, and we feel sure readers will forgive him.—EDITOR.]

THE "VI-KING" BAND-PASS FOUR

—continued from page 284

Wire them up as follows. One side of one bulb to one side of the other and to the side of the on-off switch which is *not* joined to L.T. positive.

Connect the remaining side of one bulb to the remaining side of the other and to the moving vanes of the first tuning condenser.

Now let's suppose we have just completed the set and are going to try it out together after checking over the wiring.

Ready for Test

With the aid of the operating panel we put the valves in their right holders, and make all the necessary connections to terminals.

As we are going to work on a 120-volt battery, we join H.T. + 2 and 3 together and take the lead to the maximum voltage. The G.B. for - 2 we set according to the maker's figures.

Before switching on we turn the reaction as far as it will go in an anti-clockwise direction, and do just the opposite with the volume-control knob. The wave-change switch we put over to the right for medium waves.

The trimmer is set about half way, and the balancing condenser on the back section of the gang condenser is screwed up as far as it will go and then turned back a turn. Now the great moment has arrived and we switch on.

A quick swish of the dials in an upwards direction reveals no stations, so we start at the bottom again and move the dials slowly. Thus we find the locals—easily missed because of the great selectivity. A note of their readings is made, and having got so far I will go on to tell you what to do to balance up tuning and bring in the foreigners.

Balancing Up

Tune in a distant station somewhere about the middle of the dials, using reaction if necessary. Adjust dials to the loudest position, and then reduce reaction to a minimum and retune on the second dial.

Now, with a piece of wood turn the little wheel on the back section of the gang condenser until results are loudest. Adjustments are now done, and after tuning in a station move the panel trimmer to the position giving best results

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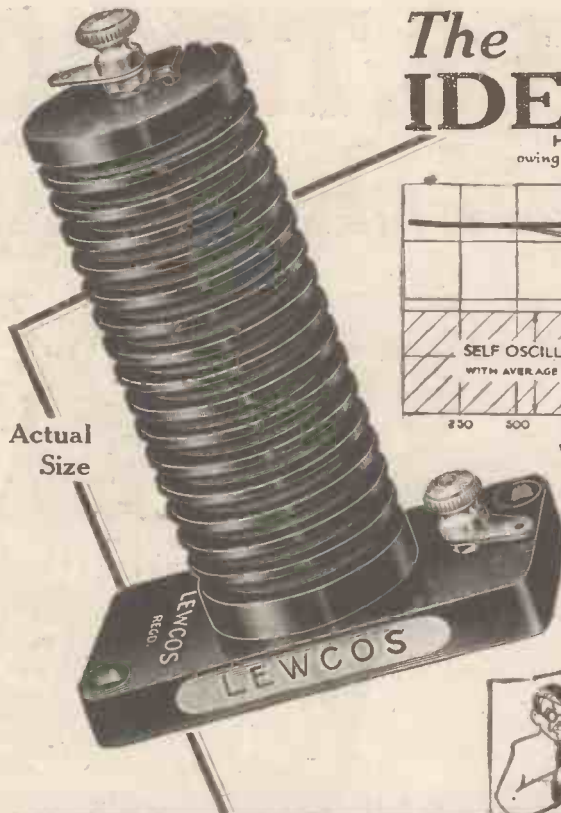
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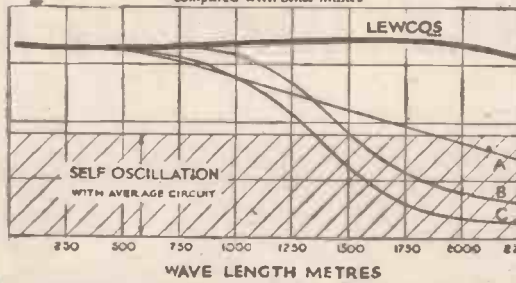
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The shaded portion of the diagram indicates the danger zone wherein self-oscillation is liable to occur in a receiver and it will be noticed the Lewcos Choke is well above this.

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THE MAN BEHIND THE VAUDEVILLE

Our Special Correspondent interviews Mr. Bertram Fryer, the B.B.C. Vaudeville Producer. Mr. Fryer is the official responsible for all the variety programmes.

WHO is the man who selects the vaudeville artistes and makes the vaudeville programmes, good or bad? Who is the man who deserves the claps when a new star is discovered, and who is the man who deserves the boos when the vaudeville hours are boring?

I have often been asked these pointed questions. I have often pondered about them myself. Last week I met the answer—in person!

Continual Rehearsals

The answer is Mr. Bertram Fryer, who bears the official title of B.B.C. Vaudeville Producer. He does more than produce, though. He plans all the vaudeville hours from beginning to end, selects the items and personally attends to auditions and rehearsals. In the old days at Savoy Hill he worked single-handed, but now he has two assistants. All three men work together on auditions for selecting new artistes, and in the very tiring and continual rehearsals they each take a joint share.

The Complete Answer

Mr. Fryer, who is a person very loath to be interviewed for the Press, at length told me many interesting facts about himself and his work. It is interesting because it seems to me to be the complete answer to critics of vaudeville hours.

He was a recruit to broadcasting, way back in 1923, from the theatrical profession. Before Cecil Lewis and others persuaded him to join up with the B.B.C. he was for many years a theatrical manager, and had also spent many years in producing revues.

"I worked jolly hard at it, too!" he said. If he expected to be able to slack off a little at the B.B.C. he

was disappointed, for his entry into broadcasting plunged him into a new batch of hard work.

There were certain little troubles at Newcastle, soon after this station opened. The Station Director resigned. There was ill-feeling in certain quarters. Fryer was asked to go and clear matters. He went, with the help, at first, of Cecil Lewis, and under his capable direction broadcasting in Newcastle was soon put on a sound footing.

Down in London his talent was recognised, and when there was money

available for starting a station at Bournemouth (a main station in those days, mind you, and not a relay) he went to beat his own record.

London Calling

It is one thing to be a Station Director of an existing station; it is quite another to get a new station going. That Bournemouth was one of the most popular stations before the Regional scheme came into being and it was changed into a relay is, I think you will agree, a tribute to his organising ability.

AT WORK ON THE PROGRAMMES



Mr. Bertram Fryer was for many years director of the Bournemouth station, where he was extremely popular. He is now in charge of the vaudeville production section in London.

The Man Behind the Vaudeville—continued

Then, six years ago, he was called back to London to take charge of vaudeville. There were many other ex-theatre managers and producers, but the London "brass hats" wanted a theatrical manager with organising ability. Fryer was the man for the job. He took it on with, at first, very severe restrictions.

Finding New Talent

At first there were no vaudeville "stars." Clapham and Dwyer, Leonard Henry, Gillie Potter, the Bugginses, Ridgeway and the rest, were not known to wireless listeners.

In between intervals of rehearsing

artistes were O.K. for broadcasting. It was still harder to convince experienced stage stars that their method of presentation did not suit the microphone.

It was Fryer who conceived the listening cabinet idea. He arranged for 'phones and an amplifier to be put in a separate listening cabinet so that he could hear newcomers without seeing them. A small batch of artistes were tried in this way one morning. Several other B.B.C. men listened on the 'phones, too, and the idea was pronounced a success.

Not only did this enable Fryer to judge newcomers by the way they

side 'phone lines so that artistes who cannot come to London for an audition can be given a trial and their test pieces recorded on steel tape. Later, during an audition session, Fryer runs the tape through and 'phones a report to the distant artiste.

By the "blind audition" system Fryer has discovered many artistes who are now famous—Alexander and Mose, Gillie Potter, Claude Hulbert, Mabel Constanduros and Leonard Henry, among a long list.

A Shrewd Judge

All ordinary vaudeville hours, comprising five or six turns, are rehearsed by Fryer and his two assistants.

Concerted shows such as the Ridgeway Parades and the Hulbert Revues are so arranged that, in the case of the Parades, Philip Ridgeway does the producing and rehearsals, and appoints a stage manager of his own, Miss Irene Vere. It is Fryer, however, who gives the show a final O.K.

He has the power of *veto* of every production, and while one of these shows is on Fryer is in the studio or down in the control-room. Artistes assure me that he is a shrewd judge. His praise is not freely given.

Listeners may not know, but every six months or so a critical examination is made of the material and style of leading B.B.C. vaudeville artistes. It does not follow that because a man has got through the audition and done a few successful broadcasts his fame is made. There is a standard to be kept up, and every so often Fryer gives stars auditions just as though they were newcomers.

That Mike Fright

There is a lot of twaddle talked about microphone fright. Experienced broadcasters do not suffer from it. They tend to go to the other extreme and forget the special needs of the microphone. It does them good to go through the audition ordeal again and have special points made clear. There have been a few cases of well-known broadcasters asked to take a few months' rest from the studios in order to get new material.

Fryer told me that he is quite aware people grumble about the vaudeville programmes. He thinks they always will. He believes that there is much more controversy and difference of opinion about humour than there is about many serious subjects.

A STREET BUSKERS' BROADCAST



Listeners will probably remember that some time ago the B.B.C. gave a broadcast of Street Buskers from Savoy Hill. This photograph was taken when they were doing their turns before the microphone.

the then popular artistes Fryer had to go out and find new talent. Talent did not, in those days, flock to the B.B.C.—at least not the right kind of talent. There was in those days a greater proportion of "duds" than there are now, and good artistes were just as hard to find.

Money was a bother, too, because at first he was allowed only £25 a show. A show lasted for about an hour and incorporated five or six artistes; not very much of a fee, you see, for first-rate performers. It was Fryer who had to move things behind the scenes in order to get more adequate payment. Comparison with theatre fees was then odious.

It was not easy to find out which

would sound to listeners, but in the case of touchy stage artistes, who felt that there was no doubt about their being suitable for broadcasting, Fryer could get the manager to come and listen in the listening cabinet while his artistes performed in the studio. In this way many a leading theatrical manager was convinced that his protégé "star" was all right in front of the footlights, but no good in the studio.

Long-Distance Auditions

All new artistes are given auditions in this way. Even the very famous ones. Within recent months it is Fryer who has arranged for the tape machine to be connected up to out-

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A PRACTICAL MAN'S CORNER

By R. W. HALLOWS, M.A.

In these pages, month by month, our contributor packs a wealth of practical information and advice on constructional work. The regular reader of this "Corner" cannot help picking up a more or less complete training in radio workshop practice, while every month there are wrinkles to read, gadgets to make, or hints to help you.

ONE of the handiest little gadgets that I have made for a long time, both for testing purposes and for the regular operation of sets, is the safety-first panel illustrated diagrammatically in Figs. 1 and 2. It contains a small panel, preferably of ebonite or bakelite, some 4 inches by 4½ or 5, mounted so as to form the top of a shallow wooden box. On the upper side of the panel appear two rows of terminals. Those near the right-hand edge are for the battery connections to H.T. +1, H.T. +2, H.T. +3, H.T. —, L.T. —, and L.T. +. Near the opposite edge are the terminals to take the leads connecting the panel to the set.

The Meter Connections

Here we have only three high-tension terminals, all positive. The remaining pair of terminals near this edge are for the common negative and for low-tension positive. Near the top of the panel is a pair of terminals, normally kept short-circuited by means of a wire link, between which a milliammeter can be connected up when it is desired to test the H.T. current consumption or when trouble hunting is afoot. A similar pair of terminals close to the bottom edge, also shorted in the ordinary way, are ready to take an ammeter for the filament current, if and when required.

Complete Protection

The arrangement under the panel is shown in Fig. 2. There are four small fuse bulb holders, one in each of the three high-tension positive leads and in the high-tension negative lead before its junction with the L.T. — lead at the common negative terminal.

Be very careful, by the way, that you wire this last fuse bulb exactly as shown. Don't in an excess of zeal try to make the wiring neater and inadvertently arrange matters so that the full L.T. current passes through the milliammeter when this instrument is applied to the terminals reserved for it. The best fuse bulbs to use in the ordinary way are those of the 60-milliamper type. If, though, you are the possessor of a large set such as a super-heterodyne, with very complete de-coupling arrangements, you may have to use bulbs that will stand a somewhat heavier current.

The reason is not that the set normally consumes more than 60 milliamperes. It is that at the moment of

out instantly when the current rises over about one-third of an ampere, and a current of this kind for a fraction of a second is not likely to do much harm. I speak from experience, for I have had scores of direct shorts in the course of experiments, and with these bulbs as protectors I have never yet burnt out either a valve or even a milliammeter.

Fuses for L.T.

It is desirable to provide with fuses not only the H.T. department, but also the main L.T. supply leads. This can be done very easily with the panel under description by using a piece of 1-ampere fuse wire for shorting the ammeter terminals. Better still, the lead between the battery low-tension negative terminal and the common negative terminal on the panel can be made of the same kind of fuse wire.

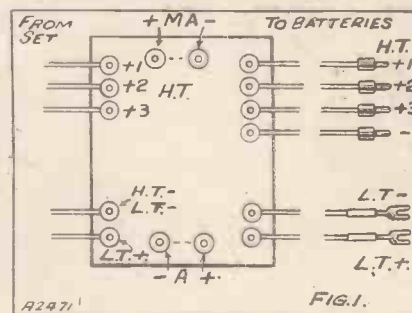
In this case it should not be covered with Systoflex sleeving, and should be arranged so as to stand well away from the underside of the panel. One-ampere fuse wire is obtainable at any shop which deals in electrical supplies.

It is also possible to obtain little cartridge fuses about the size of grid leaks designed primarily for use with mains units and power packs. One of these can quite well be accommodated in a pair of grid-leak clips on the underside of the panel in either the L.T. — or L.T. + lead.

Easy Fault-Finding

Besides safeguarding the set, a panel of this kind makes trouble hunting a comparatively simple business for those who possess those most useful instruments the milliammeter and the ammeter. When the set is

SAFEGUARDING THE SET



The useful idea behind this gadget is explained in detail this month. Easy to make, it is sure to prove of great aid in trouble-tracking.

switching on a considerable number of fat condensers have to be charged up, and for an instant a fairly heavy H.T. current flows—quite enough to "blow" 60 milliamper bulbs. Actually the standard 2.5-volt flashlamp bulb is a pretty good safeguard for both batteries and valves, since it burns

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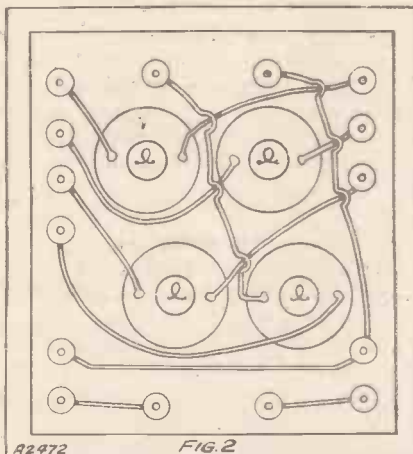
A Practical Man's Corner—continued

working well the normal high-tension and low-tension current should be read and noted. Then if anything goes wrong the short-circuiting links are removed from the two pairs of instrument terminals and the meters are connected up. A low ammeter reading shows at once that something is wrong in the L.T. department—either a broken filament or a disconnection. If the ammeter reads zero, one of the L.T. busbars is disconnected. The milliammeter is extraordinarily useful as a trouble detector, for it shows up infallibly any defect in a plate or grid circuit.

Protecting Spare Valves

How to keep spare valves out of harm's way when one is engaged in experimenting has always been something of a problem. Most of us are content to lay them on the table,

HOW IT IS WIRED



The back of the panel of the device shown on the preceding page, showing the simple connections to the various fuses.

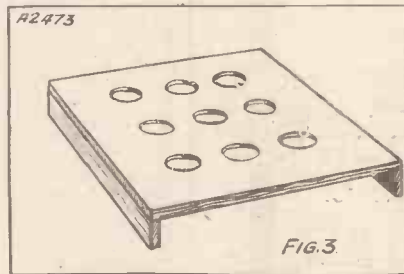
using a couple of books, or something of that kind, to act as chocks in order to prevent them from rolling.

The idea is good, but in practice it does not always work out very well. Some formula that one requires is contained in one of the books so used. Thoughtlessly it is picked up.

One valve starts rolling; a hand is shot out to stop it just too late. It lands on the floor with a faint but distinctly sickening thud, and whilst we are engaged in picking it up another and perhaps yet another follows beside it. Though enterprising manufacturers have demonstrated the strength of their filaments by hurling valves from aeroplanes,

and doing similar acts of violence, my own experience is that the shortest of falls on to the softest of carpets is often quite sufficient to

SAFETY FIRST



A valve-stand that you could knock up in a few minutes—which might save an expensive smash some day.

“do in” the filament of one's best valve, especially if it has seen a little service. Valves which you don't care two hoots about will survive much worse spills unharmed.

Having suffered recently certain casualties, over which I will draw a veil, I decided to make up something which would save my valves from—er—myself. The result was the little stand illustrated in Fig. 3.

Egg-Stands Unsuitable

“Ah,” says the reader (forgive me, reader, for putting all these exclamations into your mouth), “there is no need to make that; I can buy an egg-stand anywhere.”

That is just what I thought, and I spent no less than 1s. 9d. on a most elegant egg-stand. Unfortunately, the holes in it were just a shade too small to take the caps of the valves, and if only their pins go through they are far too wobbly to be safe. Also, the holes are rather too close together to allow any but the slimmest valves proper room.

Easily Constructed

You will be well-advised to make up your own little stand on the lines indicated with a piece of plywood as top and a couple of ½-in. soft wood battens as supports. Make your holes just 1 ¾ in. in diameter, and space them 2 ½ in. from centre to centre.

If you haven't got either a 1 ¾-in. bit or an expanding bit for your brace, any carpenter will make the holes for you for a very small charge. If you do the work yourself, don't forget not to go right through with the bit from the upper side to the lower. If you do you will tear the wood badly.

Take the bit about two-thirds the way through; then turn the wood over. The centre is already marked by the bit.

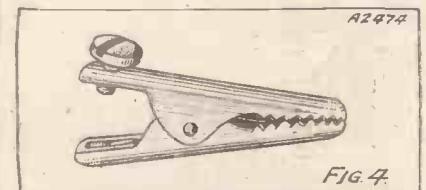
It often happens during the construction of a wireless set that one is faced with two possible points to which a certain connection may be made. The aerial coil, for instance, may be tapped, and you may have to find by experiment which tapping point gives the best results. The same applies to some intervalve coils, and the problem arises also with tapped output chokes and transformers. If you want to save yourself a great deal of trouble, take my tip and make up half a dozen flex wire connectors of lengths from 3 to 12 inches, providing them with a loop at one end and a crocodile clip at the other. Make the loop very solidly, since it may have to be used a considerable number of times.

Handy Flex Links

The best method is first of all to twist it up tightly with the aid either of bottle-nosed pliers or of a piece of round rod, and then to give it a top dressing of solder. A flex loop made in this way is practically everlasting. Possibly you don't know the crocodile clip, though it is one of the most useful of gadgets.

You will find its portrait in Fig. 4, and, having examined it, you will see the reason for the name. With a crocodile clip you can make and unmake connections to tapping points, tags or terminal nuts in the proverbial twinkling of an eye. It is not a bad tip, by the way, to cover

VERY USEFUL



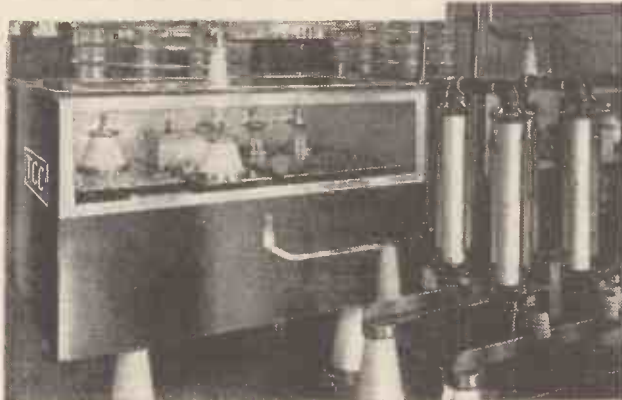
Those handy crocodile clips can be improved and made still more useful by the means suggested in this article.

the whole of each crocodile clip, except the teeth of the jaws, with a coating of Brunswick black, for the area of metal is rather large, and if it should happen to slip from your hand into the bowels of the set it might cause one of those unfortunate short-circuits that we all know only too well.

PRAGUE

★
COMES TO
T.C.C. FOR
CONDENSERS

★
The world's largest medium wave station — 200 K.W.



Here is illustrated a corner of the new Prague Station, and shows a bank of 4 T.C.C. Condensers, comprising a .00075 mfd. and a .0005 mfd. for working at 6,500v. R.M.S. at 500-1,000 K.C. 100% T.M. with peak working voltage of 18,400; together with a .0005 mfd. and a .0004 mfd. for working at 4,500v. R.M.S. at 550-1,000 K.C. 100% T.M.

Yet again T.C.C. Condensers are being used where accuracy and down-right dependability are essential. The very life of this station is dependent on the perfect functioning of these condensers. The engineers made certain of unailing service—and specified T.C.C.

— AND WHEN YOU NEED A CONDENSER



Here is illustrated just one of the many types of T.C.C. Condensers—a 2 mfd. Non-Inductive Condenser, price 3/10. Made in capacities from .005 to 2 mfd.

remember that the performance of your receiver or eliminator depends on the reliability of its condensers too. Don't risk a breakdown, it may be expensive — be safe — insist on T.C.C.

T.C.C.

ALL-BRITISH
CONDENSERS

The Telegraph Condenser Co. Ltd., Wales Farm Road, N. Acton, W.3.

♥9624

FERRANTI

TRANSFORMERS

and
TRUE
REPRODUCTION

When you build a modern set you rightly expect to secure better performance. Design has improved with the greater knowledge designers now possess. Valves are more efficient, and speakers are capable of materially better reproduction. The transmissions have attained a very high standard.

It is clearly not worth while to negative all these advantages by fitting an inferior Transformer which is incapable of amplifying uniformly all the frequencies essential to good reproduction as judged by the standards of to-day.

You must have the audio end right before you can get good reproduction from any set. The first step in that direction is to install the best Transformer you can buy.

Whatever price you decide to pay you will be certain to get the best Transformer, and the greatest satisfaction, if you fit FERRANTI.

AF3 ratio 1/3½	25/-
AF5 „ 1/3½	30/-
AF6 „ 1/7	30/-
AF7 „ 1/1½	30/-
AF8 „ 1/3½	11/6

FERRANTI

TRANSFORMERS

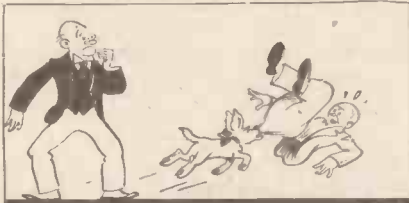
FERRANTI LTD. Head Office, and Works:
Hollinwood, Lancashire. London: Bush House,
Aldwych, W.C.2.



THE Professor and I sat gloomily smoking one on either side of the fireplace in his den at the "Microfarads." I was quite sure that something was up with him, and he must have had the same idea about me, for all of a sudden we chorused simultaneously.

"What on earth's the matter with you?"

THE "SEAT" OF TROUBLE!



Bingo became attached to me.

Having crooked little fingers in the approved manner, we embarked upon a further piece of S.B.

"I'm afraid I interrupted you."

I produced my tossing halfpenny and spun it.

"Tails," cried the Professor.

"Heads it is. My lead, I think. Now then. What on earth's the matter with you?"

"I was just going to ask you the same question," moaned the Professor, "for it is quite clear that there is something on what would be your mind if you had one."

"—With Knobs On"

I was feeling too depressed to deal with this remark as it should have been dealt with, so I merely said: "Same to you with knobs on. Been missing your Kruschen? Bust your best valve?"

"No, no," sighed the Professor. "Just simply stony broke."

"Same here," I groaned. "So stony and so broke in fact that breaking stones is about what I'll be doing in a day or two's time."

"Clearly," said the Professor, "something must be done. In the words of the politicians let us explore every avenue, leaving no stone unturned."

"D-d-d-don't mention s-s-stones

again," I sobbed. "But how does one explore avenues?"

"Generally by appointing a Royal Commission or a Committee of Inquiry," said the Professor.

"Bright idea," I cried. "We will now go into committee. What suggestions have you to make?"

A Useful Tip

Beyond pawning the micro-Goop's perambulator the Professor could think of absolutely nothing. We remained plunged for a while in thought.

Then I leapt to my feet, waving such excited arms that things were swept off the mantelpiece.

"What," inquired the Professor, "is the big idea?"

"We will start," I chortled, "the Goop-Wayfarer Wireless Service Bureau."

Interlude

With a wild cry the Professor fell upon my neck. With a still wilder cry I staggered back, tripped over the hearthrug and fell upon little Bingo. If I fell upon little Bingo, he fell upon a tender portion of my anatomy with open jaws, and the wild cries that followed made those that had gone before seem almost like silence.

The Professor was able after a prolonged struggle to detach him from the seat of my trousers, or, rather, I should say able to detach him with the seat of my trousers. Bingo retired to a corner with his prize, while I draped myself in the tablecloth and expounded my great scheme.

Stocking the Shop

"My dear fellow," I cried, "it's a positive gold mine. Can't you just see our advertisements in the *Mudbury Wallow Gazette*? Here"—I seized a pen and a piece of paper—"let us draft the first."

Furiously I scribbled and then handed to the Professor my effort.

"That," I remarked, "is a little effort by Wayfarer, the man who put the 'ad' in radio."

We spent the rest of the evening talking over plans and everything seemed to be working out swimmingly. On the following day we found an empty shop in the High Street and by taking in Sir K. N. Pepper as a kind of sleeping partner we were able

THE GOOP-WAYFARER ADVERT.

CAN YOU HEAR ZAGREB IN DAY-LIGHT?

You can't? Then bring your set without delay to be hotted-up by Goops. You will not know it when we have adjusted it.

Why be tied to Radio-Paris and Beromunster when we guarantee loud-speaker reception at any time from Karlskrona, Rjukan and a hundred others? Read these unsolicited testimonials.

Gen. Blood-Thunderby writes: "My set is a different thing since it passed through your hands."

Mr. Poddleby writes: "It is wonderful after your treatment every coil in the set moves as well as that of the loud-speaker."

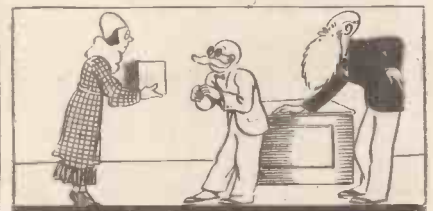
Mr. Gubbworthy writes: "Since my one-valve set passed through your hands I have had to fit it with a volume control."

Bring Your Set Round At Once to THE WIRELESS WIZARDS' WONDER SHOP.

THE HOME OF RED-HOT RADIO.

to raise enough to rent the shop. I undertook to provide the stock. This was easily done by means of a series of visits to people like Pimpleson

OUR FIRST CUSTOMER



"Good morning, Moddom."

and Tootle at times when I knew that they were out.

Trade was brisk from the very moment we opened our doors. It seemed to be desirable that people should not know our identity, so I wore blue spectacles and a fierce moustache, whilst the Professor had

SO VERY MUCH BETTER



THE difference between records played through an ordinary sound box and a BLUE SPOT Pick-up is as marked as the difference between the modern gramophone and the music box of the "nineties."

The supreme performance you get from a BLUE SPOT Pick-up lies in its ability to transmit sound vibrations with the utmost exactitude and carry them without loss or addition right up to the loudspeaker.

The result, especially if a BLUE SPOT Loudspeaker is used, is an intimate and life-like representation of the original with all its individual characteristics intact.

GET A BLUE SPOT RECEIVER

The BLUE SPOT All-Electric Four-Valve Screened-Grid Receiver brings you all the best stations of Europe at full volume. There is provision for plugging-in your gramophone which with a BLUE SPOT Pick-up gives you the equivalent of a first class radio-gram.

Send for Catalogue W.C.14

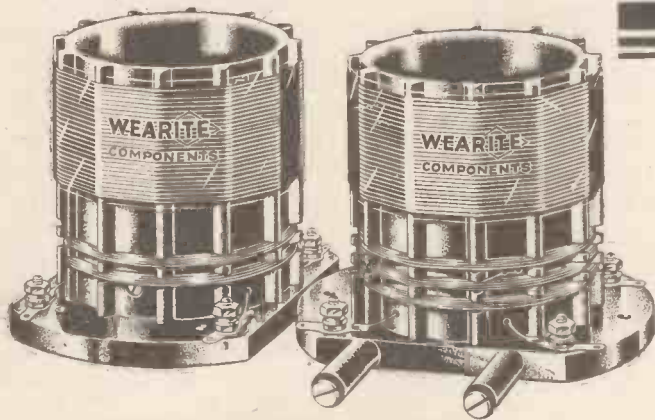
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● **BLUE SPOT PICK-UP** 63/-
complete with volume control



H.F. TESTED

These WEARITE S.T.300 COILS, as with all Wearite Coils, undergo the most searching tests—not just for continuity, but tests by a specially designed H.F. Oscillator which definitely measures the coil's EFFICIENCY—No other coil is so certain of perfect functioning, for no other coil receives such ruthless inspection.

The WEARITE S.T.300 Coils are guaranteed to fulfil in every particular the specification laid down by Mr. J. Scott-Taggart.

PRICE per pair - 12/-

GET THE BEST FROM YOUR S.T.300

A receiver with the remarkable efficiency and selectivity of the S.T.300 demands an extraordinary degree of precision in the tuning circuits—only coils that conform in every way to the designer's specification are of any use. Be sure your coils are above suspicion—be sure they are by WEARITE—the coil specialists.

AND REMEMBER . . . A GOOD EARTH IS ESSENTIAL



USE A WEARITE EARTH TUBE . . . 3/6

THE FIRST NAME IN RADIO COMPONENTS.

WEARITE COMPONENTS

WRIGHT & WEAIRE, LTD.
740, High Road, Tottenham, N.17
Telephone Tottenham 3847/8

In Lighter Vein—continued

a bushy beard. Our very first customer was Miss Worple.

"Good morning, moddom," I smiled, advancing to meet her. "And what can we have the pleasure of doing for you?"

She told me that her short-wave set had become very noisy and inefficient. As she had brought it with her, "service" began without delay.

Short-Wave Disintegration

Whipping it out of its cabinet—well, I do think that she might have told me that she had fixed the baseboard to the bottom of the cabinet with a screw, for when I performed that smart extracting motion there was a horrible cracking noise and the panel and cabinet front sort of dissolved.

Miss Worple looked rather startled, but I was quite equal to the occasion.

"It just shows you," I said, "the inadvisability of using wood for the cabinets of short-wave sets. Probably you didn't know that high-frequency oscillations cause wood to deteriorate very rapidly. It becomes, in fact, positively ionised, and you then naturally complain of noisiness and lack of signal strength.

"What a good thing this cabinet came to pieces in my hands in this lucky way. And now," I said, "we will investigate the set. This detector valve," I remarked, tapping it gently with a screwdriver, "is it microphonic? I mean if you tap it like this"—here I smote it again—"does

EXIT A VALVE!



"Does it do 'pongs'?"

it do 'pongs'?" As a matter of fact, what the valve did do was a loud pop.

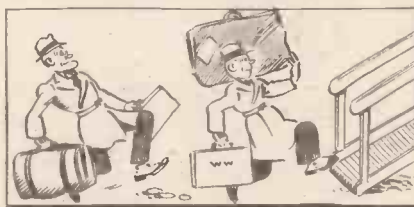
"By Jove," I cried, "this is indeed a lucky morning! You didn't know, I am sure, that you had a valve with a thin place in the bulb, and goodness knows what might have happened if I hadn't discovered it in time. We will, of course, make no charge for the damage to my hand by the flying splinters of glass, and we will replace your detector with a specially picked

one at thirty shillings. I picked it myself yesterday."

This was quite true. I had picked it from Captain Buckett's little stock.

"But," quavered Miss Worple, "I thought that eight and sixpence was the price of a detector valve?"

FLIGHT FROM THE CROWD



"A long sea voyage would be a fine thing!"

I explained that that might be the cost of ordinary detector valves, but not of those specially selected and hot-tempered by the Wireless Wizards. I then proceeded to make a thorough examination of the set, from which it became apparent that it contained sixteen "dry" joints and that both tuning condensers were shorted.

Numerous Dry Joints

The dry joints were shown by pulling the wires gently with a pair of pliers. I had been careful to incorporate a special wire cutter in my innocent-looking flat-nosed pliers.

Our condenser tester was almost as much a stroke of genius as the mutual conductance meter that we had installed. It had a scale rather like that of a megger and a fearful and wonderful outfit of switches.

By turning over the wrong switch you could prove that the condenser that you were condemning was a complete dud, or that the one you were selling was the last word in efficiency. The mutual conductance meter was designed on similar lines. With its help I easily demonstrated that the figure for Miss Worple's output valve was .0002 as against the maker's 3.6.

I showed her, too, that our specially selected detector valve had a mutual conductance of 19.7.

An Impossible Valve

"And," I continued, "I challenge Pullhard or Bossor or anybody else to produce a valve with anything like such a figure."

Miss Worple was obviously impressed, and willingly agreed to accept my estimate of £9 3s. 4½d. for putting the set into thorough order.

Things, I thought, were really going well. And then I became aware that the Professor was also dealing with a customer. Before him stood Sir K. N. Pepper, who, having heard the tale of specially picked valves, was demanding something really out of the ordinary.

Poor Specimens

The Professor was running our little store through on the mutual conductance meter, but he didn't quite seem to have the hang of the instrument, and as valve after valve registered minute figures he plucked it from the holder and flung it on to the floor with an exclamation of annoyance. Brushing the Professor aside, I took over the business and found Sir K. N. Pepper a marvellous valve absolutely in one.

Within an hour or so most of Mudbury Wallow seemed to have visited the shop and to have left their sets to undergo the hot-tempering process. As we had insisted upon payment in advance in every case, the till was full to overflowing. The shop, too, was almost in the same state, for wireless sets were piled here, there and everywhere.

"Look here," said the Professor, "this is really getting rather awful. We have guaranteed full loud speaker strength from all sorts of stations on one-valve sets, and goodness knows what for the multi-valvers. How on earth are we going to deliver the goods?"

Finishing the Job

"I rather think," I replied, "that a good long sea voyage would be a fine thing for your health and for mine. Somehow I have a feeling that when to-morrow's sun gilds the Eastern sky you and I will be far away, journeying towards the great open spaces where men are men.

"And nobody in Mudbury Wallow can grumble, for when the shop is broken open in our absence they will all get their sets back again, and they can't maintain that they didn't get jolly good value for money in the advice that we gave them."

"A good idea," agreed the Professor. "Let's send a paragraph to the *Gazette* saying that you and I have gone to America to conduct researches in transatlantic tele-mel-
paphy."

GOLTONE
COILS IN THE
"S.T.300"
FOR BEST RESULTS
IMMEDIATE
DELIVERY


FROM ALL FIRST-CLASS RADIO STORES. IF ANY DIFFICULTY, WRITE DIRECT.

Radio Catalogue RWO/127 sent Post FREE on request.

ONLY 10/- PER PAIR.

Ward & Goldstone
 PENDLETON. MANCHESTER.

THE *Goltone* DUAL RANGE TUNER



TYPE "F" PRE-SET PANEL-MOUNTING CONDENSERS
 CAPACITY .00004, FOR "S.T.300."
 Price 1/- Each.

WILL DAY LTD.
 THE BEST IN THE WEST

S.T.300.
 LONDON'S LEADING STORE
 for all components of the famous S.T.300
 AMPLE STOCKS.

LOTUS LANDMARK
3 KITS
 A magnificent piece of workmanship
 and design. The kit of the season.
 Price 39/6.

WILL DAY LTD.
 19 LISLE ST., London, W.C.2
 Telephone: Gerrard 4476.

'IGRANIC'

Permanent Magnet
 Moving Coil Speaker



Amazing Tone-Purity
 The extraordinary purity of tone, combined with brilliant clear-cut reproduction of voice and music, will satisfy the most critical ear.
 Size of Cone 10" dia. Supplied complete with Dual Input Transformer.
 May we arrange a demonstration for you?

PRICE 67/6

IGRANIC ELECTRIC CO., LTD.,
 149 Queen Victoria St., London

Write for a copy of our leaflet No. J. 1168.



OUR NEWS BULLETIN

A Radio Opening

It is now practically certain that the King will open the magnificent new bridge which has been built across Sydney Harbour. This bridge will be opened some time in the spring, and the ceremony will be performed by His Majesty pressing a button in Buckingham Palace. It is probable that the King's voice will also be heard, for it is hoped that he will make a speech into the microphone while the ceremony is taking place.

First Aid via Ether

The skipper of a Grimsby trawler, now fishing in the Arctic, was recently

able to make good use of the Canadian Government's wireless service of medical and surgical aid. Apparently one of his men was washed through a scupper door, with the result

that he sustained a fractured jaw and had half his scalp torn away. So the skipper sent a wireless message to the operator at the nearest Marine station, the message was sent on to Ottawa, and within an hour a reply was received advising the skipper what treatment to apply.

Canadian News Service

Incidentally, Canada is doing still more good work by wireless. The Winnipeg radio station has organised a weekly broadcasting service, by means of which urgent messages and news can be transmitted free of charge to missionaries in the great North-West territory of Canada.

D.F. Station to be Closed

The Board of Trade has decided that the continuance of the Lizard direction-finding wireless station is not justified by the extent to which it is used. As a result of the urgent need for economy, therefore, the station is to be closed at midnight on March 31st. As our readers probably know, this station is maintained for the sole purpose of giving wireless bearings to ships. The cost of upkeep is considerable, and we understand that the revenue obtained is less than one-fourth of the cost.

Suggested Substitute

It has been suggested that arrangements might be made for the provision of direction-finding facilities at Land's End, as a substitute for the Lizard station, and tests are being carried out to ascertain whether such a service would be practicable.

Broadcasting and Church Services

In an interview with the "Daily Mail" recently, a B.B.C. official stated: "It is an established part of the B.B.C.'s policy that broadcasting shall not be carried on during the hours when Church services are being

(Continued on page 311.)

"SQUARE PEAK" CANNED COILS

(REGD TRADE MARK)

Each coil tested and matched to within 1%. Rotary switches with self-cleaning gold-silver alloy contacts. Switch control insulated between coils.

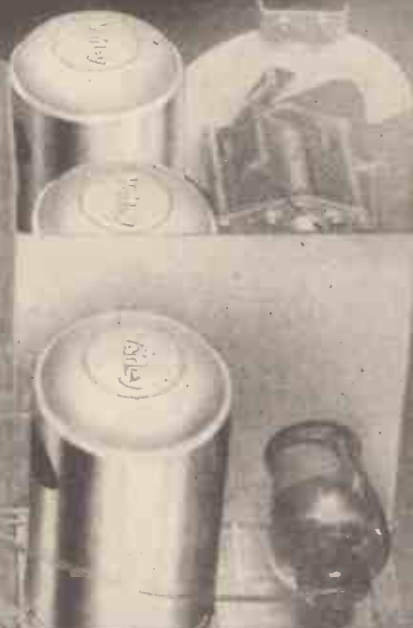
VARLEY "SQUARE PEAK" CANNED COILS (Prov. Prot.)

3-Gang Unit on aluminium base-plate, as used by "Wireless Constructor."

Type BP13. **37/-**

Adv. of Varley (Proprietors: Oliver Pell Control Ltd.), 103, Kingsway, W.C.2.

Specified in the
"VI-KING"
BAND PASS
FOUR



Varley

OUR NEWS BULLETIN

—continued from page 310

held," and we understand that the church service hours will not be infringed in any way by the extensions of Sunday broadcasting which are now being discussed in some detail.

Compact Aeroplane Receiver

It is claimed that the new wireless receiving set which has been designed especially for the use of private aeroplane owners is for its performance the most compact in existence. The receiver measures 9¼ in. by 4¼ in. by 4¼ in., and weighs 4 lb. 10 oz. Even with batteries and aerial the total weight is only 19 lb. 8 oz. The range is about 100 miles, and reception is through the ear-pieces of ordinary flying helmets.

Concerning Welsh Listeners

At last the B.B.C. has given Wales a very good talking to. For some months past the Welsh people have been agitating for a station of their own, and also for "adequate" programmes—until it became really necessary for something to be done about it. And something was done!

The West Regional Director has now pointed out that it had been proved by competent engineers that under the existing international regulations it would be quite impossible to establish a broadcasting station to cover the whole of Wales. If a station were erected in the middle of Wales it would cover only an agricultural area, and the B.B.C. had done its best to overcome the natural geographical obstacles by erecting a high-power station on the other side of the Bristol Channel.

The West Regional Director also stated that the B.B.C. was up against insuperable obstacles in this matter, and it was much to be regretted that the people of Wales had not recognised the vast amount of work that had been done on behalf of Welsh ideals and culture. In conclusion, he pointed out that far more Welsh programmes had been given than were justified by the percentage of Welsh listeners.

Radio Lessons for Chicago

Unless the State decides to come to the rescue, Chicago's education system will be entirely suspended owing to lack of funds, and its half-million school children will have to be dependent on wireless lessons. The

(Continued on page 312.)

FUSE PRICES REDUCED

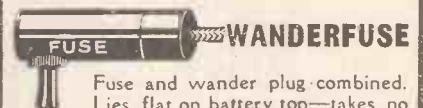


SAFETY TWIN FUSEHOLDER

With two 1-amp. fuses for mains leads. Reduced from 3/6 to **2/6**

SINGLE BASEBOARD FUSEHOLDER

The best method of mounting fuses inside a set. Complete with ½-amp. fuse. Reduced from 1/3 to **1/-**



WANDERFUSE
Fuse and wander plug combined. Lies flat on battery top—takes no extra space. Use one in the H.T.—lead to protect valves and H.T. supply. Fitted without tools. Complete with 150 M.A. fuse. Reduced from 1/6 to **1/-**

Spare fuses, all ratings, 6d. each.

BELLING-LEE FOR EVERY RADIO CONNECTION

Advt. of Belling & Lee, Ltd., Queensway, Ponders End, Mdx.

A. MUNDAY Ltd.
Electrical & Wireless Engineers
59, Watling St., E.C.4. Phone: CITY 2972
(One door from Queen Victoria Street and Queen Street)
45, Eastcheap, E.C.3. Phone: ROYAL 4632
49-51, Eastcheap, E.C.3. Phone: ROYAL 4632

S.T.300
PARTS IN STOCK
S.T.300
READY WIRED
S.T.300
ON DEMONSTRATION

"MORCO" THE NEW RADIO CABINETS

Illustrated here is an outstanding example of a Radio Cabinet made in three sizes and six designs, which allow for the majority of constructors' sets.

- SIZE A. For Sets having Panels 14" x 7", Baseboard 7".
- .. B. For Sets having Panels from 12" x 7" to 14" x 8".
- .. C. For Sets having Panels from 15" x 7" to 18" x 8", and will take any Set within the above dimensions. Baseboards for sizes B and C are supplied 10" wide.
- SIZE A is specially designed to accommodate the famous **TELSEN VICTOR 3**, but can be used for any Set having a Panel 14" x 7" and a Baseboard 14" x 7".



FOR THE "S.T.300" ORDER SIZE C.
There is a "MORCO" Cabinet for every constructor's set.

Finished in a medium Oak colour with Ebonised feet. Hand French Polished.

Write now for all particulars "FREE."

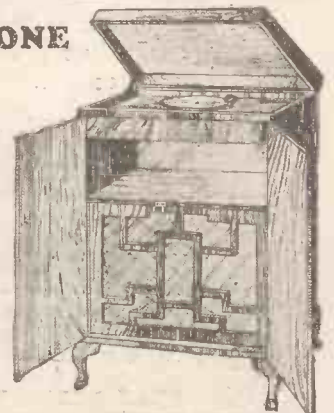
PRICES:
SIZE A: 10/6
SIZE B: 10/6
SIZE C: 12/6

NAME.....
ADDRESS.....
"w.c." 3/32.....

R. MORTON & CO. LTD.,
MAPPIN BUILDINGS,
NORFOLK STREET,
SHEFFIELD.

High-Grade RADIO GRAMOPHONE CABINET

of exclusive modern design, hand-made and polished on Queen Anne legs
Figured Oak - - - - - £5 : 5 : 0
Figured Walnut or Mahogany £5 : 19 : 6
Carriage Paid.



THE ACME OF CRAFTSMANSHIP
Radio-Gram Cabinets from £3: 19: 6 to £21
Wireless Cabinets - - - from 11/6
Photographs and 30-page illustrated Catalogue Free.

Cabinets made to order a specialty. Furniture at Maker's prices.
GILBERT, CABINET MAKER, SWINDON.

Estimates Free. Estd. 1866.



Ohmite

*The 1-meg. Resistance
Mr. Scott-Taggart used
for the great "S.T.300"*

The Graham Farish Ohmite—most popular of all Resistances—is built essentially for accurate and dependable service. Use the Ohmite 1-meg. for your "S.T.300" and get the same results as the designer. Every dealer stocks it.

*No wonder we've
sold millions!*

GRAHAM FARISH

LIMITED. BROMLEY, KENT

OUR NEWS BULLETIN

—continued from page 311

city already owes £5,000,000 in salary arrears to its teachers, and the schools in three of the suburbs have already been closed, but we understand that arrangements are being made for the children to receive lessons by special educational broadcasts.

Temporary Licences Wanted

The advent of the "all-electric" radio receiver has apparently produced a new public which is anxious to hear a set's performance before purchasing, and as it is necessary for wireless dealers to take out a licence for each set supplied on approval, a good many licences have to be wasted, for, naturally, quite a number of prospective buyers never actually materialise.

This question of licensing temporarily installed sets, however, is now under serious consideration by the Post Office authorities, and it is to be hoped that some more satisfactory arrangement will be made in the near future.

Anything For a Quiet Life

The uses of wireless are many and varied. An American dog-breeder, whose kennels were adjacent to his house, recently got so tired of getting up in the middle of the night, and complaints from the neighbours, that he had a microphone installed at his bedside. This was connected with amplifiers and loud speakers so that his voice is amplified to a shout in the kennels. And now he has no trouble in successfully quietening the animals if they get too noisy at night.

RECOMMENDED ACCESSORIES

FOR

THE "S.T.300"

BATTERIES (1 120-volt H.T., and 1 9-volt G.B.), Pertrix, Drydex, Ever Ready, Lissen, Magnet, Columbia, Ediswan.

ACCUMULATOR (Voltage to suit valves). Pertrix, Exide, Ediswan, Lissen, G.E.C.

LOUD SPEAKER. Blue Spot, Celestion, Amplion, R. & A., W.B., Epoch, H.M.V., Graham Farish, B.T.-H., Marconiphone, Undy.

MAINS UNIT (Output not less than 20 milliamps at 120 volts). Regentone, Ekco, Tannoy, Forno, Atlas, R.I., Heayberd, Lotus, Tunewell.

AS WE FIND THEM

—continued from page 289

In these positions rigid valve holders may be employed quite satisfactorily.

Another well-finished component is an illuminated drum control giving a particularly nice, smooth movement. This last component should appeal to constructors, and its price is 8s. 6d.

R.I. Choke

The latest R.I. H.F. choke is known as the "Quad-Astatic," and it employs an astatic form of winding which is claimed to render it free from H.F. interference with nearby parts. Two of the requirements of a good choke are low self-capacity and high inductance. The R.I. choke has these qualifications, and it can be used safely in parallel-feed circuits for H.F. coupling, or for reaction purposes.

We have tried this choke with satisfactory results in various receivers, and it functions well over the broadcast wave-bands.

The makers are Radio Instruments, Ltd., Purley Way, Croydon, and the price is 3s. 6d.

THREE SELECTED UNITS

—continued from page 271

Moreover, there is an output filter which prevents the H.T. current from flowing through the speaker windings, and it is also valuable in isolating the speaker when the H.T. is derived from a mains unit.

A resistance-transformer combination is employed for coupling together the two stages, and it is a combination that takes a lot of beating for quality, "punch" and stability.

The first procedure is to mark out the panel to the dimensions indicated on the wiring diagram, and then to drill the holes for mounting the terminals and components.

When you have mounted the components you can proceed with the wiring.

You will need two valves, the first L.F. being one of the "L" type and the output valve a power or super-power valve.

To connect up the unit to the existing set, join "input+" to the + phone terminal on the set, and "input—" to the other phone terminal. Connect the two L.T.

(Continued on page 313.)

THREE SELECTED UNITS

—continued from page 312

terminals on the unit to the L.T.+ and L.T.— respectively on the set. Assuming a common H.T. battery to be used there is no need to worry about H.T.— as far as the unit is concerned, because there is already an H.T.— connection on the set.

Using a Separate H.T.

If, however, a separate H.T. battery is employed, H.T.— on the unit should be taken to the negative socket of the H.T. supply. H.T.+1 on the unit requires about 80-100 volts, and H.T.+2 100-150 volts, depending upon the H.T. available.

The two pick-up terminals on the unit are joined direct to the pick-up.

Last of all we come to the A.C. mains unit in Circuit No. 61.

Now, this is a mains unit for H.T. only, and it is a very simple unit at that. The maximum safe output may be put down as 15 milliamps.

The highest voltage is given by H.T.+2, and this is in the neighbourhood of 130-140 volts, the figure depending upon the resistance of the choke and the current flowing through it.

This tapping should be used for the output valve with the grid bias adjusted on the assumption that the voltage is 150.

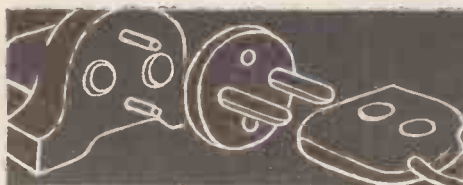
H.T.+1 is for the detector anode voltage, and this tapping is adjustable, various tapping points being provided on the potential divider to enable different voltage values to be obtained.

Straightforward Construction

So far we have said nothing concerning the actual construction of the unit. This is mainly because it is so exceedingly easy. The various parts are mounted upon a wooden base-board, which is cut away at its four corners, so that it can be placed in the iron containing box without fouling the securing bolts.

The leads for H.T.+1, H.T.+2 and H.T.— are joined to the three terminals after the unit has been inserted in the metal container.

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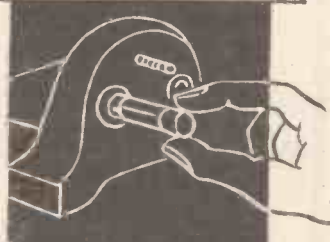
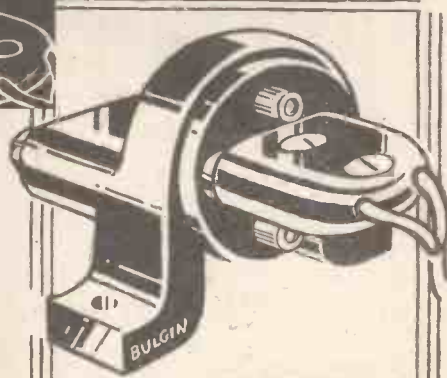
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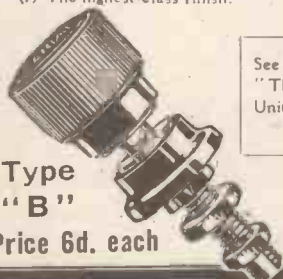
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"Three Selected
Units" in this
issue.

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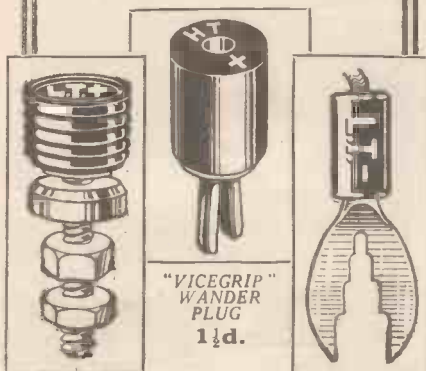


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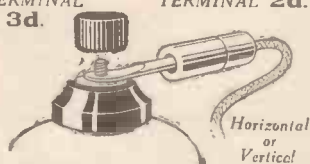
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* **ALL ABOUT** *
* **KEEPING FIT** *

MONEY talks! Money buys anything! We all want money, and we spend most of our time pursuing it. So much so that sometimes we forget that money *doesn't* buy everything. In fact, when you come to think of it, the most important things in life are just those things that money cannot buy. It cannot buy *health*, for instance, and without health what else matters?

Bountiful nature gives us good health as her greatest gift, and most of our health troubles are of our own making—due to carelessness, neglect, ignorance. If we could afford it, wouldn't it be well worth-while to engage a fully qualified doctor to be "a member of the family"? Some people have a doctor in the family already, a father or a son: how lucky for them!

But wait. Why shouldn't you know something of the human body and its needs in sickness and in health? No need for you to be worried to death about some minor ailment of the children or to make some serious mistake, in case of emergency or accident. Call the medical man in case of need, by all means, but why not gain an intelligent understanding of the main facts of health.

"Security and Happiness"

The publication of the "Concise Home Doctor" will dispel the clouds of ignorance surrounding so many aspects of disease and hygiene and will help to bring security and happiness to many a home. It is to be published in 52 sixpenny weekly parts, and is in truth an Encyclopedia of Good Health, written by a wide circle of eminent physicians, surgeons and specialist.

The "Home Doctor" is based upon the sound principle that "Prevention is better than Cure." It is a book to make and keep you fit. It tells you what to do in an emergency before the physician comes; how to spot children's ailments; all about home nursing; sex and sex hygiene; diet; simple remedies; mothercraft; first-aid; health exercises; anatomy; beauty culture; health problems at all ages, and a thousand-and-one of the very things you have always wanted to know.

The first Part of the Concise Home Doctor is published on Tuesday, February 16th, price 6d.

MORE ABOUT THE "S.T.300"

—continued from page 262

aerial and local conditions, and then left untouched. But supposing we do leave them, what would happen to the set—and all sets without proper means for variable selectivity—when stations shoot up in power?

Those sets which are good serviceable receivers to-day may lose a quarter their value next month, another quarter the month after. It's happening before our very eyes. The B.B.C. has wrestled at Rome with the other nations for a wider kilocycle separation of stations, but the others are adamant.

Progressive Design

It is therefore "up to" set designers. *We must have sets which can progressively be made to suit the new conditions as they arise.* As ultra-selectivity is accompanied by some loss of signal strength, a three-valve set must essentially provide for the fullest advantage being taken of all means to give range and output where conditions permit.

This the "S.T.300" does, and as jamming gets worse you merely turn the selectivity knobs a little more to the left—a few seconds' work! You'll be glad of those knobs—and perhaps sooner than you imagine. Or else you will build a "compromise" set and have to scrap it.

So far I have not asked you to vary the selectivity controls except to set them for your aerial and district—and to move them round to the left a little when—in three months, six months, a year—"jamming" necessitates. I have left you two dials and reaction as the sole controls. (The on-off and wave-length switches do not count.)

The Right Balance

But if you want to get more out of your set, read on. If you fear moving those knobs when tuning, please stop here and be content that I have given you a set which is adaptable to your conditions and which at intervals can be brought up to date by a simple panel adjustment which takes only seconds.

Are you still reading? Very well! My next point is this: Since ultra-selectivity and signal strength are a see-saw—one going up as the other goes down—we should be able to get the right balance for each station.

(Continued on page 315.)

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SUNDAY GRAPHIC

and Sunday News

MORE ABOUT THE "S.T.300"

—continued from page 314

That is, we *should* be able to increase our selectivity to suit that particular station. The "S.T.300" enables you to do this very simply and very quickly.

Obviously, if we make a set *extremely* selective it will be inefficient and there will be less to get!—not to mention quality loss. If, on the other hand, the set is designed for maximum sensitivity and range we shall lose in selectivity.

The set can reach, but what is "reached" is blotted out! The "S.T.300" enables you to strike the balance, and this is more important obviously in the case of a three-valve set than a many-valved receiver because you have less to "play with."

A Severe Test

In practice, the position is this. There are parts of the dial where jamming is normally very much worse if you live near a B.B.C. station. There are several letters from readers in this or last month's issue which indicate that I receive Mühlacker (11 kilocycles from London Regional) at good quality and loud strength, and clear, or almost clear, of London Regional in Central London.

This is a very severe test—usually reserved for super-heterodynes. But to do this I have to increase the selectivity by turning both couplers well to the left and keeping reaction up. This involves some loss of signal strength—and on a weaker station would affect quality, as the actual kilocycle separation adjustment of the set is well below 5 kilocycles. When London Regional is "off" there is no need for this adjustment, and we can go back to "normal."

The Swamp Zone

So if with the "S.T.300" you come near—on the dials, that is—to a powerful jamming station, you should increase the selectivity by turning the coupler knobs to the left. Whether you use the anode coupler or both couplers is a matter for trial.

But as you alter the selectivity of the set, do not forget to keep the reaction up to its former level, if the station's strength or the degree of jamming requires it. If this is done there is an unexpectedly small decrease of signal strength, on the ultra-selective adjustments.

(Continued on page 316.)
315

TUNEWELL

The Coils to use for the S.T.300



Note the new super-efficient low loss-formers, which ensure minimum dielectric loss and consequent gain in range and signal strength.

Anode Coil with neat mounting bracket, one screw fitting.

Mr. John Scott-Taggart says this is his best set and TUNEWELL have designed special Coils for it. What is more, the TUNEWELL Coils cost you *only* 9/6.

These Coils have been tested and approved by the "Wireless Constructor" technical staff.

TUNEWELL Coils and Components are famous for their efficiency, and they are constantly being used for the leading sets. Constructors who use them are assured of super results and get extra benefit by the welcome saving in cost which they make possible.

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TUNEWELL

MORE ABOUT THE "S.T.300"

—continued from page 315

As you pass the "swamp" zone you can "open the throttle," so to speak, and go back to "normal" or even to the right sides on both couplers—which sides provide reserves of signal strength, especially on the long waves.

Warsaw and Eiffel Tower—both giving good programmes, especially Warsaw—are only 5 kc. apart, yet the "S.T.300" will deliver them absolutely separately, as readers indicate in their letters; this, of course, is while Königswusterhausen, Radio-Paris and Daventry are on.

But Huizen and Oslo, for example, are at present outside the scramble, and in London both couplers can be flicked over to the right and some increase in signal strength noticed if a small aerial is in use. On a normal aerial they come in very loudly and

a change in coupler position makes no audible difference.

When logging stations, what I do is to write down the readings of the left- and right-hand dials. This is necessary with any set which will give over 60 stations on the speaker.

Dial Readings

Also, when working the set near a B.B.C. station, or where the kilocycle station separation of the stations themselves is very small, I indicate on my list with an arrow the position of the couplers. These are jotted down as the dial readings are noted.

In practice, I make a small mark on the panel opposite the pointer on the aerial coupler knob (or opposite a slight nick I make on the rim of the anode coupler knob if this is a Telsen). Three panel marks for each coupler are desirable: vertical, half-left, and half-right.

The knobs, of course, of all the condensers on the panel have already been arranged to move from horizontal left to horizontal right as usual. The aerial coupler has not got a stop, but when the pointer is horizontal left the condenser is full out. The marks can be very approximate.

Setting the Couplers

As a matter of fact, many constructors will probably only use the vertical marks and move the couplers to cut out "background." The readings in the table of stations were obtained with coupler pointers vertical—i.e. "normal" selectivity.

The stations, even if you live near a B.B.C. station, will be heard on these adjustments, but if the station desired is close in wave-length to the B.B.C. station you may get a background, and more selectivity (selectivity knobs to the left) is called for. The selectivity

controls affect tuning a little and readjustment of the dials may be necessary.

Two or three stations are given below to show how a list may be prepared. Once listed you can go back at once to any station and know you are getting the utmost out of it.

Moscow	> 82	> 88½
Motala	> 89	> 95
Warsaw	^ 101	^ 98
Eiffel Tower	^ 107	^ 102
Daventry	> 115	> 120
Königswusterhausen	> 123	^ 124
Huizen	> 146	> 150½
Kaunas	> 152	^ 152½

Here are sample readings on a duplicate "S.T.300" set adjusted to give best results on a certain London aerial. The arrows show positions of aerial and anode couplers, respectively. Note that Eiffel Tower, Warsaw and Königswusterhausen require greater selectivity than is necessary for, say, Moscow or Huizen. Most of the long-wavers are strengthened by having the couplers over to the right. But if Kaunas greatly increased its power, Huizen (5 kc.'s away) would be spoilt on the ordinary set. On the "S.T.300" you would simply increase the selectivity by means of the couplers. The selectivity is panel-controllable "from top to bottom" on the long as well as the medium waves.

The final point is that the aerial coupler can be used to get the most out of a good aerial. If you've cut down the length of your aerial to do what the set should do, you are a victim of compromise and inefficiency.

Put the wire back if you build an "S.T.300." Where absence of jamming permits, you can then turn your aerial coupler to the right and get the fullest benefit of your aerial.

NEXT MONTH

FURTHER "S.T.300" NEWS

More Articles by
JOHN SCOTT-TAGGART

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INDEX TO ADVERTISERS

Belling & Lee, Ltd.	311, 313
Bird, Sydney S., & Sons, Ltd.	313
British Blue Spot Co., Ltd.	307
British Hard Rubber Co., Ltd.	313
Burne-Jones & Co., Ltd.	298
Bulgin, A. F., & Co., Ltd.	313
Britannia Batteries, Ltd.	256
Carrington Manuf. Co., Ltd.	298
Colvern, Ltd.	Cover ii
"Concise Home Doctor"	254
Dubilier Condenser Co. (1925), Ltd.	303
Day, Will, Ltd.	309
Edison Swan Electric Co., Ltd.	Cover iv
Exide Batteries	295
Ferranti, Ltd.	305

Gilbert, J. C. (Cabinets)	PAGE 311
Graham Farish, Ltd.	312
Heyberd, F. C., & Co.	314
Igranite Electric Co., Ltd.	309
Jackson Bros.	253
Lectro Linx, Ltd.	314
London Electric Wire Co. & Smiths, Ltd.	298
Morton, R., & Co., Ltd.	311
Munday, A., Ltd.	311
Ormond Eng. Co., Ltd.	297
"OBO"	315
Peto-Scott Co., Ltd.	255
Pickett's Cabinets	315
Ready Radio, Ltd.	285, 287
Reproducers & Amplifiers, Ltd.	303
Rex Patents Co.	315

Sovereign Products, Ltd.	PAGE 298
Taylor, C.	315
Telegraph Condenser Co., Ltd.	305
Telsen Electric Co., Ltd.	290, 291, 301
Turner & Co.	315
Varley Products	310
Westinghouse Brake & Saxby Signal Co., Ltd.	303
Wingrove & Rogers, Ltd.	Cover iii
Woodworkers Supplies	315
Wright & Weaire, Ltd.	307
Ward & Goldstone, Ltd.	309
Young's (Glasgow), Ltd.	315

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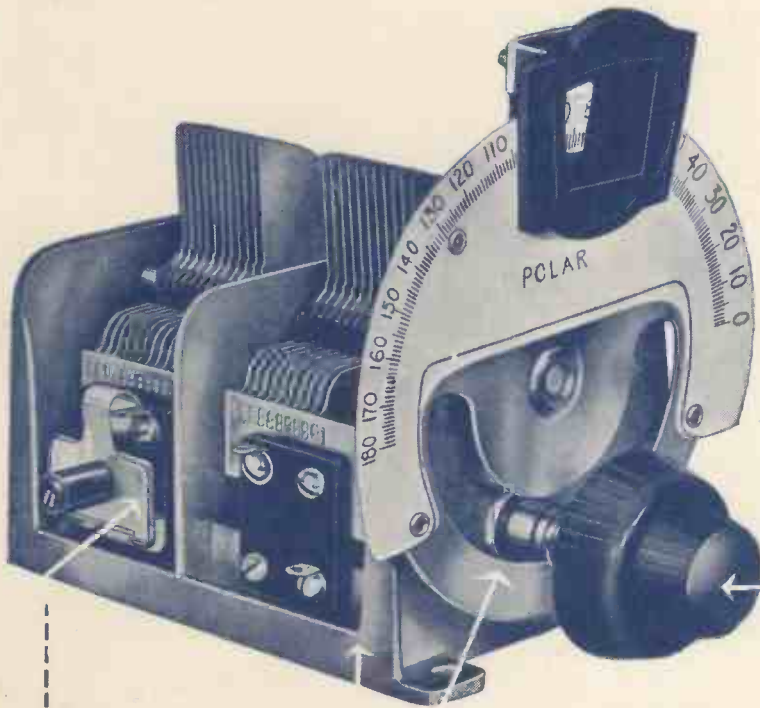
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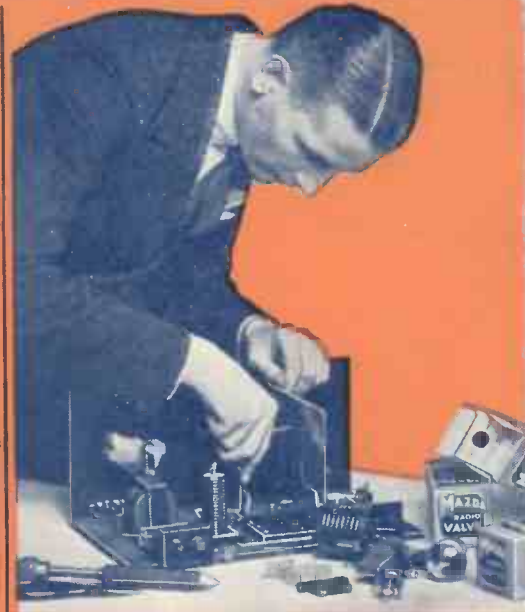
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