

Wireless

VOL. 2 NO. 10
SEPTEMBER
1935

AND TELEVISION REVIEW

6^D

In this issue

A FOUR-VALVE BATTERY SUPER

With
A.V.C.

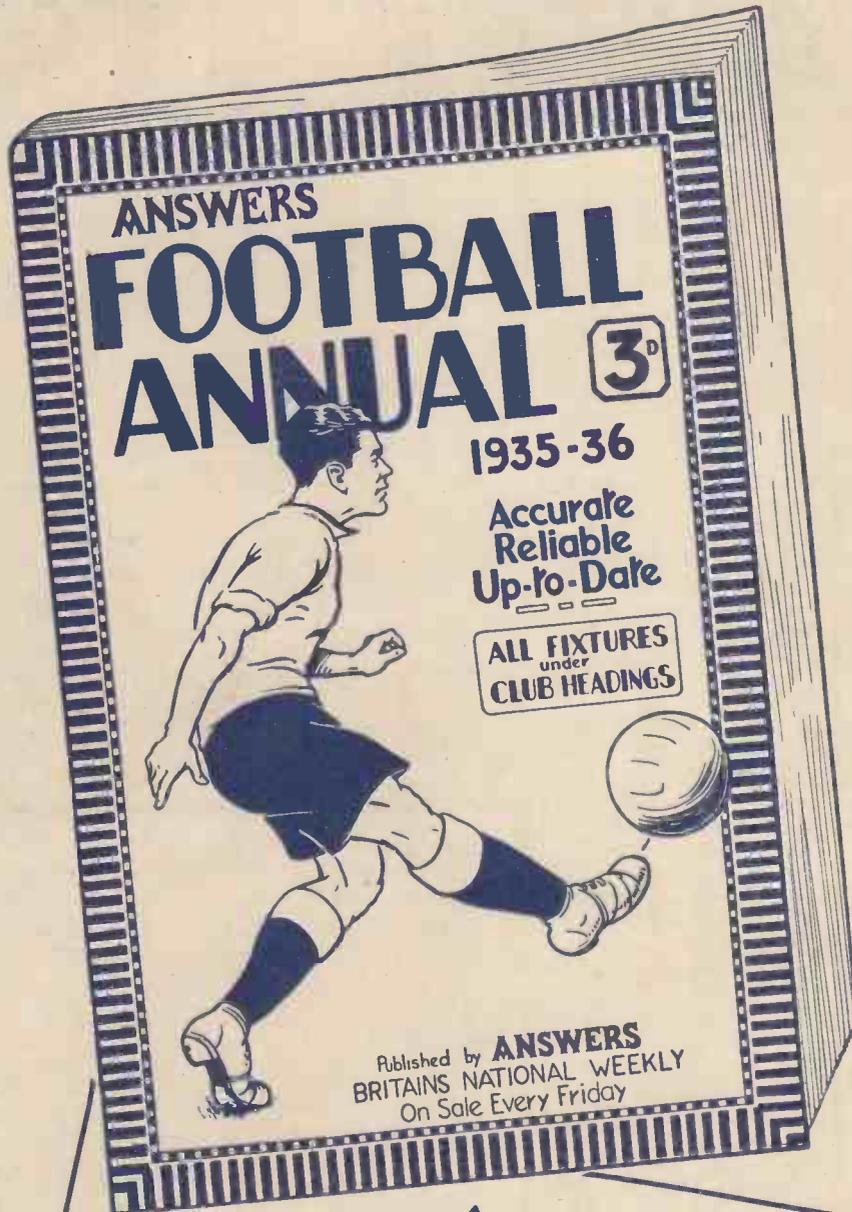


*Special
Articles by*

JOHN SCOTT-TAGGART

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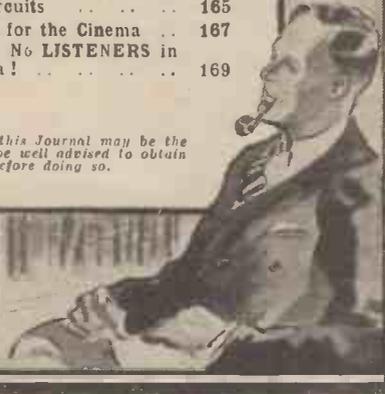
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As some of the arrangements and specialties described in this Journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.



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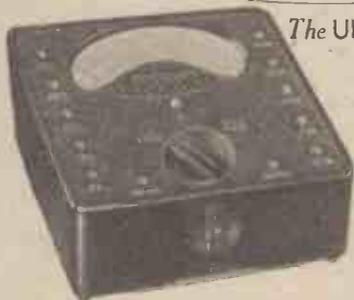
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The Editor's Chat

Wireless

& TELEVISION REVIEW

Good News for "Wireless" Readers—A Fine Battery Super

DURING the forthcoming months readers will notice considerable developments and even some changes in WIRELESS AND TELEVISION REVIEW. But the essential character of the magazine will, of course, remain unaltered. We have every reason to be satisfied with the position that has been attained and held by what is probably the most widely read monthly radio journal in the world.

Nevertheless, we are determined to press still further forward, and in the pursuit of this ambition no effort is to be spared to create attractive new features and methods of presentation. Believing that our readers would welcome contrast to the more technical material which must obviously always constitute a large proportion of the contents of WIRELESS AND TELEVISION REVIEW, we have already introduced a "breakaway" item in the form of short stories. And it is clear from our correspondence that these have proved most acceptable.

Improvements and Additions

They have not been and never will be the effusions of unskilled authors or "pot-boiler" offerings of quick-fire journalists, but carefully selected stories by sincere and competent craftsmen.

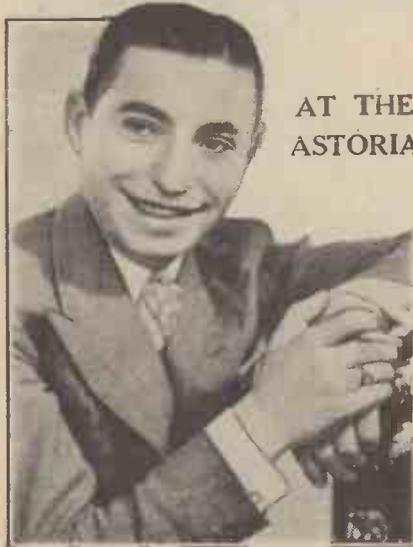
In so far as our established features are concerned, there will probably be revision, improvements and additions rather than any contraction. John Scott-Taggart, who is indisputably the world's leading radio designer and writer, will continue to contribute exclusive articles, and so will Victor King, Dr. Roberts and others of the popular team which gives strength and distinction to the magazine.

But you can anticipate some very important developments. And all in the right direction. There is no need

for us to say "look out for them." You'll see and appreciate them clearly enough in due course so long as you regularly collect your WIRELESS AND TELEVISION REVIEW from the book-stall or newsagent or, better still, have it delivered to your house.

At the Beginning

And don't forget that from now on your favourite radio monthly is to be published at the beginning of the month, instead of in the middle of it as hitherto. It may take you an issue or two to accustom yourself to this change, but afterwards you will find



AT THE ASTORIA

This is Joe Loss, leader of the Astoria Dance Band, and a popular broadcaster.

it very much easier to remember that WIRELESS AND TELEVISION REVIEW "comes out" the first of the month, which is extremely appropriate as we hope you will agree when you grasp the subtle significance of that statement!

The Great Radio Show at Olympia is still in full swing as we pen these

words. What an exhibition! What an orgy of technical delight and tyro wonder! It staggers the imagination to try and visualise the tentacles which spread away back from it into the depths and intricacies of scientific research and industry.

Over five thousand sets, and most of them different expressions of amazing achievement in the mass production of first-class apparatus for fourth-class pockets.

It isn't so very long ago that a wireless set was an individual construction, the result of the efforts of individual workers. But these 1936 sets are almost invariably cast in the moulds of the conveyer belt, the multi-functional machine and other aids to scientific mass-production.

And no one will shed a tear for the passing of the older, cruder, more expensive and vastly less efficient methods!

A "Hot-Stuff" Set

There are many, though, who prefer to build their own sets. There has been just as much, if not more, progress in home-constructor designs. Evidence of this is provided by the battery receiver, which we describe in this issue.

It is a "hot-stuff" super with A.V.C. and other up-to-the-minute refinements. In view of the fact that it uses only four valves and consumes something round about a mere ten milliamperes of H.T., the performance it gives is really rather startling.

On a short aerial in the very centre of London during the daylight, it pulled in a number of stations at full loudspeaker strength, the A.V.C. giving a wide compensation.

At night, in a provincial town, practically every station in Europe seemed to be available for the provision of programmes.

IS FOREIGN-RECEPTION ENTERTAINMENT ?

Following on the opinions expressed recently by Mr. G. T. Kelsey, particular interest attaches to the remarks on the entertainment value of foreign programmes in this article.

By ALAN HUNTER

WHEN my fellow scribe and friend, G. T. Kelsey, takes up the cudgels on behalf of short waves—as he so piquantly did recently in this journal—one expects a forcible expression of faith. For Mr. Kelsey, more perhaps than any other radio writer, believes in short waves.

Medium Waves Defended

That his faith is shared by an ever-growing band of short-wave fans is obvious to anyone able to read the signs. The thrill of the chase is nowhere keener than “down under”—where a flick of the tuning knob magically transports the listener from one end of the earth to the other.

Short waves, to anyone who really understands them, need no defence. Far flung Empire phone routes give 24-hour testimony to the unique value of short waves in spanning enormous distances with relatively small power. The B.B.C.'s Empire programmes radiate to every part of the civilised earth. Indeed, from a communication point of view the case for short waves is proved. They have verily put a girdle round the earth.

But in defending the short waves Mr. Kelsey seems to me to have attacked somewhat ruthlessly another preserve of the ether in which he is obviously not quite so interested—the medium waves. He suggests that no one can honestly claim to be able to listen to a foreigner on the medium-waves for an hour or more for entertainment as such. That is where I disagree—and I feel fairly sure that thousands of other listeners are with me.

Question of Distance

Let us clear up one rather important point right away. If you live within 10 to 15 miles of a 50-kilowatt Regional you enjoy a field strength from that station enormously greater than you can possibly hope to from any other station—whether it is at home or abroad.

Indeed, if all reception were carried on under such very nearly ideal conditions, I doubt if these elaborate superhets would be needed. As it

happens, of course, thousands of listeners are much farther than 10 to 15 miles from a high-power station, and some kind of pre-detector amplification is essential. For at greater distances the set must be more selective—and the signal must be sustained in strength after passing through its successive filtering.

Take my own case. I live in the heart of Sussex, some 55 miles south of Brookmans Park. It can hardly be said that I have a local station. Certainly I have not the boon of a very high field strength signal, greater than all others.

As a matter perhaps of surprising fact the little Normandy station is more strongly received at my place than London Regional. But then, of course, the French signal is travel-

HIGH-POWER COOLING



“Even now, with the high-power stations pumping out 100 kilowatts or more, the selection of daylight-range foreigners is very limited,” writes the author of this article. Here is the massive control gear for the valve-cooling plant at one of the powerful German stations.

ling part of the way over water, and I am perfectly certain its power is higher than advertised.

I am not going to quote this state of affairs as a direct refutation of the thesis that foreigners can't hold

a candle to the locals. All I suggest is that it gives us a line of thought possibly unlikely to occur to the listener living—as I believe Mr. Kelsey lives—extremely near a high-power programme centre.

In spite of modern automatic-volume-controlling, London Regional sometimes fades at night time down here. Fancy that—the local station fading! And, believe me, such are the peculiarities of the Kennelly-Heaviside layer, my home station's fade is occasionally much more violent than the fades of certain foreigners.

Far-Off Locals

Our Regionals were put up to enable the majority of listeners to enjoy a high field strength signal—at least one, and possibly two. Millions of listeners live within the 30-mile radius of these stations, and thus find themselves confronted with local signals very much greater in field strength than even the highest-powered foreigners. But there are vast numbers living on the fringe of these areas, and some fair proportion, like myself, outside the nominal fade-free range.

It is these less sheltered listeners who are likely to be a little astonished by Mr. Kelsey's dismissal of the foreigners as potential sources of entertainment—of sustained entertainment. To those suffering from nearest station fading and distortion the objection to variability by foreigners is hardly valid.

Altered My Opinion

A few years ago, when I, too, lived under the shadow of a local station, I used to consider that all the foreigners were “also rans.” But then in those days the power of the foreigners was much less than it is now. Our modern sets worked under old conditions would not give us anything like the present spate of programmes. For it is axiomatic that a signal is only as good as its ability to rise above “static level”—and that is a function of transmitting power, not receiving amplification.

Even now, with the high-power stations pumping out 100 kilowatts (Please turn to page 172)

The S.T.600 BATTERY RADIOGRAM

By
JOHN SCOTT-TAGGART

M.I.C.E. F.I.R.P.
F.I.R.E.



I DON'T suppose I need to tell you how to change over to "gramophone" and put the needle on the record! That's all there is to the "gram" part of this de luxe "battery" combination. But to get the best out of the radio portion calls for some element of skill—not much, but enough. First of all, learn what the various controls are for and what happens when the knobs are turned.

For Local Extraction

The Extractor condenser which is at the back is not really one of the tuning controls at all. It is solely for cutting out the interfering "local" B.B.C. station. On the medium waves this may be a B.B.C. relay or a National programme regional or a Regional programme regional station. These stations will cause overpowering interference in certain localities and over certain portions of the dial.

If, therefore, you desire Berlin and London Regional blots him out, you just turn the Extractor condenser till London Regional disappears. You will find that there is only one adjustment of the Extractor when this disappearance takes place; on each side of this point, the "local" comes back.

It only takes a few seconds to adjust and there is no need to look at the Extractor knob; you just put your hand behind the set, turn the knob till the local disappears, and then get on with the ordinary tuning job.

Very often only one of the locals causes really serious interference, in which case one setting of the Extractor is good for the whole of the medium-wave band. But when you go over to the long waves, Droitwich may very easily cause terrible interference, wiping out Luxembourg and Radio

Paris in some parts of Britain.

The Extractor is once more quite miraculously effective and Droitwich is cut down in strength till it remains a tenth-rate station. But you have, of course, to retune the Extractor condenser if you have been working on the medium waves.

The Extractor coils have a medium and a long wave winding, but the switching over is automatic and occurs in the set when you change-over on the receiver. Thus, when you are over on the long waves the Extractor is ready to extract the long wave jammer, viz., Droitwich.

There is, of course, a disadvantage in having to retune the Extractor for Droitwich, but the whole process is only a matter of seconds. The only

a moment you may wonder why. Actually, the Extractor will extract any station, weak or strong, but it is primarily for cutting out powerful locals of B.B.C. manufacture.

This may sound slighting to the B.B.C., and you may well ask what is to happen if you actually *want* the "local." You can, of course, get the B.B.C. at full strength by cutting out the Extractor circuit by tuning it off the B.B.C. wavelength. For example, you could turn the condenser to maximum (moving vanes fully inside fixed vanes).

B.B.C. Programmes

Usually this is unnecessary unless you live a long way away from the B.B.C. Ordinarily, even when the Extractor is at the best position for cutting out a "local," there remains a faint trace of the latter, and this may be brought up to loudspeaker strength by increasing the reaction, aerial coupler, and volume control—or perhaps only one (or two) of these controls.

Where you cannot bring back the B.B.C. by increasing the sensitivity of the main set, you have only to de-tune the Extractor condenser a trifle. The B.B.C. station will then, as regards signal strength, become similar to a non-fading foreign station.

★.....★
Mr. Scott-Taggart gives some valuable information on getting the best results from his latest design, constructional details of which appeared in our special exhibition number. "With these hints," says S.-T., "every constructor after an evening or two should become expert and bring in the hundred stations which this superlatively sensitive set is frequently capable of receiving."
★.....★

risk is that you may, on going back to the medium waves, forget to read just the Extractor condenser. Remember that wherever the Extractor condenser is tuned (even if you have forgotten about it!) then will it extract a station.

Thus it might easily extract a station you are wanting. For example, if the condenser just "happens" to tune the Extractor circuit to Budapest, you won't get Budapest, and for

So much for the non-tuning control. There is also a tone control which comes into somewhat the same category. It is adjusted to suit the taste of the individual listener. It will be found that when listening to distant stations any heterodyne whistle and high-note interference can be whittled down by a mere turn of the tone control. But do not forget all about this control; on a strong station you will need all the higher note response, and the tone control can be adjusted to give bright reproduction.

Single Knob

As regards the main tuning of the set, this is done by the single knob of the gang condenser. There is a small concentric knob projecting from the main, thus providing a final "titivating"

adjustment to the tuning. The gang condenser does not require trimming in the ordinary sense of the word, but a few remarks on this point are given later.

The aerial coupler does not affect

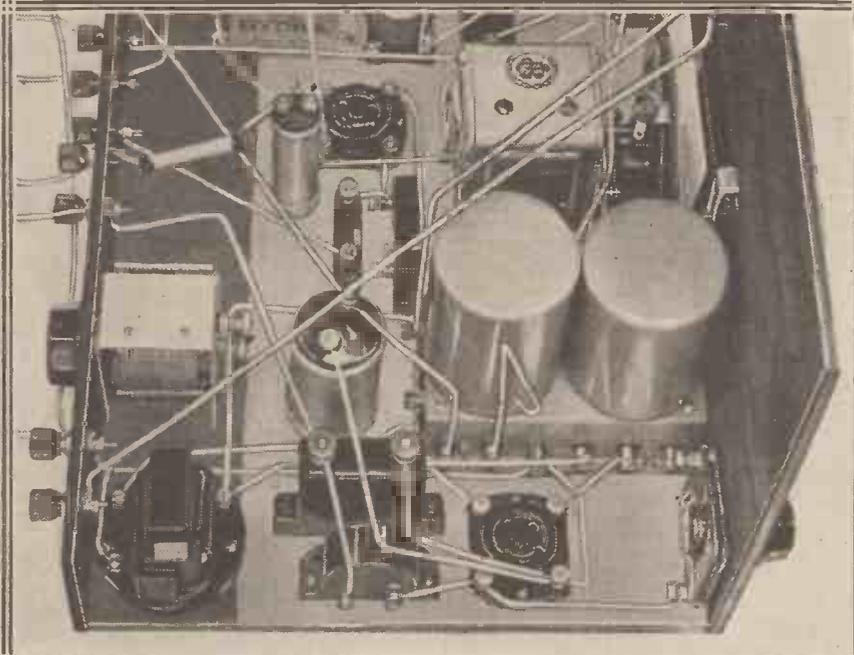
tuning to any degree that affects the technique of operating the set. The aerial coupler provides greater selectivity for the aerial circuit; by turning the knob anticlockwise (to the left) signals will be reduced in strength but selectivity will be improved.

The volume control is far more useful than its name implies. It certainly controls volume (although the aerial coupler will do the same), but its chief merit lies in providing greater selectivity. When you need this, you reduce the volume control (turning the knob anticlockwise—to the left), and bring up anode reaction.

Aerial Reaction

Needless to say, the beginner should not use the aerial reaction knob until he is quite familiar with (Please turn to page 176.)

CUTS OUT ALL LOCAL B.B.C. INTERFERENCE



The H.F. end of the set. The Extractor condenser on the terminal strip provides a ready means of cutting out any interference from a "local" B.B.C. station. Full instructions on the use of this control are given in this article.

THESE ARE THE PARTS USED IN THE S.T.600 RADIOGRAM

Components.	Make Used By Designer.	Components.	Make Used by Designer.
1 Tone control, .00075-mfd. solid dielectric variable condenser	Polar (Compax)	9 Terminals, A., E., H.T.+1, H.T.+2, H.T.+3, L.T.+1, L.T.-, L.S.-, G.B.-1	Belling & Lee (type R)
1 Aerial coupler, .0005-mfd. solid dielectric variable condenser	B.T.S.	8 Wander plugs, G.B.-2, G.B.-3, G.B.-4, G.B.+1, H.T.-, H.T.+1, H.T.+2, H.T.+3	Clix
1 Aerial reaction condenser .0005-mfd. log. mid line	Graham Farish (Litlos)	1 Volume control with 3-pt. switch (on radio chassis for radio vol. control)	Bulgin G.M.25
1 Main coil assembly S.T.600	Colvern	1 Volume control for gramophone (mounted on motor-board)	Graham Farish 1/2-megohm
1 Extractor coil S.T.600	Colvern	1 Extractor tuning condenser .0005-mfd. air dielectric	Ormond (S.T.600 type with knob)
1 Two-gang condenser with drive incorporating front trimmer (special to this set)	J.B. type S.T. 2121 and S.L.9A Dial	1 L.F. transformer	Varley Niolet (standard 1:3.5)
1 1-mfd. fixed condenser	Graham Farish (Mansbridge type)	1 Terminal strip, 16 x 3 x 1/8 in.	Peto-Scott
1 1-mfd. fixed condenser	Dubilier (type 9290)	1 Baseboard, 16 x 10 x 1/8 in., with part Metaplex (Metaplex covers 16 x 7 1/2 in)	Peto-Scott
2 2-mfd. fixed condensers	T.M.C. Hydra (300v. working type 30)	1 Panel (walnut or oak-ply), 16 x 9 1/2 x 1/2 in.	Peto-Scott
1 .00005-mfd. fixed condenser	Lissen mica	4 Valveholders, 4-pin anti-microphonic	Benjamin Vibrolider
1 .0003-mfd. fixed condenser	Lissen mica	1 Pick-up	Rothermel-Brush Piezo-Electric, type S.8
1 .006-mfd. tubular condenser	T.M.C. Hydra (600v. working)	1 Radiogram switch 4-pt. two-circuit	Bulgin S.81
1 0.1-mfd. tubular condenser	T.C.C. (type T.250-350v. D.C. working)	1 pair needle cups	Bulgin N.C.5
1 0.5-mfd. fixed condenser	Dubilier (type 9200)	1 Loudspeaker	British Rola (type F. 624 P.M.00 with terminals)
1 Anode reaction condenser .0003-mfd. differential solid dielectric	Graham Farish (Litlos)	1 Cabinet (special to this set)	Peto-Scott
2 1-megohm mounted resistors	Ferranti (type G.H.1)	1 Turntable motor	Garrard (type No. 20), with 7-inch handle
1 25,000 ohm 1-watt resistor	Dubilier metallised		
1 75,000 ohm 1-watt resistor	Dubilier metallised		
1 20,000 ohm 1-watt resistor	Dubilier metallised		
1 300,000 ohm 1-watt resistor	Erie		
1 50,000 ohm 1-watt resistor	Erie		
1 Anode reaction choke	Wearite H.F.P.J.		
1 Aerial reaction choke	B.T.S.		

VALVES. 2 COSSOR 210 V.P.T. 4-pin, 1 MULLARD P.M. 2 D.X., 1 MULLARD P.M. 202



Broadcasting and the Indian Empire

By *The Rt. Hon. LORD STRABOLGI*

IT is customary to speak of the Un-changing East ; but the East is changing rapidly. The development of broadcasting, for example, is likely to change the mental outlook of India's 350,000,000 inhabitants faster than any other discovery of the two thousand years of the Christian era.

Caxton's printing press eventually brought great changes in the world by giving the masses of the people access to the printed word in literature and the newspapers. But of India's vast population only about 23,000,000 can read and write ; so the printing press has not affected them to anything like the same extent.

Few Can Read

It is true that the vernacular newspapers circulate in the villages, and the few people who can read pass the news on to their hearers ; but with broadcasting, every one of India's teeming millions can be reached. And nine-tenths of the population live in the villages.

The wonder is that the Government of India, and the India Office in London, have not moved more quickly in establishing a broadcasting service throughout the vast peninsula. A start has, however, now been made.

It is intended, within the next five years, to establish a chain of stations throughout India. Mr. Lionel Fielden, well-known in the broadcasting world, has received the important appointment of General Manager of Broadcasting, and is leaving for Delhi. The first station was opened at Peshawar, the capital of the North-West Frontier Province, this spring ; and the second high-power station, one of the most powerful in the world, is under construction at Delhi at a cost of £22,500.

The Financial Position

Now there is this excuse for the Government of India : our Indian Empire has passed through the same economic crisis as the rest of the world

Unique in its large number of spoken languages, India presents quite a big problem where the provision of an organised broadcasting service is concerned. The vital considerations are clearly set forth in this authoritative contribution.

and the revenues have been strained to the uttermost. For the present it is administratively impracticable to charge a licence fee for receiving apparatus. The bulk of the public who live in the 700,000 villages of India are

miserably poor, and could not possibly afford to pay a licence to an amount worth the cost of collection ; so that, whereas in Britain the B.B.C. not only pays its way but contributes substantially towards the general expenses of the nation, in India the cost of a wireless system will be a direct charge on the Exchequer.

A Difficult Problem

Another difficulty is the number and variety of the languages. India is a conglomeration of races, many of them differing widely from the others. Only about 10 per cent of the population understands English. There are 220 spoken languages ! The vast majority of the inhabitants only speak their own language. These 220 different languages are divided into three main groups—the Aryan, the Dravidian, and Hindustani itself. The Aryan languages are spoken by the descendants of the great waves of immigrants and invaders who passed over the mountains into India in the long lost past ages of history at the same time that another great wave of the same races occupied Europe.

The Chief Dialects

Just as the Aryan languages in Europe are now divided into Spanish, French, German, English, Russian, and so on, so the Aryan languages in India are divided into a number of chief dialects, of which the principal are Hindi, Marathi, Punjabi, Bengali, Uriya and Gujarati. These languages are spoken by 257,000,000 people. Entirely distinct from this group are the Dravidian languages spoken by the pre-Aryan indigenous inhabitants of the South of India, of which the chief are Tamil, Telugu, Kanarese and Malayalam. These are the languages of another 71,000,000 people.

Four hundred years ago occurred the great Moslem invasion of India ; and there was evolved an official language, Hindustani, which is a

THE AUTHOR



The Rt. Hon. Lord Strabolgi, who writes this interesting article on a subject which is of considerable moment at the present time.

corruption of Hindi mixed with Persian and Arabic and ranks with English as the official language and general means of communication. Hindustani is spoken by the small percentage of educated people.

Broadcasts in Vernacular

Now broadcasting will be of most value if it reaches the masses. It is therefore obvious that programmes must be broadcast in the vernacular languages, and the changes will have to be rung amongst at least a score of leading dialects if the villagers are to be able to understand what is coming over the ether. Furthermore, the service must be under strict Government control, because the greatest care will have to be taken not to upset the religious and social susceptibilities of the various creeds and castes. Thus, while there are 240,000,000 Hindus, there are 77,000,000 Mohammedans, and 13,000,000 Buddhists, not to mention the 6,000,000 Christians, the Parsees, Jews and others. The adherents of the creeds are in fierce rivalry with each other, especially the Hindus and Mohammedans, and the greatest care will have to be taken that nothing appears in the programmes to upset the feelings of any of these people.

The first station at Peshawar has begun to function, and the first programme was made in the language of the Pathan tribes. The reason this Northern station was erected first of all is that we have had great difficulty with the independent and semi-independent tribes on the frontier. Fierce fighters, Moslems by religion, they have caused us trouble ever since we assumed responsibility for the peace and order of India. If they can be reached by wireless, the results should be good in helping to preserve peace on this troubled frontier.

"Speech from Heaven"

The first spoken word by wireless in India was during the initial broadcast last March, when Sir Ralph Griffith, the Governor of the North-West Province, broadcast a message to the Pathans in their own dialect. This was received with astonishment by the tribesmen who have named the system with a native word meaning "speech from Heaven." I have never heard any listener in this country talk of the B.B.C.'s programmes as "speech from Heaven," and I should think that Lord Bridgeman and the other Governors would be highly flattered if this expression were applied to their programmes!

THOUSANDS OF LANGUAGES

It is intended to broadcast native music and also talks on health, sanitation and, most important of all, agriculture. Apart from the political value from the Government's point of view in reaching the villages of India by wireless there will be an undoubted educational effect. One of the troubles in India is the out-of-date system of agriculture. The ploughs are the same as those in use for thousands of years, and they do not plough deep enough. The use of modern fertilisers is little understood, veterinary practice is very backward, and, by way of an example, the Indian peasant proprietors for the most part, that is to say the Hindus, are prejudiced against keeping poultry, which they regard as unclean. So poultry farming, the great standby of the European smallholder, is neglected.

THE MAN IN CHARGE



Mr. Lionel Fielden, well known in connection with British broadcasting, has been chosen as General Manager of the India Broadcasting Company.

Indeed, the greatest problem of India is not political at all. It is economic; the extreme poverty of the teeming millions, whose numbers have increased under peaceful rule, and whom the land will barely support. Any better methods, therefore, of farming and irrigation, that can be taught to the villagers will be of tremendous benefit.

One-third of India is under the rule of the semi-independent princes.

Certain of the great states, Hyderabad, Mysore, Kashmir, and others, rank in size with European countries. The Indian Princes have shown great interest in the Peshawar station, and are investigating the possibility of establishing their own radio stations in co-operation with the main Indian system. This will be a great help also. From what I know of India, I cannot visualise a peninsula wide hook-up such as is practised in America, with one message or programme going through all stations; and that because of the language difficulty. I believe the solution will lie in a multiplicity of small low-power stations, each serving its own district where one or two leading languages are used; and two or three high-power stations, principally for official communications.

Public Speaker System

There will be few independent "sets" bought in proportion to the vast population; but probably the Russian system will be adopted by which a loudspeaker is installed free in each village square. This will be costly, and it will strain the resources of the Finance Department of India to complete it within five years; but it will be money well spent, and should have important and beneficial results of almost incalculable value.

SIMPLE AERIAL SEPARATORS

By A. H. CUTT

FOR short-wave work it is becoming common practice to use double lead-ins, or "feeders" as they are termed. If these feeders are crossed at short intervals there is a great reduction in background noise due to man-made static, etc. Special separators are sold for the purpose, but they are rather costly. The following is a cheap way of making them.

The material used is ordinary plywood. This is cut into narrow strips and four holes drilled in each piece. They are waterproofed by soaking them in a solution made by dissolving a tallow candle in petrol.

The feeder wires can be of rubber-covered flex or high-tension cable. Thread the wires through a sufficient number of the separators, allowing at least one for each foot of the feeder. They are then grouped in pairs, the wires crossed, and each pair tied together with short pieces of cord to prevent the wires from untwisting.

Tuning the Aerial

By Victor King

THIS is going to be an article for the amateur experimenter or the constructor who likes tinkering about with his set to get better results. Like I do. I sometimes find it very difficult to leave a set alone even when it is supposed to be working for the entertainment of others. I itch to adjust this, turn that and generally mess about with the thing.

The Urge to Tinker

One of these days I suppose I shall relax and the urge to tinker will disappear—and so will I, from radio journalism! However, that day is in the distant future. In the meantime, one still experiments. That there are very many readers of WIRELESS who do likewise I have complete proof.

Not so long ago I said something about the hotting-up of modest two- and three-valvers to give performances well above their supposed powers. It took me about a month to clear off the correspondence which arrived. Not that I minded a scrap, and I don't think there is one correspondent of that period, or any other for that matter, who can say that he did not in due course get a reply to any questions he may have asked me.

Hey, there! Put down that pen, I'm just away for a vacation down south!

"Coddling"

Now about this experimenting. You can do some extremely interesting things with the aerial circuit of your set or any other set-owner willing.

You know, we don't use our aerials these days. Amplification is so liberally applied that the average set doesn't properly start being a scientific job until the grid of its first valve is reached.

In the sterner days we used to conserve and coddle every possible particle of energy which could be

A VALUABLE CONTRIBUTION OF INTEREST TO ALL EXPERIMENTERS

wrung from the ether. Our aerials were boldly thrust into the sky and made to form part of a circuit which could be tuned exactly to the wavelength of the station we wanted to pick up. Made receptive to the umpteenth degree, in fact.

What we do now is mostly to regard the aerial as a collector pure and

wanted kind. Look at my first little diagram. It's all most theoretical and so on, but, alas, as the Polynesian said when he picked up the ripe end of a thousand volt supply, experiment without a little theory is as a book without its pages.

A Well-Known Defect

Fig. 1 shows a simple aerial arrangement such as has been widely used and is still frequently encountered. The aerial taps into the coil, which forms part of a tuned circuit. A shorting switch cuts out part of that coil for the medium waves but enables

the whole of it to be employed for long-wave tuning. Actually, the coil may consist of two windings, but in effect it is one coil for our purposes.

The aerial is supposed to be untuned, but it is not "aperiodic." That is to say, it will not "accept" all stations equally and give no favours. It possesses inductance and capacity and will, therefore, respond to one wavelength, or a more or less narrow band of wavelengths, better than the others.

Now it has happened very often, to the great discontent of listeners, that the "natural" wavelength of the aerial system when the switch is over to "long waves" falls close to that of a medium wave station owing to the fact that its self-capacity and inductance, plus the inductance of that part of the coil which is included in the aerial circuit, "tune" to the medium wave station. Hence, break-through!

And how is break-through sometimes cured? By sticking another small coil in the aerial circuit to raise the "natural" wavelength above that of the medium-wave broadcaster which is

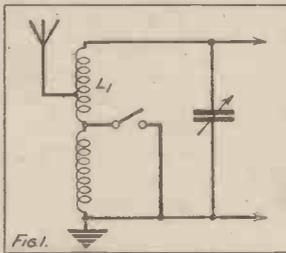


FIG. 1.

SIMPLE SCHEMES

The circuit on the left shows a simple untuned aerial scheme, the one tapping serving both medium and long waves. On the right is a similar circuit with an

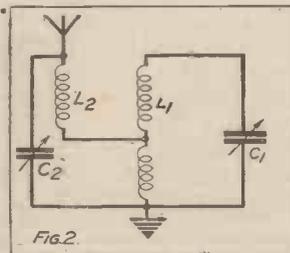


FIG. 2.

additional coil L2 and a condenser C2 for tuning the aerial circuit. The wave-change switch is omitted for simplicity.

simple in the broadest and most general sense. And a collector not of the one station but of every one, leaving it to the set to apply the discrimination and a whale of amplification, to make up for the loss of

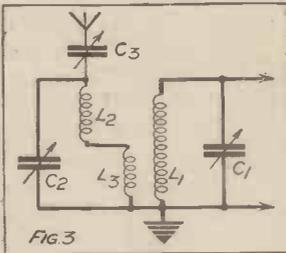


FIG. 3.

INCREASED SELECTIVITY

In Fig. 3 a small preset condenser is connected in series with the aerial to improve selectivity, while in Fig. 4 the aerial is taken to the centre tapping on the tuned aerial coil and a coupling condenser is inserted as shown.

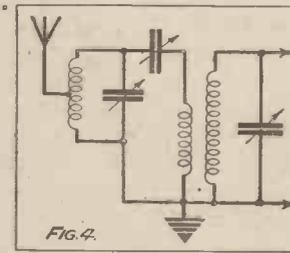


FIG. 4.

power. Maybe that method has its points. I said *maybe*.

Often though, when applied rather more carelessly than usual, you get discrimination of a very much un-

broadcasting its way unfairly and unethically into the long-wave pastures of the set.

Now you who have experienced break-through, let me ask you a question. Have you ever noticed how loud that break-through is despite the fact that all the tuning circuits in the set are welded against it? I bet you have. And the reason? The aerial tunes to the interferer and grabs so much power from it that you want a minifier not an amplifier, to deal with it! (I fancy that crack's a trifle too subtle; still, let it pass.)

An Interesting Experiment

The moral of all this is quite obvious and it is that if there is a station you want to bring in with the biggest punch possible on a given set, or, for that matter, if you want to boost up all the stations, then you have a method right to hand. It is simply that you should tune the aerial system in the same way as you tune the grid circuits in the set.

Try it. You'll meet with some surprises. Let me explain the idea in detail. Take our little Fig. 1 circuit. I'll simplify that still further by knocking out the wavechanging. We now have Fig. 2. But there is a coil and condenser added. The added coil (L2) is for the purpose of increasing the inductance of the aerial circuit. There won't be enough without it. I can't tell you exactly what size of coil will be needed, for so much depends upon the coil in the set and the position of its tapping. This is where the experimenting begins to creep in.

As a start you could wind twenty turns on a two-inch former, using 24-gauge wire (or 26 or 28 if either of these is more convenient), and decrease or increase the turns after a test or two.

Strength Will Increase

A .0005 mfd. solid dielectric condenser will do for the tuning. This condenser appears as C2 in the diagram.

With such a scheme you will find that the strength of the medium wave stations will bump up considerably. But they may be too powerful for the selectivity of the set, for there will be a fairly strong coupling between the aerial and the grid circuits.

You can, therefore, see what a series preset as in Fig. 3 will do. That will

STATIONS WILL BE LOUDER

give you some control over selectivity, and I'll eat my only trilby if you have to apply so much series capacity that your stations will fall to their original level of strength.

Some of you might conclude that tapping down the new coil as in Fig. 4 would give similar results and save a

EASY TO TRY

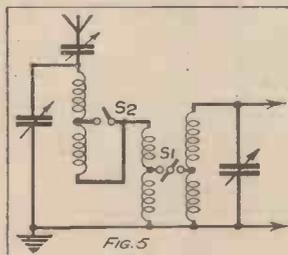
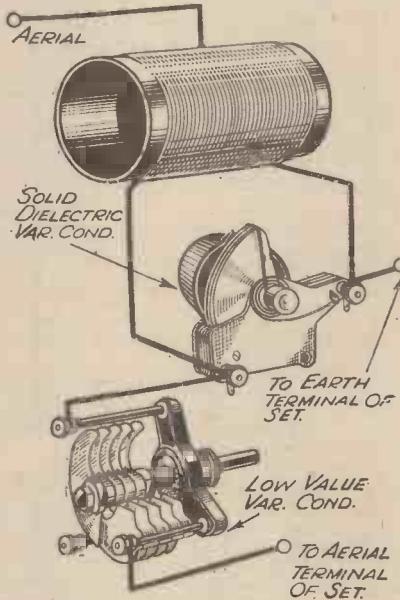
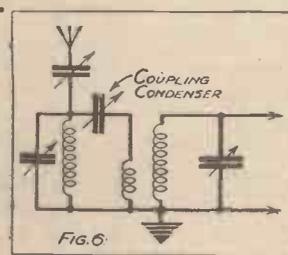


Fig. 5 shows the Fig. 3 arrangement adapted to both medium and long waves. Fig. 6 is a very efficient scheme giving excellent selectivity and volume, and Fig. 7 (above) is a practical circuit based on this scheme.



condenser. Don't believe me if I say "No" to that, but experiment for yourselves. If you tap down and use a series coupling condenser as shown, your results will be controllable. But I like the coupling condenser idea applied as I shall describe later.

So far we have tackled only the medium waves, and that might be all right for the U.S., where they don't believe in big things; but we in Europe have to consider the long waves, too.

Well, there is no reason why you should not wave-change your aerial booster, is there? Fig. 5 shows you Fig. 3 adapted to both medium- and long-wave stations.

Yet we haven't gone as far as we can go along the route of aerial tuning experiments. It is quite on the cards that some of you would get astonishingly superior performances by means of simple expedients such as I have already described. But there will be others. There always are.

A Complete Tuner

To those I commend Fig. 6. Here we have an aerial tuner complete with series condenser coupled to the set by means of the aerial winding (or tap) of its aerial coil and a coupling condenser. This last should be one of those .00015 mfd. maximum air types. Fig. 7 gives you a practical circuit based on this scheme. But this again is only for medium waves, and for the reception of long waves a long-wave winding and a wave-change switch would need to be provided.

This Fig. 6 circuit not only tunes the aerial and therefore increases its pick-up, but it provides another complete tuning circuit and increases the selectivity of the set. Though I warn you that if you chase selectivity up to super degrees you are bound to lose sensitivity. You always will.

On the other hand, I fitted such a circuit to a commercial battery set not so long ago and improved its selectivity no end, and at the same time I reckon the strength of most of the stations was pushed up at least five times, if not more, believe it or not.

When your additional circuit is loosely coupled to the circuit in the set itself you will get sharp tuning on the set, although the aerial circuit, the

new one, is bound to be somewhat flatter. It is for this reason that one of those better quality solid dielectric condensers will serve the purpose quite well. There is not much to be gained by using an air condenser complete with calibrated dial. With a tighter coupling, band-pass effects will begin to creep in. But you need not worry yourself about that. It is more likely that the overall curve of the set will be improved rather than otherwise.

Harking back a bit to the question of aeriels, I want to leave this thought with you. It has been commonly accepted as a fact that modern sets are so good that you don't have to bother much about the aerial. But mightn't many of us take this too literally?



B.B.C. News

Light Entertainment Surprises—Augmenting the Empire Service—The New Post Office Cable—Children's Hour To Tour

By Our Special Commissioner

More Jobs Going

I HEAR there are lots more jobs going in the B.B.C. For example, the promotion of Mr. J. Beresford Clark to succeed Mr. Cecil Graves as Director of the Empire Department means the appointment of a new Programme Director for the Empire. Another job that is going is that of Information and Talks Assistant at Belfast, on the promotion of Mr. MacMullan. There will be at least a dozen similar appointments to fill in the autumn.

The procedure now followed by the B.B.C. is to give present staff the right of first refusal of all such posts. If this does not lead to the application of suitable candidates, then the posts are advertised and the short list of candidates is interviewed by an Appointments Board. This procedure is obviously much better than the old methods.

Jack Hylton's Radio Revue

At Broadcasting House there is much interest in Jack Hylton's Radio Revue, which will be given in the Regional Programme at 8 p.m. on Saturday, September 21st. Mr. Hylton is preparing some surprises in the way of light entertainment. If the programme is as successful as expected it will mark a new era in B.B.C. entertainment history.

Commercial Information for the Empire

Beginning this month, the B.B.C. will provide a new service of commercial information on all the short-wave programmes. The idea is to encourage the spread of accurate commercial

information on all subjects affecting the development of trade within the Empire. It will be interesting to observe whether the B.B.C. succeeds in this laudable enterprise.

Lady Reading

I am told by a member of the Ullswater Committee that Lady Reading has been "the life and soul" of their little parties. Her vivacity, alertness, and interest have helped to penetrate many an obscure problem. She has



AWARDED THE O.B.E.

Miss Mary Somerville, Director of School Broadcasting at the B.B.C., who was recently awarded the O.B.E. The B.B.C. broadcasts to schools mainly aim at serving children between the ages of 11 and 14.

now mastered all that there is to know about broadcasting, and it is generally expected that she will be chosen to succeed Mrs. Mary Hamilton as woman Governor of the B.B.C. when the latter retires at the end of 1936.

Television

The announcement of the sensational new Post Office cable capable

of carrying two hundred messages simultaneously may have an important bearing on the development of television. A limiting factor so far has been the accepted fact that high definition signals could not be satisfactorily transmitted by land line. Thus an uneconomic duplication of programmes seemed inevitable.

Now, however, it is promised for the new cable that high-definition television signals can be carried any distance and faithfully reproduced at the end. If this is proved in practice, then there will be an enormous saving in the cost of covering the whole country for adequate television. It would bring the national coverage stage much closer.

A Trade Union in the B.B.C.

Encouraged by the concessions granted as a result of complaints by manual workers and junior engineers at a staff meeting some weeks ago, members of the staff of the B.B.C. are being canvassed secretly to secure their acceptance of the idea of a staff council or trade union which will be entirely independent of official control.

The movement so far has been ignored by the administration of the B.B.C. If this attitude is maintained, it is difficult to see what good the staff organisation will accomplish, because it is only through being recognised for purposes of negotiation that such a movement can justify its existence. The fact that it has begun even in a tentative way reveals a degree of dissatisfaction which should call for the attention of the Board of Governors.

My information is that conditions of work and pay are, on the whole, good. The chief cause of trouble is the attitude of autocratic authority and despotism, however benevolent.

Mr. Fielden Off to India

Mr. Lionel Fielden, the new General Manager of the India Broadcasting

(Please turn to page 174.)

INTELLIGENT LISTENING

Our short-wave expert deals on this page with an imaginary day's listening, telling you on what wavelengths to listen at the various times of the day.

□ □ □

SHORT-WAVE reception is an art in itself, both on the technical side and when it comes to handling a receiver. On the average broadcast receiver we simply know, from experience, that certain stations can be heard throughout the hours of daylight, while many more appear in the evenings.

On the short waves, until we have had first-hand experience of things, we cannot form any assumption of that kind. Certain stations can only be heard in the small hours of the morning, others at breakfast-time, and others during the afternoon and evening.

Always Something

At any hour of the day or night there is something coming through, if we listen on the right wavelength for it. Suppose we are starting an imaginary bout of listening at about 2.30 p.m. on a Saturday. Personally, I should go either to 16.87 metres and listen to Bound Brook (W 3 X A L) or to 19.72 metres for Pittsburgh (W 8 X K). The 16-metre station will probably be the stronger of the two, and if it's a bad day they'll both be pretty weak until later in the afternoon.

Other programmes that will definitely be on the air are those from the Empire Station at Daventry and from the various Zeesen stations—probably on the 19 or 31-metre bands.

On the 20-metre amateur band, during the afternoon, there will be a profusion of signals from the U.S.A., and probably from Asia as well, but if you're not a Morse enthusiast your chance won't come till later in the evening.

Early Evening

By tea-time the 16 and 19-metre bands will have livened up consider-

ably, and W 8 X K, in particular, should be fairly strong and reliable. If you're lucky you might hear Bombay between 5 and 6.30 p.m., on 31.36 metres. He often puts over quite a strong transmission nowadays.

Since I'm not suggesting that you put in a 24-hour bout of listening—a feat that only appeals to super-men—I think it might be a good plan to shut down until 8 o'clock or thereabouts. Punctually at eight you will hear W 2 X A D start up on 19.56 metres for an hour's programme from one of the American medium-wave stations.

He will be about the strongest American station you will ever hear, and there's hardly any chance of missing him if your receiver is anything like a receiver.

If you care to get on by 7.30, and atmospherics aren't too bad, you ought

From 9 p.m. onwards a bout of "all-in" reception is indicated, since stations are becoming more numerous and you are liable to hear interesting transmissions on practically any of the wavebands—19, 25, 31 or 49 metres. W 8 X K starts up on 25.27 metres at 9.30, having closed down his 19.72-metre transmission at that hour.

By the time 11 o'clock arrives, the 49-metre band will be filling up with North and South Americans, working so close together that identification is no easy matter unless one hears an announcement.

Most of these stations will steadily improve in strength until the early hours of the morning. By the time midnight arrives, by the way, there won't be much point in listening for anything below the 31-metre band. That and the 49-metre band will be carrying practically all the traffic.

The Best Telephony

The 40-metre amateur band, by the way, will be fairly full of Americans, but they are not licensed to use telephony on that band. The telephony is at its best on the 20-metre band between 10 and 11 p.m., although sometimes, on freak nights, it persists in coming through until after midnight, in spite of what I have just said.

By the time 6 a.m. arrives you will be able to go down there again. If you have a really good receiver, you may hear telephony on the 20-metre band from amateurs on the West Coast of America, or even from Hawaii. In any case at 6.30 you might be able to hear Suva, Fiji Islands (V P 1 A) on 22.94 metres.

Australia

Most of the 49-metre stations close down at 3 or 4 a.m., and there are really very few transmissions on the air between those hours and 8 a.m. If it's Sunday morning, however, Sydney (V K 2 M E) will start up on 31.28 metres at 7 a.m., and should be received well until 10 a.m. If it is a weekday you will have Lyndhurst (V K 3 L R) as

an alternative Australian transmission, although he does not switch on until 9 a.m.

You can see from the above that you still have to treat the shorter wavelengths almost as "daylight bands," going steadily up your wavelength scale as darkness draws near. W.L.S.

AN AMATEUR OF THE FAR EAST



Seichiro Handa, an eighteen year old Japanese student, whose transmitting station J 1 D M has proved very successful in long-distance contacts.

to be able to bring in Nairobi (V Q 7 L O) on 49.4 metres. He hasn't been strong lately, but an ordinary two-valver has been fetching him in night after night. Johannesburg (Z T J) on 49.2, is weaker still, but keeps on till a later hour and is generally quite good between 8 and 9 p.m.

A Four-Valve

BATTERY SUPER

Economy combined with great efficiency makes this receiver an attractive proposition for all battery users. Using only four valves, it gives a wide choice of stations and provides ample selectivity to cope easily with modern conditions.

With
A.V.C.

DESIGNED AND DESCRIBED BY
THE "WIRELESS" RESEARCH
DEPARTMENT

ONE of the greatest problems in designing a really powerful set for the battery user is that of getting the desired results without excessive H.T. current consumption. Undoubtedly one of the most popular types of set at the present time is the superhet and this popularity is fully merited.

In the Front Rank

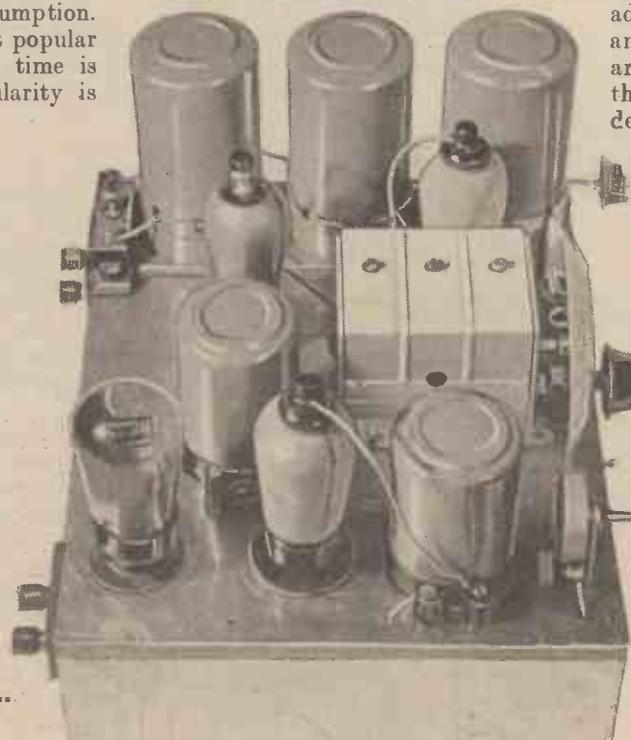
Few receivers can compare with the superhet for selectivity. This is due to the superhet principle itself, although obviously first-class tuning coils must be incorporated in order to achieve anything approaching 100 per cent. efficiency. In many ways the superhet has been looked upon as the mains users' pigeon. People often say: "He's a lucky fellow because he's got the mains, and therefore H.T. and L.T. current consumption don't bother him."

This, as a matter of fact,

until fairly recently, has been justified. The battery user has had rather a thin time as compared with his more fortunate brethren, who have the advantage of A.C. or D.C. supply; and yet, curiously enough, there are more battery set owners than there are owners of all-mains designs.

Better and Cheaper

We, in this country, have not yet gone "all electric," for the simple reason that there is no electricity laid on to many thousands of houses in various parts of the British Isles, outside the immediate vicinity of the larger towns. Perhaps one day the grid scheme will solve the problem, but that day seems a long way off at the moment. Until then the battery user can only hope that the valve manufacturer will go on conducting intensive research on his behalf, as he is doing at present, with the object of



Modernity, both in appearance and design is a distinctive feature of this fine battery superhet.

ALL THE PARTS—

- 1 Polar 3-gang tuning condenser superhet type.
- 1 Polar semi-circular drive for above.
- 1 Set Colvern superhet coils type K81, K82 and K63.
- 2 Colvern I.F. transformers type 110.
- 1 Ferranti L.F. transformer type A.F.8.
- 1 Bulgin screened superhet H.F. choke type H.F.10.
- 1 Varley screened Nicore H.F. choke type B.P.26.
- 1 Dubilier 1-mfd. fixed condenser type B.B.
- 1 T.M.C.-Hydra 1-mfd. fixed condenser type 30.
- 1 T.C.C. 1-mfd. fixed condenser type 50.
- 2 T.C.C. 1-mfd. tubular fixed condensers.
- 2 T.M.C.-Hydra 1-mfd. tubular fixed condensers.
- 1 Dubilier 1-mfd. tubular fixed condenser type 4503.
- 1 Dubilier .0005-mfd. fixed condenser type 665.
- 1 Dubilier .0001-mfd. fixed condenser type 620.
- 3 Graham Farish 1/2-meg. 1 1/2-watt Ohmite grid leaks in horizontal holders.
- 1 Erie 100,000-ohm resistance 1-watt type.
- 1 Amplion 100,000-ohm resistance 1-watt type.
- 1 Bulgin toggle on/off switch type S.80.
- 1 Peto-Scott mounting bracket type 22.
- 1 Peto-Scott mounting bracket type 22/1.
- 1 Erie 50,000-ohm volume control graded type.
- 1 Formo preset condenser .002-mfd. (max.).
- 3 Clix 7-pin chassis-mounting valveholders with screw terminals.

—YOU WILL NEED

- 1 Clix 5-pin chassis-mounting valveholder with screw terminals.
- 1 Westinghouse Westector type W.6.
- 1 Peto-Scott baseboard covered both sides with copper foil or "Metaplex," 12 x 10 x 3/8 in. and runners 10 x 3 in.
- 2 Peto-Scott terminal strips, 2 x 1 1/2 in.
- 4 Clix indicating terminals type B.
- 2 Belling-Lee accumulator spades.
- 1 Belling-Lee wanderfuse.
- 7 Clix wander plugs.
- 1 coil B.R.G. "Quikon" connecting wire.
- Screws, flex, etc.

	VALVES			
Marconi or Osram	Signal H.F. V.P.21	Mixer. X.21	I.F. V.P.21.	Output P.T.2

- BATTERIES**
- H.T.—120 volts. Drydex, G.E.C., Ever-Ready, Lissen.
 - L.T.—2 volts. Exide.
 - G.B.—4 1/2 volts. Drydex, Ever-Ready, Lissen.
 - Loudspeaker.—W. B. Stentorian.

getting better results with fewer valves and a lower current consumption.

This month we are describing a splendid example of the most modern radio technique in the form of a four-valve superhet with automatic volume control. It is a set, we can assure the home constructor, that will give exceptional results as regards range, selectivity and quality of reproduction.

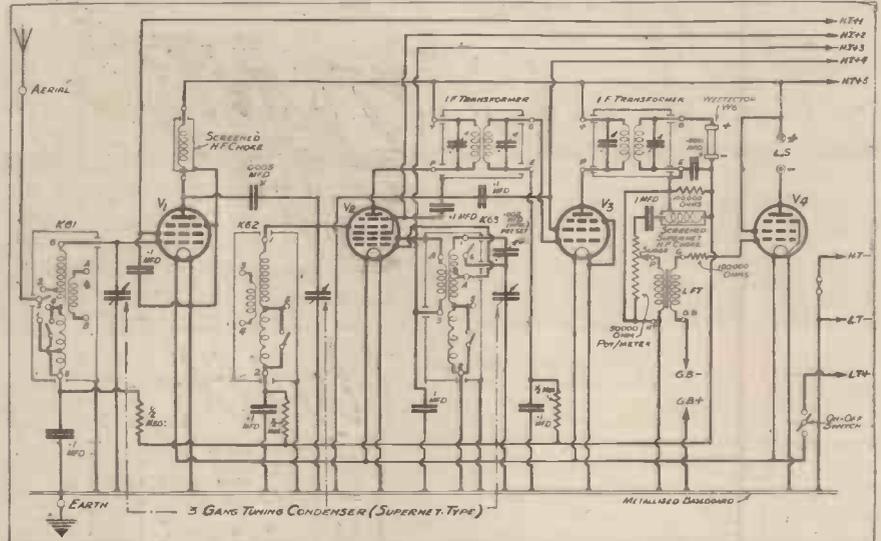
These results are due to the fact that the most advanced technical developments have been combined together to form a compact and extremely efficient whole.

Saving a Valve

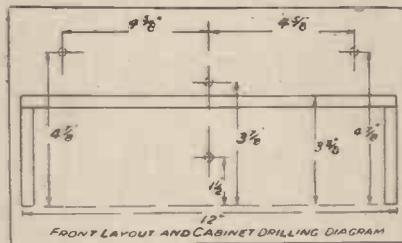
We have been able to reduce the number of valves to four and yet obtain remarkable efficiency and a high degree of selectivity. As you will all realise, every superheterodyne requires two detectors, and in the past both of these detectors have been of the thermionic valve type. But now the designer is able to replace one of these valves, namely, that which carries out the functions of the second detector, with a small dry rectifier called the "Westector."

This is a device similar in most respects to the familiar Westinghouse mains rectifier, but has been specially adapted by the manufacturers to

THE "WESTECTOR" RECTIFIER SAVES H.T.



Pentode amplification is employed throughout, the H.F., intermediate-frequency and output valves being of this type. This arrangement, together with a heptode mixer valve and a "Westector" second detector produces an exceptionally powerful combination.



carry out the important duties of rectifying H.F.

The "Westector" is an ideal second detector in a superhet., and we have used it in this receiver with highly successful results.

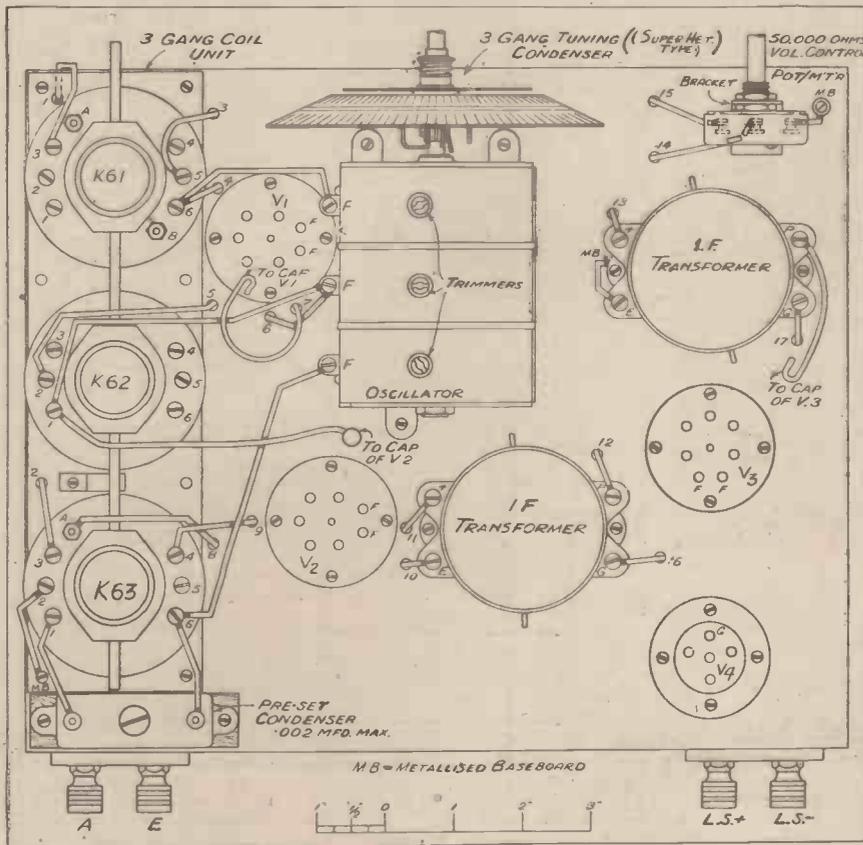
Though the "Westector" allows a valve to be cut out, credit is due to the valve manufacturer, because it is he who has enabled us to get such remarkable efficiency. In this particular design, for example, the first valve is a variable-mu pentode. It carries out the important work of amplifying the incoming impulses at their ordinary broadcast frequencies. This scheme not only produces high initial stage gain, but also provides a much greater degree of selectivity than other methods.

Mixer and Oscillator

The second valve is an X21, which acts as a mixer, that is, a combined first detector and oscillator. The incoming impulses, after passing through this valve, are then amplified at intermediate frequency by a second variable-mu pentode, finally arriving at the "Westector," where they are rectified, and afterwards amplified at L.F. by a high-efficiency pentode output valve.

Although the stage gain is so colossal, the set is, nevertheless,

THERE ARE NO PANEL MOUNTING COMPONENTS



The diagram on the left shows the above-chassis layout. It will be seen that all the controls are actually mounted on the chassis itself, so that only the clearance holes for the spindles have to be drilled in the cabinet front. The dimensions for these are given in the small diagram.

absolutely stable in operation. It will be appreciated that the greater the amplification per stage in a receiver the greater also are the chances of instability taking place. There need be no fears on this score in the case of this superhet.

All the vital parts are screened, and we have used a foil-covered baseboard, which serves to separate various leads and components which might otherwise interact.

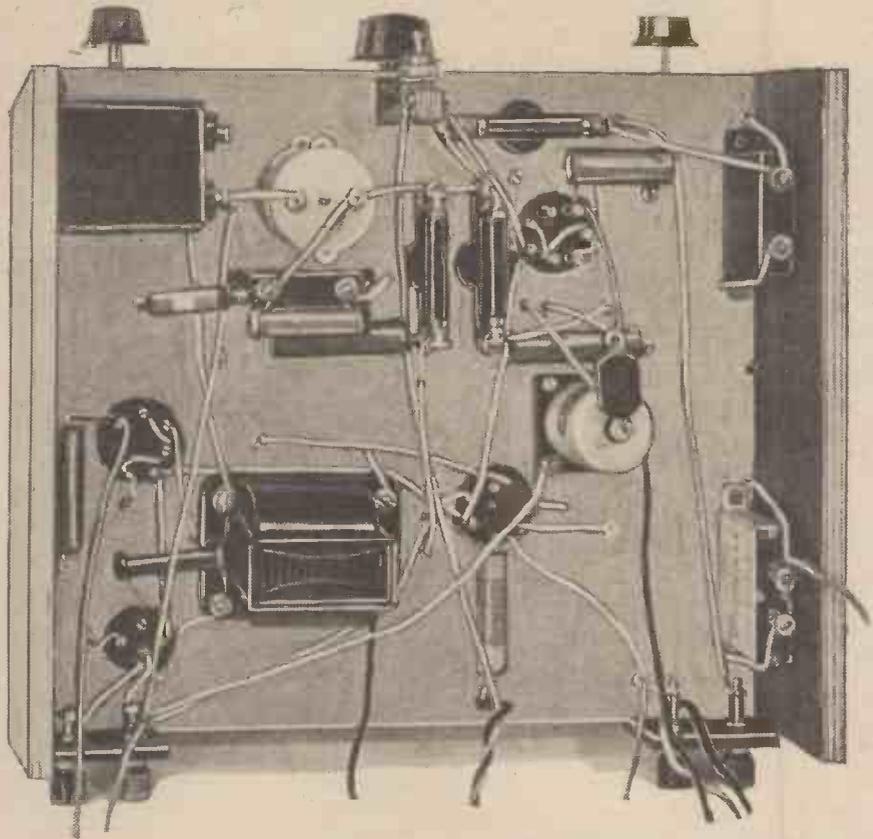
Very Clean Layout

On the top side of the chassis are mounted the tuning coils, gang condenser, manual volume control, and intermediate frequency transformers, and, of course, the valves.

On the under-side are the remaining components, together with most of the wiring.

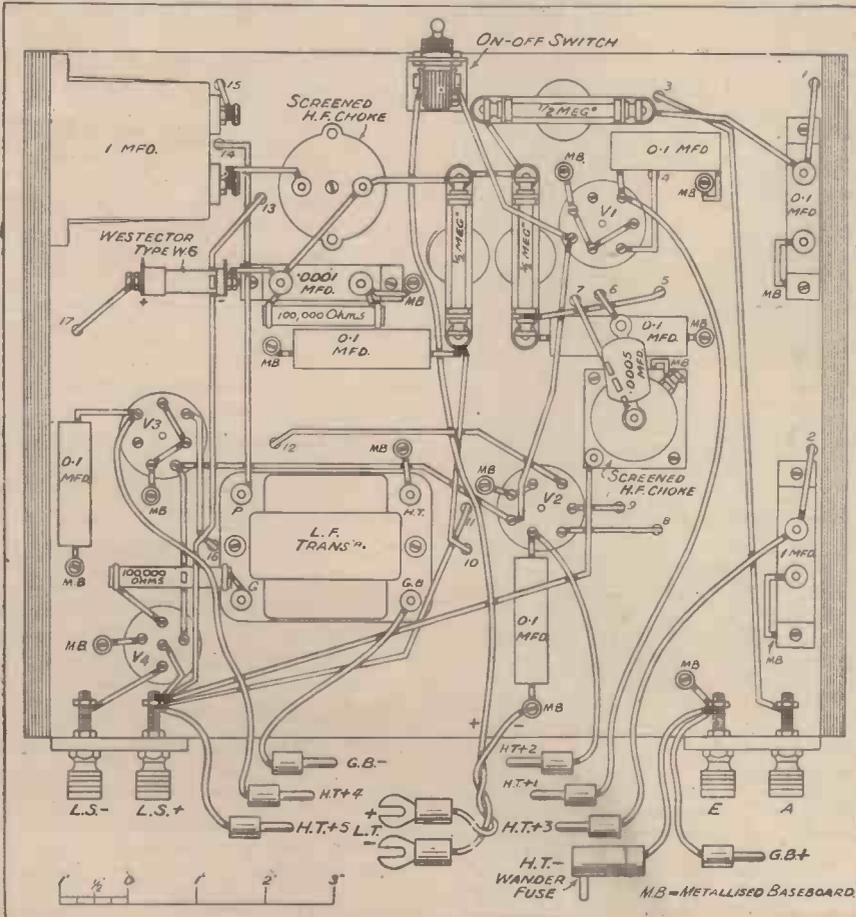
This gives an extremely neat appearance to the assembly, although we would add that this neatness is simply incidental, efficiency having been our primary consideration.

There is also a three-gang tuning control giving single knob tuning for the broadcast wavebands. Once the trimming of the three sections of the



This photograph provides a useful reference to the practical run of the wires when used in conjunction with the diagram below.

A DESIGN WITH EXCEPTIONALLY SIMPLE WIRING



gang condenser has been carried out, the whole operation of tuning in a station becomes merely one of turning the knob until the pointer indicates the wavelength required.

The Coil Kit

The three Colvern coils are, of course, very accurately matched up and designed for use in conjunction with this type of superhet receiver. And they are, of course, intended to be used with the intermediate transformers specified; in fact, the coils can be looked upon as one complete kit and no attempt should be made to use mixed coils in this set. Only by adhering strictly to the specified parts is it possible to achieve the degree of efficiency which the receiver gives.

From the construction standpoint, everything is straightforward and free from snags. As we previously pointed

Most of the wiring is carried out below the baseboard, as this sub-chassis diagram illustrates. Where leads pass through to the components above, the holes are numbered to correspond with the numbers in the wiring diagram on the preceding page.

out, the baseboard must be metal covered, either with copper or the popular "Metaplex." And, moreover, it is essential that this metal covering should be bonded so that both sides of the baseboard are common from the electrical point of view.

If copper foil is employed one piece can be used and wrapped round both sides of the baseboard in one continuous sheet. In the case of a "Metaplex" baseboard, cut to size, it is advisable to run a bolt, terminating in a nut and washer, right through, so that the top and underneath surfaces are electrically short-circuited.

Chassis Earth Points

Some care is necessary when cutting the four holes for the valve holders to ensure ample clearance between the edges of the holes and the sockets which take the valve pins. Each pin should be well clear of the metal baseboard covering. Adopting the accepted modern principle in set design, we have connected certain leads direct to the metal coating on the baseboard. This coating is, of course, earthed, and each lead connected to it is thus also earthed. Hence, the metal work forms a common earth, and it is far more effective to carry out this earthing by means of short wires on to the nearest point on the baseboard,

ENSURING THE BEST SENSITIVITY

than to take each wire to the earth terminal.

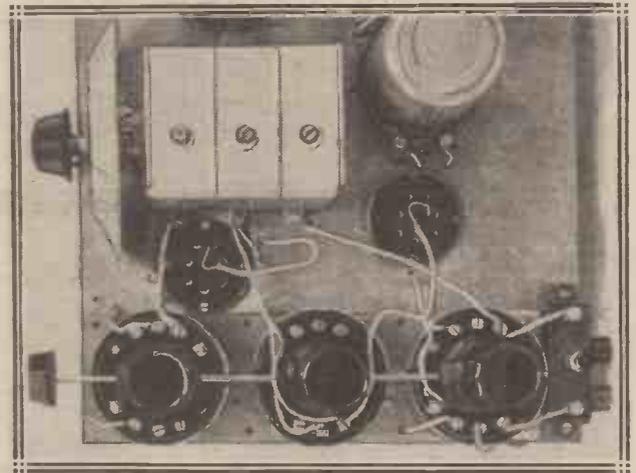
It is more efficient from the radio point of view, and, of course, it simplifies the construction. Each point where a lead is joined to the baseboard is marked M.B. on the wiring diagram, and it is essential that these connections should be firmly made, so that the electrical contact between the lead and the metal coating offers the very minimum resistance path to the alternating currents flowing in the circuit.

And now for a few hints on adjusting the trimmers. First of all, make a start by screwing the gang condenser trimmers right in, and then unscrewing each one half a turn. Set the intermediate-frequency

trimmers midway. You will find the trimmers on the two I.F. transformers at the base of the coils, a little lever projects through a slot, and you can move this either way as desired.

Now tune in a station at the lower end of the dial on the medium waveband. Adjust the oscillator trimmer—that is the rearmost one on the gang

HOW THE COIL UNIT IS WIRED



The wiring to the coil unit terminals is clearly seen here, since the screening cans which cover the individual coils have been removed. The preset condenser on the right is a trimming adjustment for long waves.

condenser—so that the station's wavelength corresponds with the wavelength marked on the dial. For example, if it is a station on 300 metres, then you should adjust the oscillator trimmer until you get the loudest results when the pointer is opposite the 300-metre mark on the scale.

Now adjust the remaining gang condenser trimmers.

Next, tune to a station at the upper end of the dial and adjust the intermediate-frequency trimmers. Finally, switch over to the long waves by turning the wavechange switch to the left, and adjust the .002 preset condenser, which is located just behind the coil unit assembly, until the volume of the long-wave transmissions is the best you can get.

The "Local" Switch

Incidentally, the H.T. voltages we recommend are as follows: H.T. + 1, 60 volts; H.T. + 2, 36 volts; H.T. + 3, 45 volts; H.T. + 4, 72 volts; and H.T. + 5, the maximum of the H.T. battery, say, 120 volts.

The G.B. plug should be inserted in the 3-volt tapping on the G.B. battery.

The automatic volume control will prevent any overloading and serve to keep the volume constant on practically all stations. But there are

(Please turn to page 174.)



BALANCING UP THE TUNING

The operation of adjusting the gang condenser is simple, and full instructions are given in the article. Note that the ends of the ivory scale are cut away so as to clear the baseboard.

DEVELOPMENTS WORLD COMMUNICATION

A Special Article of Interest
to All Our Readers

IT might be said with a good deal of truth that this is the age of world communication. Certainly developments in methods of communication between different parts of the earth have been one of the outstanding features of the present age. Those of us who are particularly interested in radio broadcasting do not need to be told of the numerous milestones which mark the road of progress in our particular science. We are sometimes apt to forget, however, that this is only a part of the whole vast scheme of national and international communication. Whilst radio broadcasting has been going forward, long-distance telephony, short-wave transmission, cable communication and many other branches of this great science have not been standing still.

A Comprehensive Survey

These thoughts are prompted by a remarkable paper which was recently read before the Institution of Electrical Engineers by Colonel A. S. Angwin, the Chief Engineer to the Post Office, whose name will be well known to most of you in connection with the Postmaster - General's Television Report issued some time ago. The paper is an amazing document and comprises a comprehensive survey of the work which is being done in all the various fields of communication which come directly or indirectly within the scope of the Post Office Engineers.

The Editor has asked me to give you a digest of this information, but, as you will appreciate, it is only possible in this short article to give you a mere outline of so large a subject; those of you who wish for more detailed information, however, should consult Colonel Angwin's original paper which is printed in the Journal of the Institution of Electrical Engineers for 1935, page 177.

Progress in Broadcasting

It is natural that radio broadcasting is the first subject to which your interest will turn, and therefore I will begin by giving you a few observations on the principal developments of this science during the past year or two. In the first place, you may get some idea of the general development by



the increase in the number of licensed listeners. In Europe in the beginning of 1932 this number was 13,678,320, and by the end of March 1934 had reached the figure of 19,626,315.

This may well be described as the age of communications. In the following pages our Scientific Adviser gives a rapid survey of the immense strides that have been made in recent years not only in broadcasting but in the various other methods by which communication links together the uttermost ends of the World.

In 1932, as you may know, there was a great Convention, called the Madrid Telecommunications Convention, which laid down certain important provisions with regard to the power of broadcasting stations of Europe. According to the arrangements arrived at, the power was limited to 100 kw. in the medium waveband (200-500 metres) and to 150 kw. in the long waveband (1,000-2,000, metres). There is, however, the exception of one station at Moscow, which has a power of 500 kw.

This brings us to the establishment of the Droitwich station, which came about in this way. The B.B.C. retained the long wavelength in use at Daventry as a result of the Lucerne Conference, but it was felt quite early on, even in 1932, that this channel, which was regarded as a valuable one, was not being made the best use of by the seven-year-old transmitter at Daventry, which was radiating only 25 kw. The quality of reception in distant areas in the case of Daventry 5 X X was found to be much inferior to that of the more modern medium-wave Regional stations and consequently it was decided to build a new long-wave station with a much greater power. This is how the Droitwich station came about, with a transmitter of 150 kw. The transmitter, as you know, has now been completed, and it is expected that the signal strength which it provides will eventually render unnecessary the relaying of the same programme by a medium-wave transmitter in the North, London and West regions.

As regards the "little National" transmitters sending out the National

CAN BE HEARD ALL OVER EUROPE



ONE OF THE LATEST WORLD VOICES, the West Regional transmitter at Washford Cross in Somerset. This is the power house, with its four Diesel engines and generators.

programme, an interesting problem arises, namely, the problem of synchronising high-power transmitters. This problem had to be faced by the B.B.C. because the international wavelength situation prevented certain of their transmitters from having separate wavelengths. This synchronising arrangement has been found to work out very well and the B.B.C. are now operating not only three stations on one wavelength, but have actually in practice operated as many as seven with an accuracy of one part in 100,000.

The Use of Telephone Lines

Great progress has been made in relaying broadcast programmes over telephone circuits and, in addition to providing for the relay of foreign programmes, practically the whole of the internal simultaneous broadcast system has been changed over from the old overhead open wire circuits to underground cable circuits. It will be interesting to many of you to know that the B.B.C. permanently rent from the General Post Office close upon 5,000 miles of underground circuits for the purpose of linking up the various stations and regional headquarters.

A Further Development

Another important development in the long-distance relaying of programmes has been the increasing use of radio telephony circuits for linking up the broadcasting organisations in different parts of the world.

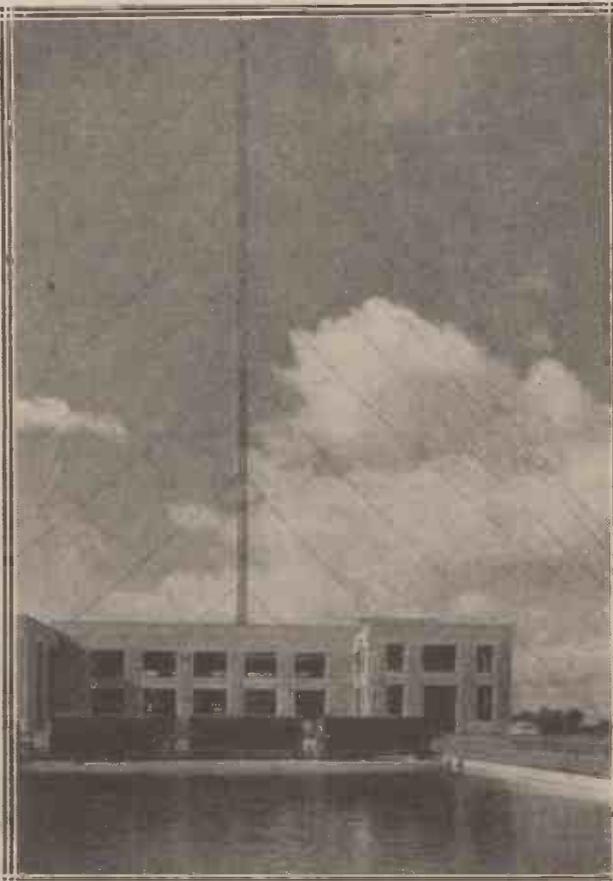
You will remember how various programmes from distant parts have been provided in the Christmas-day programmes, culminating so fittingly in a message from His Majesty the King to the entire Empire.

You will readily appreciate that the question of the acoustics of broadcasting studios is very important to the B.B.C. and this has consequently received a great deal of attention

LONG-DISTANCE RELAYS

during the period under review. At Newcastle, Manchester, Leeds, Birmingham, Cardiff and Bristol new studios have been completed, whilst in London a large studio has recently been built at Maida Vale for the use of the B.B.C. Symphony Orchestra of 119 players. This new studio has been constructed inside part of the Maida Vale skating rink. A very interesting feature of this studio is that it forms practically a separate building inside the skating rink, separate walls and roof trusses having been provided so as to prevent the transmission of

ANOTHER BIG VOICE



OUR NATIONAL GIANT, the Droitwich station, with its huge masts supporting both the long-wave and Midland Regional aerials.

sound through the roof of the studio and *via* the fabric of the building to any further studios which may be constructed in the future in other parts of the skating rink building. In other words, any studios inside the building will be acoustically separate and distinct from one another and will not interfere with each other to any appreciable extent. Incidentally, this broadcasting studio is the largest

which has yet been built in this country and has a content of about 230,000 cubic feet.

Empire Service Transmissions

As you will remember, a short-wave service was started some considerable time ago from Daventry for servicing the British Empire. The actual date, as a matter of fact, was December 19th, 1932. This is done on two transmitters each capable of delivering 15 k.w. to an arrangement of directional aerials, the wavelengths being in the short wavebands between 13.9 metres and 50 metres for reception in the various parts of the Empire. A good deal of work had to be done in this connection on the design of suitable aerials for short-wave broadcasting service, since the requirements here are very different from those of point-to-point services. As a result of the experiments and trials a good deal of experience has now been gained on the design of suitable aerials and the original aerials which were used at Daventry have been replaced by others which have proved more suitable in practice. Further improvements in the service are still being made.

This brings us naturally to the question of the fading of broadcast transmissions. The earlier broadcasting stations were all comparatively low-power, and the service area was limited owing to the fact that the attenuation of the received signal soon prevented it from being able to override the local interference. It has been found, on the other hand, that modern high-power stations will give adequate signal strength at distances far beyond the points where serious fading has set in, showing that the service area is determined by the radius at which fading becomes intolerable, rather than by considerations merely of signal strength.

Improving Radiation Efficiency

In the light of this information various kinds of aerials have been tried in an endeavour to improve efficiency of radiation. You will note that the efficiency of radiation depends not only upon the actual power radiated at the transmitter, but also very much upon the design of the aerial. It has been found that the height of the aerial in relation to the wavelength used is very important, a figure for the height of 0.58 times the wavelength having been found to be the best. In the new transmitter which is at present under construction at Belfast, an experimental vertical mast radiator will be used having a

height which is in the neighbourhood of 0.58 times the wavelength in use, but being adjustable for experimental purposes.

Receiver Design

I do not think I need say very much about developments in receiver design, as these will be pretty well familiar to most of my readers. The superheterodyne receiver has, of course, largely superseded the "straight" set, mainly owing to the fact that unwanted signals can be filtered out at an intermediate frequency with great ease. Receiver design has been greatly simplified by the introduction of multi-electrode valves and also by improvements in valve performance generally, so that the number of actual stages required for a given amplification has been reduced. Automatic volume control is practically universal on better class sets, whilst amongst components metalised resistances and electrolytic condensers are now in wide use. For special purposes where a minimum of space is important, e.g. in motor-car equipments, valves of very small dimensions are being produced which are perfectly efficient.

Telephony on Ships

Considerable increase has been made in the number of ships equipped with telephone apparatus to facilitate communication between passengers and telephone subscribers on land. Even trawlers are now mainly equipped with a simple and robust type of telephone apparatus which enables them to communicate with coast stations. These transmitters work on a wavelength of 177 metres, with a power of about 50 watts. The corresponding equipment has been installed at all coast stations; but the transmitters here are of higher power, with inputs ranging from 500 to 3,000 watts.

To those of us who only use the telephone for local calls, or at most for trunk calls in this country, it will come

STRINGENT STANDARDS EMPLOYED

as a surprise to know the extraordinary developments that have been made within the past two years in long-distance telephony. It is now possible for telephone subscribers to speak to one another from the farthest corners of the earth. I would just like to give you a case in point to illustrate the ingenuity of this method of communication. The chief engineer cites as an example a subscriber in Sydney communicating with one in Bulawayo; the circuit in this case would be from Sydney to Baldock by radio, Baldock to London by land line, London to Rugby by land line, Rugby to Cape Town by radio, and finally Cape Town to Bulawayo by land-line.

in fact, they were separated by thousands of miles from one another. One might be permitted to say that this surely represents the high-water mark in world communication!

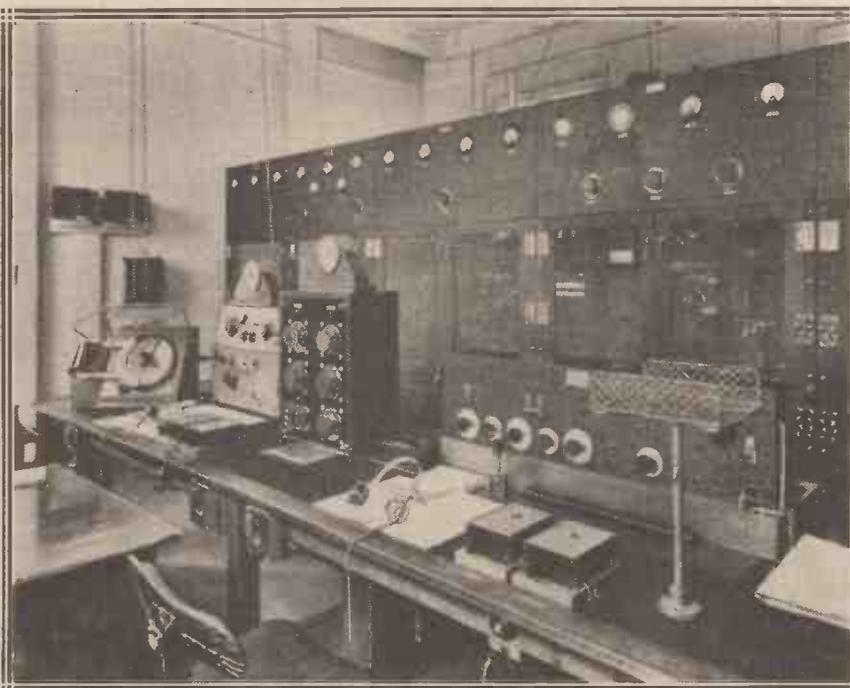
Frequency Stabilisation

The improvements in radio transmission and the increasing congestion of the ether call for more stringent standards of accuracy of the frequency and stability of radio waves. Experiments have for a long time been going on at the National Physical Laboratory, and these show that international agreement as regards frequency standards can now be attained to a few parts in 100 millions; whilst in the laboratory comparisons of a research character can actually be made to a few parts of 1,000 millions. These experiments are very important in their bearing on new systems of radio transmission, such as the single side band suppressed carrier system, where the carrier has to be inserted at the receiving end, and the inserted frequency must be within a few cycles per second of that of the original carrier.

The interference due to electrical machinery and electric signs and such-like apparatus we have always with us, and I hardly need to tell you that this is receiving the careful consideration of the Post Office research engineers. Those of you who live in open country districts will not be troubled very much

by interference of this type, but those who live in large towns know it only too well. A committee of the Institution of Electrical Engineers, which is representative of all the various interests concerned, is now actively dealing with this important question. At the same time collaboration is being sought through the International Electrotechnical Commission, who are seeking to correlate methods of measuring interference and international standards of permissible strength of the interference field.

DOWN IN SUNNY CORNWALL



ON THE WESTERN SEABOARD. Land's End radio station keeps up constant touch with ships. Up-to-date gear and direction-finding apparatus are installed, and have kept this old-established commercial link well to the fore.

A kind of world round-table conference was held some little time back between the representatives of a certain firm, these representatives being situated in Bombay, Sydney, Johannesburg and London respectively. Each representative addressed the conference in turn, whilst listening points were also provided in Paris, New York, Montreal, Calcutta, Melbourne and Perth (Australia), at which other members of the company were able to hear all conversations. It was as though these various members were situated at the same table—and yet,

Questions I am Asked

Q. 149. As the Hexoverter will be connected to the family set, will not the calibration vary, since it is unlikely that one should go back to the same point on the long waves?

A. Why unlikely? It is the obvious thing to do, surely, if only because it is desirable to select a point at the top end of the long waves where direct pick-up of a long wave station is not experienced.

But you are quite right in saying that an alteration of the long wave tuning will throw out the oscillator condenser calibration since the long wave tuning is really the intermediate frequency setting.

If you have selected a given intermediate frequency by tuning to a certain point on the long waves, the calibration of the oscillator condenser will only apply to that frequency. You do not need to know what the frequency is.

If you forget where you "were" on the long waves, it means a new set of readings on the oscillator, although you could set the two condensers of the Hexoverter to their recorded readings and then tune the long wave portion of the main set until the desired short-wave station is heard.

Q. 150. When are you going to bring out a new set? Is it going to be a three-valver? If not, why not?

A. My next set will be the S.T.700. It will be published—periodical unknown—in two months' time. I do not reveal what the circuit is like till zero hour. But why the craze for special numbers of valves? A valve is only a component, after all. Putting it in glass does not make it any different. The only factors that influence me are initial cost and running cost. Extra valves may quite easily reduce both. I have never tracked down the reason for preferring three valves unless it has something to do with complexity of construction or expense.

On the whole, the more valves the more outlay, but where performance is concerned an additional valve adds proportionally far more than its cost.



This month our distinguished contributor goes at some length into the question of valve overloading, and gives some very valuable advice.

Q. 151. How can I tell if my set is overloading? What are the disadvantages of overloading?

A. Overloading can occur at any stage in a receiver, e.g. at the H.F. valve, the detector, the so-called 1st L.F. valve if there is one, and the output valve. Overloading may occur in an H.F. valve, especially where this is of the "fixed" S.G. type. As little as one or two volts may cause the operating point on the characteristic curve to travel on to a bend on the anode current curve, or grid currents may be set up when the grid becomes positive due to excessively strong input signals.

Overloading simply means that the valve no longer operates under the intended conditions. As long as these conditions are maintained all is well, but if the applied signals (high-frequency or audio frequency) are too strong, the conditions are altered and things begin to happen. In the case of the H.F. valve, distortion of the H.F. currents may take place and cross-modulation between two signals may occur; thus a strong "local" and a foreign station may become

inextricably mixed, and subsequent selectivity will not separate them.

In the case of a detector valve using "leaky grid" rectification overloading may actually reduce signal strength; this is occurring when a certain "double-hump" tuning effect is noticed. It will be found when tuning to a strong signal that it appears to come in best at two separate tuning points, while it is weaker between these points. Actually, the H.F. signals are strongest *between* the two points but the output from the detector falls off because it is being overloaded; a weaker H.F. input under these conditions will give a louder signal than will the stronger H.F. input. This, of course, only applies to the special case of operating the detector near the point where its sensitivity falls off.

Two Kinds of Detection

Overloading such a detector will set up two kinds of detection or rectification: the first is the normal grid-leak rectification which calls for a straight anode current curve; the second is due to curvature of the anode current curve, i.e. anode bend detection. A strong signal will cause the average grid voltage to fall, i.e. become more negative. If the average operating point approaches or reaches the bottom bend of the grid-voltage—anode-current curve—anode bend rectification sets in.

Grid-leak rectification causes the average anode current to decrease; anode bend rectification results in the anode current increasing. These effects may oppose each other in case of overloading.

The commonest example of overloading is the application of too strong a low-frequency signal to the output valve. Such a valve has (excluding Class B and special cases) a negative bias applied to its grid. It is worked so that only the straight portion of its grid voltage—anode-current curve is employed. If the input signal is too strong, the operating point on the curve will momentarily stray on to a really curved part of the "curve." For example, a strong negative half-cycle may carry the

(Please turn to page 173.)



“Look here!” I said to Professor Goop, “we must really pull our socks up about the Exhibition this year!”

“And why,” inquired the sharer of my labours in the field of wireless, “and why is it incumbent upon us to tauten our hosiery, as you suggest?”

Last Year’s “Report”

“Why,” I said, “don’t you remember that last year we somehow spent the whole of our time lunching and teating and dining in one or other of the restaurants of Olympia and never managed so much as a walk round the stands?”

“True,” returned the Professor; “but didn’t we report upon the restaurants?”

“We did.”

“And are they not an important part of any exhibition?”

“They are.”

“Very well,

then. What is the trouble? I am sure that many readers found our hints most valuable.”

“Possibly; but you must remember that our first duty is to tell wireless enthusiasts all about wireless. Therefore I insist that this year we shall do the thing properly, visiting each stand and recording our impressions.”

“And shan’t we have any lunch?”

“Just a sandwich.”

“Or tea?”

“Another sandwich.”

“Or dinner?”

“Made an Early Start”

“If our consciences will allow us to spare the time we may go as far as two sandwiches a head for dinner.”

It took me a little time to convince the Professor, but once he had appreciated my point of view he agreed that this year we would stick entirely to business, sacrificing, if need be, even our meals in the interests of readers:

**OUR WIRELESS FRIENDS
TRY TO VISIT
THE RADIO SHOW**

On the opening day we made an early start. Since neither of us is very good at rising with the lark or that kind of thing, we thought it better to sit up all night so that we could easily catch the 9.35 a.m. from Mudbury Wallow. The trouble about getting to Olympia (if you can’t commandeer Sir K. N. Pepper’s car, as we did a year ago)

is that you have to change at Willesden Junction, which has platforms and trains simply all over the place. That is probably why we presently found ourselves at Richmond instead of at Addison Road. Discovering that the

only way of getting back to Olympia from Richmond without buying fresh tickets was to return to Willesden Junction, of which we had both had more than enough, we decided to try a ’bus this time.

We both felt, though, that after our somewhat exhausting experiences a breather was necessary before our travels were resumed. Having therefore staggered the waiter at the Car and Starter by ordering two cups of cocoa, we hired a skiff and spent an hour or so snoozing happily upon the bosom of old Father Thames.

A kind policeman gave us the number of the ’bus—which, as he put it, would take us past Olympia.

TWO CUPS OF COCOA



We staggered the waiter at the Car and Starter.

He was right. It did. The Professor somehow got into an argument with a fellow passenger about the Heaviside Layer, and before we knew where we were we had reached Trafalgar Square. Braced by another cup of cocoa apiece (we are sending the record of these cups of cocoa to Ripley for his “Believe It Or Not” series), we set ourselves to tackle the problem of transport seriously.

Down the “Up”

“So far,” I said, “we’ve tried overground trains and buses, and they haven’t been successful. Let us see what Lord Cinderpath can do for us with his Underground. If he can get us to Olympia we shall be Duly GratefuL.” We walked up to Piccadilly Circus, whose station is well named. I suppose we went about seventeen times round its subterranean promenade before we found our way to the escalator. And once we had reached this our adventures were by no means over, for the Professor would insist on demonstrating the bracing powers of cocoa (see Ripley above) by descending the ascending escalator. Time after time he nearly did it. Time after time he was borne back to the top and swept off at the grating thing. Odds were being freely laid amongst the crowd of spectators which had assembled by this time, and I

“GOING UP!” OR “DOWN?”



Demonstrating the bracing powers of cocoa by descending the ascending staircase.

think that the Professor would have succeeded at his last attempt in landing the packet for which he had backed himself had not the authorities intervened and forbidden further attempts.

At long last we reached the platform. Exhausted we sank into our seats and who shall blame us if for a moment or two our tired eyes closed.

We were aroused by loud shouts of “Arnos Grove.” We enquired whether

the next station was right for Olympia and having been assured that it most emphatically was not, we disembarked hastily.

"Every form of transport that we have tried so far has let us down badly," I lamented. "What can we do now?"

The Professor suggested an aeroplane, but on enquiry we found that there was no aerodrome in the immediate vicinity and that, anyhow, the nearest landing place to Olympia was probably Croydon.

"I Hailed A Taxi"

Another kindly policeman whom we consulted told us that by walking a mere mile or two we would find a tram that would take us to Tottenham Court Road. Let me tell you here and now that trams are jolly fine. This one, unlike all the other things, went where it said it was going and duly delivered us at our intended destination. We felt that we were getting warmer and decided that we would finish the journey by taxi, though as we were rather cramped by so much sitting we felt that a little walk to stretch our legs was indicated.

We hadn't walked far when we came to a particularly jolly wireless shop. Having flattened our noses against its windows for some minutes, we entered and found a most genial chappie behind the counter. He was one of the best salesmen that I have ever come across, the sort of fellow who would have made a real success of selling tinned vegetables to cannibals. Anyhow, before we knew what had hit us, we found ourselves the proud if somewhat staggered possessors of 17 variable condensers, a complete outfit of shop-soiled short-wave coils, a dozen valves of the most complicated types and half a score of assorted low-frequency transformers.

A FINE SALESMAN



The sort of fellow who would have sold tinned vegetables to cannibals.

Just as we left the shop a taxi came bowling along with its flag up. I hailed it. "Olympia!" I cried. We heaved our parcels inside and followed them ourselves.

"Phew!" I ejaculated, sinking back into my corner; "this has been a

day. By Jove, wasn't that fellow a marvellous salesman? Pretty well cleaned me out."

"Me too," sighed the Professor. "However, it's all in a good cause and though we've had a tiring time I'm feeling all keyed up for running round the stands at the Exhibition."

The last stage of our journey was comparatively uneventful, despite the antics of those queer pedestrians who believe that you can really take Mr. Hore-Belisha at his word when you want to cross the road between two of those toffee-apple things of his.

"And here," I remarked with a smile as we swung round the corner towards the entrance, "and here, my dear Professor, is Olympia. It takes some getting to, but it's dogged as does it,

"FOUR AND NINE, PLEASE"



Would he take it out in condensers? He would not. Or transformers? No.

and by sheer perseverance we have arrived."

We stopped; the taxi man got down and opened the door. We descended. Each of us looked at the other.

"If you wouldn't mind—" I ventured, looking at the Professor, after an exploration of various pockets.

"I am afraid I must ask you," smiled the Professor, who appeared to be turning most of his clothing inside out.

The "Simple Cell"

"Four and three, please," remarked the taxi-man, "and sixpence for the luggage. That makes four and nine."

Simultaneously the Professor and I tried to explain that though we were really men of substance we had spent our very last penny at the wireless shop.

Would he take it out in condensers?

He would not.

Or valves?

No.

Or transformers?

No.

We were both distinctly disappointed in London policemen. The two that we had previously consulted had done their best to be helpful. The one who now strolled up was not.

If anybody now wants a thick ear, all that he has to do is to ask us for a description of a simple cell.

BELOW 100 METRES

By A Special Correspondent.

WE are now just over two months past the longest day, and short waves are beginning to conform to what we may call "Autumn conditions." The fade-out, on waves below 25 metres, is occurring at a noticeably earlier hour, and the 49-metre band, in particular, is livening up quite early in the evening instead of remaining dead until most people are thinking of bed.

Coming back to conditions, however, I predict that the Americans will be extremely good for the next few months between 2 and 7 p.m. (this referring, of course, to wavelength below 30 metres, and including the 20-metre amateur band). Most of the broadcast stations are increasing their powers still further—why, I don't know—and the "hams," of course, live perpetually in a state of growth.

"DX" Ultra-Shorts

By the time the shorter wavelengths begin to fade, the 31- and 49-metre bands and the amateur 40-metre band will be well away. The only dull times of day will be the mornings, and even then one may often hear New Zealand and Australia in the 20-metre band.

The 49-metre band is far from good at the time of writing, the chief disadvantage being atmospheric and general noise. I invariably find that it has bucked up by the beginning of September, however, and I think it will soon be possible to go slowly down the band and tick off eight or ten "Yanks" on the log-sheet.

If there is a dead period this coming winter, it seems to be due in December or January. The autumn should, from the look of things, be unbelievably good.

We have been accustomed to look upon the so-called ultra-short waves as immune from variations in conditions. The 10-metre band, of course, has completely given that theory the lie by the way in which it has turned into a real "DX" wave again this year. Contacts between Europe and America (both North and South), between Australia and America, and between Australia and Japan have been frequent during the past few months.

It seems quite within the bounds of possibility that 5 metres will show similar symptoms by next year.

SHORT-WAVE NOTES

By W.L.S.

THIS year's Radio Exhibition has, without a doubt, interested more people in short waves than any of its forerunners. One has previously had to hunt round for a mere handful of stands to find anyone betraying even a passing interest in the short waves. This year we have found the all-wave type of receiver very much in evidence, and really good short-wave components are relatively plentiful.

The "Straight" Set

Up to now I have only dealt in these notes with the more simple types of short-wave receiver, suitable for those real enthusiasts who like to do a little experimental work on their own, and to whom a weak headphone signal is just as interesting as real wall-bending loudspeaker reception from a distant station.

The difference between the two types of result, it might be thought, is only one of degree, and to a certain extent this is true. A set using the circuit I showed last time will give comfortable headphone reproduction on any of the better-known stations, and the addition of a good big L.F. stage will make it most definitely a loudspeaker receiver.

Single Control

Many people who visited the Show, however, will only be content, for the new season, with a short-waver that handles just like a single-control broadcast receiver, and gives equally reliable results. That, I am afraid, cannot be achieved by a detector-and-two L.F. arrangement; it calls either for a set with one or two H.F. stages or for a really good superhet.

The accepted fashion for a good all-wave receiver seems to be to make use of a separate short-wave detector (possibly with an H.F. stage ahead of it) which, by means of the ordinary wavechange switching, comes into use as a superhet adaptor when short-wave reception is desired. This, of course, is in every way an excellent scheme. Wavechange switching for the two

broadcast bands is quite complicated enough, in some commercial receivers, without having to introduce a third range about which one has to be considerably more careful.

★.....★
The large effect of valve noise on short-wave reception is discussed in this article, which contains details of a new superhet on which the author is working.
 ★.....★

The use of a "built-in" short-wave adaptor is by far the easiest method of doing the thing properly. The scheme has only one disadvantage, and that, probably, will not concern the people who make use of it. I refer to the background noise that is, unfortunately, inevitable when a large number of valves is used.

The chief feature that distinguishes the short waves from the medium and long waves is, of course, that most signals are *relatively* weak—in other words, the background noise assumes a position of far more importance.

peans. If they receive that much on the loudspeaker with fair quality and volume they are doing all that anyone can reasonably expect from them, and are obviously providing a tremendous amount of entertainment that cannot be derived from a set that only covers the medium and long waves.

The real short-wave fan, however, has a perverted mind (forgive me—I'm one myself!) and wants to dive deeper into the subject than that. His one crowning desire is, so to speak, to bore a little hole in that omnipresent background noise and to hear some of the stations that, at present, are underneath it.

Small But Sensitive

So long as valves depend upon jostling streams of electrons, he stands more chance of doing that with a few valves than with many, since each succeeding stage will introduce a little more hiss.

If we can get in between the two ideals—the huge multi-valver with a 4-watt output and the really quiet little affair with two valves—we are more likely to be able to please everybody.

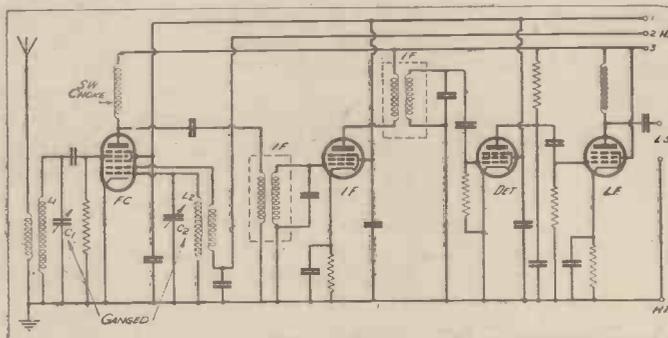
I am working, at present, on a fairly small superhet using a heptode frequency-changer, one H.F. pentode as I.F., another as second detector, and an output pentode. Four valves, each one going "all out"—completely at variance with the American ideal of the greatest possible number of "tubes."

Local "Background"

The circuit and the rough layout of this midget superhet are shown on these pages. At the moment it doesn't seem as if it will be necessary to add another valve as pre-selector before the heptode; but even if it is, the set will still be reasonably small. The new X 41 triode-hexode is, of course, interchangeable with the heptode, and I am carrying out comparative tests between the two.

The actual "radio" background noise with this scheme appears to be very small indeed. My own main

A GOOD S.W. SUPERHET CIRCUIT



This circuit is a good compromise between the huge multi-valver with a 4-watt output and the really quiet little affair with two valves.

We hardly ever fail to receive a station because the set isn't "powerful" enough—it's nearly always because the set isn't *quiet* enough.

This is where the short-wave superhet, in its present stage of development, leaves room for improvement. All the good commercial short-wave superhets will give really excellent results on, say, rather more than a dozen American stations, Sydney, Nairobi and Johannesburg and, of course, all the Euro-

trouble is local background, mostly from electrical apparatus, and many of the noise-reducing aerial schemes simply have no effect upon it at all.

These, by the way, were much in evidence at the Show, and, in general, their use will be found tremendously beneficial. It just happens that most of my own special interference does definitely come down the aerial and is not picked up and re-radiated by the house-wiring, as it is in so many cases.

To be really useful on short waves, these aerial coupling schemes should employ a low-impedance down-lead, necessitating the use of an auto-transformer at the junction between the down-lead and the aerial proper, and another one at the point of coupling to the receiver. Such a down-lead, completely screened, will certainly not pick up local interference, and if the horizontal part of the aerial is right out "in the clear," a very efficient system will result.

Worth the Money

In one or two extreme cases I have met, the only way to eradicate the interference completely has been to take the lead-in from the far end of the aerial, bringing it down vertically and along underneath the ground (see below). This, of course, costs rather a lot for screened cable—but if there's no other way out it is worth the money.

Overseas readers who are cursed with irregular mains often complain of noises from the power station being transmitted along the mains—sparking of brushes on ancient commutators, arcs at age-old "power-leaks," and so forth. Most of us in this country, fortunately, have little to complain of in this way. Mains filters are available, however, consisting of two H.F. chokes and two pairs of condensers.

The whole range of "suppression" devices, as seen at the Show, is well worth studying, as there is almost certain to be something that will be right for your particular trouble.

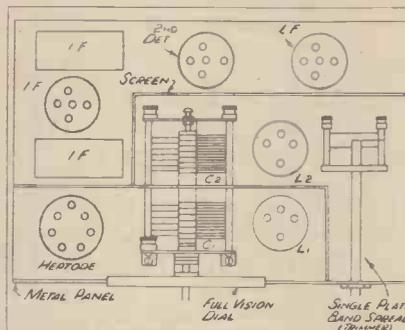
Midget Short-Wavers

An aspect of short-wave reception that must not be neglected during the coming season is the popularity of the "midget" receiver. Thanks to the various types of tiny valves that are now being marketed, it is possible to compress a two-valve short-waver into a very small space, and there is a certain charm in the use of a short-wave portable which can be taken out to the top of a nice quiet hill, far from all electrical interference.

NOISE-REDUCING AERIAL SCHEMES

I have lately been using a super-regenerative set for ordinary short-wave listening, as well as for the "ultra-shorts," and provided there aren't too many stations working in adjacent channels at the time, its selectivity is just about adequate. Its sensitivity, of course, is terrific. I have listened to W3XAL on 16 metres at good loudspeaker strength in a moving car with four feet of aerial! This, by the way, on three valves built into a set about the size of a fat cigar-box.

COMPACT LAYOUT



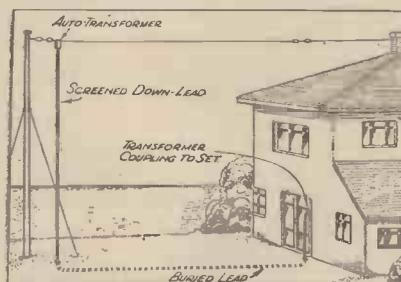
The circuit on the previous page lends itself to a small, neat layout as shown above.

The charm of a really small and really portable short-wave set is simply that of novelty, I suppose. One is thoroughly used to portable broadcast receivers, and to the programmes that they bring in, and car-radio is well beyond the "novelty" stage this year.

To take out a small short-wave set during a country picnic, though, and to produce dance music from America at teatime, means the establishing of one's reputation as a real wizard. In passing, I may as well remark that it's not nearly so easy as it sounds.

Those readers who are not going in for "all-wave" sets this season will

FOR SILENT WORKING



Where interference is especially bad this method of taking the down-lead from the far end of the aerial may prove valuable.

probably be thinking seriously of building a small short-waver to use as an addition to their own broadcast receiver. Whether it is a two-valve headphone receiver or a converter of some-kind doesn't matter very much—in either case they will be making available some scores of programmes that otherwise could not be heard.

I believe I have already referred to the fact that the erection of a separate aerial for the short-waver is not necessary. If your broadcast receiver operates from a fairly good outside aerial, use the same one for your short-wave listening, even if both sets have to operate at once.

Several alternative schemes may be tried, among them that of tapping the broadcast set on the end of the aerial, and taking another lead-in from the centre of it (roughly) to the short-wave set.

Try Two Earth Leads

Another method is simply to feed the end of the aerial to the two sets, using a small midget or pre-set condenser in series with the lead to the short-waver. A common earth sometimes causes slight difficulties, although two separate leads down to the same earth-tube will usually work well. It is the common lead that causes interference between the two sets.

In case there is anyone who has read thus far, and who has, as yet, no intention of becoming a short-wave listener during the autumn and winter, let me appeal to him to think things out and to estimate how much radio enjoyment he is going to miss.

Roughly a hundred programmes may be heard, for the expenditure of a very modest sum, that simply cannot be heard by any other means than short waves. But it is not the mere thrill of listening to long-distance transmissions that constitutes the chief fascination of short waves. It is the fact that there is still plenty of experimental work to be done, even by the unskilled home-constructor.

Sure of Results

You may try out the new circuits that I show occasionally in these pages, and for no particular reason, you may suddenly find yourself obtaining tremendous results with one or other of them. Whatever happens, you will find no difficulty in getting some results right at the outset, whatever arrangement you use.

Let 1936 be a real short-wave season for you. Conditions should be improving for another two years yet, and even when the next "trough" in the cycle of conditions comes round, there will still be plenty to go for.

BUSMAN'S HOLIDAY



IT happened almost exactly at midnight.

How many million aural witnesses there must have been to the crime will probably remain a matter of dispute.

But if a hundred thousand listeners heard the famous Studio Murder, when the actor Parsons was strangled before the microphone in the course of a radio play, a few millions almost certainly heard the shot that killed Branson Potts in the Cuba night-club.

For an hour and a half dance-music had been relayed from the Cuba; dance-music played by a new Rumba Band of some celebrity. About a minute and a half before twelve o'clock there came the voice of the announcer: "The dance-music you have just heard has been played to you by Carlos and his new Rumba Orchestra from the Cuba Club. As the cabaret entertainment is beginning a trifle early, the National Programme is now closing down until to-morrow. Good-night, everyone, good—heavens! . . ."

Several million listeners stared at each other, unable to believe their ears. But their sets were silent. The National Programme had closed down until to-morrow. And they had to wait for the next morning's papers to satisfy their curiosity. Even then some of them were not satisfied, and the B.B.C. postbag was proportionately the heavier.

Scotland Yard, however, in the person of Detective Inspector Simon Spears, was not doing any waiting. For Spears, by the irony of an inscrutable fate, had been sitting in the Cuba, enjoying his first holiday for months, and pretending very fairly successfully that he had forgotten what the word "policeman" meant. Miss Topsy Levine, that blonde young person who was such an asset to the second row of the Pallodrome chorus, had been helping Spears considerably to the degree of forgetfulness he desired.

And now, at a little after three, instead of escorting Miss Topsy on

an agreeably prolonged taxi-drive to the confines of Hendon where she lived, Spears found himself facing Inspector Moresby, a colleague whom he rather disliked, across the table of the manager of the Cuba's private office. The contrast was both striking and depressing, nor was the depression appreciably lifted by the manager's expression. Of normally dark features and with a face to be described charitably as Levantine, Gipsy Ricardos as he stood between the detectives, was a muddy grey, and quivering at that. "A grubby blancmange improperly set" was Spears' description of him later.

A

Thrilling Mystery Story By VAL GIELGUD

*B.B.C. Drama Director and co-author
of "Death at Broadcasting House."*

"Well?" inquired Moresby abruptly. "You took charge, of course. Any luck?"

Spears scratched his jaw.

"It's a teaser," he said.

"What do you mean?"

Spears grinned. He still felt sufficiently on holiday to be able to think of Moresby as having the real responsibility for the case.

"Listen, Moresby," he said, "and see if you can piece it together. Bramson Potts was sitting alone at a corner table next to the dance floor."

"Wait a minute, Spears. Who the devil was this fellow Potts?"

"The best-hated theatrical agent in London, which makes it so much easier," said Spears. "He was a swine in private life, and a crook in business. I've no doubt we'll find within twenty-four hours that about a quarter of the people in the club had it in for him one way or another. The Cuba's the

latest thing in the pseudo-fashionable theatrical set."

Moresby's face assumed a puritanically grim expression; and Spears grinned.

"I know it all from Topsy Levine," he said, "the girl who came with me."

"Your prospects would be better, Spears, if you kept away from stage-doors," said Moresby virtuously. "Especially as you're a married man."

"Oh, grandpa, what a blue nose you have," murmured Spears. "Shall I go on?"

Moresby nodded irritably.

"Very well. The medical report tells us that Potts was shot at close range. Almost the whole of the top of his head was blown away—messy, very. Gun with a silencer, of course."

"Yes," objected Moresby, "but even a silencer—"

"Wait. I happened to be looking at my watch—Topsy asked me the time. As I did so the lights went down, and the dance music died away almost to nothing while the announcer was talking into the microphone. I could hear him, because I was at a table on that side of the floor—the side opposite to Potts."

"Well?"

"I couldn't see my watch when the lights went. I looked up, and just at that moment there was the devil of a crash from the cymbals and the drum. That must have covered the shot—just as the darkness covered the shooting. After thirty seconds the lights flashed up again—and there was Bramson sprawled all over his table."

Moresby nodded slowly.

"The murderer must have known that band routine for the cabaret opening," he said shrewdly.

"Yes," said Spears. "But about thirty people can be picked on as having been in the club more than once during the last week. Besides"—he paused dramatically, enjoying in anticipation the shocking of Moresby—"there's no weapon!"

"What!"

"I tell you there's no weapon—not the ghost of one! I've had every

man—and woman, too—searched to the skin."

"Yes," groaned Ricardos, fiddling with a cigarette-holder with shaking fingers, "it is that that ruins me. No one will come to a place where such . . ."

"An outrage is perpetrated," concluded Spears sarcastically. "The ladies didn't object."

"Of course not," sneered the Levantine. "But an Englishman will not risk such a thing happening to the lady he takes to a club."

"Anyway, it was done," said Spears, "and it was done thoroughly. There wasn't a revolver in the place; not so much as a water-pistol."

"You're sure nobody left the room?"

"Positive. I've good eyes and a loud voice, Moresby. I used both. I got the doors shut in a jiffy, and I've the whole boiling lot still there, in vile tempers and wilting boiled shirts!"

"Don't be so dam' bright about it, Spears!"

"Sorry. Well, what next?"

Moresby got to his feet and took the shaking Ricardos by one elbow.

"I imagine you've got the table and the body isolated," he said. "Take me there, please."

The Levantine led the way, and Spears brought up the rear.

The Cuba ballroom was a pathetic spectacle of pleasure-seekers who for once had been provided with a real sensation. Frayed tempers, incipient hysteria, pompous indignation, naked fright were all being displayed in their several and unedifying ways. Only Miss Topsy Levine, who was smoking calmly at Spears' former table, scandalised Inspector Moresby by waving cheerfully to his colleague and asking shrilly if she could order another packet of cigarettes . . .

The gross carcass of Branson Potts had been removed to decent seclusion, but the stained tablecloth and splintered glass lay clear for Moresby to see. He stood and peered down at the table, frowning, his massive jaw clamped. Then he picked up the broken glass.

"There was champagne in that glass," he said quietly.

HOW THE WEAPON VANISHED

"You surprise me," said Spears. "Champagne is drunk in the Cuba, you know."

"I know," said Moresby calmly. "Where's the bottle?"

"The bottle?"

"I said 'the bottle.'"

"All bottles taken away at midnight," said Ricardos smugly, as befitting a man who broke every law but one.

"I thought no one left the room," said Moresby, turning to Spears.

Spears flushed and said nothing.

"Like Chesterton's postman, you didn't notice the waiters, Spears, did you? No one does, do they? That's how your weapon vanished. It was dropped into an ice-pail. Go and empty them, Spears. But first look into them and prove to yourself just how opaque is the ice-pail when it's full of ice."

"Yes," groaned Ricardos, fiddling with a cigarette-holder with shaking fingers, "it is that that ruins me."



"I'm sorry, Moresby, That's confoundedly ingenious of you."

"It was darned ingenious of the killer, especially as you won't be able to identify the particular ice-pail with any particular table. Still, the medical report allows us to cut down the possibles to the people at about half a dozen tables. When we've gone into the motive and personality questions—"

But Spears had gone. In ten minutes he was back, and there was a

heavy revolver, complete with silencer, wrapped in a cloth in his hand.

"You were right," he said.

"Did you look at the brand of champagne?" asked Moresby.

"I did," said Spears, raising his eyebrows. "Why? It was Lanson '21."

Moresby turned to Ricardos.

"Send over the waiters who looked after this lot of tables," he said.

The proprietor obeyed, and four waiters came slowly across the room.

"Which of you served Lanson '21 this evening?" asked Moresby.

Then Spears could grin again. It appeared that all four had served Lanson '21 that evening. They were sorry. The year was popular with discriminating clients

Suddenly Spears jerked up his chin.

"Which of you served Mr. Branson Potts?" he demanded.

The second waiter in the line took a step forward, a pale, weedy youth with a spotty face and a smudge of a moustache which only accentuated his lack of chin and his pallor.

Spears put out his long arm and twitched the second waiter's napkin from his arm.

"Hold him, Moresby!" he said.

There was a futilely pathetic scuffle, and the weedy little man stood still, swaying on his feet.

"All right," he said. "I did it all right. I had my reasons—the swine! I don't care. I'll go quietly."

"How the blazes—" began Moresby.

Spears turned the napkin over. There was a long smudge of powder blackening across the linen.

"Inspiration," said Spears quietly.

"He knew the dance band routine. He knew Potts always drank champagne. He thought of the ice-pail trick; I give you marks for that, Moresby. He shot Potts under cover of the napkin at close range during those thirty seconds of black-out, and he dam' nearly got away with it. I'm glad you're on duty, Moresby. I'm still on holiday, and now I can take Topsy home. Good-night."

RELAYS FROM BUDAPEST

ON September 24, 25, 27, and 28, listeners will hear four relays from Budapest.

These broadcasts will be representative of night life in that city and will necessitate the use of forty microphones located at various points. If the experiment is successful there is a possibility that the idea may be extended to other cities of Europe.

Round the world of

TELEVISION

Television Patent Pool

I UNDERSTAND that an arrangement has been entered into between the Farnsworth Television Inc. of America, and Baird Television, Limited, whereby there will be a complete interchange of patents and technique. Already the Farnsworth Company has made a similar agreement with Fernseh A.G., the German Television Company, and Fernseh A. G. in turn have made a similar arrangement with the Baird Company. According to this, the patents and technical data of each of the three companies is available to the others.

According to reports which have reached me from Philadelphia, Mr. P. T. Farnsworth, the vice-president of Farnsworth Television Inc., and inventor of the various television devices used by that firm, predicts that television will open up new fields for employment and will be a tremendous factor in giving a renewed impetus to business.

What Definition?

At present there does not appear to be any very set policy with regard to the degree of definition which is to be used in television transmission and reception in this country. As has been arranged, the Baird people are to use a definition of 240 lines; whilst Electrical and Musical Industries are to supply a transmitter working on 405 lines.

There has been a good deal of technical argument about all this. The Baird experts say that, although theoretically the higher the number of lines the higher the definition, best results will be obtained at present from 240 lines, and that to adopt a higher number of lines at this stage would be premature. It has also been suggested that whilst 240 lines can be sent out on a wavelength of 7 metres or thereabouts, if we go to 400 odd lines it will require a much shorter wavelength to obtain the full effect.

A REVIEW OF DEVELOPMENTS IN THE VARIOUS COUNTRIES

By Dr. J. H. Roberts, F.Inst.P.

But the 7-metre wave has an estimated range of some 25 miles, whereas the shorter waves will have, it is believed, a still shorter range.

"Lacing"

The experiments of Electrical and Musical Industries have naturally been conducted in considerable secrecy, but it is known, or rather it is believed, that a special system of "laced scanning" is used and that the shortening of the wavelength can be avoided.

Some people say that there has been far too much secrecy all round amongst

THE "ULTRA-SHORTS"



A combined Telefunken micro-wave transmitter and receiver for two-way communication. The same aerial and reflector are used for both transmission and reception.

the different firms who are working on television, and that this secrecy is a great bar to progress. Germany is going ahead, and many people complain that we in this country are allowing ourselves to fall behind. On the other hand, I am told that the buying of sets in Germany has not yet reached any great proportions, although the service is actually existing. At any rate, it seems pretty certain that when the British television service does start we shall have a much higher standard of excellence in our television reception than any other country in the world.

P.E. Mosaic

Talking about Electrical and Musical Industries, by the way, I understand they are forging ahead with their television system which employs a photoelectric "mosaic," based on the fashion of that of Zworykin, the famous television expert of the R.C.A. Victor Company of New Jersey, U.S.A. I believe the Electrical and Musical Industries are working in pretty close co-operation with R.C.A. of America under some kind of patent pooling scheme.

"Aerial Movies"

The Radio Corporation of America has allotted more than a million dollars for the erection of a television broadcasting station and the manufacture of receiving equipment. The well-known president, Mr. David Sarnoff, said that his company's "aerial movies" would be a reality within eighteen months.

The Philco Radio Company, operating more secretly, was reported to be spending a similar sum in its Philadelphia Laboratories; while the American Telephone and Telegraph Cable Company are reported to be ready to instal the first of the "electric picture pipes" between New York and Philadelphia, which I mentioned in these Notes last month.

In fact, there seems to be a kind of race between England, Italy, Germany,

Belgium and the United States, to see who can get ahead first in practical television.

Progress in Berlin

Talking about Germany, Berlin does not intend to be outdone by London in the matter of television. According to reports, plans are going forward swiftly for an expansion of visual broadcasting in the Reich. The Germans have already started a public service with a station of 4,000 watts operating in Berlin to send out vision on the ultra-short waves at 44.7 kc. with accompanying sound at 42.9 kc.

The Germans started to broadcast 240-line television nearly two years ago, but limited the reception to scientific laboratories and amateurs who built their own sets. It was found that a radius of about 30 miles could be obtained, covering the whole of Berlin. From this station it is intended to continue visual broadcasting, but it is also planned to erect a station on the Brocken mountain and to connect it with Berlin to serve the western portion of Central Germany.

Ready for the Market?

One German firm, I am informed, has a large stock of television receivers all ready for the market. Programmes at first will consist of ordinary news reels, changed every week. The German Post Office, which has television in charge, has ordered a special television van to go to places to obtain news events and to make special reels for immediate transmission to owners of vision receiving sets.

Television and the Theatre

"Television in the theatre is a development for the future and for many years will not affect the attendance at cinemas." At any rate, this is the opinion of Mr. H. R. Lubcke, director of television for the Don Lee Broadcasting System, of the West Coast, U.S.A.

"Television," he says, "is adapted to reproduce a few events for many individuals in many small groups—in other words, to reach the public in their homes. The motion picture and the theatre, however, are adapted to reproduce a few events to many individuals

AN INTERNATIONAL TELEVISION RACE

in a few large groups—that is, to entertain the public in theatres. We shall look to television as a source of news and timely presentation, whilst to the theatre we look for artistic productions. Television can present events as they happen, as well as recorded versions of the same happenings."

The great purpose of television in his belief is not to supersede other forms of entertainment, but to supplement the broadcast of sound in the same manner that sound supplemented vision in motion pictures.

The Iconoscope

I referred previously to the Iconoscope, which is sometimes called the "mosaic electrode." In this arrangement the scene which is to be transmitted is focused, by means of a camera optical system, upon a photo-

sensitive surface; this surface is made up of a very large number of small individual photo-sensitive cells. The arrangement, in fact, is somewhat like that of a very coarse photographic plate, but instead of a chemical change being produced, a photo-electric or chemical-electric effect takes place. The result is that the current emitted by the mosaic varies as the scanning spot passes from point to point.

It would seem that some arrangement of this kind is about the only really practical method so far discovered for the direct transmission of a scene or an event as it takes place.

Short-Wave Circuits

One of the few things that *does* seem to be definitely established about the new television broadcast scheme is that the transmission will be on ultra-short waves of 7 metres or less.

This raises the question as to what types of circuit will be most convenient for receiving at these high frequencies. The superheterodyne circuit has been used very largely during recent years for reception even down to comparatively short waves, but whether it will be just as good in the ultra-short-wave region remains to be seen.

Another scheme is the circuit with the quenched valve which was used quite a good deal some years ago but has not found much favour in the meantime.

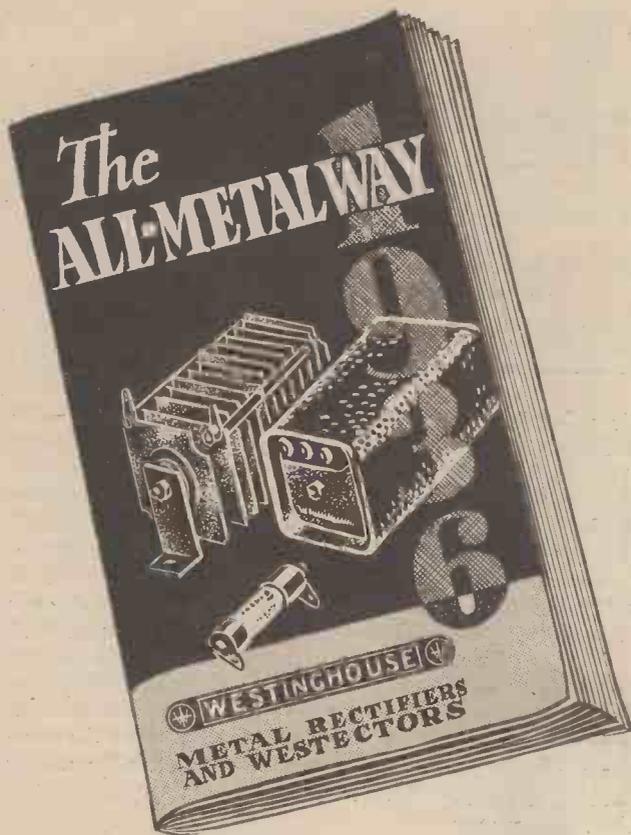
Another Scheme

The Barkhausen circuit is another one on which a good deal of work is being done at the present time on ultra-short-wave reception; the most important feature of this circuit is the fact that the valve works with a high positive potential on the grid and no potential on the anode. The result of this unconventional arrangement is that the electrons oscillate in and about the grid at enormously high speed. The point is that the electrons do not have to travel right across the valve and since they have only part of the distance to go they can be made to oscillate at a correspondingly higher frequency. You will appreciate this when you bear in mind that a 7-metre wavelength corresponds to a frequency of about 40 million cycles per second.

ITALIAN BROADCASTING HOUSE



This is the studio centre of the South Italian stations. Note the anti-fading aerial of the Rome III transmitter. In this building the Italian television developments and experiments will probably be carried out.



There's one booklet you mustn't fail to get when you visit KelvinHall—"The All Metal Way, 1936." It's more than a catalogue of Westinghouse Rectifiers and Westectors—it's a treatise on A.C. Mains Radio, distortionless detection, Automatic Volume Control. It contains chapters on trickle-charging both H.T. and accumulators, operation of moving coil speakers from the A.C. Mains, Universal Rectifier, etc., etc. Get a copy from Stand 9, and if you're there, don't forget to ask for the technical information you may require.

Westinghouse Brake & Signal Co.,
82, York Road, King's Cross, London, N

WESTINGHOUSE

**METAL RECTIFIER
STAND**



Wired Television

AFTER wireless came "wired" wireless, and now, close on the heels of television, comes the prospect of picture programmes, distributed not *via* the ether, but over a special form of high-frequency transmission line or cable.

Following Radio Practice

It should, however, be made clear that the plan proposed for "wired" television has very little in common with the well-known method of relaying broadcast programmes to a number of subscribers over low-frequency lines. Although this is often called "wired wireless," it is strictly speaking only a modified form of telephone relay.

FOR LONG DISTANCES

The latest types of cables make it possible to send wide bands of frequencies, such as are required for high-definition television, over land-lines. Below, Carden Shiels describes the practical details of this valuable development.

But if one speaker's voice is first applied to modulate a high-frequency current of, say, 30,000 cycles, and the second speaker's voice is similarly superposed on another high-frequency current of, say, 60,000 cycles, then both the "carrier" currents will travel along the same line, without merging or mutually interfering with each other.

This kind of wired wireless is very much on all fours with what happens in broadcasting. So long as they remain in the ether, carrier-waves from different stations do not interfere in the least with each other. They may do so in the receiving circuits of the

The whole secret, of course, lies in finding a wire circuit capable of transmitting the carrier-frequencies over long distances without serious attenuation. The ordinary "plain" wire circuit will not serve the purpose, though carrier-frequencies of the order mentioned can be transmitted over telephone lines which are "pupinized," or loaded at intervals with inductance coils. In practice, several telephone messages are now being transmitted in this way simultaneously over the same trunk line, with a considerable saving both of time and money.

A Million Cycles

But in order to transmit a television programme of high-definition pictures by wire, the line must be able to handle frequencies of a much higher order. Instead of 60,000 cycles, it must carry currents ranging well over a million cycles, and this without losing the higher frequencies at a greater rate than the low. In the first place,

RUBBER SPACERS



FIG 2

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A DUAL LINE

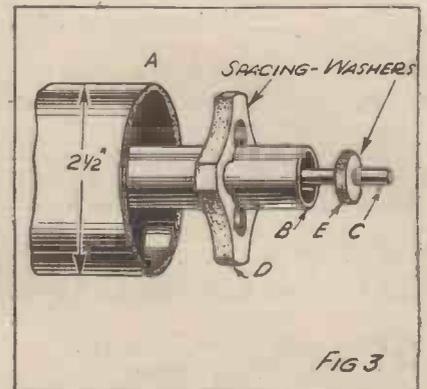
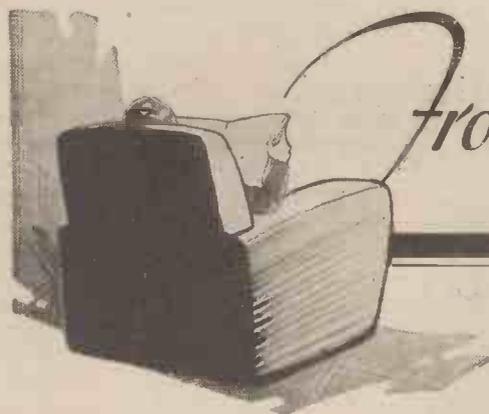


FIG 3

Two distinct channels are provided with this special double "cable."

the overall attenuation must be small, otherwise the signals will not "carry" for any distance; and, in the second place, whatever loss does occur must be equally distributed over the entire band of frequencies.

(Please turn to page 175.)



From My Armchair



Radio and Marriage—Seeing One's Name in Print and The "700" are among the topics dealt with by Mr. Scott-Taggart this month.

Is an interest in radio the first sign of unhappiness in marriage?

Does it reveal the first rift in the eternal lute, the initial crack in the fabric of everlasting bliss?

It would seem so from an advertisement I have just read. It shows a wife looking tired, drawn and run-down. She looks so unappetising that I was not at all surprised to find her writing: "My husband got restless." But let me recount her tale of woe—woe, that is, before she finished the first bottle.

"Tired and 'Drawn'"

"I kept the home lovely, but my husband got restless. Housework made me so TIRED and run-down looking—thank goodness I did something. We live in an awkward house—lots of stairs and soot settling on everything. But ever since we were married, I've taken a pride in keeping the home lovely. I even soda the bath every day. Last winter all my strength seemed to go. I got tired right out—but I had to keep going.

"Then suddenly I noticed that my husband was less interested in the home. Being run-down made me look tired and "drawn." *He was restless in the evenings, fiddled with the wireless.* Thank goodness I was sensible about it. No use blaming him. The truth is that any man gets tired of a tired-out wife."

A Sad Story

The good lady, I feel, has worried needlessly. Surely a sudden interest in wireless has a simpler explanation? The good fellow has probably just read all about the S.T.600. The picture of him in the top right-hand corner shows a very decent vague-faced enthusiast in his shirt sleeves, obviously constructing a very vague receiver from an undecipherable blueprint in a fog-bound kitchen.

He is, of course, as vague and as much in the background as most

husbands, but on this occasion the heroine, lined, dyspeptic, washed-out, must occupy the front of the stage. The danger, of course, is that thousands of wives will see that advertisement and, looking over the edges of their newspapers, will find their throats clutched by fear as they see their harmless Harrys screwing down valveholder V3 nearest baseboard edge.

Laying down her newspaper with trembling fingers, she whispers:

"Harry, don't you love me any more?"

Harry looks up: "What's that? I can't hear you. This confounded screwdriver's too big."

"Must you swear, Harry? You didn't use to when we were first married," says Jeannie wistfully.

Harry grunts as he fits the grid-leak holder. "That was before I took up wireless."

Jennie dabs her eyes. "You didn't use to fiddle with the wireless then."

"There *was* no wireless then,"

Harry remarks brutally, screwing the terminal strip to the baseboard.

"Are you," she asks tremulously, "building this set because I am tired-out, done-in, and washed-up? You no longer seem to admire the soda-cleaned bath."

"Hallo, what's the matter with you?" cries Harry, seeing the tears roll down the sunken, lined cheeks and on to the crêpe neck and triple chin. Jeannie sobs against his shoulder: "I was so happy till I read this advertisement. Now all my life is shattered."

Sowing Grave Suspicion

Harry says something about rubbish, clumsily wipes away her tears, kisses her absently and fits the L.F. transformer. Jeannie smiles happily. But she buys a bottle, and gives Harry some. He likes it and builds another six sets.

But will all such stories end as happily? Will not grave suspicion be sown in many a home? It seems

THE CONCERT STUDIO AT WSUI



This is the concert studio and lecture hall at Iowa City Broadcasting Station (WSUI). It is large enough to hold an audience of two to three hundred.

so unfair to pick on wireless as a restless diversion from a washed-out wife. And even if, here and there, wireless is an escape from a nagging, hen-pecking or merely dull wife, what of it? Surely it's better than gadding about with stamp collectors or being out half the night gathering mushrooms.

There are many worse occupations for a bored husband than "fiddling with the wireless." Let "washed-out wife" rejoice lest worse befall. And what is the moral of all this? Simply that even a bath washed daily with soda will not hold a wayward wireless man's love.

* * *

From a reader.

Dear Mr. Scott-Tagert,—Your name is a household word. . . .

Then why not spell it correctly?

My First Competition

He goes on to suggest that I write to see my name in print. No; after all these years—twenty-one, about—it makes me feel faintly sick. About the only fun I now get is to juggle with the diploma initials at the end, changing their order, acquiring new ones, deciding which to use on special occasions, and so forth.

At first, of course, it is great fun to see an article in print. Or even to see your name. I remember how proud I was—at eight years of age—to see my name amongst five hundred other first prize-winners of a competition dealing with station names—you know the kind of thing: picture of a piece of liver lying next to a pool of water. Usually the piece of liver is meant to be a rock and the pool something else, but I seem to have been lucky. As you couldn't expect the Editor to divide ten shillings amongst five hundred, we prize-winners each received a bag of filthy sweets.

Wielding the Pen

The first time I ever made any money out of my pen—one of the chief *raison d'être* of this useful implement—was when I contributed not one but two jokes to the Royal Magazine. I was seven years old at the time, and I received half-a-crown each. My friends—inventors occasionally scrape together a few—declare that these were the last jokes I ever made. I remember distinctly the day the money arrived; I was sick the whole of the following night. It was no joke.

My next effort was a puzzle magazine jointly edited by myself and my best friend, who was the son of a clergyman—believe it or not. We charged 6d.

SHOULD RADIO ENGINEERS WRITE?

per copy, sold about a dozen copies per week, and made a good thing out of it. It died after a month. In 1914 I started writing wireless articles. The first was about quite an ingenious tapping key which enabled you to send and receive at the same time, or rather to "break-in." Since then I must have written a thousand articles, several million words and about fourteen books on wireless, of which 850,000 copies have now been sold.

I think the pleasure of seeing one's name in print wears off very quickly. Some foolish people think that "popular" writers become conceited; those who think that usually cannot write or don't write or are not permitted by their jobs to write. I've yet to meet a regular technical-writer who is without a sense of humour as regards his own importance, or lack of importance.

He gets a great deal of publicity, of course, but it is essential for the dissemination of knowledge. Professionally he does not benefit at all from the publicity, although much of

the old prejudice is dying since so many famous scientists have taken up their pens to write for the public and not merely for learned societies.

Sometimes young radio engineers engaged in research ask my advice as to whether they should supplement their incomes by writing. Usually I discourage them, although I urge them to develop prestige in their technical societies provided this meets with the approval of the companies employing them. Jealousies are very easily aroused the moment you put pen to paper—and the young engineer cannot afford to arouse the jealousy of his seniors.

During the War

The only time I myself have aroused feelings which could injure me was during the war, when I was writing—often from a trench—the first comprehensive accounts of the new valve technique. My articles—so the chiefs in France thought—ought to have gone through them. It appeared to be unknown to them that military regulations permitted the submission of such articles direct to the Press Bureau in London.

(Please turn to page 173.)

MAX KESTER WRITES SONG FOR NEW FILM



In the Fox film "The Price of a Song," the composer writes a new number called "My Heart's Beating out of Rhythm." While he is playing it over he is murdered, but the song remains fixed in the murderer's mind. This tune brings about the sensational climax and discloses the murderer. "My Heart's Beating out of Rhythm" was specially written for the film by Ronald Hill and Max Kester, of the B.B.C. In the photograph are Eric Manturin, Charles Mortimer, and Oriel Ross. The general release date is October 7th.

"HARD" & "Soft" Scanning Circuits

By G. Stevens

IN designing scanning circuits using high vacuum valves, the aim is to reproduce exactly the action of the gas-filled relay connected across a condenser. Unfortunately there is no simple method of doing this, since the peculiar action of the relay cannot be imitated by a thermionic valve.

In the former the anode current starts instantaneously at a given anode voltage and is more or less unaffected by variations in anode or grid voltage, but in the valve we have a definite relation between current, anode and grid volts and with even a steep characteristic the anode current rises gradually as the anode voltage is increased.

VERY INGENIOUS

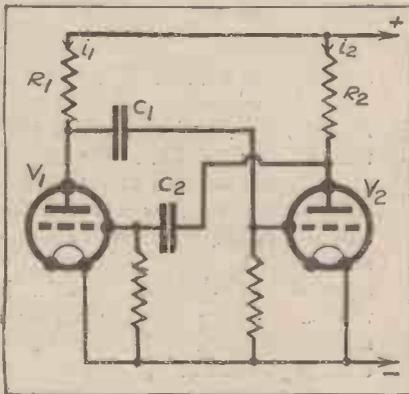


Fig. 1. The circuit of the "multivibrator" oscillator which can be made to produce saw-tooth oscillations.

The valve, to act as a discharging relay, must be adapted so that the anode current is delayed until a given value of anode voltage is reached, and then, once flowing, must be increased very rapidly, the impedance of the valve "coming down with a run," so to speak.

The "Multivibrator"

In the July article we had an example of the adaptation of hard valves to the discharge of a condenser, and the second one is of sufficient interest to consider in detail, as a number of hard valve circuits are based on its action.

The "multivibrator" circuit, which is reproduced again in Fig. 1, belongs

Continuing his discussion from the July number, of cathode-ray time-base circuits, Mr. Stevens here explains how the hard valve type operates.

to the type of circuit in which the anode current can be made to alter very rapidly in either direction, and the curve of current is approximately the same as that of the ideal saw-tooth wave that is required for linear television scanning.

To make the action of the circuit clear, the valves and components have been lettered. The valves V_1 and V_2 are connected to the H.T. through the anode resistances R_1 and R_2 . Each anode is coupled to the grid of the other valve through the coupling condensers C_1 and C_2 , and each valve has a grid leak. In practice these leaks would be low, about 100,000 ohms.

How it Works

With R_1 and R_2 equal and C_1 and C_2 equal, at the moment of switching on, the anode currents of both valves should be theoretically equal and the circuit should be stable. Owing to slight momentary variations in the emission, however, one valve will have a slight increase in anode current. Suppose it is V_1 . Then the current through R_1 increases and the voltage drop across R_1 increases. Since the H.T. battery volts are equal to the sum of the anode resistance drop and the volts across the valve itself, it

follows that the voltage across the valve will fall.

This falling voltage will be communicated to the grid of V_2 through the coupling condenser C_1 . The grid of V_2 will thus become more negative, and will reduce the anode current of V_2 . Owing to the amplification of the valves, this reduction in current

THE SAW-TOOTH

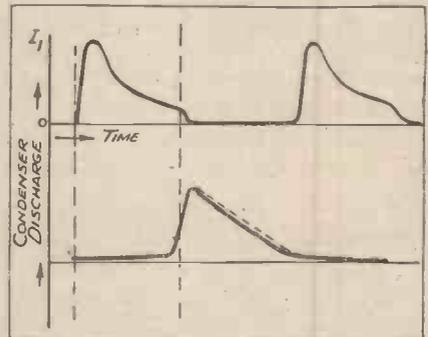


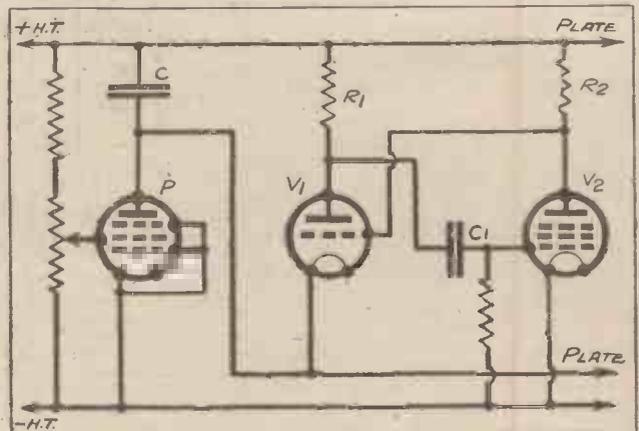
Fig. 2. Top: The wave-form of the anode current change in the "multivibrator." The curve below is of the condenser discharge, which can be made linear (dotted line) by the use of a diode.

will be much greater than the rise in V_1 which caused it. The voltage drop across R_2 will therefore become much less, and the volts across V_2 itself will rise. This rise in voltage will in turn be handed on to the grid of V_1 through the coupling condenser C_2 . V_1 grid will therefore become less negative still, and will rapidly increase the current in V_1 .

Since each interchange of voltage between the valves is magnified by

A SUCCESSFUL CIRCUIT

Fig. 3. A useful hard-valve time-base circuit developed by the Cossor Co. It uses a triode actuated by a pentode for discharging the condenser.



the amplification factor of the valve itself, we can see that the initial small increase in anode current becomes like a cataract in growth. The limit to the increase is set by the grid of V_2 , which is becoming more negative with each increase of anode current in V_1 . Eventually V_2 will be so negative that the anode current will cease altogether, leaving the coupling condenser fully charged. This condenser will now discharge through the grid leak and the conducting valve V_1 at a rate which is determined by the values of C and the grid leak.

Valves Used Alternately

As the condenser discharges, the grid of V_2 gradually becomes less negative until the anode current starts to flow again. This builds up in the same way as the current in V_1 , until V_1 's grid becomes negative and shuts down. The process is thus one of a rapid rise and fall of anode current, each valve in turn acting as the brake on the sustained oscillation.

The interval between the condenser charge and discharge can be made as

AN ORIGINAL SCANNING SCHEME

long as desired by increasing the value of the coupling condensers and leaks. With couplings of 2-3 microfarads and a high grid leak, the time taken to reverse the oscillation will amount to several seconds.

From the television circuit point of view the most important point is the wave-form of the oscillation produced. This is shown in Fig. 2, and it will be seen how closely it approximates a reversed saw-tooth. If the resistance of the grid leak is replaced by a diode or constant current valve such as a pentode, the curve of the condenser discharge becomes practically a straight line.

The advantage of such a circuit is its remarkable stability, and the ease with which it can be synchronised to a signal of a definite frequency such as is obtained in television. If a low voltage is injected into the anode circuit of the valve and the constants

are adjusted to the approximate value of oscillating frequency required, the circuit will "lock" itself easily and maintain the rate of oscillation without wandering.

An original and very successful scanning circuit has been developed by O. S. Puckle of the Cossor Company. The circuit is shown in Fig. 3, and it will be noticed that two valves are used, marked V_1 and V_2 in the diagram.

The Charging Condenser

The main charging condenser, marked C is charged through the pentode P, whose impedance is controlled by the voltage applied to the screen from the potentiometer. V_1 , the discharge valve, is connected across the condenser in series with a resistance R_1 . The grid of this valve is connected directly to the anode of another pentode, V_2 , which has an anode resistance R_2 . The grid of this pentode is connected back to the anode of the discharge valve through a condenser C_1 . The deflector plates of the tube are connected across the discharge valve in the simple circuit, as shown in the figure.

At the instant of switching on current will flow through V_2 and the resistance R_2 . The voltage drop across R_2 is applied to the grid of V_1 , and makes it negative with respect to its cathode, which is at full H.T. + potential at the instant of switching on. No anode current will, therefore, flow through V_1 , and the condenser starts to charge at a linear rate through the resistance of the pentode. Eventually the condenser potential reaches a sufficiently high value for anode current to start in V_1 .

Altering the Swing

This produces a drop in voltage across R_1 , which in turn is applied to the grid of V_2 through C_1 . V_2 is thus made more negative, and the anode current is reduced. This in turn lessens the bias on V_1 , and the anode current rises with a rush, discharging the condenser rapidly. The condenser discharged, the voltage across V_1 falls again, and the circuit is re-set ready for the next condenser charge to take place.

The potential at which the discharge takes place is determined by the value of R_2 , which thus controls the amplitude of the swing of the beam. R_1 has the effect of altering the rate at which the condenser discharges and is normally of a low value.

THE LONDON TELEVISION STATION



The choice of the Alexandra Palace for the London television station enables a very well-balanced area to be covered, as is shown in this map. About 25 miles radius is stated to be the real service range of the transmissions, and the circle shows the limit of this radius. It is probable, however, that places outside the circle will in many cases obtain perfectly satisfactory reception.

Television for the Cinema

THERE are various methods of producing large screen pictures, the three most important methods being the mechanical, the intermediate film, and the high-power cathode-ray projection tube.

Television has been projected on to a large-size screen by means of mechanical methods, using large mirror drums rotating at high speeds. This is the way in which the televising of the Derby from Epsom was carried out and reproduced on a screen in the Metropole Cinema, Victoria, three years ago.

Intermediate Film Method

Mr. Baird has now developed a high-definition method of projecting large pictures, limited, however, at the moment to close-ups only. In this mechanical method he uses a system called interlacing, where lines are not scanned sequentially in order, but out of turn, which has the effect of reducing flicker.

The method for which I have the most hope, at the moment, is the intermediate film method, which gets over the great difficulty, experienced with mechanical and cathode-ray systems, of insufficient light.

We are now working on providing a complete equipment which projects full-size pictures on to the cinema screen having ample light and definition.

Two Forms

There are two forms in which it can be made:

Firstly, an arrangement which has been developed and constructed by the Baird Associated Company in Germany, Fernseh A. G., in which a continuous loop of celluloid film passes through the machine again and again. The film, with the unexposed emulsion on it, passes through a continuous motion camera, on which is projected a television image received by radio by

means of a rotating disc, the modulation of the light from black to white being carried out by means of the Kerr cell.

This film is then developed, fixed, washed and dried, and is seen at this

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A review of various methods of projecting television on a large scale, and the possibilities of its application to cinemas.

By A. G. D. WEST, M.A., B.Sc.

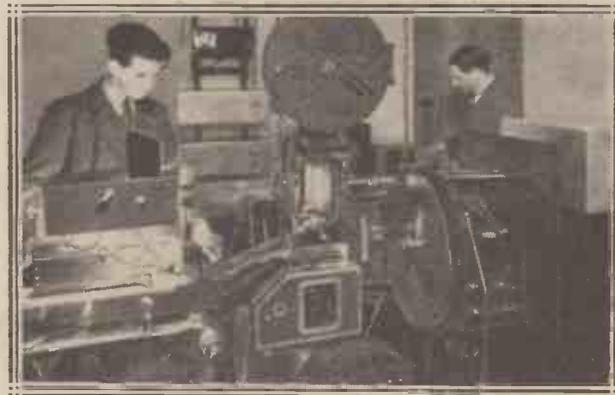
(Technical Director of Baird Television Ltd.)

★

point as a finished positive print, which is then immediately projected on to the cinema screen. After leaving the projector it passes through tanks where the emulsion is scraped off, and the remaining clear celluloid is dried, and then it runs through a chamber where new emulsion is applied and dried, before running into the camera again.

I have seen this system working in Berlin, giving quite excellent results,

TRANSMITTING THE FILM



This is the Baird disc apparatus used to transmit films for the purpose of television reception. Either ordinary or intermediate film process can be used.

but I think that the quality is not as good as that obtained by the method which I am going to describe.

In this case, which is a development of the Baird Company, a television picture is picked up by radio and

transferred to a cathode-ray tube. The picture is then photographed on to a continuously moving film using a special form of camera. The camera has two rotating drums inside it, both moving at a constant speed. One is in the position where the picture is recorded, the other is for the recording of sound.

How It Is Done

The film, after being exposed to both vision and sound, runs straight into a developing bath, where it is developed for twenty seconds, washed for five seconds, fixed in twenty seconds, washed for a further fifteen seconds, and dried in less than a minute. After a total period of under two minutes, it then passes immediately into the projector and, after leaving the sound gate, is taken up on the pick-up spool.

The method has one disadvantage, namely, that the cost of film is rather high. This is, of course, saved in the continuous loop process. On the other hand, better quality is obtained and the event, having been televised, and reproduced, is in a recorded form, and the spool can be removed, re-wound, and projected on any subsequent occasion.

For instance, if the Derby were televised in this way and thrown on to the screen at 3 p.m., the same film could be used again at 4 p.m., 5 p.m. and 6 p.m. on the same day, until replaced by the standard news reels.

A Third System

Before considering the commercial possibilities of this system, I want to refer to a third method, which is now in process of development, called the projection tube.

This is none other than a special form of cathode-ray tube having an intensely brilliant picture, something between 3 in. and 6 in. square, so bright and well defined, in fact, that it can be projected by means of a

lens on to a screen with good brilliance and detail.

At the present moment, only small screens about 3 ft. or 4 ft. square can be filled in this manner. A brighter picture can be obtained on the tube, but there is then so much power put into the screen that it disintegrates.

In any case, a voltage of up to 10,000 volts is necessary to produce enough brilliance to be able to project pictures of the small size mentioned, but it is a form of development which the cinema industry must certainly keep an eye on, because when it does become practicable, as it will do in the course of the next five years, it will possibly do away with the standard projector mechanism itself.

Radio and Cable Channels

The projectionist will become the electron engineer, and, instead of cleaning his gate and spooling his films, he will be adjusting his voltages and watching his modulation metres. In this case, of course, the television is instantaneous. There is no delay whatsoever, but, on the other hand, no record whatever is made of any event which passes over its screen.

Its application can well be compared with the effect of broadcasting where,

LINKING UP THE CINEMAS

cinemas will be linked up with the source of programmes. There are possible radio links and cable links. It seems clear that the first cinemas to receive their programmes by means of television will do so by radio links, from large high power central transmitting apparatus on ultra-short wavelengths sending out signals which cannot be resolved by any home receiver, and which will therefore be secret, picked up by radio receiver and projected on a screen.

Later on a big central radio transmitter may quite easily, with the future development of the concentric cable, be replaced by a central distributing exchange point, say, in the centre of London, and the same method will also be of use in connecting up a distant programme item with the central distributing radio transmitter or the central programme distributing exchange.

In this latter case, however, it is possible that micro waves, with wavelengths of the order of one metre or

were asked how, at the present moment, a picture of the Boat Race or of an Albert Hall Boxing Contest, could be relayed to cinemas in London, I would say that it could be done by the following method.

An outdoor scanner, of the intermediate film or electron camera type, preferably the latter, could be installed in an aeroplane for picking up the Boat Race, or in the Albert Hall for scanning the fight. The signals developed would modulate a low-power microwave radio transmitter, which would shoot the vision signals straight at the Crystal Palace, to be picked up there and relayed from the high power ultra-short-wave transmitter to the whole of the London area. This would then be picked up by radio receivers in cinemas and projected by the intermediate projection process on to the full-size screen.

Competent Staff Required

Now, there are certain qualifying points which I must mention. First of all, the apparatus, although it works admirably well, is still in an experimental stage.

Secondly, no official permission has yet been given for a service of this nature to be instituted.

Thirdly, it will need a highly trained and competent staff to look after all the apparatus. No more competent, however, than that necessary for sound recording on film in its early stages and before it became a matter of rule of thumb.

You would not like me to finish without referring to some of the commercial aspects of television and the cinema.

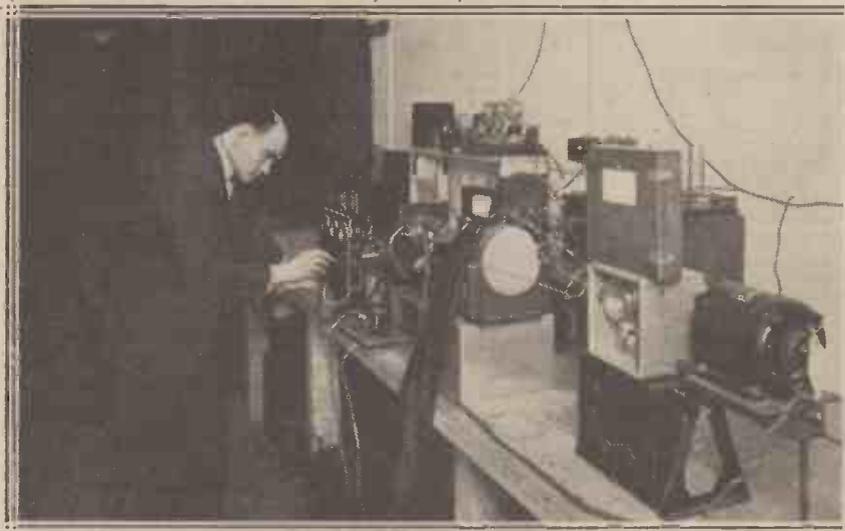
In Experimental Stage

First of all, I must emphasise again that the results which are obtained at present with this system are still in the experimental stage, but I wish to impress upon you that in my opinion all the fundamental problems have been solved and that it is only a matter of attention to detail to put the results of this work into commercial form to arrive at a satisfactory service, with full programme value.

The apparatus, photographs of which I have already shown to you, will not take up very much more room in the cinema than the ordinary projector, the same width and height but possibly another three or four feet more from back to front lens. It is, of course, very difficult to say at this stage what will be the cost of providing a television programme to cinemas and what will be the cost of expenditure in the

(Please turn to page 171.)

THE APPARATUS AT THE RECEIVING END



The televised scene is produced on the end of the cathode-ray tube shown in this illustration. It is then photographed on to film by a cinematograph camera.

like sound, it is transmitted once and for all, projected and sent out, and is never seen again, whereas the intermediate film can well be compared with sound recording, where events are shown and recorded and filed for future reference.

There is one important point, to which I have referred before, that is the answer to the question as to how

less, will also be used for relay purposes. A micro-wave transmitter can be built, which will operate over a distance of perhaps 10 or 20 miles on very low power on a highly directional basis, that is to say, transmitting its power in the form of a beam or searchlight from the outside point to the distributing centre.

To take a practical example. If I

There Are No LISTENERS In America!

Says John Watt to Alan Hunter

DON'T ask me how I enjoyed my holiday in the States," warned John Watt when at last I hailed him between shows at St. George's Hall. "Because, you see, it wasn't really a holiday at all. I went over there to take a look-see at American radio. And that meant keeping my nose pretty well to the grindstone—for radio's a big thing on the other side of the Herring Pond."

Switched On All Day!

I suggested that he was looking all "pepped up" as a result of his recent trip across the Atlantic, at which he mopped a furrowed brow. And then dazzled me with the famous John Watt smile.

"Well, I did three shows over there," he confessed. "The whole business is so different, all the same. The average American seems to switch on his set at about 9 a.m. and leave it switched on until midnight. I should say there are between twenty and thirty million sets installed in America. But there are no listeners—not real listeners!"

"Over here we have built up something like a real audience—a million or so people at least. These folk turn on their wireless sets because they want to listen. We have educated them to believe that B.B.C. programmes are worth the effort of listening. There's nothing comparable with that in America. There the radio—not the wireless, you note!—is just a background.

"A Kind of Monotony"

"Is that the only way American radio differs from ours? I should think not! Their basic standard of judgment is quite different.

"They are not primarily concerned with whether a programme is good broadcasting. With sponsors it is not enough that the programme should be good—it must be demonstrably popular, or have a high prestige value. Over here, of course, our only com-

mercial concern is whether the turn or programme is costing too much!

"Are they snappier? Yes, I suppose they are. But there's a kind of monotony you don't often see mentioned by people who are praising American programmes at our expense. I mean the monotony of the *shape* of their programmes. The commercial system forces the broadcasters to stick to an approved formula. Experiments are not too kindly looked upon—in case they fail to sell the toothpaste or cigarettes or whatever it is.

JOHN WATT



Famed for his "Songs from the Shows" and similar programmes, John Watt is one of the most energetic producers in the B.B.C.

"The sponsor pays for his comic turn, for example, and expects the same old sequence to be followed. The comic comes on the air with a few gags, cracks them and then goes off while a band plays a tune or two. Then he comes along with a few more gags, and so on.

"That's the general formula. The jokes may be different—or not. The tunes will certainly bear a strong similarity, for a reason I'll talk about in a moment.

"In this country only the Music Hall shows conform to a definite shape or pattern. All the other variety shows have something individual about them. In that way we certainly ring the changes better than the average sponsored show in the States.

Length of Programmes

"Of course we have our monotony, too. Our one-hour light orchestral programmes must seem monotonous to the American, because he is not used to such long stretches of broadcasting without gags or high lights.

"Their programmes are much shorter than ours? Well, everyone seems to think that a quarter of an hour is the limit on an American network. Actually, that is not true these days. They have more and more half-hour shows. And even some hour shows—like that sponsored by Ford, for example.

"Jazz mad? Certainly not! Their entertainment idiom is expressed much more often in dance tune tempo than not. You hear the same current dance numbers running right through the American programmes—in a way that we do not exploit over here. I should say that they use dance numbers in the same way we use light music numbers over here.

Prepared to Learn, But . . .

"Did I really learn anything from my visit? Well, that's a hard one! I may as well tell you that I went over there prepared to learn a lot—but I didn't find they had it to teach!

"I got into New York on a Saturday afternoon—and for the first forty minutes heard not a word of honest-to-goodness American. Plenty of Yiddish, Italian and German—but no American! Still, I did discover America in the end—by going to my bedroom and

listening to the radio from about 4 in the afternoon until midnight.

"My impression? One of intense amazement at the way programmes flipped from place to place without a break or an interval. I certainly missed the Bow Bells!

"The Americans have developed this programme change-over business to a fine art. I must say it is most impressive. And yet, as I later discovered when I put my own shows over, there is nothing particularly difficult about it.

How It Is Done

"How they work it is this. In the studio there is a clock with a large second hand, carefully watched by the control or monitor engineer from his silence cabinet adjoining the studio.

"As the second hand begins its slow sweep round for the last half minute—representing a 180 degree travel round the clock face—he begins to turn the knob of his fade 'pot'—also calibrated in 180 degrees.

"I NEARLY WENT MAD"

network or which programme one is about to crash into. By the time he has finished, the engineers have done their work—and the show goes on.

"From a production point of view the whole thing is perfectly simple. These large clocks with their continuously moving second hands give one a feeling of moving along with time—and it is perfectly easy, as I say, to synchronise the fade knob with the movement of the clock."

Those Long Intervals

All of which interested me strangely. Some time ago I made an investigation of the long delays in some of our programmes, discovering to my surprise that it was a programme timing fault, not an engineering hold-up. The Control Room at Broadcasting House as good as admitted that they could

As far as I can see it simply needs someone in high authority to pass along the word—and all those annoying intervals in the programmes would disappear overnight. John Watt bears out a contention I have long held. Cut the intervals and make things snappier!

American "Continuity" Features

But I hadn't done with the good John—even if, obviously, he had very nearly done with me.

"Humour? No, they don't exploit straightforward humour any better than we can. They seem to concentrate on witty commentaries of current affairs—giving them a humorous slant, so to speak.

"Amos 'n' Andy are the most famous exponents of this kind of thing. They come on the air every night. There are other 'continuity' features of a similar kind. They all work on the idea that characters can be built up and sustained over a series of broadcasts. It is the exploitation of human interest rather than humour, this.

"Supposing all our producers were sent over to the States for an educational period?" I suggested. "I shouldn't suppose anything of the sort," replied John. "Why not? Because they'd all go mad—I nearly did myself!"

"Yes, I did a certain amount of listening to Empire programmes—which certainly come in very well over in the States. All-wave sets seem to have caught on there, and many listeners tune in the European programmes on short waves as a change from their own stuff.

Our Methods Best

"Plenty of folk are saying out there that our system of broadcasting is better than their commercialised idea. It is significant, I think, that one hears a good deal more emphasis thrown on to the occasional broadcast of a symphony orchestra than on the unending supply of light entertainment."

So John comes back to St. George's Hall convinced that all's for the best in the best of possible worlds. That our system is the right way for us. And the American system probably right for the States.

I left John clearing up to go away for a real holiday—climbing and swimming and all that in the Bavarian Alps. When he gets back he will get down to some more "Songs from the Shows"—as well as plenty of other shows all for our delight.

GETTING READY FOR THE SHOW



A B.B.C. musical comedy being rehearsed in St. George's Hall. This building has now been taken over on a long lease by the B.B.C. and is undergoing alterations to permit of built-in microphones and other improvements.

"The result is that the programme fades dead on the stroke of the hour or half-hour or quarter—and the line engineers have precisely 17 seconds given them to switch over—possibly in a coast-to-coast hook-up extending over thousands of miles.

"While this is going on the local announcer is stating in brief terms which station one is tuned to and which

speed things up if necessary—but what was the hurry?

There is nothing to prevent us installing suitable clocks and fade knobs in our studios. Further, the task is much simpler than it is in America. Our "S.B." land-line system is obviously much more self-contained than the vast trans-Continental networks over there.

TELEVISION FOR THE CINEMA

—continued from page 168.

rental or purchase of such apparatus, neither can I give you any comparison with present news-reel costs.

Neither can I say definitely that television will be applied only to the field now covered by news reels. With an entirely new science, new technique, art and presentation follow. To come back to more practical points I have to say that good television pictures in one form or another will be shown in London cinemas before the end of the year. They will show results of fair entertainment value and should attract the public from this point of view rather than from the point of view of novelty, or from the fact that television is a matter of the moment.

In a Few Years

I think I am right in saying that within two years from now several London cinemas will be taking regular television items in their programmes. Perhaps within three to four years from now provincial cinemas will have

NEXT MONTH

DON'T MISS THE

"EASY-BUILD" THREE

a set that is

CHEAP ENOUGH FOR ALL

and is so simple that

ANYONE CAN MAKE IT

Full details in the October Number
of

"Wireless and Television Review"

their own distribution stations to cover local areas only. But it will take many years before every cinema in the country is equipped to give full screen television of programme value. This will depend entirely on the technical progress which is made with regard to cable and radio relay links.

In the meantime television for radio broadcasting will have gone ahead very rapidly. Will it have any effect on the cinema box office? In my opinion it will have no effect at all. There are two main reasons for this, one is that television broadcasting programmes will have presumably the same limitation in conception as the present sound broadcast programmes. The cinema will, however, continue to give the public what it wants. It

must do that, otherwise box office receipts will go down and the cinema trade will cease to exist.

Unconscious Attraction

Secondly, I am convinced that even if programmes for the home were made really attractive the average member of a family will still want to go out to his local cinema or theatre, and laugh and cry and enjoy himself in common with many hundreds of others. One cannot get away from the fact of the influence of mass psychology and its unconscious attraction.

Summing up, I venture to say as follows: Television broadcasting for

the home is here now and will soon be seen in a large number of homes throughout the country.

Television for the cinema is in an experimental form now, but it is gradually developing to become a feature in the programme presentation.

The cinema need have no fear of television in the home as regards reducing box office receipts. Television will result eventually in new technique in presentation which will gradually develop in its own style and in the form most suitable to it.

Note: The foregoing article by Captain A. G. D. West was taken from the special lecture given recently by the author before the Conference of the Cinematograph Exhibitors' Association.

AN ACHIEVEMENT

TO BE PROUD OF
says "Wireless"



Type 36S

Read this extract from the Exhibition Number of "Wireless":—

"We consider the advent of this new range to be of such importance to constructors that no review would be complete without a reference to this remarkable speaker development."

When you hear a 1936 Stentorian you will realise that this striking tribute is indeed well merited; for never before has such a high "laboratory" standard of reproduction been available to the public at popular prices.

New production methods make possible a vastly improved performance at no price increase. New designs of magnet and component parts bring an order of efficiency hitherto beyond the bounds of possibility. Hear the 1936 Stentorian to-day! Listen to the enormous volume from weak inputs. Notice the marvellous definition, incisive top notes, and magnificent natural bass. You will find it hard to believe that prices remain at the same level as last year!

In this startling new range of instruments, W.B. engineers again give triumphant proof of the value of consistent and intensive research.

Prices

Senior Chassis	..42/-
Junior	..32/6
Baby	..23/6
Midget	..17/6
Stentorian	
Duplex	..84/-
Type EM/W	..70/-

1936



STENTORIAN

Whiteley Electrical Radio Co., Ltd., Radio Works, Mansfield, Notts. (Electrical Dept.)

Sole Agents in I.F.S.: Kelly & Shiel, Ltd., 47, Fleet Street, Dublin.

IS FOREIGN - RECEPTION ENTERTAINMENT?

—continued from page 136.

or more, and receivers building up to a loudspeaker power of 3 watts or more, the selection of daylight range foreigners is very limited. Those that do come in—down here, for instance—are, of course, quite free from fading.

Cologne, Brussels, Poste Parisien and Fécamp are daylight signals of great merit—but not necessarily so good at night, when the layers begin their fun and games. London Regional is not a very strong signal in the daytime, while the London National is pitiable.

Alternatives to B.B.C.

I have not mentioned the long waves, which provide day and night-time source of programmes of real entertainment value to the countryman. Droitwich gives us our only reliable National signal. Kootwijk, Radio Paris and Luxembourg always come in well.

These are odd examples, not too significant because they affect, perhaps, only a minority of listeners. I quote

them merely to show that, without thinking or checking up, here are some stations as engrained upon my listening consciousness as the locals and the short wavers are upon Mr. Kelsey's.

But there is a larger issue at stake—the issue of the method of listening. For my part, I treat my wireless reception in two distinct ways. I make a date with the set for special broadcasts or talks or plays or musical items I am interested in. Or, more usually, I simply switch on, twiddle the tuning knob until I come upon something tuneful—and leave that to provide my background until such time as the blather of an unknown foreign tongue drives me to seek pastures new.

I do not wish to make out a wonderful case for the foreigners. All I say is that, time after time, one or other of the foreigners does provide me with tuneful music at periods when nothing of the kind can be extracted from the home programmes.

Very often when some elaborate show is being put over by the B.B.C. in a vain attempt to compete with the legitimate stage, music-hall or concert-hall, I turn with a sigh of relief to the relative simplicity of Hilversum's musical entertainment, or a German station's lilting melodies.

Am I obsessed with the awful

variability of such stations? In truth, no. My automatic volume control helps to hide the modest fades. And when a particularly horrid moment of distortion blurs the programme I cannot grumble—because my home station does much the same thing.

I have long since lost any thrill in saying to myself, "How wonderful this is—music coming from 800 miles away." We all talked like that at the beginning.

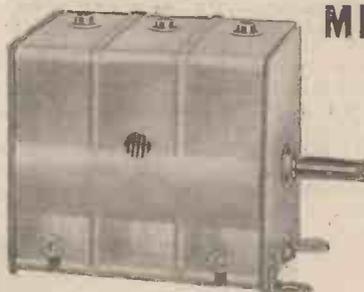
A Question of Music

Now, as I say, it is merely a question of getting on to some reasonably tuneful music—and hanging where it actually comes from. I feel no "latent desire" to conquer other territories, and in that, possibly, I differ fundamentally from the short-wave fan.

But then so do thousands of "B.C.L.'s." who nightly find amusement in prosaic reception of medium-wave foreigners. I am perfectly sure that no one—after the first fine careless rapture has gone—would willingly stay put on a foreigner just because it was a foreigner. No, only because it so happened that that foreigner was giving them something they could not get from perhaps a more reliable local source.

POLAR Specified for the

4 VALVE SUPER MIDGET 3-GANG
(Super-hot)



One-piece steel frame, aluminium vanes. Ball-bearing shaft. Sections matched within 2 per cent. or 1 unit, whichever is the greater. Trimmers operated from top. Small overall dimensions.

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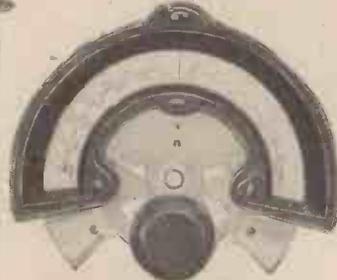
With the recent introduction of the 4-gang types, the range is now complete and comprises the following:

Two-Gang	11/-
Three-Gang	16/6
Four-Gang	22/-
Four-Gang Super-hot	22/-

SEMI-CIRCULAR DRIVE

Slow motion Bevelled scale in wavelengths. Moulded Esentecon. Lamp holders provided. **5/9**

Other Suitable Polar Drives
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The choice of experts. This Nicore H.F. Choke shown here has been chosen by the designers of the "Four-Valve Super." When you build this unique set you will rely on the efficiency of this Choke and will not be disappointed. The list number is BP26 and the price 4/6. A postcard to Woolwich will bring you our new illustrated Catalogue, which describes our complete range of radio components.

Varley

Oliver Pell Control, Ltd., Bloomfield Road, Woolwich, S.E.18.
Telephone: Woolwich 2345.

QUESTIONS I AM ASKED

—continued from page 152.

grid voltage into the dangerous lower bend region, where distortion will arise. It will be noticeable in the loudspeaker but far more easily traced by including a milliammeter in the anode circuit of the output valve. When extra loud passages of music are received the needle of the milliammeter will kick forward to higher current readings, due to the rectification at the lower bend. Small kicks can be ignored, but violent ones indicate definite distortion.

Insufficient Negative Bias

Another effect will be obtained if the negative bias is insufficient; this time the positive half-cycles will—on a very strong signal—exceed the negative bias and the grid will become momentarily positive. This will set up a grid current and the full positive half-cycle will not be properly developed on the grid. This effect is traceable by the use of a microammeter of suitable range in the grid circuit. Normally, when no signals or medium strength signals are being applied to the grid of the output valve, the microammeter will show no reading. When overloading occurs, due to the signal causing the grid to become positive, the microammeter at once shows a reading indicating a grid current which, no doubt, will cause distortion. By using two current meters, one in the grid and the other in the anode circuit, it is possible to see at once when overloading occurs. Usually it happens at a signal level much below that at which it becomes obvious to the ear.

Similar distortion may occur at the 1st L.F. valve, when such a valve is used. The tests are the same.

FROM MY ARMCHAIR

—continued from page 164.

Since then, I have always had complete charge of a department or of a company or been completely independent. I have been able to write as I like with no consequences to consider. The chief disadvantage of much writing is that one is apt to be considered a writer! I attach so little importance to writing that I have never regarded it as anything but a by-product (albeit a remunerative one) of practical work or a relaxation from legal and patent study.

Our West Country doctor writes: *Eddy currents are what swirl about small boys after currant cake and a dose of castor oil—I can prove this.*

A. E. I., of Brewery Buildings (what a gorgeous address!), Cainscross, Stroud, Glos., would like a visit but asks nervously: "Does it entail any obligation financially?"

I should be glad to pay to come. But we might get twice as many stations as in the Lucerne Plan.

The charge for visiting Chorltoncum-Hardy would be 50 guineas per aerial.

In between spurts of deciding what to do about Abyssinia, I am completing

my big set of the year. Which means, of course, that while you are revelling in the glorious sunshine, I am imprisoned in a laboratory.

Vast Amount of Work

I suppose that no one would need a dozen guesses before arriving at the magic figure 700, and believe me, there are many times seven hundred circuits leading up to this latest set. It is going to create a bigger sensation than any of its predecessors, if I am any judge.

A vast amount of laboratory measurement work has been necessary—far more than with any previous

(Continued on next page.)



**PIFCO
TEST INSTRUMENTS
ENSURE
100% EFFICIENCY
FROM RADIO**

Buy to-day one 42/- Pifco Rotameter-de-Luxe (Moving-coil) or one 29/6 Rotameter (Moving-iron) and you will receive a complete set of 3 Pifco Valve Adaptors costing 15/-, in velvet-lined case for 7/6.

Either of these indispensable instruments together with a set of Valve Adaptors will form a complete test set which will ensure 100% efficiency from your radio set at all times.



**PIFCO
VALVE ADAPTORS**

Each adaptor has a 5-pin base with top sockets for "plug-in" testing of 5, 7 or 9-pin valves under working conditions without alteration to set wiring. Four nickel-plated terminals complete with strapping links are fitted, to connect meter in either grid or anode circuit of valve.

Ask your dealer to-day to show you Rotameters and Adaptors, or write for Pifco Testmeter Folder, post free, from PIFCO LTD., SHUDEHILL, MANCHESTER, or 150, Charing Cross Road, London, W.C.2.



ROTAMETER-DE-LUXE
(9 Ranges including valve test)

Every conceivable test, including valves, can be made with this amazing instrument (400 volts—500 ohms per volt). Finished in black bakelite, complete with leads and fitted in handsome velvet-lined case. Price 42/-.

ROTAMETER
(9 Ranges including valve test)

Eight separate dials and valve test available at the turn of a knob. Size of each dial 1 1/2 ins. by 1/2 in. Finished in black bakelite, complete with leads. Price 29/6.



ROTAMETERS and RADIOMETERS
PIFCO ON THE SPOT WILL TRACE YOUR TROUBLES LIKE A SHOT

FROM MY ARMCHAIR

—continued from previous page.

set—the reason being that entirely novel principles are being applied for the first time, and the results have been so—what's another word for that overworked and wilted "amazing"? —that I have wanted to be certain that the performance is easily obtained under all sort of conditions.

The circuit itself is fascinating in the extreme, and those who expect something really new and exciting in my chief annual set, are going to have something to make their tongues loll out. There are also other interesting features which will whet the appetites of even the most blasé constructors.

Still Very Much Alive

Once again we shall prove that there is still rich red blood flowing in the veins of the amateur movement. The days of indiscriminate building are over, it is true. Once upon a time, there were hundreds—perhaps thousands—ready to build each and every design published. Merit did not matter. Who was to decide which was the most meritorious? The periodicals themselves did not seem to know, for masterpiece followed on the heel of masterpiece, and a new epoch-maker was born in the dust left by its recent predecessor.

Bad old days. Self-righteously I declare I had no hand in it. For years the public knew me not. For years I had just disappeared and was unheard of by the general public—unless I was wrecked in my aeroplane in the Channel. I became severely professional, and the limelights of publicity were dimmed. But I was lured from the plough by very large offers of gold, and promised great freedom of expression.

Fewer and Better

Freedom and high reward—who would refuse? In the autumn of 1931 I realised that home-construction was at the cross-roads, and with the S.T.300 I initiated the fewer-and-better sets policy. It certainly gave new life to the constructor movement. I have been criticised for "cornering" the set-construction field, and creating a monopoly. If, in fact, anything like this has occurred it is more a compliment than a criticism. Believe me, I am always very much on my toes. I have seen many a designer eclipsed and I never risk resting on my laurels. The S.T.700 is being

evolved with desperate efforts to produce a set of overpowering performance and appeal. I have no hesitation in recommending you to build what will be my best set of 1935-36.

* * *

I see an enterprising inventor has taken out a patent for a gramophone record made of chocolate. The idea is that if you weary of a particular tune you just eat the record. The scheme, of course, is not new. I once met an inventor who had a set with valves made of marzipan. He started experimenting with a 10-marzipan-valve circuit, working night and day. As he grew hungry he would eat the output valve and this resulted in a rapid diminution of signal strength.

Fortunately, this was compensated for by the extreme ingenuity of the inventor, so that as the number of valves was reduced the improved efficiency made up for the expected loss of signal strength. He claims that most modern developments derive from his enforced inventiveness.

When I visited him in his laboratory, there was only one marzipan valve left, and he claimed that, thanks to his circuit-mongering, just as good results were obtainable as with ten of the valves. In a careless moment I ate the sole remaining valve. Signals remained as good as ever.

J. S.-T.

B.B.C. NEWS

—continued from page 143.

Company, departs this month to take up his duties. He has been for the past six or seven years one of the most valuable members of the Talks Staff of the B.B.C. He plans to take with him to India a small nucleus of B.B.C. officials.

His Director of Programmes is likely to be Mr. R. A. Rendall, who is now in charge of programmes for the West Country at Bristol. Mr. Rendall is the nephew of Dr. Montague Rendall, formerly Governor of the B.B.C.

Children's Hour to Tour

I heard the other day of an interesting suggestion that the London Children's Hour should make itself better known to the public, and in particular to its most devoted listeners by touring the children's wards of hospitals. Already it has visited the Great Ormond Street Hospital with success. The idea is likely to be adopted.

A FOUR-VALVE BATTERY SUPER WITH A.V.C.

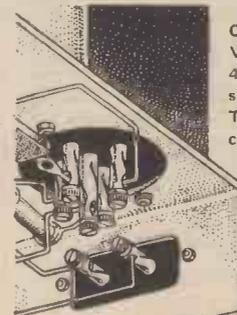
—continued from page 148

times when the local transmission—if one resides only a short distance away from a powerful B.B.C. Regional—tends to become overpowering.

In cases of local station overloading, it is quite easy to rig up a local distance switch, consisting of 100 ohms resistance and an ordinary on-off switch.

All that has to be done is to join one side of the switch to the aerial terminal, and the other side of the switch to one side of the 100-ohms resistance. Then connect the remaining side of the 100-ohms resistance to the earth terminal. When the switch is in the "on" position, the resistance will be connected across the aerial and earth and will reduce the volume of the local station sufficiently to prevent overloading. For the reception of all other transmission the switch should be "off," so that the resistance is not in circuit.

EASY WIRING



Clix Chassis Mounting Valveholders of the 4, 5, 7 or 9-pin type are supplied with either Terminal or Soldered connections.

The cheese head contact screws, having the same external diameter as the sockets, make for neatness and ease of wiring.



The centre socket of the 5-pin and two sockets of the 7-pin type are made longer than the others: this reduces the possibility of short-circuits and adds to the ease of wiring.

- 4-pin - 8d.
- 5-pin - 9d.
- 7-pin - 1/-
- 9-pin - 1/3

CLIX

Specified for the "FOUR VALVE SUPER"

Illustrated Folder "C" Free on request.

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CABINETS. Write for Free List
GILBERT (cabinet maker), SWINDON.

A LOUDSPEAKER DEVELOPMENT

Results of our tests of the new Stentorian Senior.

SENSITIVITY has always been one of the outstanding features of W.B. speakers, and the new ones are more sensitive than ever.

This year larger and stronger magnets have been fitted and, in addition, a new type of baked speech coil former is employed. This provides improved centring, besides giving greater rigidity and lightness to the coil.

Since the details of the firm's range were published in our last issue, we have had the opportunity of trying out the new Stentorian Senior model 36S. This is a permanent-magnet instrument, and incorporates the "Microlode" system of matching up to any type of output circuit.

The Two Switches

On the back of the chassis there are two switches. One of them controls the matching, while the other one is for high or low resistance extension work. Terminals are provided so that the speaker can be employed in conjunction with power or pentode outputs, as well as push-pull, Q.P.P. or Class B. Two further terminals are provided for connecting up to a volume control.

A useful innovation is the provision of information—actually on the chassis—for connecting up the speaker as an extension with most of the well-known commercial sets. Incidentally, the cone itself is of hand-made paper, and the makers state that this improves attack and eliminates frequency doubling.

"Very Sensitive Indeed"

On test, we found the instrument to be a very fine example of loud-speaker design. It is very sensitive indeed, and the reproduction is excellent.

Given a good undistorted input and the correct setting of the input transformer switch-arm, the high and low notes are brought out with remarkable clearness and fidelity. It is suitable for use with every class of set, big or small, and is a speaker that we have no hesitation in recommending.

The price of the model 36S is two guineas. The results of our tests of the other models will be given in an early issue.

"WIRED" TELEVISION

—continued from page 162.

A special type of high-frequency conductor has recently been developed for this kind of work. It consists essentially of an outer conducting tube and a central wire core, arranged so that the high-frequency currents travel along the space formed between the inner surface of the tube and the outer surface of the centre wire.

The signal currents travel by skin effect, i.e., they are confined to the surface of the metal, and do not penetrate through to the outer surface of the tube. The latter, therefore, acts as an effective protection against outside disturbances.

Figs. 1, 2 and 3 illustrate different constructions of modern high-frequency carrier-lines.

The cable shown in Fig. 1 is about half an inch in outside diameter, and is capable of transmitting a frequency band of one million cycles over a distance of about 10 miles. By inserting repeaters or amplifiers at this distance apart, the range of transmission can, of course, be extended almost indefinitely.

An Ingenious Design

The inner conductor A is a solid copper wire, which is insulated from the tubular conductor B by a spiral wrapping C of cotton string. The outer conductor B is a tube made of overlapping copper strips, held in place by a brass binding-tape D. An external sheath E, of lead, protects the line as a whole from moisture.

If the repeaters are inserted every 5 instead of every 10 miles, the line will transmit a frequency-band of four million cycles without appreciable loss. Alternatively, by doubling the diameter of the outer tube the frequency is squared.

Fig. 2 shows a modified form of transmission-line, in which the outer tube A is spaced apart from the centre core B by a series of hard rubber insulating washers C.

In Fig. 3 the outer copper tube A is $2\frac{1}{2}$ inches in diameter, and surrounds a small tube B which, in turn, contains the centre wire C. This arrangement provides two separate transmission lines, one between the outer and inner tubes A, B, and the other between the inner tube B and the wire core C. Spacing-discs or washers D E are inserted at intervals.

PETO-SCOTT

PILOT AUTHOR KITS for sets featured in "Wireless" and all other Technical Journals are only obtainable direct from Peto-Scott. We can supply any Kit described in this Journal during the past 3 years. SEND FOR DETAILED PRICED LISTS OF PARTS. PETO-SCOTT are again FIRST with EVERYTHING NEW, in Radio and Television, for Cash, C.O.D. or H.P. IMMEDIATE DELIVERY.

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DETAILED PRICED LISTS OF PARTS ON REQUEST. Any item supplied separately. Orders over 10/- sent C.O.D.—Carriage and post free.

4v. SUPER WITH A.V.C. KIT "A" Cash or C.O.D. £7:11:6
Carriage Paid

Author's kit of first specified parts, including Peto-Scott ready-drilled Chassis and ebonite terminal strips, less valves. Yours For **14/-** and 11 monthly payments of 14/-

1 Peto-Scott Ready-Drilled Metaplex Chassis	4 0
1 Polar Midget 3-gang Condenser, with drive	1 2 3
1 Set of 3 Colvern Coils	1 10 0
2 Colvern I.F. Transformers	5 0
1 Set of 4 Specified Valves	2 19 0

S.T.600 BATTERY RADIOGRAM KIT "A"

CASH OR C.O.D. £5:11:6
Carriage Paid

Comprises all components as first specified by Mr. J. Scott-Taggart, including Peto-Scott Structakit, less Valves, Cabinet, Needle, Cups, Gramo Motor, Pick-up and Speaker. OR YOURS FOR **10/-** and 11 monthly payments of 10/3.

S.T.600 RADIOGRAM CABINET

Exclusively Specified by Mr. John Scott-Taggart, this exquisite Peto-Scott cabinet has a modern two-tone finish with inlaid walnut veneer panels. Cash or C.O.D. Carriage Paid £3/3/0. (Carriage and Packing 2/6 extra. Speaker Baffle assembly, 3/6 extra.) Yours For **7/6**

and 11 monthly payments of 6/3. (including carriage and speaker baffle assembly.)

KIT-BITS

You pay the Postman. We pay post charges on all orders over 10/- Gt. Britain Only.

1 Garrard No. 20 Motor with 7" handle	17 0
1 Rothermel-Brush Piezo-Electric Pick-up	2 2 0
1 Rola F624 P.M.O. Speaker	1 17 6
1 Set of 4 Specified Valves	2 4 6

1936 Peto-Scott ELIMINATORS 1936

Model A.C.12. For A.C. mains, 200/250 volts, output 120 volts at 12 m/a. Four taps—40v., 60v., 90v. and 120v. Cash or C.O.D. Carriage Paid, £1 10/0 or 2/6 down and 10 monthly payments of 3/-.

2/6 DOWN



Model D.C.1. Cash or C.O.D. Carriage Paid £1 7/6, or 2/6 down and 11 monthly payments of 2/6. Model A.C.25. Cash or C.O.D. Carriage Paid £2/9/6, or 5/- down and 10 monthly payments of 5/-. Model M.A.10/30 with Frickle Charger. Cash or C.O.D. Carriage Paid £2/19/6, or 5/- down and 11 monthly payments of 5/6.

Peto-Scott 1936 PERMANENT MAGNET MOVING COIL SPEAKERS HIGH FIDELITY REPRODUCTION.



Type New Baby for Power or Pentode. Complete with input transformer. Send 2/6 with order. Balance in 6 monthly payments of 2/6. Cash or C.O.D. Carriage Paid, 15/6.

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S.1 Chassis for Power or Pentode. Cash or C.O.D. Carriage Paid, 19/6, or 2/6 down and 8 monthly payments of 2/6. S.3 Chassis de Luxe for Power, Pentode or Class B. Cash or C.O.D. Carriage Paid, 32/6, or 2/6 down and 11 monthly payments of 3/-.

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**THE S.T.600
BATTERY RADIOGRAM**

—continued from page 138.

the operation of the other controls. The aerial reaction knob (at the bottom left-hand corner) should be at zero—i.e. fully anticlockwise (to the left).

The greatest fault in tuning wireless sets is to have the signal too loud before applying reaction. The result is that poor selectivity and distortion are needlessly experienced. Even with full reaction, with the set on the point of oscillating, signal strength should be just below the maximum possible.

Of course, when the signal is very strong and reaction is not necessary, the only limit is that where distortion commences. But when receiving foreign stations of average strength, reaction is desirable—if only to give the required selectivity; it is then that it is wisest to keep the normal signal weak and bring it up to good loudspeaker strength with reaction.

Extremely Effective

Aerial reaction on the S.T.600 is extremely effective, and it works more smoothly even than the anode reaction. When first testing it out, leave the anode reaction at zero (full left). You will find you can get all the usual reaction effects perfectly with aerial reaction. A slight readjustment of the front concentric trimmer will help. The previous rule applies: Do not apply reaction to signals that are already strong; cut them down with the aerial coupler.

It is very important to know that aerial reaction comes from the screen-grid circuit of the first variable-mu pentode. If, therefore, the volume control is cut down too much, there will be so much negative bias on the control grid of this valve that there will be insufficient reaction current flowing in the screen-grid circuit, which is robbed of its H.T. current. In practice, this simply means that you cannot get aerial reaction unless you

have the volume control turned up (to the right) enough.

Having noticed the aerial reaction effect you can try combinations of aerial reaction and anode reaction. At first try just a little anode reaction and a little aerial reaction. Then adjust either to give "critical reaction" effects. Once more let me remind constructors that signals should be really weak before applying the two reactions. As the volume control may require to be turned up to permit aerial reaction, signals can best be weakened by reducing the aerial coupler—i.e. turning it to the left.

As regards the trimming of the gang condenser, this is extremely simple as we do not rely on trimming in the ordinary sense, since the operator can adjust the front trimmer at any time. All you need do is to set the front trimmer about half-way, leaving the aerial coupler turned about one-third way from zero (full left) to the right.

You now choose some fairly weak station about half-way along the dial of the medium waves and try progressively different adjustments of the rear trimmer on the gang condenser. At a certain position of this trimmer loudest signals will be obtained when the main condenser knob is moved. Likewise, signals should weaken if you adjust the front trimmer to either side of its half-way position.

You may find that at the extreme bottom of the medium waves, the aerial coupler will affect wavelength to

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a small extent and it may be necessary to keep the aerial coupler at a low value (nearly full left) when receiving such stations; otherwise the front tuning may just fail to give a sharp tuning point.

With the above hints on tuning, every constructor after an evening or two should become expert and bring in the hundred stations which this superlatively sensitive set is frequently capable of receiving.

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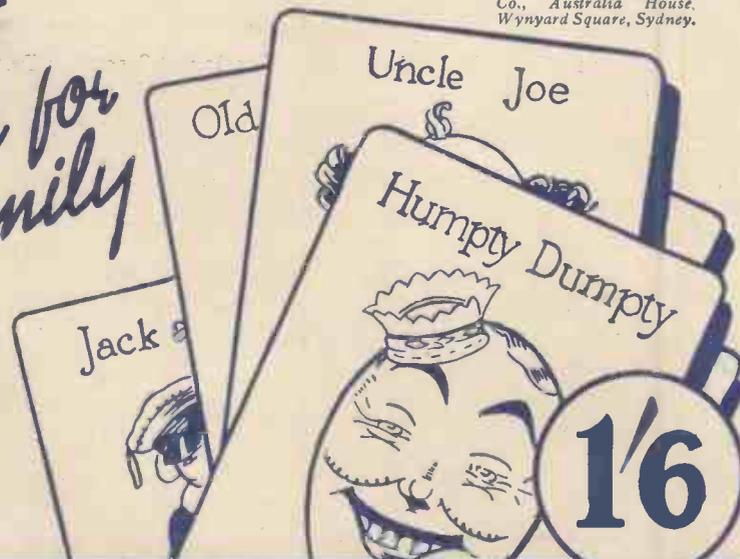
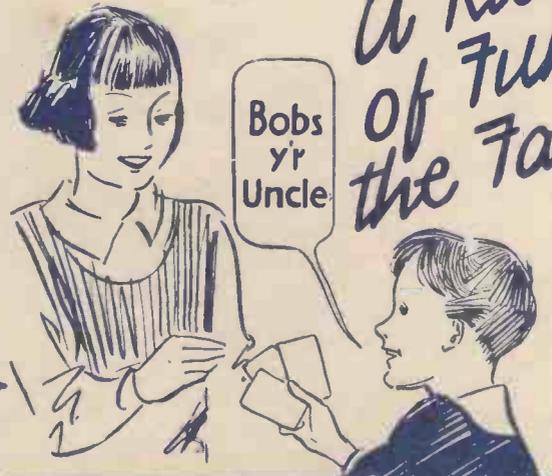
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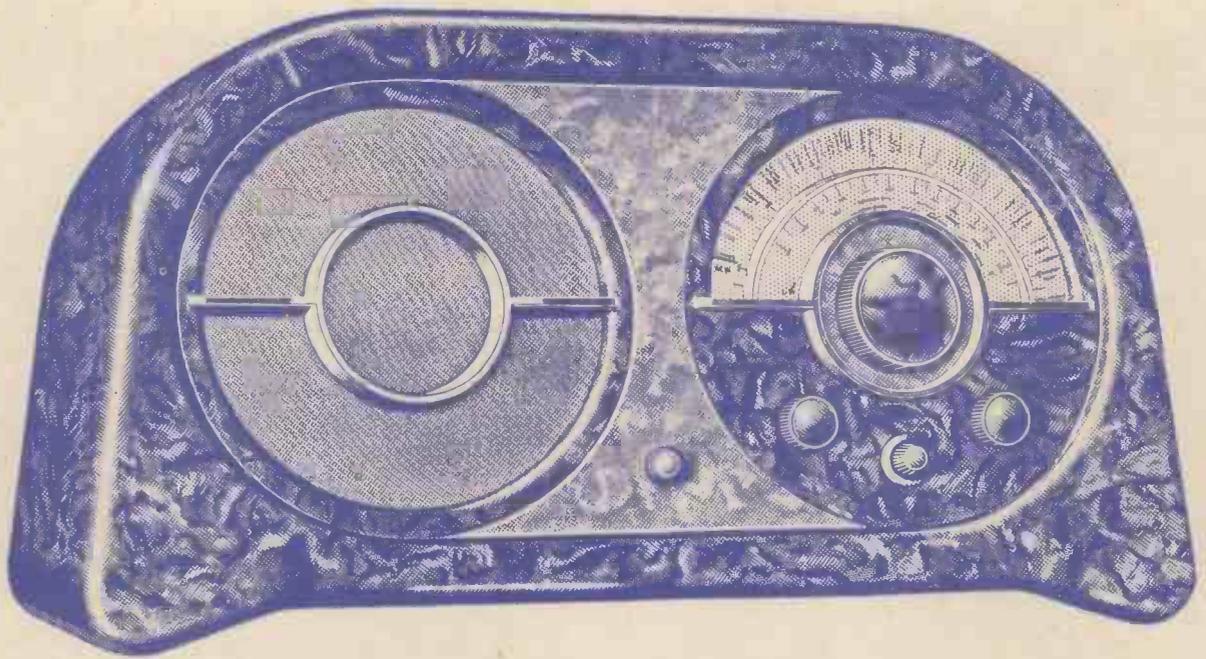
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