

THE COMING OF THE TETRODE (See Page 525)

Popular Wireless

Every Thursday

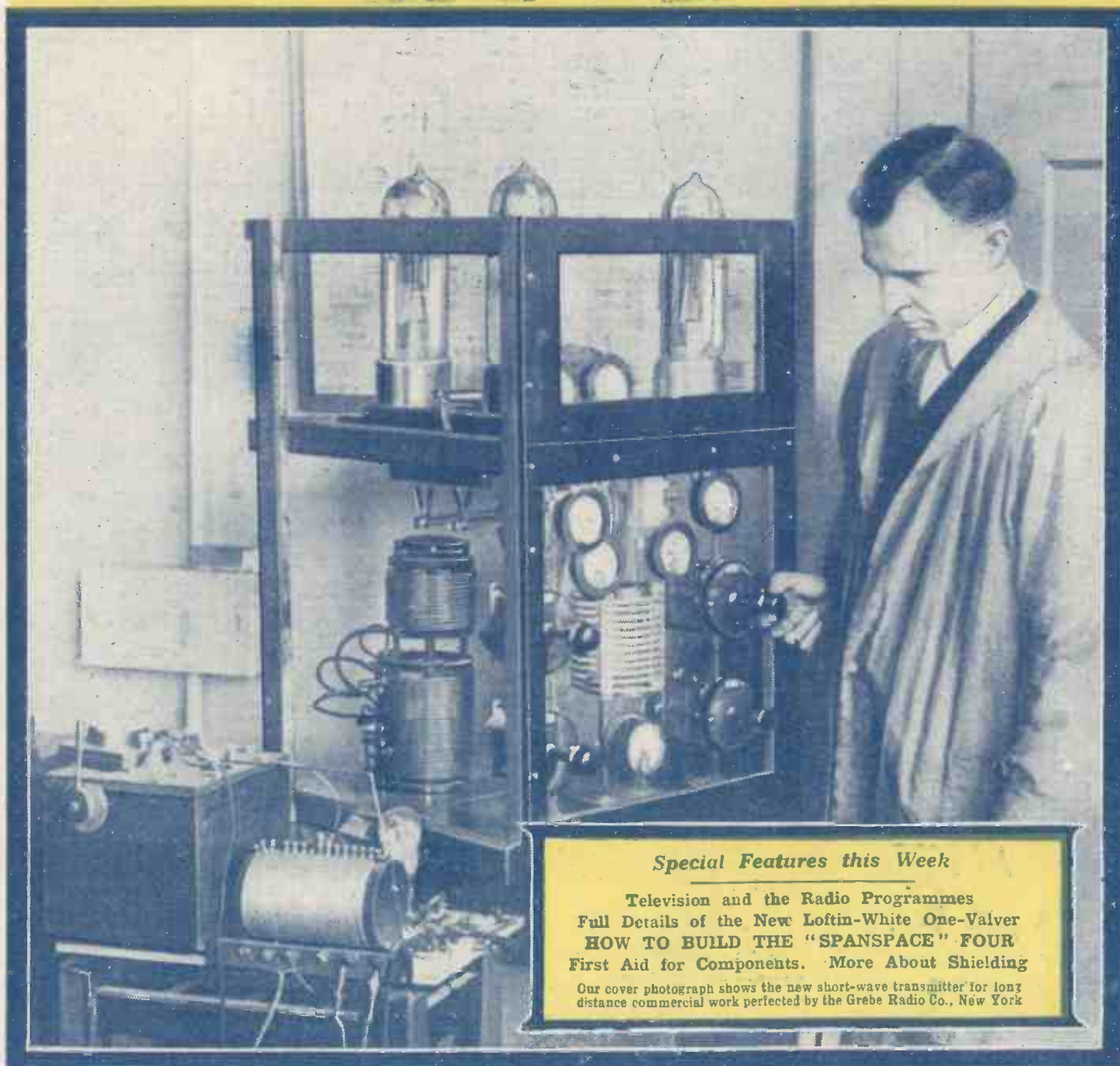
PRICE

3d.

No. 260. Vol. XI.

INCORPORATING "WIRELESS"

May 28th, 1927.



Special Features this Week

Television and the Radio Programmes
 Full Details of the New Loftin-White One-Valver
HOW TO BUILD THE "SPANSACE" FOUR
 First Aid for Components. More About Shielding

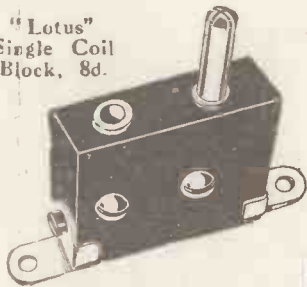
Our cover photograph shows the new short-wave transmitter for long distance commercial work perfected by the Grebe Radio Co., New York

LOTUS COMPONENTS PREFERRED

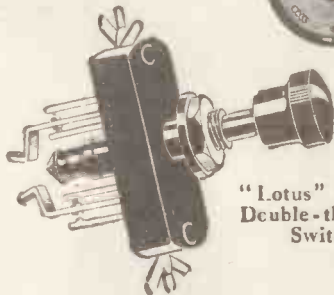


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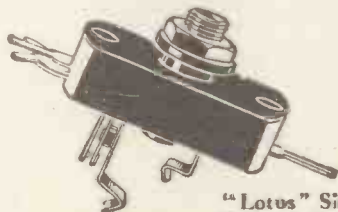
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"Lotus" Plug, 2/-



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"Radio for the Million" Circuits are prepared by technical experts and show great skill and care.

Only the best components are good enough, and that is why "Lotus" Valve Holders, Jacks, Switches and Plugs are used.

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Each musical instrument retains its characteristics, each voice its individuality. There is no unnatural accentuation of the treble, no deliberate emphasis of the bass, no artificial "sharpness" or "mellowness" in the new AMPLION CONE SPEAKER—just a faithful rendering of notes and tones.



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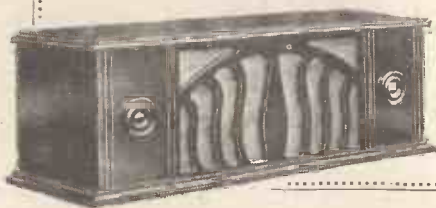
The
AMPLION
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has the following outstanding features:—

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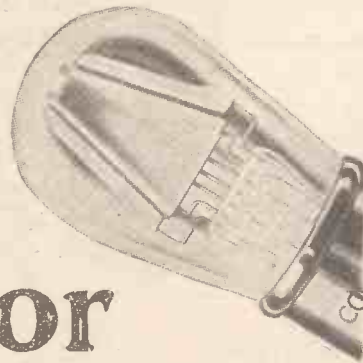


Cossor

—the really strong Valve
essential for all Portable Receivers

IF you own a portable Wireless Set you need robust valves. The ordinary valve with its delicate gossamer-like filament is much too fragile to resist hard knocks. An accidental blow and its life is ended. But fortunately for those who enjoy their Radio music in the open air Cossor has invented a filament which is practically unbreakable. The Cossor Kalenised filament is so tough that even after 12 Cossor Valves were hurled 600 feet from an aeroplane every filament was found to be intact. Such a dramatic test had never before been attempted in the history of Radio. It proves once and for all that the Cossor Kalenised filament is the strongest in the world. Remember this when you buy your next valves—whether you want them for a portable Set or not. After all, every man wants long service from his valves—and the Cossor user gets it every time.

Full range
for 2 volt
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Cossor

—the melody maker

Popular Wireless



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RADIO NOTES AND NEWS.

This Week's Bouquet—"P.W.'s" Transatlantic Flight—The Future—Crocodile Tears—Swimming de Luxe—Soviet Broadcasting.

This Week's Bouquet.

ALL this sorrowing over lost octets and fleeting fiddlers reminds me that I do not remember having heard any special praise for 2 L O's Wireless Orchestra, which scrapes and tootles as well as any of 'em, to my way of thinking. I consider them the backbone of 2 L O, and there are not many items I would exchange for a couple of hours of "light orchestral" from them. Those in favour—

Swimming De Luxe.

ON dit (as the "gossip" paragraphs say) that Herr Otto Kemmerich, a German swimmer, had a receiver fixed to his head and took a programme from the island of Sylt while swimming round it. Rather fantastic, and more like the trick of a Latin with a taste for "limelight!"

Don't Butt In.

I REGARD the ever-increasing activities of the B.B.C. with alarm, and now that it is a sort of cousin of the Post Office, another Jack of all Trades, I fear that the habit of straying from its *raison d'être* will develop into a vice. The B.B.C.'s job is to transmit, but, not content with publishing periodicals, canvassing schools and teaching us how to pronounce, it is now trying to show the public how to design receivers. I foresee danger to the radio "trade" in this.

"P.W.'s" Transatlantic Flight.

WHAT do you think of "P.W.'s" latest feat—Mr. P. W. Harris's, I mean? Quite the "P.W." touch! A record for wireless journalism in this country and a "scoop" for our readers. To go shouting across the Atlantic and bang into Washington to get what he wanted for some articles is fairly saucy, I think. Life is full of surprises, but the surprise the operator had when Mr. Harris tried to put twopence in the slot must have been unique.

The Future.

I DO not know whether the Loftin-White Circuit epic, as it is called in the office, will render us inordinately ambitious, for these high-stepping episodes have a very tonic effect, but I do not think it will be very long before anything particularly

important evolved in America is sent to "P.W." by facsimile telegraphy, circuit and all. Anyway, you would do well to watch us.

Soviet Broadcasting.

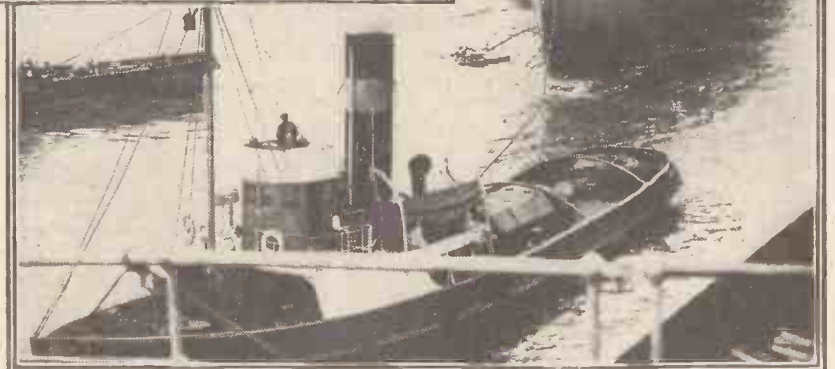
I HAVE been honoured with a copy of the "Soviet Union Monthly." An article therein states that in the Soviet Union broadcasting is principally used for educational purposes. Sounds awful, doesn't it? Here they squeeze the education in in sly bits; there it is spread on generously over the whole slice. No wonder the Soviet Government has to exert itself to "stimulate" an interest in wireless. I would

like to know what is the matter with the schools in Holy Russia, that broadcasting must pursue the unhappy peasant with "education."

Crocodile Tears.

S. B. B. (Chelmsford)—(Jove! what memories! I was quartered there early in the War, and died thrice of boredom. They say it's better now)—weeps, he says, tears as big as footballs when he reads of the DX reception exploits chronicled in these Notes. This man sports, I understand, a seven-valve super-het, and pretends that he cannot imitate the feats of some of my Valve Baronets. Hum! I smell sarcasm. Chelmsford is "Hoffman's, Crompton's and Marconi's." I am too busy for leg-pulling, my friend. Try again!

Incidentally, I don't publish
 (Continued on next page.)



The launching of a liner, a "running commentary" of which was recently broadcast. (Inset) Describing the scenes before the microphone.

NOTES AND NEWS.

(Continued from previous page.)

results unless I am fairly sure of their authenticity. I am the sceptic *par excellence*. Glad you like the Notes.

Interlude.

THIS week's libel is the story of the Scotsman who bought a valve, used it for three years and then took it back to the shop and said he had just learned that it contained a vacuum and he would like either a gas-filled valve in exchange, or his money back.

The Vacuumless Valve.

NOT long ago I commented upon the remarks of a north-country paper anent a certain valve said to have been invented by a Mr. Myers. It was the valve of our dreams—almost; no vacuum, and a replaceable filament. An acute observer of Hove has been good enough to send me a clipping of an article (dated July, 1925) describing this prodigious invention.

Not Yet!

NOTHING or little has been heard of this valve since. I do not wonder why. Given an open-air valve, what would happen inside? Would stability be possible? Speaking from experience of every general type of valve made since the original Fleming two-electrode, I think I would rather try to drive a Spanish mule and an angry chameleon in tandem than wangle such a tube.

Langenberg.

THE mystery of the varying strength observed in this station's signals is solved at last. A kindly reader draws my attention to the fact that, according to a contemporary, it transmits, "from 1.5 kv." The further from that, in arithmetical progression, the better.

Spain.

A FRIEND just returned from Spain tells me that radio there is as dead as a doornail. I don't wonder. As the source of revenue of the exploiting companies is that derived only from advertisements, the programmes are—what they are, and of course, the listeners are enthusiastic in direct proportion to the quality of the programmes. Bull-fights and the war in Morocco, and perhaps lotteries, are too strong in competition, I suppose.

A Long-Distance Toot.

AN American firm, having produced a new motor-horn and being desirous of letting their associates in this country hear how the brute sounded, gave a demonstration over the wireless telephone service, probably the first of its kind. But it is not the first time an American has blown his horn in England.

Wireless and Flying.

THE sad silence which is all the news the admiring world has received from the heroic Captain Nungesser and his colleague, M. Coli, since they set out from Le Bourget on their proposed flight to New York, demonstrates the unwisdom of scrapping the wireless transmitter on such

an enterprise. Commandante Franco, the Spaniard who last year flew from Spain to South America, is almost lyrical in his appreciation of the value he attaches to the wireless set which he took with him. One can only say, "What a pity."

Short-Wave Tesis.

I AM indebted to R. B. (Warrington) for this. Beginning to-day (May 28th) at noon (U.S.A. time?) the G. E. C. (Schepectady) will transmit tests on short waves until noon on the 29th of May. Also from noon June 4th till noon June 5th Station 2 X A F will operate on 32.77 metres and 2 X A D on 26.8 metres on May 28th; and on the following Saturday 22.02 metres and 32.77 metres will be used simultaneously. Please send more dope like this, R. B.

Forced Laughter.

RUMOUR has it that the B.B.C. intends to persist in its unhappy intention to imitate America by trying to produce "community laughter." I regret this, if it be true, most sincerely. Are we to cackle by infection, like an hysterical schoolgirl class? Why not give us some items by true, professional laughter-makers? I refuse to laugh without knowing the just cause, and I advise "P.W."-ites to "shut down" during the attempt—if it is ever made—as a protest against an insult to the intelligent listener.

SHORT WAVES.

Wireless experts are considering how to make Britain laugh louder than it has ever laughed before. An experiment in community laughter is mentioned, but nobody seems to have suggested funnier jokes.—"Time and Tide."

SOMETHING LIKE A SET. One of the largest wireless receiving installations is that at Leicester, where fourteen calves supply 680 pairs of headphones and 20 loud speakers.—"Provincial Paper. SOMETHING like a miracle, too!

Tests are to be made by the B.B.C. on June 29th to discover whether solar eclipses have any bad effect upon wireless transmission.

If it is found that they do, one thing, of course, is certain—there must be no more solar eclipses.—"Birmingham Gazette and Express."

Radio manufacturers appear to have settled their differences by the throwing over of both wholesalers and retailers.—"Electrical Industries. This seems to us a fairly complete lay-out.

A wonderful quartette was singing some old Southern songs over the radio. A little girl listened in silence for some time, then jumped up and said: "Gee, if we couldn't all keep together when we were singing at school the teacher would make us sit down."—"American Paper."

It is reported that burglars recently made a big haul of wireless components in South London. We hope this will be a lesson to them.

Many people were disappointed the other evening when it was found impossible to broadcast Mussolini's speech. The atmosphere was evidently anti-Fascist.—"Everybody's Weekly."

The programmes provided by the B.B.C. to put it mildly, do not appear to be giving unqualified satisfaction to the listening public.—"Yorkshire Telegraph and Star."

Especially judging by several letters recently received—which were certainly not put mildly,

Phyllis, I should not wish to hurt you,
But I should like to have you know
You'd be a paragon of virtue—
If you'd forget your radio.
I would not want to stop your mirth,
But the most ardent lovers tire
Of hearing how you got Plymouth
Or else Hawaii.—"London Opinion."

Wireless Wisdom.

HOW do they do it? Here's a commission of six well-known people, dealing with the Post Office Transatlantic Telephone Service, and in their report they tell us that the service is not secret, "in the full sense of that word." The cream is that they recommend that "the improvement of the present partially secret system of wireless telephony should be pressed to a conclusion." Bill Jones of Billingsgate could be relied upon to arrive at the same recommendation within a few seconds.

The One-Valve "Hale."

HERE'S another shock for S.B.B. (See above.) F. C. (Greenwich) has made up the one-valve "Hale," and has received some 42 stations, including all the better-known continentals. Langenberg, Bournemouth, Brussels, Frankfurt, Hamburg, Daventry, Toulouse and a few others work a large loud speaker fairly well. By the way, F. C. has an "earth" in a million. It is buried on the river shore, and at high tide is under water. These results prove that with very moderate equipment you can eavesdrop all over Europe.

"Straight" One-Valve Work.

I MUST give one more result for S. B. B.'s benefit. A. L. H. B. (Harlesden), using a straight single-tube hook-up, succeeded, on April 24th, in receiving Moscow (Komintern) at 'phone strength; two complete items and the "close down" call, strength R4. It was A. L. H. B.'s lucky night.

Wake "Up," England.

THE D.O.T. report on the Melbourne Wireless Exhibition held in March is not pleasant reading. "American-made apparatus predominated." I hear the same of South Africa, Egypt, Peru and other South American countries. The tendency "down under" appears to be in the direction of sets of five or more valves; but I doubt whether any good English multi-valve sets could compete, in price, and in Australia, with American goods. But a way out has to be found.

Australia's Trend.

SUPER-HETS have lost ground in favour of the neutrodyne types; moving-coil reaction coupling has almost disappeared, and plug-in coils are considered to be out of date because the difference between the highest (Perth excepted) and lowest wave-length is small in Australia, and sets are designed to get distances up to 1,200 miles with great selectivity.

Business Note.

FOR whom it may concern. The address of the British Radio Valve Manufacturers' Association has been altered to 59, Russell Square, London, W.C.1.

Our Free List.

MR. S. E. THOMAS, 2, Langland Road, Mumbles (which I believe is near Swansea, Wales), has about 150-back numbers of "P.W." that he will send to the first remitter of adequate postage. We thank him and hope he will accumulate another batch. ARIEL.



"If only," I once remarked to Captain Round and Captain Eckersley over a luncheon table, "if only the radio programmes kept any sort of pace with your engineering side of the business, what a wonderful service it would be!"

And those gentlemen cordially agreed with the sentiment.

The remark of two years ago came forcibly back to mind with the news which television investigators have just given to the world. News which, I dare swear, no reader of POPULAR WIRELESS has failed to study with the liveliest interest.

In a nutshell—television is now an accomplished fact over any distance that wireless telephony can be broadcast; and the beam system gives us simple telephony over, in effect, the whole world.

What is the B.B.C. Doing?

The scientific wonder of such achievements is beyond my comprehension. I accept them just as I accept the wonder of the daisies growing in the fields. "Here," say I, "is yet another instrument to hand for the entertainment of the people. What can I do with it?" My mind leaps ahead to the radio programmes. What is the B.B.C. doing about it? What ought it to do?

Within a very short time, perhaps, the existing programme system and technique

 By **A. CORBETT-SMITH.**
(Late Artistic Director, the B.B.C.)

will be upon the scrapheap. That is the first and most obvious reflection. The moment television sets are on the market in quantity I can foresee such an overwhelming popular demand as hardly any scientific invention has yet secured. That will react upon the

Technical articles about the theoretical and practical possibilities of television have appeared often in "P.W.," but in this article Mr. A. Corbett-Smith, whose work in connection with the artistic development of broadcasting may be likened to the work of Reinardt and Craig in the theatre, deals with the interesting possibilities of television as an aid to broadcast programmes. It may be many years before television is sufficiently developed to warrant the B.B.C. adopting it as part of its service to listeners, but our author's vision of the future of the artistic possibilities of television is of undoubted interest and value.—The Editor.

makers for swift, continuous improvements and a steady lowering of prices.

Radio has set the people using their ears and trying to exercise an atrophied imagination for the first time in history. They are just beginning to learn how to listen in

the dark, when—*crash!*—the sunlight bursts in and they see once again. The history of the cinema shows what pictures mean to the people at large. The first of the arts to reach the great masses. The immediate swing back upon the line of least resistance is inevitable. And I can foresee a demand upon the B.B.C. programmes department which, compared with past criticism, will be like the French Revolution to a girls' hockey match.

In the Near Future.

If, for example, Mr. Baird's prophecy is fulfilled the first television sets, at some £30 apiece, will be on the market by Christmas. If the B.B.C. means business it will have begun preparative work upon the new form of radio art long before this article appears.

Although much yet remains to be done in the matter of perfecting television, no time should be lost in preparing for its debut as an ally of broadcasting.

Folk will want to see what they are listening to. And, in a manner of speaking, the greater part of what they hear now is not fitting to be seen. The eye will need satisfying as well as the ear.

I dare not think (for example) what would have happened if my audience had seen me playing Shakespeare's "King Henry V." at the London station. I wore a dinner jacket, and my crowd of soldiery before Harfleur were the members of the orchestra, who put down their instruments to shout defiance at the invisible enemy. And in flashing armour and crimson robes I look about as much like Henry V. as Dan Leno might have done. Television would have rendered my Cardiff year a sheer impossibility.

Complete Revision Required.

It seems to me that the whole of the programme side will need complete reconstruction from bed-rock. How that is tackled is no concern of the audience. For an audience is interested only in results. But I think that I may sum up the main essentials in the one word "showmanship." And this, if the job is done properly, will need to be applied to every single item.

Shall we tolerate the sight of a tubby little bald-headed, be-spectacled man standing at a desk and gravely reading us a discourse upon the domestic habits of shrimps? I hardly think so. (The audience

(Continued on next page.)



Mr. J. L. Baird (right) testing some of his more recent television apparatus.

THE NEW ALEXANDERSON TELEVISION SCHEME.

An American attempt to solve the Problem.

By F. G. BAILEY.

RADIO transmission of a single photograph has been accomplished by Dr. E. F. W. Alexanderson, consulting engineer of the General Electric Company of America, in the short space of two minutes. Television will require the transmission, reception and reproduction of a single picture in not more than one-sixteenth of a second. One of the fundamental difficulties in the way of a speed of sixteen pictures per second is the development of a projector which will enable anyone to see on a screen the movement of objects miles away.

Dr. Alexanderson explained the television projector, as illustrated, which he now has in operation in his laboratory, and by means of which he is hopeful of getting the 300,000 brush strokes per second that are necessary for producing motion pictures.

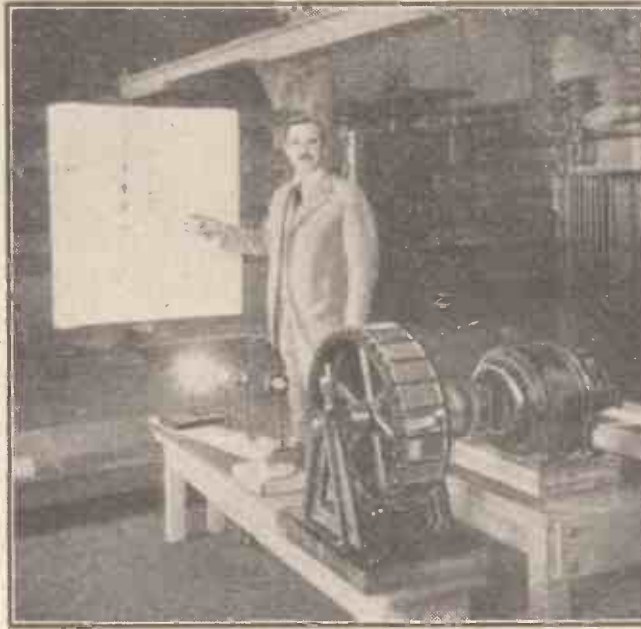
A Novel Method.

In the course of an address before the members of the St. Louis Section of the American Institute of Electrical and Radio Engineers, on December 15th, 1926, Dr. Alexanderson explained that it is easy enough to design a television system with something like 40,000 picture units per second, but the images so obtained are so crude that they would have no practical value.

Work in radio photography has shown that an operating speed of 300,000 picture units per second will be needed to give pleasing results. This speeding up of the process is, unfor-

tunately, one of those cases where the difficulties increase by the square of the speed.

The method which has been devised by Dr. Alexanderson to speed up the process of moving mechanical parts is the use of seven distinct light sources, the lights converging in a cluster of brilliant lights which scan the picture, each light painting a crude picture,



The Alexanderson projector, which focuses seven spots of light on the screen.

but all seven interlacing optically to produce a single good picture.

The model of the television projector used

by Dr. Alexanderson consists of seven light sources converged by an optical system revolving drum carrying 24 mirrors. These mirrors reflect the light cluster to a screen. Using seven lights instead of one, the useful illumination is increased 49 times. Furthermore, in using seven light beams in multiple, the speed at which each light beam must travel has been reduced at a rate of 7 to 1.

High Modulation Speed.

In addition to these advantages for multiple light beam operation, each beam needs to move only one-seventh as fast and, therefore, needs to give only 43,000 instead of 300,000 independent impressions per second. A modulation speed of 43,000 per second is high with the present radio practice but is yet within reason, being only ten times as fast as is used in broadcasting, according to Dr. Alexanderson.

Dr. Alexanderson, in discussing radio photography, showed some of the results he had obtained in the radio transmission of pictures using both the modulated and interrupted signal. Under the former system any broadcasting station can transmit photos for distances as great as music of good quality can be transmitted by that station. For long distance transmission the short wave, telegraphic system may be used.

Eliminating Static.

Reception of pictures by telegraphy is independent of signal strength. Thus if the signal is strong enough to be recorded at all, it gives the same kind of records at the maximum as at the minimum signal intensity. This makes the recording independent of fading. If, furthermore, the signals are stronger than the prevailing static, it is possible to eliminate the effects of static by introducing a threshold value of signal strength in the receiver, and nothing is received unless the signal exceeds this value.

TELEVISION AND THE RADIO PROGRAMMES.

(Continued from previous page.)

would have a serious shock if they could see some of their radio favourites.) Or shall we look for a graceful young maiden, kilted to the knee, wading in a rock pool, merrily telling us, the while, all about it? "Am I right, sir?"—as Datas used to say.

The pictures which we see upon our television screens must convey the right atmosphere for the song or story to which we listen. And this is going to be a big task. If the best brains in the country are needed now, what of the future, with the volume of work increased tenfold?

Current events, like the Derby or Boat Race, will be child's play. Of course, we shall be seeing these as they happen. A race meeting in Sydney, the Shanghai

barricades, an eruption of Mount Vesuvius, Mussolini signing a decree (with "close up" of the paper for all to read), anything and everything of news interest. Nor must we forget that new ray which makes objects visible in the dark without illuminating them. Thus, why not pictures of animals at night in the Indian jungle? We could actually dramatise Kipling's "Mowgli," by superimposition as they do on the films.

A Difficult Problem.

All this, as I say, is the A B C of the new game. The obvious. The real difficulty lies in the creation and development of this new art of radio entertainment which now becomes imperative. The new technique for the drama, "feature" programmes, speech, and music. Instead of grafting speech and music on to pictures, as in the films, we have to graft pictures on to sound. A vastly different affair.

I can see the use of the studio becoming more and more restricted in favour of specially constructed theatres, with or

without audiences. For the tendency will be towards bigger effects. In the same way I see the growth of public reception halls in which the television pictures will be magnified in conjunction with the sound amplification. For I think that we shall not long be content with viewing world events upon our tiny home screens, as though we were looking through the wrong end of a telescope. They may well suffice for single figures, but we shall need the larger canvas for such a performance of "Cyrano" as we heard the other night.

Programmes will become far more concentrated and selective, for artistes will have to satisfy upon more than one count. Only the supreme fittest will survive. Provincial stations, already emasculated, will disappear in favour of centralised, alternative programmes and "features."

But give me a volume, not a page, of "P.W." in which to pursue this fascinating topic. Still, I should very much like to know what the B.B.C. is doing about it. I think I can guess.



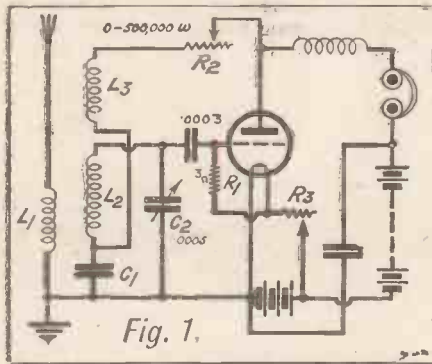
The "Trans-Ocean" One

IN last week's POPULAR WIRELESS I explained how, thanks to the efficient organisation of the transatlantic telephone, we were able to get into touch with Mr. Edward H. Loftin, joint inventor of the Loftin-White circuit, and obtain from him, specially for POPULAR WIRELESS readers, a new single valve circuit of exceptional promise. Readers will remember how after it had been found that Mr. Loftin was not in his New York office, he was located in Washington and put into direct telephonic touch with the Editor's

Full practical details of the efficient Loftin-White one-valve circuit which was telephoned direct from Washington, U.S., to the "P.W." offices in London.

By P. W. HARRIS, M.I.R.E.
(Editor of the "Wireless Constructor.")

Looking ahead for a few moments, let us examine the actual circuit and the values ultimately decided upon and see how these affect the working. Fig. 1 shows the Loftin-White circuit, and it is interesting to compare it with Fig. 2, which shows the single valve circuit regarding which I had a conversation with Mr. Loftin on the telephone.



Very Small Capacity.

In the circuit it will be seen that there is combined capacitive and inductive feedback from the plate of the valve in order to produce oscillation, which is "held down" by the variable high resistance. In the new circuit an inductance L_3 , shunted by a variable condenser C_3 , is placed in the anode circuit of the valve, and also tuned to the frequency we desire to receive. There is a combined capacitive and inductive feedback from the plate of the valve, but this is controlled by a variable condenser C_3 . It is, of course, possible in the original Loftin-White single valve circuit to substitute for the variable high resistance a variable condenser and obtain results, but having tried this scheme I did not find it particularly satisfactory. The presence of the tuned circuit L_3-C_3 , however, in the new arrangement

makes a very great difference, and gives us a receiver which is considerably more sensitive.

It took a good deal of experimental work to find the right values all round, and a point on which I would like to make particular reference is that unless the capacity C_1 is exceedingly small, the set is unworkable. Those people who confine their experimental work to pencil diagrams on the backs of envelopes might easily come to the conclusion that C_1 should have a value of, say, .0001 or .0002 mfd., but if they try it out on the bench they will find that even the *minimum* of the ordinary .0001 mfd. condenser will probably be too large!

Home-made Coils.

Again, it is not practicable to make this receiver with the ordinary plug-in coils, as the capacity coupling between them will nullify any fine adjustment that is made. Special coils must be wound, but as these are exceedingly simple and cheap to make, readers will have no difficulty in this regard.

(Continued on next page.)

room at Fleetway House. From here we were privileged to have a long conversation with him. During this conversation Mr. Loftin gave me particulars of the remarkable new single valve circuit of which I am able to give you technical details this week.

Preliminary "Hook-up."

The days immediately following this successful conversation were full of technical thrills for me. As soon as I was able to sit down quietly in my laboratory and examine the theoretical circuit, I found there were several practical ways of making up the receiver and that certain values would have to be determined experimentally to suit British components. This took some hours of hard thinking, after which the first preliminary "hook-up" was prepared on the bench, and, with a writing pad alongside, the collection of data for the final circuit arrangement was begun.



Mr. Harris takes notes during his transatlantic conversation with Mr. Loftin.

THE "TRANS-OCEAN" ONE.

(Continued from previous page.)

Before giving further technical details it will be helpful if I devote a little space to describing how the set operates in practice, as this will help the reader in understanding the choice of various values. When both tuned circuits are in resonance this receiver can be made to oscillate owing to the coupling effect of the valve itself.

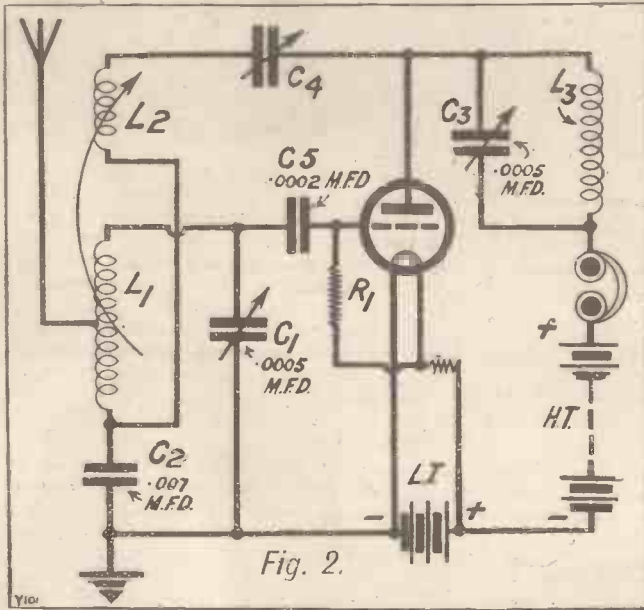


Fig. 2.

The condenser C_4 , which is of the type usually sold for neutralising, can be set (with weak coupling between L_2 and L_1) so that the receiver will oscillate towards the top of the scale, say, from 50 degrees upwards on a 100-degree condenser, but will be stable at the lower end. Similarly the value of L_2 can be so chosen that the set will oscillate on the lower part of the scale and not on the upper. If oscillation is found at any particular portion of the scale it can be checked by adjustment of C_4 . Of course, the set will not oscillate except when the two tuned circuits are approximately in resonance.

Constructional Details.

By this time you will want to know a little more about how to make the receiver. Starting with the valve itself, this I have found can be of the high magnification type (such as are designed for resistance-capacity amplification) or one of those generally called "H.F." valves, having a magnification of 18 to 25 and an impedance of about 15,000 to 25,000 ohms. The grid condenser can be .0003 or, as I have actually used in my experiments now, .0002 mfd. with a grid leak of two, three or four megohms, the higher values seeming to be slightly better.

The coil, L_3 , should be a good plug-in coil (a No. 60 in the numbered types, or a C in the series which are lettered). The condenser, C_3 , should be of .0005 mfd., and the same value should be chosen for

the variable condenser, C_1 . C_2 should be variable in steps, and for this purpose you can use, as I have done, the C.A.V. multiple fixed condenser having a range from .001 to .015 mfd. A value of about .004 to .007 will generally be found to suit, although I am still carrying out experimental work in this connection. It is, however, very simple to alter the value a step or two on either side. Incidentally, .007 mfd. is obtained by using the terminal marked with 0 alone on one side, and as the other side the terminal marked 5 and the terminal 2 is paralleled. Coil L_1 should be a single layer coil wound on a 3 in. tube (3 in. long and 3 in. in diameter).

This should be of paxolin or "Pirtoid." The latter tubes are sold by the makers of the "Atlas" components, and I have used them very successfully in a number of high-efficiency low-loss coils I have recently constructed. "Pirtoid" tubes were used for both grid and reaction windings in my experimental set. The coil wound on this 3 in. tube should be of No. 22 D.C.C. wire wound tightly and with turns touching. Fifty-two turns will be found suitable, and three or four tappings with loops should be made at equal spaces. Within this tube should slide another tube carrying the re-

action winding, L_2 . As it is important to avoid unwanted capacity coupling between the two windings, I have found it advisable to make L_2 a coil of about 25 turns of No. 36 enamelled wire, slightly spaced. The direction of winding should be opposite to that of the coil, L_1 , the outer end being connected to the condenser, C_4 , and the inner to the condenser, C_2 .

In general experimental work this inner tube can be roughly slid in and out of the tube carrying the winding L_1 , but should be kept approximately co-axial with the winding L_2 , by making it slide on two bits of cardboard or wood.

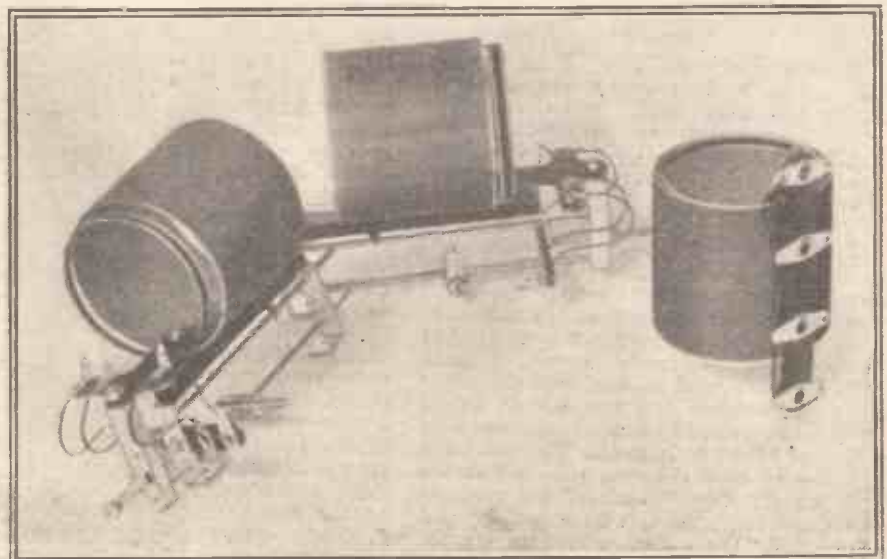
Note that a condenser is *not* placed across the telephones, although a Mansbridge condenser across the H.T. battery will be found an advantage if the battery is old.

Set the condenser, C_4 , at an intermediate position between maximum and minimum, but nearer minimum than maximum, and slide the tube bearing L_2 out of the tube bearing L_1 , until the two windings are separated by an inch or two. Turn the condenser C_1 and C_3 so as to bring the two circuits into resonance, successively, at various portions of the scale from top to bottom.

Final Adjustments.

You will probably find that when the circuits are in resonance the set will burst into oscillation most powerfully at the bottom end of the scale, less towards the middle, and possibly not at all on the upper reaches. If this is so, put the set into resonance at the lower end of the scale, and very carefully push the coil L_2 into L_1 until oscillation just stops. It should now be possible to bring the set into oscillation and out again by adjustment of C_3 , and if all is well a setting of C_3 can be found which remains fairly constant over the whole scale, keeping the set in a very sensitive condition a little way below oscillation point. If, however, you have not succeeded in getting everything right, you will still be able to obtain as good results as far as sensitivity and selectivity are concerned by adjustment of C_3 , the only difference being that this adjustment will not be constant over the whole band.

The operation of this set will be found quite different from that of any other you have tried. For example, with some adjustments of coupling and of C_4 you will pick up stations on C_1 quite loudly and clearly and will find that you can still hear them almost equally well at any reading on C_3 ! This indicates that a readjustment of C_1 is required, when the tuning will be immediately sharpened up and signals will go up in strength.



Coils specially produced in America for Loftin-White circuits.

The "SPANSPACE" FOUR



LAST autumn I described in THE WIRELESS CONSTRUCTOR a set consisting of one H.F. valve (neutralised), detector, and one L.F. stage under the somewhat fanciful name of the "SpanSpace" Three, which has been accorded a considerable measure of popularity. Correspondence which I have received from builders of the set and others seems to indicate a certain demand for a set with a similarly sensitive

Essentially a long-distance receiver. The "SpanSpace" Four will bring in many foreign stations at full loud-speaker strength.
Designed and described by
G. P. KENDALL, B.Sc.
(Assistant Technical Editor).

stage of H.F. amplification, but with two stages of note magnification, so that loud-

speaker results might be obtained from a good number of distant stations.

The addition of a second stage of L.F. to the original circuit was considered, but finally this idea was dropped, because the first arrangement, sensitive as it was on the H.F. side, was also rather critical, and very slight hand capacity troubles, and so on, become objectionable with two stages of L.F. when with only one they would be unnoticed.

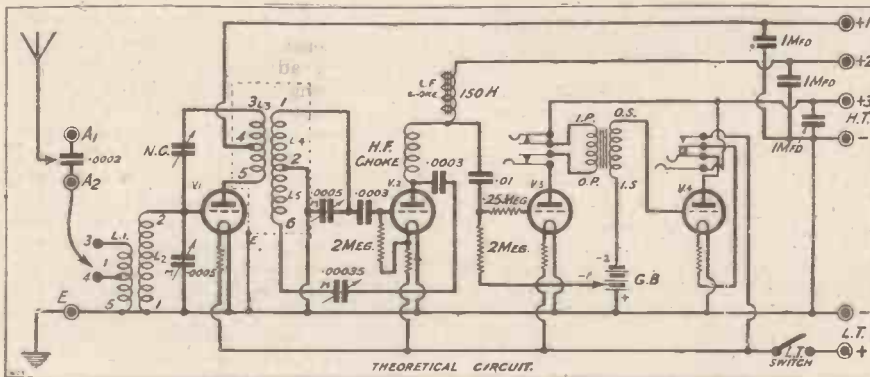
Simple Control.

A type of H.F. coupling was therefore adopted, giving simpler control and greater stability, and various schemes were tried to ensure as great a degree of sensitivity as that of the original three-valve set.

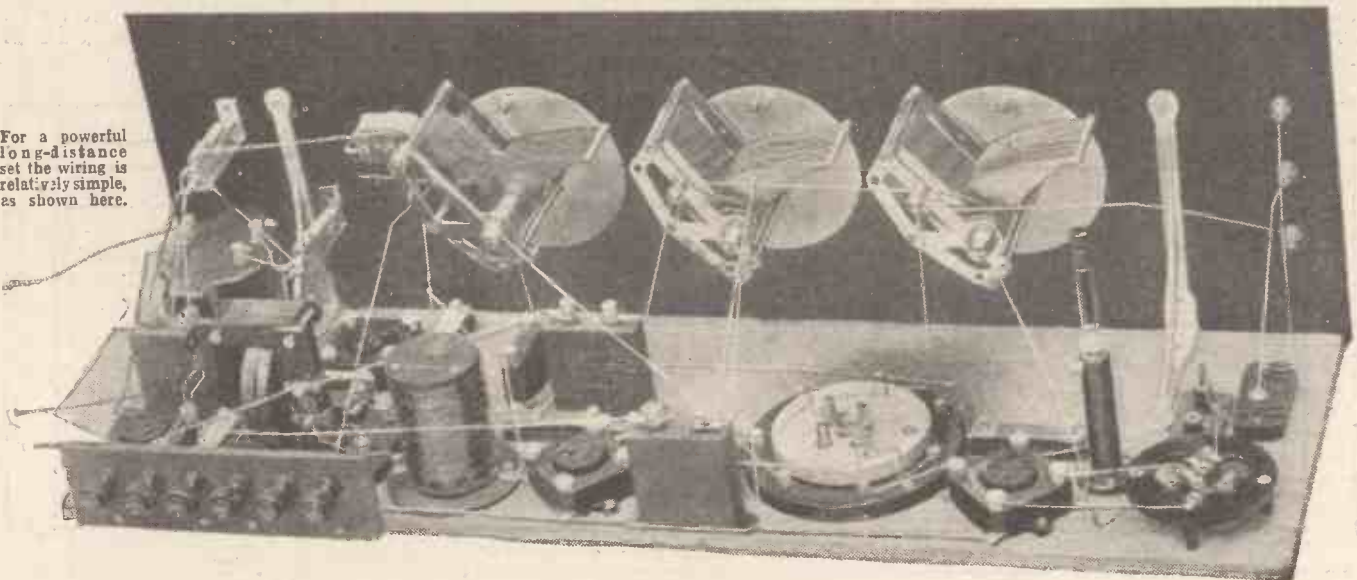
It was found that by using a really low-loss coil in the grid circuit of the H.F. valve (unscreened), and a standard screened split primary H.F. transformer to couple the H.F. valve to the detector, the desired results could be obtained, reaction of course being provided by the usual extra winding on the H.F. transformer.

This combination I find extremely pleasant to operate, the various adjustments being extremely simple to make, and the

(Continued on next page.)



For a powerful long-distance set the wiring is relatively simple, as shown here.

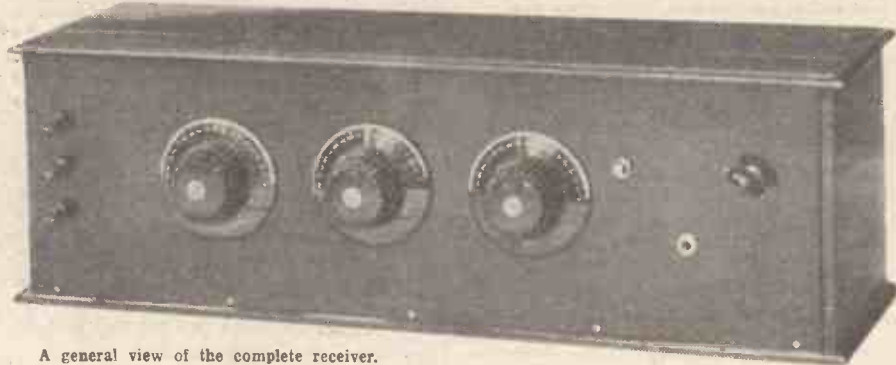


**THE
"SPANSPACE" FOUR.**
(Continued from previous page.)

results have been better than those given by any previous set which I have built containing one stage of H.F.

In general, I have no great liking for the use of screened coils with only one stage of H.F., since the H.F. resistance of a screened coil is naturally considerably higher than that of a similar coil without a screen, and it seems a pity to incur such losses if it can be avoided.

However, I find in this set that by using a really efficient coil in the first circuit the use of a standard screened coil as an intervalve coupling was not accompanied by any discoverable loss of signal strength and there was a considerable gain in stability



A general view of the complete receiver.

of neutralising adjustment and ease of control generally. (To screen one coil only, of course, is sufficient to stop interaction between them.)

The circuit used in the set is illustrated in one of the accompanying diagrams, and it will be seen to be of a perfectly straight-forward type, with an untuned aerial circuit coupled to the usual tuned secondary forming the grid circuit of the H.F. valve. This valve is coupled to the detector by a "split primary" H.F. transformer, reaction of what is usually called the Reinartz type being provided upon the secondary of this transformer in the standard fashion.

The first stage of L.F. is choke-coupled in the set as illustrated, but resistance

coupling has also been tried, and found to make little or no difference to the functioning of the set as a whole, so that it can safely be used as an alternative if desired. The only change required, of course, is to connect an anode resistance of 200,000 ohms (not more, or the reaction control may suffer) in place of the L.F. choke.

Choke or Resistance?

The advantage of the choke, of course, is that at a pinch the set can be worked with a lower value of H.T. than if a resistance stage were used. On the other hand, a very slight gain in the faithfulness of reproduction of the elusive lower notes may be expected with resistance coupling.

The second L.F. stage is transformer-coupled, a 4 to 1 ratio transformer having been chosen for the purpose. Remember that the whole performance of the set from the musical point of view depends upon the quality of this component, and resist the temptation to use anything but



A special "Spanspace" Four coil is provided, having an interchangeable primary.

of the set, the first step is, of course, to collect the various components in the list and fit the panel to the baseboard. Next detach the panel again, drill it in accordance with the diagram and fit the various components, after which it can be reattached to the baseboard and the rest of the components screwed down, pains being taken to follow carefully the lay-out seen in the photographs and the wiring diagram.

A Reaction Point.

The actual assembly of the set and wiring up is a simple operation, and I think the diagrams will be found a sufficient guide without further description. Two points will probably be noticed in building the set which perhaps call for a word of explanation. First, it will be observed that there is a fixed condenser connected in series with the reaction condenser, and this serves a double purpose, being intended to act as a safety device to prevent the shorting of the H.T. if the plates of the reaction condenser should chance to touch, and secondly to enable an adjustment to be made of the effective capacity of the reaction condenser to suit the particular valves in use.

This last is important, and the aim should be to choose such a value for the fixed series condenser as will enable about two-thirds of the capacity of the reaction condenser to be used before the set breaks into oscillation. In other words, use as

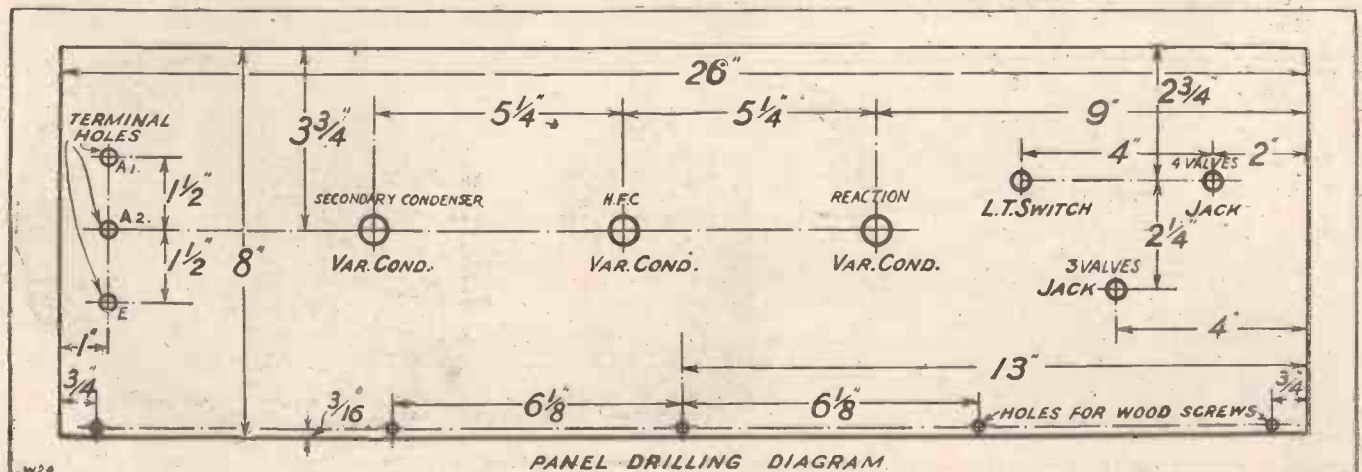
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one of the really high class makes of transformer.

Jack switching is provided so that three or four valves may be employed, the jack for four valves being of the filament control type, automatically switching on the filament current of the last valve when the plug is inserted.

Separate H.T. terminals are provided for the H.F. and detector valves, but only one common one for the two L.F. valves, since these normally require all the H.T. available for best results. Separate terminals are provided for the grid bias applied to the two L.F. valves; the correct use of these various terminals will be considered later.

Turning now to the actual construction

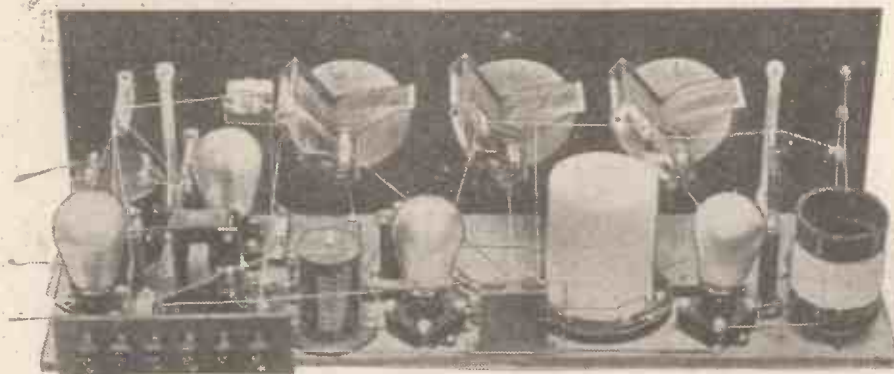


THE "SPANSPACE" FOUR.

(Continued from previous page.)

small a fixed condenser as will still allow you to get sufficient reaction, since in this way the smoothest control is obtained. The value actually given in the design is .0003 mfd., and this suits many valves, but it is worth while to obtain also a .0001 and a .0005 and try them also.

The other point concerns the connections



In this receiver only one stage is screened, as the set is perfectly stable with this arrangement.

of the first L.F. valve. It will be noted that there is a low value grid leak connected in series with the grid lead of this valve, and the purpose of this is to prevent troubles due to the passage of unwanted H.F. currents into the L.F. circuits.

The special coil required is a home-made

(Continued on next page.)

COMPONENTS AND MATERIALS.

- 1 Ebonite panel 26 by 8 by 1/4 in.
 - 1 Baseboard, 26 by 9 in.
 - 1 Pair angle brackets.
 - 1 Cabinet for above (Cameco).
 - 2 .0005 variable condensers, plain, straight-line frequency (Ormond, J.B., etc.)
 - 1 .00035 ditto. [etc.]
 - 3 Slow-motion dials (Ormond, J.B., etc.)
 - 1 Push-pull switch (Lissen or Igranic).
 - 1 Jack, No. 63 (Igranic).
 - 1 Jack, No. 68 (Igranic).
 - 4 Valve holders (Benjamin, Lotus, etc).
 - 4 Baseboard resistors to suit valves (Peerless).
 - 1 Neutrovernia condenser (Gambrell).
 - 1 L.F. choke, 150 henries (Pye).
 - 1 L.F. transformer, 4:1 (Marconi Ideal).
 - 3 1 mfd. condensers } Dubilier
 - 3 Grid-Leak holders } or
 - 2 2-meg. grid leaks } Lissen
 - 1 .25-megohm grid leak (Dubilier).
 - 1 H.F. choke (Radio Instruments).
 - 1 .01 mfd. fixed condenser (Dubilier).
 - 1 .0003 mfd. fixed condenser (Lissen or Dubilier)
 - 1 .0002 mfd. fixed condenser (Dubilier)
 - 1 .0003 mfd. fixed condenser (T.C.C.).
 - 9 Terminals, lettered as per diagram (Belling and Lee, or Eastick).
 - 2 Sockets on strips of ebonite, with wander pin.
 - 1 Split primary H.F. transformer with screen and base (Lewcos).
 - 1 Feather-weight Daventry-size former, six-pin base and interchangeable primary (Collinson).
 - 1 Terminal strip for 6 terminals.
- Wire, screws, etc.

POINT-TO-POINT CONNECTIONS OF THE FOUR-VALVE RECEIVER.

One filament socket of each valve holder to one side of each of their respective fixed resistances.

L.T.+ to one side of the L.T. switch. Other side of the L.T. switch to the top outside contact of 2nd jack (for 4 valves) and to the remaining sides of the 1st, 2nd and 3rd fixed resistances.

Top inside contact of the 2nd jack to the remaining side of the 4th fixed resistance.

H.T.— to L.T.—, to the remaining filament sockets of the valve holders, G.B.+ plug, one tag of the 1 mfd. fixed

variable condenser. Fixed vanes of same condenser to one side of the .0003 upright T.C.C. fixed condenser.

Other terminal on the .0003 T.C.C. fixed condenser to the plate of the 2nd valve holder and to one side of the H.F. choke.

Grid of the 2nd valve holder to one side of the .0003 mfd. grid condenser and to one side of the 2 meg. grid-leak holder.

Other side of the grid-leak holder to the end of the 2nd fixed resistance that is joined to the filament socket of the 2nd valve holder.

Remaining side of the .0003 grid condenser to the No. 1 terminal on the H.F. transformer-holder base and to the fixed vanes of the 2nd .0005 mfd. variable condenser.

E and No. 2 terminals on the H.F. transformer-holder base joined together and to the moving vanes of the .0005 mfd. variable condensers.

No. 4 terminal on the same base to the remaining tag of the 1 mfd. fixed condenser nearest the back of the baseboard (near the 2nd valve holder) and to H.T.+1.

Remaining side of the H.F. choke to one side of the .01 mfd. fixed condenser and to the bottom contact on the L.F. choke.

Other side of the .01 mfd. fixed condenser to one side of the .25 meg. grid-leak holder and to one side of the 2nd 2 meg. grid-leak holder.

Remaining side of the .25 meg. grid-leak holder to the grid of the 3rd valve holder.

Remaining side of the 2nd 2 meg. grid-leak holder to G.B.— 1.

Remaining tag of the 1 mfd. fixed condenser (near to the upright .0003 T.C.C. fixed condenser) to the top contact of the L.F. choke and to H.T.+2.

Plate of the 3rd valve holder to the bottom outside contact of the 1st jack (for 3 valves).

Bottom inside contact of the 1st jack to the O.P. of the L.F. transformer.

I.P. of transformer to the top inside contact of the 1st jack.

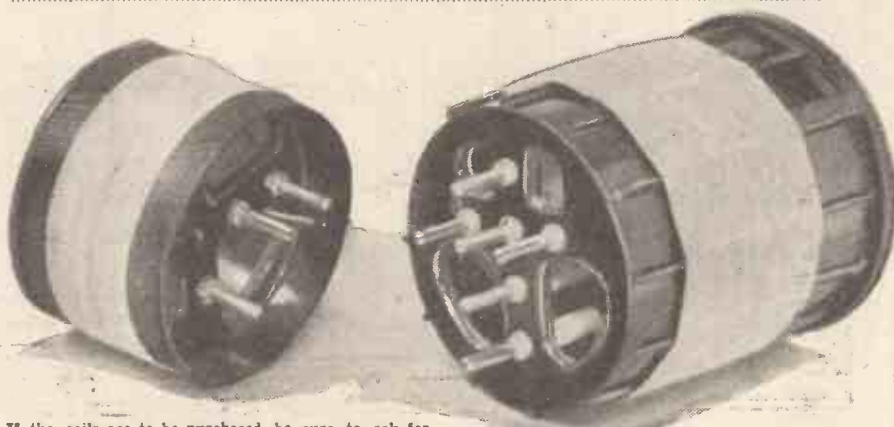
Top outside contact of the same jack to the bottom contact of the 2nd jack, to the remaining tag of the 1 mfd. fixed condenser near the 4th valve holder and to H.T.+3.

Remaining contact on the 2nd jack (3rd from top) to the plate of the 4th valve holder.

O.S. of the L.F. transformer to the grid of the 4th valve holder.

I.S. to G.B.— 2.

This completes the wiring.

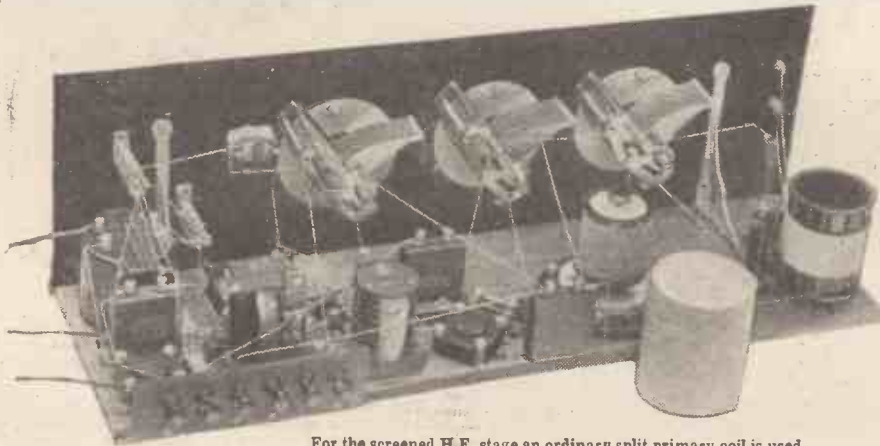


If the coils are to be purchased, be sure to ask for "Spanspace Four" and not merely "Spanspace" Coils.

THE "SPANSPACE" FOUR.

(Continued from previous page.)

one, and the winding of this can be tackled next. The basis is a Collinson "Feather-weight" former and base with an interchangeable primary fitting inside the secondary, as may be seen in some of the photos.



For the screened H.F. stage an ordinary split primary coil is used.

The primary consists of 20 turns of No. 24 double-cotton-covered wire with a tapping at 14 turns. The beginning of the winding is connected to the pin which makes contact with socket No. 5 of the base, the tapping to No. 4, and the finish to No. 3. The ends are secured by passing them through small

holes which must be drilled in the former, the tapping being made by passing a loop through such a hole.

The secondary is also a plain single-layer winding, this time of No. 22 gauge D.C.C. wire of 50 turns. The beginning (the end nearest the base of the coil) goes to pin No. 1, and the finish to pin No. 2, the ends being secured by passing through small holes as before. The H.F. resistance of this secondary winding has proved to be exceptionally low, and this is no doubt one of

the principal factors contributing to the extremely satisfactory results I have obtained with the set. Its low resistance appears to result mainly from the fact that a sufficiently large diameter former has been used to permit quite thick wire to be employed without the coil becoming unduly

long in proportion to its diameter. The absence of any serious losses in the former, of course, also plays its part.

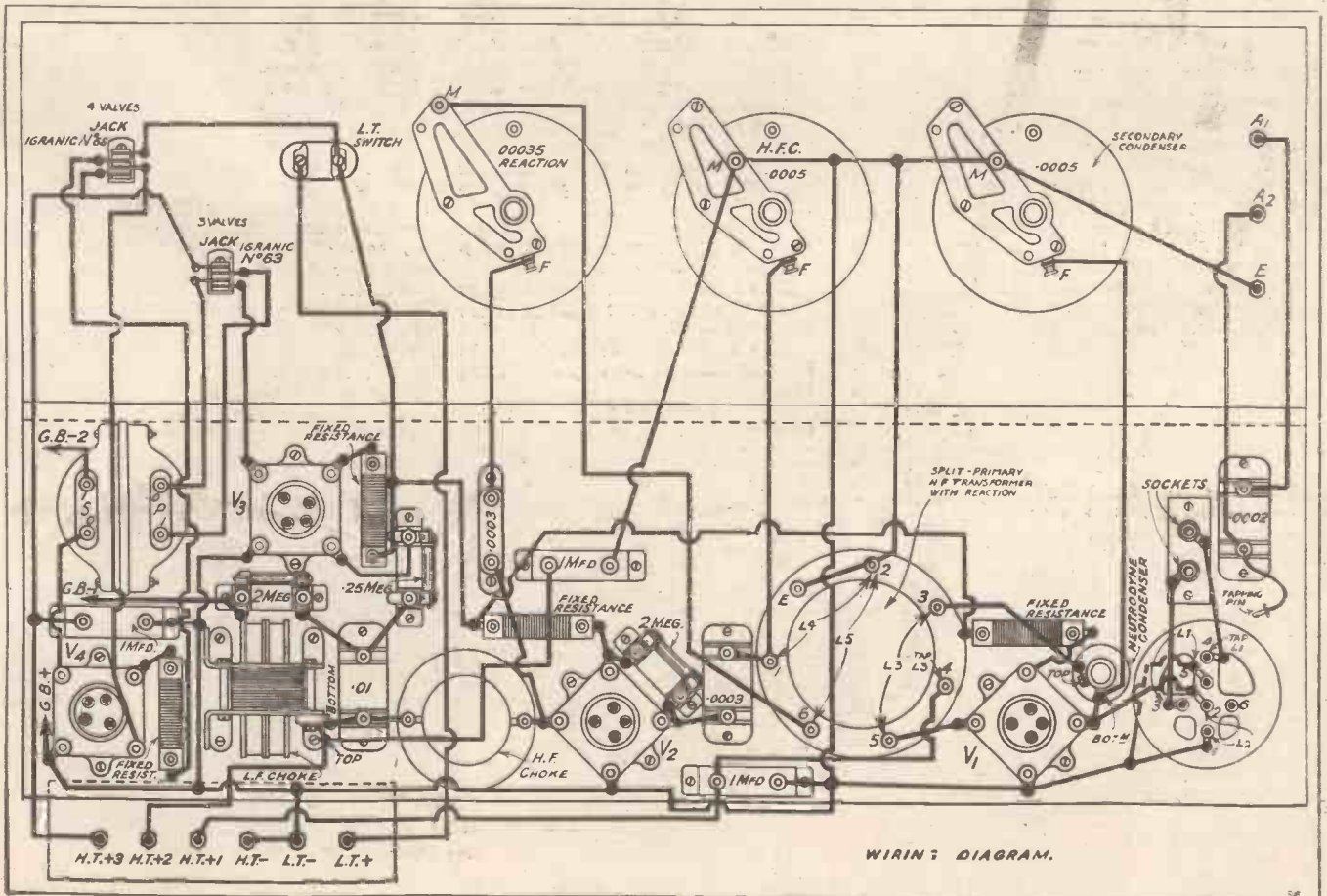
Provision is made for using either the whole of the primary or the 14-turn tapping by the provision of a strip of ebonite on the baseboard carrying two sockets such as "Clix" or valve leg sockets, in which a plug on the end of a flex lead can be inserted as shown in the photos and diagrams.

When the set has been completed it is connected up as follows for the first test: Aerial to A₂ (when it is connected to A₁ it brings in a small series condenser giving more selectivity and slightly less signal strength), and earth to E. Place the pin on the end of the flex lead from A₂ in the socket on the baseboard wired to the No. 3 socket of the first coil holder.

H.T. Voltages.

Connect up L.T. to the correct terminals, switch on, and see that all the valves light. Now connect up the H.T. battery and apply 80 volts to H.T.+1, 60 to H.T.+2, and the maximum available (should be at least 100 volts) to H.T.+3. Insert the G.B.+ plug in the positive socket of the grid bias battery, the G.B.-1 plug in a socket giving 4½ or 6 volts negative, and the G.B.-2 plug in the 9-volt socket (or thereabouts, according to the type of the last valve). Now set the reaction condenser and the neutralising condenser at zero (in the case of the Gambrell "Neutrovernia" used in this set this means that it should be unscrewed as far as possible).

Set both tuning condensers to the same reading near the middle of the scale, (Continued on page 526.)



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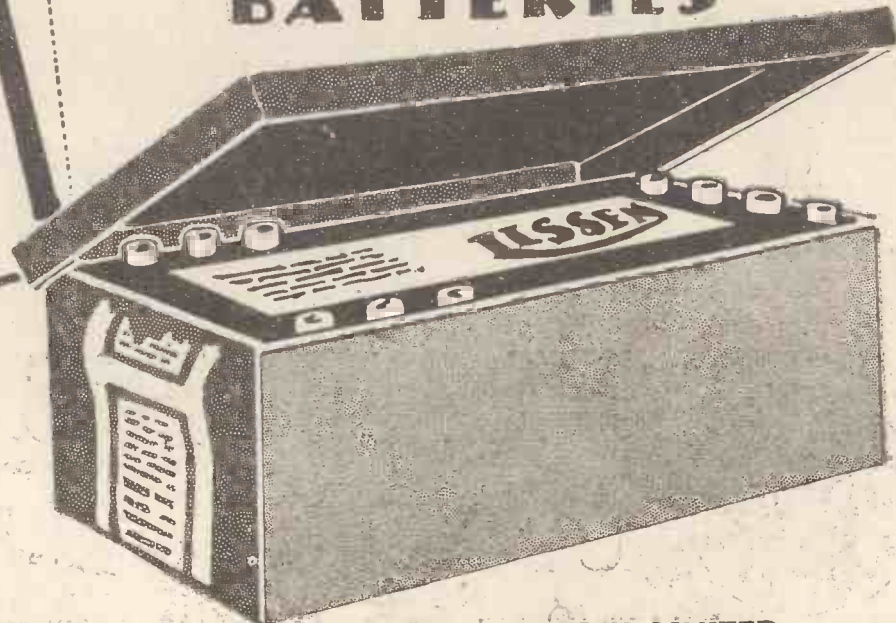
7/11

(previously 10/6)

66 volts.

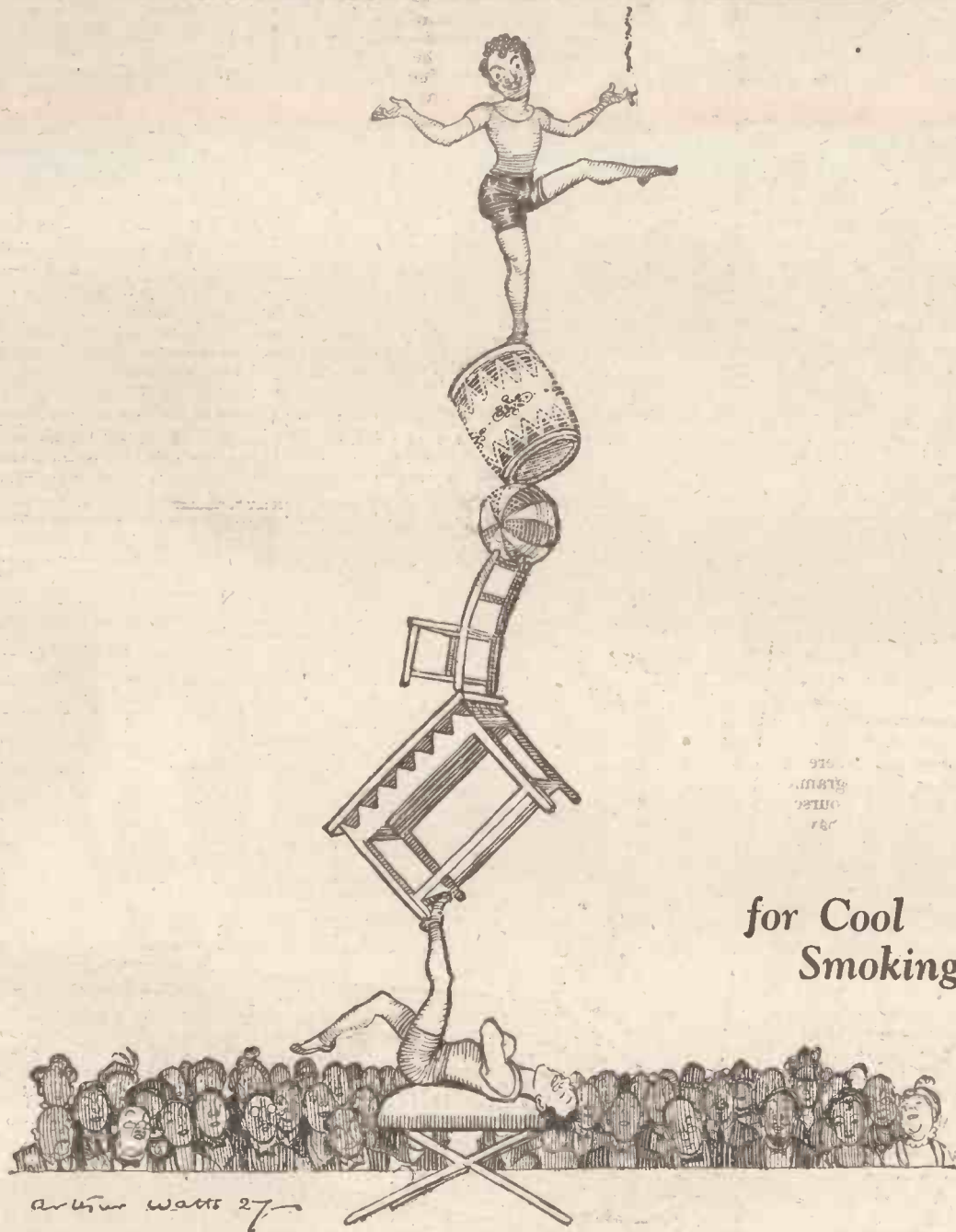
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NCC 150

THE latest grouse against the B.B.C. is that they are "stingy"!

According to Mr. J. H. Squire, "the B.B.C. is just chaos, chaos, chaos! Method? They don't know the meaning of the word! And they're stingy—the fee they give my Celeste Octet hardly pays for cigarettes. I've finished with them."

There is another side of the picture. At a meeting of the Select Committee of the House of Lords the other day, which was considering the Royal Albert Hall Bill (that, if passed, will allow a more modern type of entertainment to be given), Sir J. Reith, Director-General of the B.B.C., said that the corporation contracted to pay £800 for a series of twelve concerts in the Albert Hall. Previously they had been allowed to rehearse free, but "owing possibly to the new management, we had to pay additional money for rehearsals, and the total amounted to about £1,000." The B.B.C. is now being asked for £200 a concert in comparison with £66 a concert.

Money Carefully Spent.

We understand the B.B.C. does not feel inclined to pay so much. If it doesn't it will doubtless be called "stingy"; but the B.B.C. has this at least to its credit, it does not spend listeners' money indiscriminately.

It may be argued that with such a huge income the B.B.C. can afford to pay very high fees, and it may be argued that if it doesn't it is being "stingy." But people seem to forget that the B.B.C. has enormous expenses in connection with the technical side of broadcasting, and it cannot throw a hundred guineas here, two hundred guineas there, and perhaps a thousand guineas somewhere else, for one particular item in the programme.

Now and again, of course, as special items, it can afford to pay heavy sums for famous artistes, but even then one doubts whether the expenditure is worth while. It was, of course, thrilling to hear Paderewski broadcast a recital, and thrilling to hear Tetrizzini and other famous artistes, but when one considers the high fees they have to be paid for their services, it is a matter of argument whether the money could not have been expended in other directions which would have lightened up a week's programmes considerably instead of only in spots.

Listeners have probably noticed that during the last two months or so programmes have improved on the whole. Some time ago we had occasion to criticise adversely the programmes and their method of development. At that time, we pointed out, the Corporation seemed to have very little hand in the actual control of the programmes, and most of the work was left to a Programme Board consisting of seven people, these people representing the various sides of programme activity. Mr. R. H. Eckersley was the chairman, whilst Mr. George Crossmith looked after the light entertainment side; Mr. Percy Pitt, music; Mr. R. E. Jeffrey, drama; J. C. Stobart, education and religion; and Miss Hilda Matheson, talks.

The Programme Board met once a week and practically controlled broadcasting programme fare; but of late, we understand, the weekly meetings of the Programme Board have ceased, and have given way to occasional meetings and constant informal discussions concerning programmes.

THE LATEST GROUSE.
Improved Programmes—How They Are Arranged—Sir Henry J. Wood and the B.B.C.—Davertry Junior.
By THE EDITOR.

The less formality in connection with building up programmes the better, and undoubtedly the result has been an improvement in the programmes.

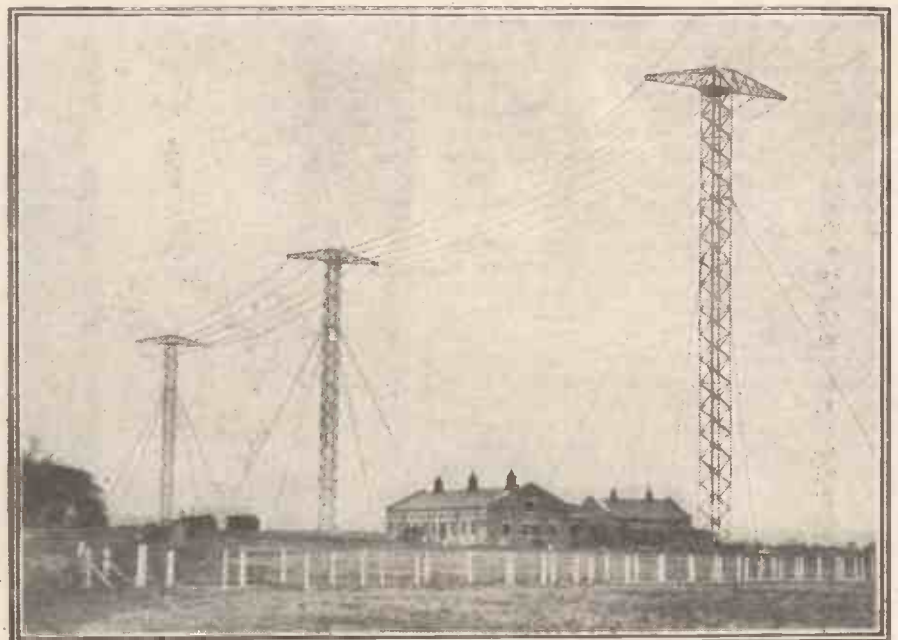
The *modus operandi* of preparing programmes is interesting. These days the director of the London and Daventry stations prepares a rough programme for coming broadcasts, and this draft comes before the Director of Programmes for his criticism and approval. The draft is then sent round to the other stations and the director of each station makes his suggestions as to what items should be taken from London or Daventry, and how the

Sir Henry J. Wood, the famous conductor, has decided to associate himself with broadcasting. This probably means also that arrangements are being made for a contract between the B.B.C. and Sir Henry Wood's Symphony Orchestra. Sir Henry has promised to conduct a number of special concerts for the B.B.C. during the summer, and the B.B.C. states that it regards this development as a favourable augury for the future progress of its efforts to reconcile the essential interests of music with broadcasting.

Davertry Junior.

There seems to be a considerable amount of discussion about Daventry Junior these days. We have received many letters from readers stating that they have heard this station testing, while, on the other hand, we have received many authoritative statements that the station has not yet sent out one single wave.

What is interesting, however, is the fact that the new high-power station has had a temporary wave-length allocated to it of about 400 metres. If this wave-length is



Buildings and masts for the Australian "Beam" service at Grimsby.

rest of the programme time should be filled in. The Director of Programmes again has to approve this list before it comes into force, and then the other five members of the Board, noting how much time they have at their disposal in the programmes, fill up the list with features of their own.

Mr. A. J. Alan.

According to the "Daily Telegraph," the weekly analysis of correspondence with regard to broadcast programmes recently showed that Mr. A. J. Alan heads the list with regard to popularity, and it seems the B.B.C. still place a great deal of reliance on the suggestions and criticisms sent in by listeners. These criticisms are now forwarded to individual members of the Programme Board for their attention.

The most interesting announcement with regard to the programme side of broadcasting which has appeared lately is the fact that

adhered to it will mean that many listeners possessing simple sets not particularly selective as regards tuning out stations within 50 miles of 5 X X, will have no little difficulty in cutting out their local station from the high-power station. It has been pointed out that in the case of London listeners, the field strengths of the two stations will be about equal, and therefore the interference should be small, about twelve miles from 2 L O measured in a direct line to Daventry.

This is based on the assumption that the power of Daventry will be in the neighbourhood of about twenty kilowatts in the aerial, while 2 L O's power in the aerial is roughly two kilowatts.

However, these points must be settled when Daventry Junior really starts regular transmission. At the moment we hear that the finishing touches are being put to the station.

TECHNICAL NOTES

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

MORE ABOUT SHIELDING

BONE DRY RECTIFIERS—"TAPER" CHARGE—HIGH RESISTANCES—
GRID LEAK ACCURACY.

Bone Dry Rectifiers.

SOME little time ago I referred to the recent development of dry rectifiers—the of the crystal type but adapted to carry currents sufficiently heavy for battery charging, and mentioned that chargers embodying these new types of rectifier were being prepared for the market. Two or three such chargers have now appeared, and in one of these a current of 3 amperes is obtainable. The charger is "bone-dry," operating without acids, alkalis, valves, vibrating or other moving parts, or water.

It is clear, therefore, that the dry rectifier is a really practical proposition. Moreover, the resistance of the rectifier itself must be very low, since the charger is designed to deliver what is sometimes called a "taper" charge. A "taper" charge is only obtainable when the voltage applied to the battery is slightly in excess of the maximum voltage which is developed by the fully charged battery, and for a "taper" charge to be delivered, the internal resistance of the charging device must be low.

For example, suppose the applied voltage were 8 volts for a 6-volt battery, there would be about 2 or 2½ volts difference between the applied voltage and the battery voltage if the latter were, say, 6 or 5½ volts. As the battery became fully charged, however, its voltage would rise to approximately 7 or 7½ volts, and consequently the excess voltage available for driving the current through the battery in the "charge" direction would diminish to a final minimum value of about half a volt with a corresponding reduction in the charging current. This is what is meant by a "taper" charge.

"Taper" Charge.

If, however, the charging device had an appreciable internal resistance, it would be necessary to use a voltage considerably above that of the battery to be charged. For example, suppose 20 volts had to be applied, then the rise in the back-electromotive-force from the battery, say, from 6 volts to 7½ volts, would only reduce the charging difference from 14 volts to 12½ volts, which would make very little difference to the current.

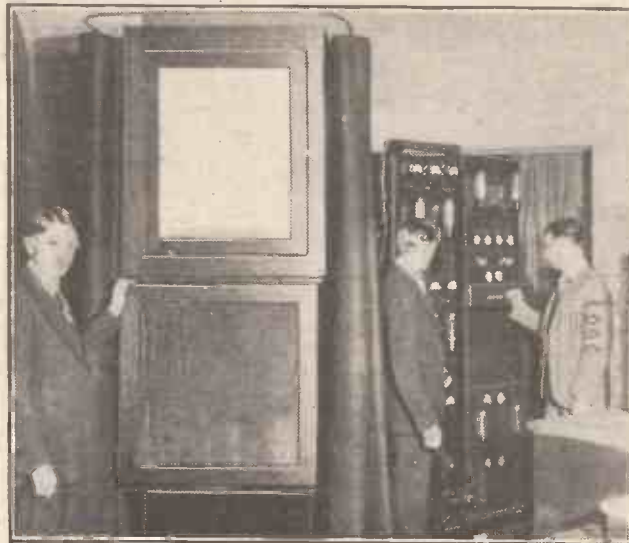
It is presumable, therefore, that the dry rectifier referred to above, since it delivers a taper charge, has a low internal resistance.

These dry rectifiers are being intensively developed, more particularly in the United States, and I think there is a considerable future for them. A dry rectifier has all the advantages of a wet electrolytic rectifier (that is, absence of noise, and of initial and running costs) whilst at the same time it has the further great advantage that it obviates the use of any liquid in the charging device.

High Resistances.

The manufacture of fixed high resistances for wireless circuits is becoming quite a

specialised industry. At one time almost any old thing would do for a high resistance and the usual plan was to take a strip of cardboard, glass or other material, and to make a trace upon the same with graphite or indian ink, end-contacts being clipped upon the "resistance element" thus made in order to provide terminals. Not only was a resistance of this kind very uncertain as to its resistance value, but it was unstable in use, and liable to vary with the effects of moisture and temperature and, worst of all, the making of satisfactory end-contacts was a matter of considerable



The television reproducing screen used in the recent successful American demonstration.

difficulty. Frequently there was more resistance in the actual end-contacts than there was in the resistance element itself!

Grid Leak Accuracy.

Such resistances were rarely within 20 per cent. of their rated value, and they were, as a rule, unable to dissipate more than one-fiftieth or one-hundredth of a watt satisfactorily. About 1924, however, a great improvement was made in the manufacture of resistances of this kind by the introduction of metallic-coated glass tubes or rods. These glass tubes or rods were of very small diameter (about one-thousandth of an inch) and were coated on the outside with "silver" by any of the methods commonly used for silvering glass. Other methods for the deposition of the metal film upon the glass have since been developed and used with success. The thickness of the metallic deposit can be controlled with considerable accuracy, as can also the diameter and length of the glass tubes or rods. Consequently, the resistance of the element made in this way can be estimated

beforehand with a quite good accuracy. Another great advantage is that an element of this kind is much more adaptable for end-contact than the graphite or Indian ink element. The metallised glass tube may be soldered, or, what is now better practice, it may be mounted in a stout protective tube with metal end-caps, the glass rod element projecting into solder or Wood's metal cups at the ends. Elements can be made in this way to dissipate upwards of half a watt.

More About Shielding.

I have had a considerable number of letters from my readers on various aspects of the question of shielding. There appears to be much diversity of opinion on shielding, some readers thinking that it is a panacea for half the troubles in the wireless receiver, whilst other readers state that they have never found any need for shielding, and, having tried it, they observed no advantage to be gained. Of course, as I said before, the necessity for or advantage of shielding depends almost entirely upon the type of circuit which is used—as well as upon the lay-out and other conditions. It is not suggested for a moment that shielding

is necessary in all cases. Shielding is not even always necessary when H.F. stages are used, but there are some cases where, with H.F. amplification, the circuit would become unmanageable—and consequently the sensitivity for which the circuit was designed would be unobtainable—without the aid of proper shielding.

You should remember also that if the shielding is adopted in cases where it is unnecessary, or if it is carried out in an unscientific manner, it may—by the losses which it always introduces—be a disadvantage instead of an advantage.

Not a Substitute for Bad Design.

The experimenter is often advised to shield every stage of tuned H.F. amplification. If the set is not properly designed and is liable to break into oscillation, shielding will probably cure that particular trouble, but at the same time it will cut down the selectivity and also the sensitivity, and will, therefore, reduce the range of reception of a DX set. In this case the use of shielding can only be regarded as a poor substitute for the proper re-designing of the set.

The proximity of a metal or other conducting sheet to a coil produces an effect equivalent to increasing the H.F. resistance of the coil, owing to the eddy currents which are set up in the metal.

The logical purpose of H.F. shielding is to prevent the capacitive coupling of one stage to another. This is caused by the stray fields from variable condensers and valves and the electrostatic field of the coil. In order that the benefit gained by shielding shall not be negated by the effect

(Continued on page 540.)

The Coming of the "Tetrode"

THE time is approaching when the three-electrode valve must look to its laurels if it is to retain its present position of supremacy.

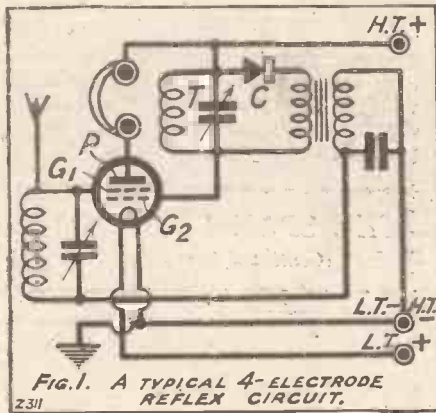
History is apt to repeat itself, and just as the old-fashioned two-electrode detector was displaced by De Forest's three-electrode detector-amplifier, so the latter may before long find itself ousted in popular favour by the undoubted merits of the tetrode or four-electrode valve.

It is a curious fact that whilst the "bi-grille," or two-grid valve, has been widely used by the amateurs of France, Germany, Austria, and Holland for several years past, it has not yet received the attention it deserves amongst listeners in general over here.

The Unidyne Circuits.

Readers of "P.W." are, of course, excepted from this general atmosphere of indifference. The Unidyne circuit, invented by Messrs. Dowding and Rogers, is generally recognised as the first practical attempt to popularise the four-electrode tube in one particular direction, namely, as a means of eliminating the use of H.T. batteries.

In spite of the success achieved by these two inventors, it must be remembered that



at the time they launched the Unidyne circuit the design of the four-electrode valve was practically in its infancy.

Owing to the widespread demand for valves of the standard three-electrode type, manufacturers had little time or opportunity for concentrating on the peculiar and difficult problems of tetrode design.

Erratic Valves.

As a consequence, many of the valves then on the market lacked the steadiness and reliability of performance which distinguished their three-electrode rivals.

Their characteristic curves were complex and often decidedly erratic. The saturation current in most cases was very small—somewhere in the neighbourhood of four milliamps—whilst the straight-line portion of the characteristic curve—i.e. that part available for distortionless amplification—was comparatively limited in extent.

We publish below an article from a special correspondent on the four-electrode valve. As our readers know, the four-electrode valve was first brought into prominence before the amateur with the publication of details about the Unidyne H.T.-less Circuit invented by Mr. Dowding and Mr. Rogers of this journal. There are to-day, however, many signs which indicate that the four-electrode valve may usurp the three-electrode valve.

We understand that the Marconi Company, which to-day takes a royalty of 12s. 6d. per valve holder from manufacturers of sets, is to modify this licence, and now wishes another clause to be inserted in the royalty agreement, limiting the terms of that licence to a valve holder only capable of taking a three-electrode valve, thus placing outside the range of this agreement four-electrode valves.

We understand that owing to important developments of new types of valves containing more than three elements, the Marconi Company has communicated to its licensees that it wishes to clear up the situation to enable manufacturers of valves to continue their work without any misunderstanding arising.

But it is not quite clear whether this modified form of general licence will allow manufacturers to make four-electrode valves or not. Whether a special licence will be granted we cannot state as yet, but we are given to understand that a special type of four-electrode valve which has been the subject of a good deal of research work by the Marconi Company's engineers, and which gives very extraordinary results, will shortly be placed on the market.

If the Marconi Company allows other manufacturers to make this valve under licence they may impose a royalty charge in excess of the 12s. 6d. at present charged per valve holder for three-electrode valves. It is to be hoped, however, that the Marconi Company will not feel it necessary to increase the royalty or to retain a complete monopoly of the manufacture of this new four-electrode valve, otherwise the influence on the trade in general for the future is bound to be adverse.

THE EDITOR.

These defects were, however, present in the early stages of development of the original Audion, or "soft" three-electrode valve, and it is not too much to say that what manufacturers have done in the one case, they can do in the other, as soon as the demand makes itself felt.

Before indicating some of the many useful applications of the four-electrode valve in modern practice, it may be useful to state briefly the precise use and purpose of the additional grid.

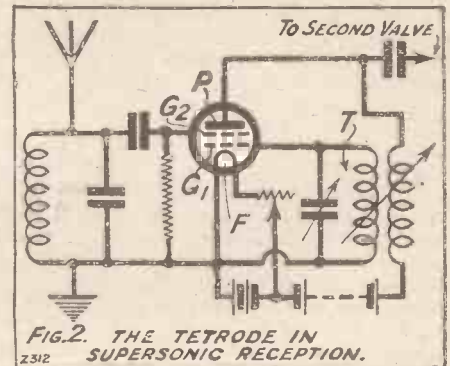
As most readers are aware, the electrons liberated from the filament of the ordinary three-electrode valve are initially trapped or confined between the filament and grid, and are only allowed to escape through the latter, so as to reach the plate, as and when the grid field or potential is favourable to their passage.

When the grid is strongly negative, the electrons are held tightly in the trap, so that few can escape. As the grid becomes more positive, the trap opens, so to speak, and the plate current increases.

In addition, however, to

the applied grid potential, there is another "blanketing" effect caused by the actual presence of the crowd of free electrons immediately surrounding the filament. These constitute in themselves a further negative field, tending to prevent the liberation of any more electrons from the filament, and serving to bar the "plateward" movement of those already liberated.

The existence of this negative field determines the internal resistance of the valve. When the grid potential is made



more positive, the effective resistance of the valve lessens, so that more current can pass through for a given plate voltage. The same applies to any reduction of the negative field due to the crowd of electrons clustering around the filament.

Reducing the Space Charge.

It is one function of the second grid to apply a positive voltage, and so lessen the effect of the space charge in a four-electrode valve. This, in turn, reduces the internal resistance of the valve, and allows it to pass more current for a smaller value of applied H.T.

(Continued on next page.)



A popular Unidyne receiver, employing three four-electrode valves.

THE COMING OF THE "TETRODE."

(Continued from previous page.)

In the Unidyne circuit a small positive charge on the second grid—amounting to no more than the voltage of the filament-heating battery—was sufficient to give fair loud-speaker reproduction without any other H.T. supply.

With an improved design of tetrode "power" valve excellent full-strength loud-speaker reproduction can already be attained by using only one-half to one-third the existing standard of H.T. values. Within a short time the H.T. will, no doubt, disappear entirely as a separate unit, and this without sacrificing one iota of the present standard of volume and clarity.

This is, however, only one aspect of the peculiar advantages to be gained by using a second grid. From another point of view the tetrode offers a promising field for the development of new types of reflex circuit.

It is also a convenient means for rectifying and simultaneously generating local oscillations both in super-heterodyne and super-regenerative reception.

Finally, it simplifies the problem of balancing the internal capacity coupling between the plate and grid circuits in H.F. amplification.

Reflex circuits using a tetrode valve have been in use for some time on the Continent, though Mr. Scott Taggart was apparently the first to advance the idea in this country.

Reflex Arrangements.

In reflex circuits of the kind shown in Fig. 1 the space-charge grid, G_2 , and the plate, P, usually carry the same H.T. voltage, so that the former in this case may be considered to function as a second plate.

The aerial input is connected to the control grid, G_1 , as usual. H.F. amplification takes place across to the second grid, the external circuit of which comprises an H.F. inductance-capacity loop, T, shunted by the crystal, C. The crystal then feeds the rectified currents back through a transformer to the first grid, where L.F. amplification takes place across to the plate proper and so to the phones.

In the super-het. type of receiver, any

device for reducing the number of valves required is particularly welcome. As previously explained, the extra grid here offers a clear-cut method of utilising the same valve both for generating the local oscillations and for simultaneously handling the incoming waves.

As shown in Fig. 2, the incoming signals, with or without a preliminary stage of H.F. amplification, are applied to the control grid, G_2 . The circuits of the plate, P, and inner grid, G_1 , are back-coupled to each other so as to generate the local oscillations at a frequency determined by the tuned circuit, T, of the inner grid.

The resulting beat frequency is then transferred from the plate circuit of the first valve to the intermediate frequency amplifiers by any suitable form of coupling as shown.

Neutralised Circuits.

When similar H.T. voltages are applied to the plate and space-charge grid of a four-electrode valve, and input potentials are applied to the control or outer grid, it is found that the currents flowing to the space-charge or inner grid and the plate are of opposite phase—i.e. the plate current increases whilst the inner grid current decreases, and vice versa.

If tuned circuits are connected in these two circuits, then the voltages on the plate

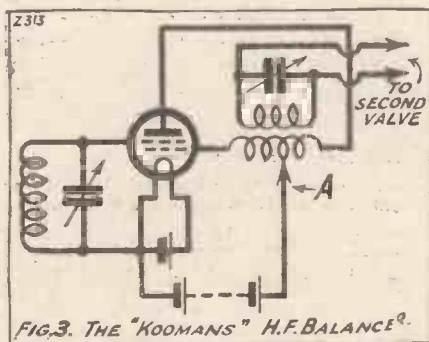


FIG. 3. THE "KOOMANS" H.F. BALANCE.

and inner grid will also be in opposite phase. Consequently, their electrostatic effects on the control grid are in opposite phase, and may be arranged to balance each other out.

It follows that the output circuit and the input circuit are mutually uncoupled so far as the valve electrodes are concerned, and the well-known neutrodyne or balancing effect is produced. In this way the production of unwanted self-oscillation is prevented.

Fig. 3 shows a tetrode H.F. amplifier in which a neutrodyne or balance effect is secured in a very simple way. The method is due to Koomans, a well-known Dutch radio engineer. In this case, feed-back between the two grids and the plate is completely eliminated by a mere adjustment of the tapping point A.

If the two electrode capacities are equal, the point A will lie midway along the plate inductance. If they are unequal, the balance point is shifted proportionally.

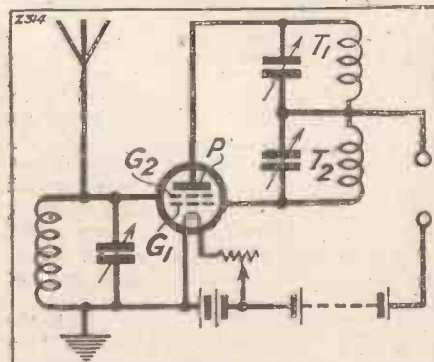


FIG. 4. ANOTHER CAPACITY BALANCED TETRODE.

The effect of external lead capacities can be compensated in the same way.

Fig. 4 shows a recent French circuit embodying the same principle in slightly different form. The aerial circuit is connected across the filament and the outer grid, G_2 , and similar tuned circuits, T_1 , T_2 , are connected respectively between the H.T. positive and the inner grid, G_1 , and plate, P.

Automatic Neutralisation.

This arrangement is somewhat similar to the ordinary neutrodyne circuit, using a divided plate inductance, except that the inherent capacity between G_1 and G_2 takes the place of the usual small external condenser. Owing to the phase opposition that exists between the plate and grid voltages, the feed-back effect of the capacity between the control grid, G_2 , and the plate, P, is completely balanced out.

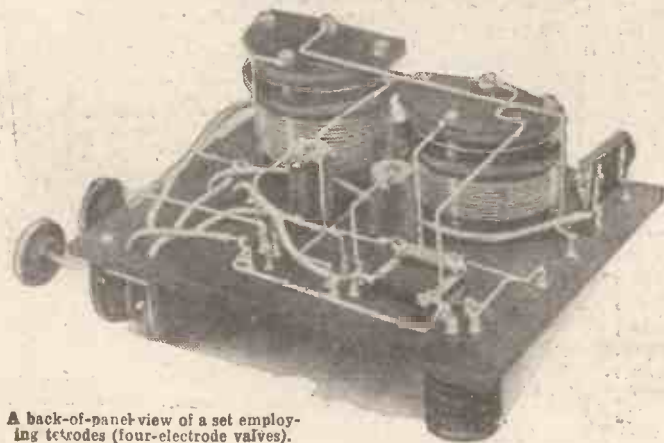
THE SPAN SPACE FOUR

(Continued from page 520.)

connect a pair of phones to a plug, and insert this in the 3-valve jack. Now touch the fixed plates of the tuning condensers and see whether the receiver is oscillating. Fairly strong clicks should be heard, and then the neutralising condenser should be gradually screwed down until oscillation ceases and does not start again when slight readjustments are made in the setting of the tuning condensers.

Now bring up the reaction condenser gradually until the set is once more found to be oscillating, whereupon the neutralising condenser should be advanced again until oscillation ceases. Again bring up the reaction condenser, advance the neutrodyne condenser until oscillation once more ceases, and proceed in this way until you find that you have overshot the correct adjustment of the neutrodyne condenser, and further increases in its capacity make the set oscillate more strongly instead of stopping it. The object is to find such a setting of the neutralising condenser that the greatest possible reading of the reaction condenser is required to produce oscillation.

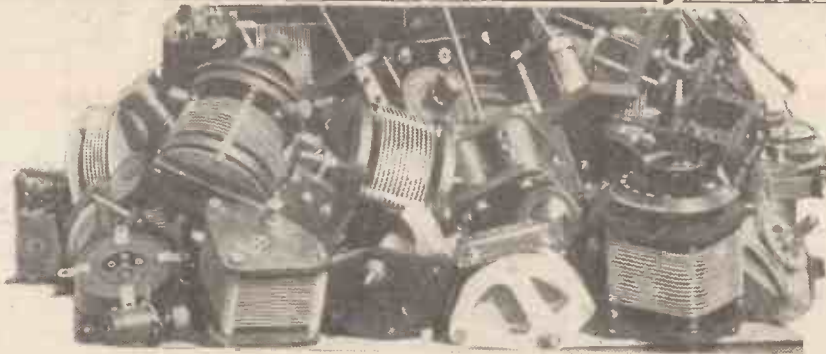
Next week I shall have something more to say about this receiver and the correct method of operation.



A back-of-panel view of a set employing tetrodes (four-electrode valves).

First Aid for Components

Make sure that your "useless" apparatus is really no good before you scrap it. Very often a little care will restore it to its former efficiency.



An article of interest to all constructors.

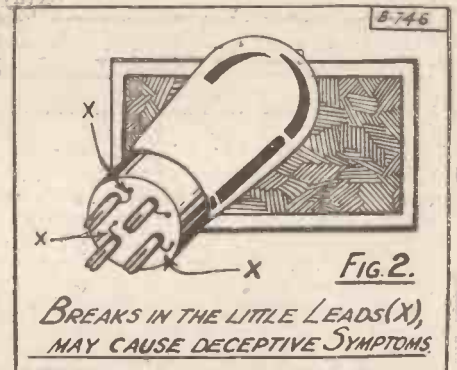
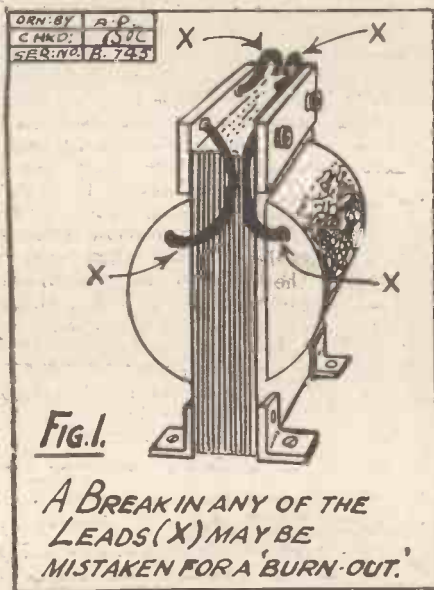
By
R. W. HALLOWS,
M.A.

A GREAT many of the components which are thrown away or relegated to the "junk" cupboard owing to their having suffered injuries of a more or less serious nature are really far from being such completely hopeless cases as they are thought to be. Often, in fact, the carrying out of some simple little job will restore

anything seems to be possible in wireless—but a breakdown of this kind is certainly exceedingly rare, the primary being the winding that is practically always affected.

Fig 1 shows where the fault really was in many of these broken-down transformers. No burn-out at all had occurred in the windings; there was simply a break in one of the four leads that run from the ends of the windings to the terminals. Never condemn a transformer as burnt-out until you have satisfied yourself that one of these leads is not to blame for its silence. Connect a small battery and a pair of telephones across the terminals of each winding in turn and move the appropriate leads about with a finger.

nothing of the kind has really happened. I have in use at the present time two valves, each of which was laid aside by its former owner as being of no further use. Neither has visited a firm of valve repairers, yet both are in perfect working order. The



Queer Valve Faults.

If one of them is broken the movement will now bring its ends together and now separate them, with resultant unmistakable noises in the telephones. A repair is usually not difficult to effect here. The faulty portion of the wire is cut away and a new piece is soldered on. There may be no break in the lead at all, but merely a disconnection between the end of a lead and the shank of its terminal, owing to the solder having come adrift.

Valves may develop queer little faults that produce all the symptoms of such serious things as a broken filament, though

first was believed to have a broken filament, for the very good reason that it would not light up when current was switched on. When this kind of thing happens, one's first business should always be to examine the base of the valve cap. In many makes the leads from grid, plate and filament are brought out through tiny holes near the

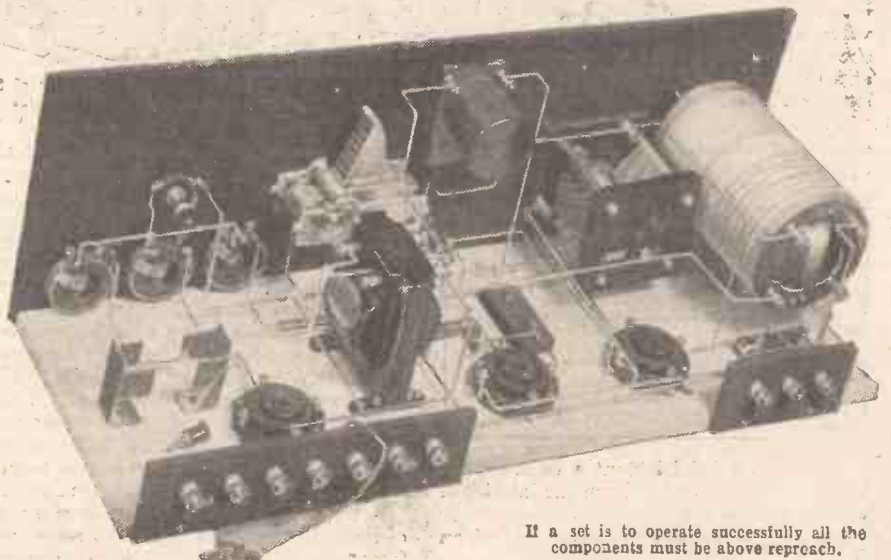
(Continued on next page.)

them to their full usefulness and will enable them to give good service for a long time to come.

I do not know how many times friends have shown me, almost with tears in their eyes, "burnt-out transformers" that were really not burnt-out at all. All the usual signs of a burn-out were there, it is true. The set became more and more noisy; then came a final crash, followed by complete and utter silence. When the transformer was subjected to the usual tests for continuity it was found that there was no response across one or other pair of terminals, and a burn-out was not unnaturally diagnosed.

Testing Transformers.

What first led me to suspect that the diagnosis was at fault was the production by a friend of a transformer which was stated to have a burnt-out secondary. I would not like to say that a burnt-out secondary never has occurred—almost

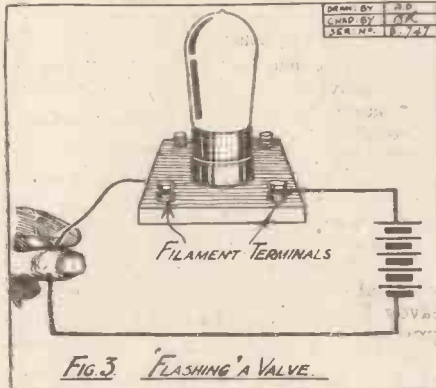


If a set is to operate successfully all the components must be above reproach.

FIRST AID FOR COMPONENTS

(Continued from previous page.)

base of the pins. Each lead is wound once or twice round this pin and then secured with a little solder. Now, if a valve holder is a very tight fit, or if the pins have become at all loose in their seatings, these fine leads may easily be broken (Fig. 2). There is thus no connection between the pin and the point



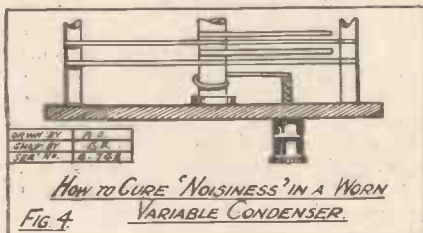
within the valve to which it should be attached.

An examination of the base of the valve to which I am referring showed that this was exactly what had happened to one of the little filament leads. By employing a fine soldering iron and a little patience the lead was repaired and the filament lit up as well as ever.

The second valve was discarded because it was noisy. There could be no doubt about that! The trouble here was that the plate pin was very loose and that the lead was fractured. A repair was made as in the previous case, the plate pin being subsequently tightened up with Chatterton's compound.

"Flashing a Valve."

If a valve has lost its emission, the case is not always hopeless so long as the filament is of the thoriated type. A somewhat desperate remedy is required—but, then, the disease also is desperate. The valve should be "flashed" in the way shown in Fig. 3. Lost emission is due as a rule to the fact that there is no longer sufficient thoria on the surface of the filament to enable it to emit a dense electron stream at low temperatures. By applying a high potential across the



filament for a brief instant a fresh supply of thoria may be driven from the interior of the filament to the surface.

To flash a valve, attach one pole of an H.T. battery to one of the filament terminals.

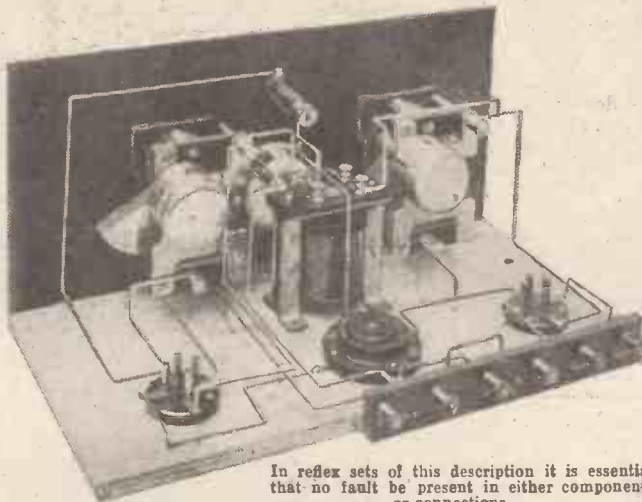
Fix a length of flex wire to a wander plug, and place this in the 12 or 15-volt socket. Bare the other end of the flex and with it touch the second filament terminal for a fraction of a second. Repeat this two or three times, then try the valve in the receiving set again. Should you burn out the filament you are no worse off than you were before, since the valve was, anyhow, useless in that condition.

You can always have a new filament put in by a firm of repairers. It is worth remembering that when the filament is touching the grid, or when all attempts to restore lost emission fail, re-filamenting can be carried out at about half the cost of a new valve.

Rheostats and Resistances.

Rheostats are often regarded as useless when their resistance coils have become crushed or otherwise deformed. Actually, a new lease of life can often be given by very simple expedients. If the coil is of the open type a fresh one can be obtained for sixpence from firms such as the Igranic Company or the Grafton Electric Company, and it is a very simple matter to take out the old coil and to fit the new one in its place.

A resistance coil with a solid core can often be re-wound. The safest method, in order to make sure that there are no short-circuits between turns, is to use enamelled resistance wire of suitable gauge, putting it on as tightly and as evenly as possible and afterwards giving a coating of shellac to fix the turns. When the shellac is dry the insulation must be



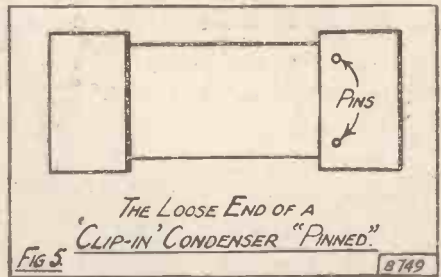
In reflex sets of this description it is essential that no fault be present in either components or connections.

rubbed away with emery cloth over the path taken by the contact arm. Cracked rheostat formers may often be mended with Chatterton's compound.

Old variable condensers are often put out of commission owing to their having developed a certain amount of noisiness. In most cases this condition is the result of wear, the spindle being able to wobble a little, and so making a "chaney" contact. Such a condenser is usually of little further use for a delicate or sensitive circuit, but it can be made quite quiet and may be serviceable in circuits where fine tuning is not required. The remedy here is to fit a spiral contact in the way shown in Fig. 4.

A terminal is inserted into the end piece of the condenser, $\frac{1}{2}$ in. or a little more away from the spindle. To the latter is soldered

one end of a strip of copper foil some 3 in. in length and about $\frac{1}{8}$ in. in width. The foil strip is wound several times round the spindle and its free end is then soldered to the shank of the terminal. You now



have a perfectly positive contact, the spring coiling up and uncoiling as the plates are rotated, but always remaining fast at both ends.

Improving Condensers.

If the fixed vanes are not bent, but have simply got out of alignment, so that the moving vanes touch them as they are rotated, the former can be adjusted in many condensers by means of the nuts above and below them, which hold them in position on the pillars. Use a small flat spanner for the purpose, mesh the moving vanes fully and bring the others into line by slackening off and tightening up the nuts referred to. It is usually rather a hopeless case to endeavour to straighten bent vanes, either fixed or moving, though I have known success achieved by the use of an old-fashioned copying press. By far the best method is to obtain fresh vanes from the makers, if they are willing to supply them.

It occasionally happens that one of the ends of a clip-in condenser becomes loose, or even altogether detached. Provided that the overlap of the two sets of plates is not too great, a repair may be effected here in the way shown in Fig. 5. Force the clip quite home and drill two very small holes right through. Into each of these pass a small brass brad or a little copper rivet. Cut off the ends fairly close on the far side and rivet over with a light, round-ended hammer.

I have successfully repaired a good many clip-in condensers in this way, but care must always be taken to test them out when the job has been done, before they are brought into use, in order to see that the two sets of plates have not been shorted by the rivets.

Decreasing sensitiveness in either telephones or loud speaker is due as a rule to weakening of the permanent magnets, a process which is accelerated either by rough handling or by connecting them to the output terminals, so that current passes in the wrong direction through the windings. Most makers will undertake re-magnetization for a very small charge.

BROADCAST NOTES.

By OUR BROADCASTING CORRESPONDENTS.

B.B.C. and Television—The Cenotaph Broadcast—A B.B.C. Coup—P. F. Warner to Broadcast Cricket—A Bolton Occasion—A Cardiff Novelty—Covent Garden Opera—The Local News Crisis—The Prince of Wales—New Story by A. J. Alan.

B.B.C. and Television.

CAPTAIN ECKERSLEY vehemently denies the suggestion that he and the other engineers at Savoy Hill ridicule television. The Chief Engineer of the B.B.C. declares that, in his opinion, television will in due course become a *fait accompli*. At the same time, however, he insists that a considerable period must elapse before television comes into general practical use. The B.B.C. opinion, as interpreted by Captain Eckersley, appears to be that such methods of television as have been proposed so far are more in the nature of laboratory experiments on which future systems will be based. They are not looked upon as immediate practical solutions of the problem. It is pointed out that wireless telephony was known to be a possibility fifteen years before broadcasting, and that its theoretical possibility was realised twenty years earlier. Captain Eckersley would have us believe that his attitude towards television is one of benevolent interest. He declares that the B.B.C. will naturally co-operate in whatever way possible with any concern bringing forward a practical system of television capable of general application.

The Cenotaph "Broadcast."

The first broadcast to be done from the Cenotaph will be in connection with the annual service of the British Legion, and will take place at 5 p.m. on Whit Sunday, June 5th. This will probably be the most difficult "Outside Broadcast" ever attempted by the B.B.C. Severe conditions have been laid down by the authorities. The microphones must not be visible. There must be a guarantee that none of the gear will interfere with the traffic. Thus it will be necessary to extend a steel hawser across the roadway, and suspend the "mikes" from this. The amplifying gear will be installed in a room in the Home Office. The Dean of Westminster (the Very Rev. William Foxley Norris) is to conduct the service, during which listeners will hear "The Last Post" and the "Reveille."

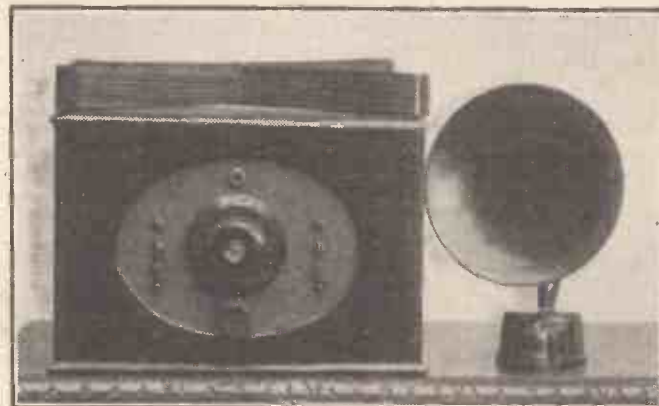
A B.B.C. Coup.

The engagement of Sir Henry Wood on a long contract is undoubtedly a great coup for the B.B.C. It was known that various negotiations were spinning out their tortuous course in connection with a number of proposals aimed at saving the Queen's Hall and its skilled personnel. Apparently Messrs. Chappell and the B.B.C. found agreement impossible, so the latter set out on its own. It rightly regarded Sir Henry Wood as the key to the situation. With his capture other important developments became much easier and indeed almost inevitable. For instance, it is obvious that Sir Henry would not leave his brilliant Queen's Hall orchestra "in the soup." No doubt this will be drafted gradually but

surely into the service of the B.B.C. on a permanent basis. Then, with such a brilliant aggregation at work, the B.B.C. will have very strong levers with which to overcome the opposition of the Queen's Hall people. It looks, therefore, as though the B.B.C. will get a finger in the Queen's Hall pie before next winter. But even if the "last ditchers" hold out, the B.B.C. concerts under Sir Henry Wood will be given elsewhere, so that in any event both the public and the music lover stand to gain by the recent success of the Savoy Hill negotiators.

P. F. Warner to Broadcast Cricket.

Mr. P. F. Warner, the famous cricketer, will give a running commentary on the Middlesex v. Nottingham match at Lord's on Saturday, June 11th, from 2.15 to 6.30. Mr. Warner will open with a ten minutes' description of the ground, with reminiscences



A three-valver built from the "P.W." Blue Prints by Mr. E. A. Lewin, 15, Windmill Road, Edmonton.

generally, and thereafter will give five-minute talks at 3, 4, and 5 p.m. He will sum up with a ten minutes talk at 6 p.m.

A Bolton Occasion.

Thursday, June 9th, is a red letter anniversary for Bolton. It is the centenary of the invention by Samuel Crompton of the spinning wheel. Speeches at the Albert Hall, Bolton, will be relayed by Manchester on that day. Lord Derby and Sir William Haworth will be among the speakers. Professor G. W. Daniels, who occupies the chair of Commerce and Administration at Manchester University, will give a talk from Manchester on the life of Crompton on Tuesday, June 7th.

A Cardiff Novelty.

Following the broadcasting through Cardiff of Evensong from Llandaff Cathedral on Sunday, June 19th, a special programme by Don Pedro's Mexican Band will be relayed from the field adjoining the Cathedral. It will be interesting to note the reaction of this contrast on Welsh listeners.

Covent Garden Opera.

The third and final broadcast in connection with the present Opera Season at Covent Garden will take place on Friday, June 24th, when listeners will be given Act II. from Bizet's "Carmen." There has been some adverse criticism of the B.B.C. on the score of the meagreness of its excerpts this year from Covent Garden. The difficulty appears to have been chiefly financial. The Covent Garden people opened their mouths very wide indeed. For instance, the short extract from "The Huguenots," on May 30th (already announced in "P.W.") is costing more than £200 in fees alone.

The Local News Crisis.

The B.B.C. has been trying to reorganise and improve its local news services. These are handled through the Agencies in accordance with the terms of the main agreement between the B.B.C. and the Press. The Agencies had nominated a local press man to give local items to the B.B.C. station. The arrangement for local news alone cost the B.B.C. some thousands a year. But it was not the cost so much as the quality of the service that concerned Savoy Hill. Apparently there has been a growing volume of complaint from listeners because of the varying quality of the local news service. After careful consideration, Savoy Hill decided to change the system. Instead of putting on local news regularly

whether there was anything to report or not, they decided to make the local news fit the event. In other words, there was only to be local news when something happened worth reporting by radio. This would seem to be a reasonable plan, but it is a further sign of the difficulties of Broadcasting administration that the change-over has been accompanied by a considerable popular clamour, questions in Parliament, and

numerous other demonstrations of popular disapproval. But the B.B.C. will be well advised to carry on without modification.

The Prince of Wales.

Listeners will be glad to learn that they are to hear the voice of the Prince of Wales again when he opens the new building of the University College of the South West at Exeter on Tuesday, June 7th. The proceedings will be put out S.B. through Plymouth. The broadcast will be between 1.30 and 2.45 p.m., and will include Community Singing by the students, prayer by the Bishop of Exeter, a speech by Sir Henry Copes, and then an address by the Prince of Wales. Mr. John Murray, Principal of the College, will close the proceedings.

New Story by A. J. Alan.

Mr. A. J. Alan, admitted as the champion raconteur of the microphone, will tell another of his inimitable stories on Monday, June 14th, S.B. from London.

THE VITAL QUESTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with great interest the correspondence published each week on L.F. coupling. May I say that after studying sound reproduction in connection with the loud speaker for some considerable time, I have come to the conclusion that the present type of horn speaker, particularly when connected to a transformer coupled set, is now obsolete in so far as natural reproduction is concerned. I italicise natural because there is such a gap between natural and the so-called pure reproduction. I am willing to admit that a first-class horn speaker coupled to a resistance amplifier is very pure reception, and will satisfy a great majority of listeners, especially if they possess little or no musical knowledge; but to a musician the result of connecting a moving coil instrument to the same set is so amazingly different that I cannot imagine even the uneducated listener not being able to appreciate the contrast in musical balance.

I am quite sure that if the majority of the public could receive what the B.B.C. are at present sending out they would be more than surprised at the advance in transmission. Personally, I am of the opinion that the transmission at times is so faithful as to be positively uncanny.

May I presume to suggest to 2 A P.W. apart from his wish to suppress the bass, that it is exceedingly difficult to obtain a preponderance of bass from a loud speaker on account of the intensity required to even approach the volume of the fundamental bass of a normal orchestra or pipe organ.

Mr. Bonavia-Hunt, in his letter of May 7th, has put the whole question in the proverbial nutshell, and I can thoroughly recommend experimenters, if they have not already done so, to carry out his suggestions and experiments, particularly changing over rapidly from horn to moving coil speaker.

In conclusion, after experimenting personally for many years in the quest for good quality and natural reproduction a four-valve consisting of a D.E.B. detector (anode beam rectification), followed by a well-designed two-stage amplifier resistance coupled, using two super power valves in parallel for the last stage and a suitable tone control in conjunction with an instrument on a principle similar to the moving coil, is very difficult to improve upon at the present time, but I think the great question is: Can the majority really appreciate the difference between transformer and resistance coupling?

Yours faithfully,
FELGATE KING.

280, Earl's Court Road, London, S.W.5.

SHORT-WAVE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—You may be interested to hear that on April 27th, 1927, at 3.40 a.m. B.S.T., I succeeded in picking up the short-wave transmission from W.L.W., Cincinnati, on a wave-length of 52 metres (approx.) on two valves. Strength was very good, almost attaining the standard of 2 X A F., every word of the announcements being easily understood. However, high-speed fading and atmospheric were more noticeable on this wave than on 32 metres. At 4 a.m. (10 p.m. E.S.T.) W.L.W. signed off for the night. On two successive mornings I have since picked up their transmission, but not at such good strength. I might mention that I was using a short aerial and no earth, as is my usual custom on the short waves. I am a fairly regular listener to 2 X A F.'s programme, and would be pleased to hear from other readers who have heard W.L.W. on the short waves.

Yours faithfully,
D.C. GATTIKER.

"Mon Desir," Boreham Wood, Herts.

"SATURATING" A LOUD SPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have on numerous occasions seen reference to the use of "Super Power" valves for good quality reproduction, and also articles upon their correct use as to the potential applied to the grid and anode, etc. There is, however, a point that I have not seen mentioned, and that is the effect of the increased anode current as compared with that of the usual "small power" valve upon the loud speaker.

I have found the increased current flowing through the loud-speaker windings may, especially in the case of some "cone" type speakers, cause distortion if a filter circuit is not used.

This may take the form of "rattling," apparently caused by the diaphragm being drawn much nearer one pole piece than the other, or distortion may only be noticeable upon very loud or high-pitched passages; in this case I believe that it is due to "saturation" of the speaker magnets, neither of which would be so pronounced when using a valve of less emission.

Yours faithfully,
E. ALAN P. DOUGLAS.

Parbold Hall, Wrightington,
Near Wigan.

HAVE READERS NOTICED THIS?

The Editor, POPULAR WIRELESS.

Dear Sir,—I should be interested to know if any of my fellow readers have experienced any "blasting" of the piano from any particular studio at Savoy Hill?

CORRESPONDENCE.

DRY OR WET H.T.?

**THE VITAL QUESTION—
"SATURATING" A LOUD SPEAKER—
AN UNUSUAL BURN-OUT.**

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

Every time this studio is used, the same "blasting" effect, but immediately a piano is played in any other studio, it is perfect. I know my set and batteries are in good condition, so cannot throw the blame on them.

Yours faithfully,
V. A. M. POWELL.
"Kingsmore," 1, Druce Road,
Dulwich Village, S.E.21.

ACCUMULATOR H.T. BATTERY.

The Editor, POPULAR WIRELESS.

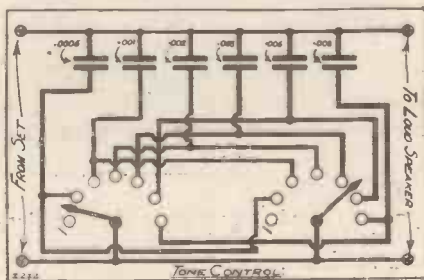
Dear Sir,—I am using a four-valve set with H.T. accumulators of 2,500 milliamperes capacity. I use only two valves on the local station, and three on 5 X X. The valves are new B.T.H. valves, using 6 milliamp. total, and the batteries only last me a month. Is this normal or abnormal, as I was informed that they would last four or five months? It is used about four hours daily. I put a dud valve in the H.F. position, as it is not used.

Wishing "P.W." every success.
Yours sincerely,
W. MITCHELL.
124, Vauxhall Road,
Birmingham.

A TONE CONTROL.

The Editor, POPULAR WIRELESS.

Dear Sir,—I herewith enclose a sketch of a tone control I made up for my loud speaker, and which I find works very well. You will notice there are two switches and seven studs for each; the first stud in each case is a dummy, so that the arrangement can



be put out of circuit if not required. Also one, two, three, or four condensers can be put in parallel (the three or four by placing the switch arms or arm on two studs), so that quite a number of capacities can be placed across the loud speaker. Perhaps readers can make some use of this little control.

Yours faithfully,
R. H. TICKLE.
22, Gresford Avenue, Liverpool.

AN UNUSUAL BURN-OUT.

The Editor, POPULAR WIRELESS.

Dear Sir,—Apropos the article, "How to Burn Out Valves" in a recent issue of "P.W.," I would like to add yet another cause, and one which must be of rare occurrence. I was using a Magnavox loud speaker, and for convenience—although it proved very inconvenient—was using the filament battery to energise the field. All went well for a time until one field connection worked loose and opened the circuit, which caused the back E.M.F. kick to burn out the filaments and also, it seems to break the filament supports. This may be of interest to other readers and serve as a warning.

Yours truly,
A. W. SIMONS.
31, The Gardens,
E. Dulwich, S.E.22.

DRY OR WET H.T.

The Editor, POPULAR WIRELESS.

Dear Sir,—Mr. R. W. Hallows is to be congratulated on the very interesting article which appeared in one of your March issues, but he perpetuated a fallacy which the writer, amongst others, has endeavoured repeatedly to clear up.

In comparing the accumulator battery with a dry cell battery and the Sac Leclanché battery. Mr. Hallows asserts that the accumulator is distinctly more vulnerable than either of the others, as a brief short-circuit may be vastly more serious to an accumulator battery—"it will certainly curtail the total life of the battery very greatly, and it may even put some of the cells altogether out of action through the bucking of their plates."

I have yet to see an accumulator battery of any make which has been damaged by a brief short circuit. To put the matter to a proof, an interesting experiment has been carried out during the past week in our laboratory, taking an ordinary 20-volt H.T. Exide battery. Two 12-in. lengths of rubber-covered flex 110/0076 were brought from the terminals of the battery to a tumbler switch which was closed every half-hour for about two seconds. The internal resistance of the battery was approximately 1 ohm and the resistance of the external circuit through which the battery was shorted, was 0.01 ohm; the short circuiting current was about 20 amperes. It was noticed that the battery voltage very quickly reached 20 volts again after removing the short circuit.

The test was stopped after 100 short circuits had been given, without any need to re-charge. There was no trace of bucking, flaking, or shedding of active material either after the 100 short circuits or on the subsequent re-charge. It is not possible to convey any convincing evidence to this effect by means of photos, so I am forwarding one pair of plates taken from the battery after the completion of the experiment.

This is not a surprising result; it is what every accumulator battery will withstand if we are to believe the claims of the manufacturers.

One other statement made by Mr. Hallows also requires correction. He alleges that "at the end of three years, both the dry cell battery and the accumulator will be done for." This is surely a very pessimistic forecast of the results which will be obtained with the thousands of accumulators now in service already two years old. There does not seem the slightest reason to assume that they will only last another year.

Yours faithfully,
E. C. MCKINNON, M.I.E.E.,
(Chief Engineer to

The Chloride Electrical Storage Co., Ltd.)

Clifton Junction, Nr. Manchester.

Ed. Note.—The plates referred to certainly appear to be in perfect condition, despite the treatment to which they were subjected.

H.T. ACCUMULATORS.

The Editor, POPULAR WIRELESS.

Dear Sir,—With regard to Mr. H. G. Hookey's letter in a recent issue of "P.W.," I am afraid his experience of H.T. accumulators and mine do not agree.

I have four 20-volt "Exide" W.J. units, and a three-valve set (Det. and 2 L.F.) with two P.M.3 and a P.M.4 valves, and the set is only in use for about 25 hours a week on an average, and for three-quarters of this time on two valves only. My H.T. accumulators, however, will only last for just over a month, six weeks at the outside; and at the end of this time the voltage has dropped to about 30.

This, of course, is very disappointing, as I purchased this make of accumulator because they seemed to be of larger capacity than the usual run of this type of battery, and I certainly expected them to last for considerably longer than this. I have tested the acid and it is up to the strength recommended. I charge them up myself in accordance with the instructions by the makers, and I do not think it can be said that they are undercharged.

A friend of mine who also runs this make on a four-valve set finds that his accumulators will not stand up for more than three weeks.

I shall be glad to hear if any of your readers experience the same.

Yours truly,
A. F. CARELESS.

4, Nighthall Buildings,
Grovc Road, London, N.W.8.

THE Q. & A. SET.

The Editor, POPULAR WIRELESS.


Dear Sir,—I thought the following details might interest you concerning the "Q. & A." receiver, full particulars of which appeared in your issue of Jan. 15th.

On Sunday, Jan. 23rd, I had completed the wiring and everything was ready for testing by 3.30. I connected up and, using an Amplion Dragon L.S., Mullard P.M.1 and P.M.2 valves, and Lissen transformer, obtained a reception which, I think, would be hard to beat for a two-valve set for purity and volume.

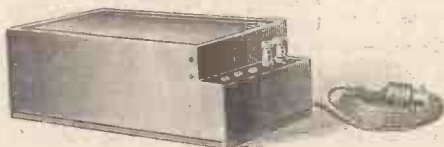
In the evening, between 6 and 8, I reached out for foreign stations. I was not disappointed: I received four different stations on splendid headphone strength. But being new to long distance work I was unable to locate them. The following Sunday, however

(Continued on page 540.)

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Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

A CHEAP LOUD SPEAKER.

A FELLOWS' "Junior" loud speaker has been received by us for test. The outstanding feature of this accessory is its price—it is sold at 13s. 6d. But notwithstanding this extraordinarily low figure the loud speaker has a height of 19 inches and is of quite good appearance. It is provided with an adjustment which enables a close control of its sensitivity to be obtained.

Now it would be unfair to compare a horn speaker of this type with a "Cone" costing many pounds, and the low price must be taken into consideration when criticising its performance. Not that the Fellows' "Junior" appears to require much in the way of a concession, for it works exceedingly well in our opinion. It can handle a fair input and reproduce all the medium and higher tones very well—quite as well, in fact, as some loud speakers whose prices are very much higher than 13s. 6d. Connected to a

two-valve set of a very popular design—i.e. one including a stage of transformer-coupled L.F. amplification, the Fellows' "Junior" gave a clear rendering of the local station's programme. Speech was quite good, and strings came through very well.

We are sure that the average listener would have very few faults to find with it, and it certainly does widen the horizon for those who have loud-speaker aspirations but crystal-set pockets!

A LOG BOOK AND DIARY.

We recently received a copy of "The 1927 Log Book and Diary" issued by the Radio Society of Great Britain. It is an excellent production, and besides a generous allotment of pages to the Diary section it contains many interesting articles and tables of vital interest, to the listener and amateur. A list of amateur transmitters is given. At

the price of 3s. 6d. it strikes us as being an excellent proposition.

A NEW EDISWAN VALVE.

The latest Ediswan valve is the R.C. 610, a 6-volter taking 1 ampere of filament current, and designed for use in resistance-capacity-coupled amplifiers. It has an amplification factor of 40 and an impedance of 100,000 ohms. The bulb is almost completely silvered, but a circular inspection area of clear glass is arranged on the top, where at one time there would have been a "pip". The valve is sold with one of its filament legs sealed up in a small glass tube. Until the seal is broken the valve cannot possibly be plugged into a holder, so that the purchaser has definite proof that the valve has not been used before it came into his hands. The characteristic curve issued by the makers for the R.C. 610 does not compare well at first sight with the curves issued for other makes of similar types of valves. Actually Messrs. Ediswan show a couple of inches or so of quite straight line on the plus side, while the minus side is occupied mostly by "bends of rectification." They could quite legitimately have stretched out the vertical scale and omitted most of the plus side. The curve is liable to give the amateur who reads such things as pictures, a rather bad impression.

As a matter of fact, the R.C. 610 works quite well. Used in a detector position preceding an R.C. coupled L.F. amplifier, it provides considerable magnification and can handle considerable strength of signals. In the leaflet accompanying the R.C. 610 it is stated that, "It (the R.C. 610) has a

(Continued on page 534.)

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| 4 mfd. | 0 10 0 |
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Full particulars on request.

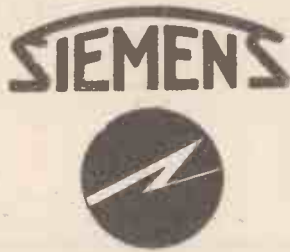
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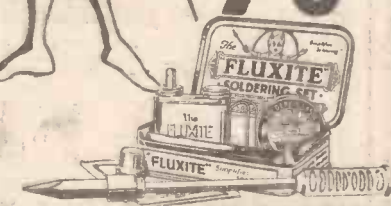
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All Hardware and Ironmongery Stores sell FLUXITE in Tins, price 8d., 1/4 and 2/8.

Another use for Fluxite—Hardening Tools and Case Hardening. Ask for leaflet on improved methods.

FLUXITE Ltd. (Dept. 324) Rotherhithe, S.E.18



APPARATUS TESTED.

(Continued from page 532.)

lower impedance than the famous R.C.2 with a consequently higher amplification factor." The word "consequently" is unfortunately placed, for to lower the impedance of a valve is generally to lower its amplification factor as well, hence the comparatively high impedances of "hi-mu" valves and the "lo-mu" of output valves where the necessity for low impedances is vital. That Messrs. Ediswan have lowered the impedance in the 610 and increased the amplification factor is a double gain, and for such they could deservedly ask for commendation.

However, the R.C. 610 is priced at 14s., and it is an excellent valve; and besides giving good results in R.C. L.F. stages and in detector positions we have found it very useful in certain H.F. stages. We are inclined to think that it is the best Ediswan valve that has been brought forward for some time, and this with no reflection on the several other excellent Ediswans on the market.

LAMPLUGH NEUTROCON CONDENSER.
Messrs. S. A. Lamplugh, Ltd., of Birmingham, recently sent us one of their new

Neutrocon condensers. Designed for either panel or baseboard mounting, it is provided with a long adjusting handle, and is very well made, compact and neat in appearance. It has a smooth, easy adjustment, and amply covers the normal range. It is impossible to short circuit the two plates at the maximum position. The retail price of this component is 3s. 6d.

AN IMPORTANT AMALGAMATION.

The amalgamation of two leading radio concerns was recently announced. These are R.I., Ltd., and the Varley Magnet Co., and the new company is to be known as R.I. and Varley, Ltd. The directors are Mr. J. Joseph (managing director of R.I., Ltd.) and Mr. J. M. G. Rees (director of Oliver Pell Control Ltd.), whose photographs are reproduced on this page.

Both R.I. and Varley components will be known to "P.W." readers as efficient, high-class productions, and readers will no doubt agree with us that the amalgamation is a happy one. Both of the units involved were strong ones individually—shoulder to shoulder they should pull their weight even better than ever. The histories of both concerns are records of steady progress, and we have no doubt

that the future of R.I. and Varley Ltd. will justify the optimism of its directors.

A SAFETY DEVICE.

Messrs. A. Hunt, Ltd., recently sent us one of their "Saveit" safety fuse devices. This is a neat baseboard mounting article containing a "pealamp" with a red indicator and two small terminals and soldering tags. This component is for connecting in direct series with one of the H.T. leads to protect the filaments of the valves against accidental burn-outs through H.T. shorts. It is well made and cannot fail to operate when the need arises, as the pealamp provided had a filament consumption of but .05 amperes or less than that of a .06 valve. The complete device costs 2s., and spare bulbs are 9d. each.

A LOUD-SPEAKER WALL JACK.

Amateurs who run extension leads for loud speakers or telephone receivers will be interested to learn that Messrs. A. H. Hunt, Ltd., of Croydon, have produced a new wall jack of a very neat, compact design. It will accommodate any standard plug, and is arranged on the simple two-pole "cut-in" plan. It is mounted longways on a small base, and has an overall width of but $\frac{3}{4}$ in. and a height of 1 in. Thus it can be fitted along the side of a window or door frame or under a window ledge. And the plug projects sideways when inserted and is thus safely and neatly disposed.

This walljack is very well made, and, with its nice nickel-plated cover, is quite dustproof. At the price of 2s. 6d. it appears to be reasonably priced. In operation we found it to be efficient and it provided a definite, clean contact.



Mr. J. M. G. Rees.
Photo by Elliott & Fry.



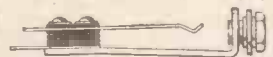
Mr. J. Joseph.
Photo by Elliott & Fry.

Ashley Radio

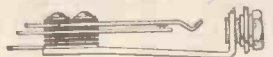
Guaranteed Components for high efficiency Sets.

Guaranteed to be manufactured of materials which have secured the approbation of experts associated with this and other journals Ashley Components can pass any examination with distinction. Cheaper than others they may be, but nevertheless they are a repeated feature in many valuable sets.

JACKS



JACK No. 1. Single Circuit (Open) 1/3



JACK No. 2. Single Circuit (Closed) 1/6



JACK No. 3. Double Circuit 1/9

JACKS No. 4 and 5 for Filament Single and Double Control 1/9 and 2/3 respectively

Positive in action, these Jacks were designed by telephone engineers whose experience in other directions has enabled them to simplify the movements; embody refinements, and to recommend the materials and methods for their construction. Tags are tinned and spread fanwise for easy soldering.



VALVE HOLDER

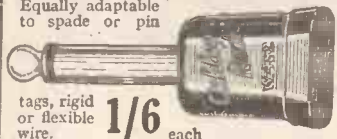
This Valve Holder has been adopted by B.T.H. for their R.K. Loud Speakers, a tribute to its high insulation and anti-capacity properties. Bakelite. 1/3 each.



Patented construction differing from all others and undoubtedly superior. each 2/6
50,000 W. to 2 megohm. Bakelite Base. 1/-

STANDARD TELEPHONE PLUG

The neatest finish to any pair of leads. Equally adaptable to spade or pin



tags, rigid or flexible wire. 1/6 each



RESISTORS

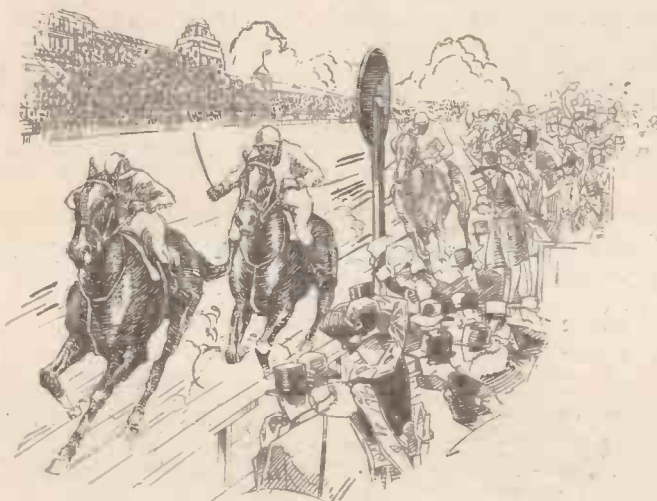
The modern method of ensuring correct and unvarying L.T. Supply. Obtainable in any desired value for inserting in circuit with any make of valve. Guaranteed accurate to within 2%.

The base is moulded of genuine Bakelite, with nickelled Phosphor-bronze clips, which grip with firm contact but permit of easy extraction.

All Standard values 1/6
Base 1/-

ASHLEY WIRELESS TELEPHONE CO. (1925) LTD.,
17, FINCH PLACE, LONDON ROAD, LIVERPOOL.

If unobtainable mention local dealer and we will send post free.



A GOOD TIP!

IN the "Sport of Kings" uncertainties are, of course, common; but if you want to hear "The Derby" effectively broadcast, there is one certainty you can rely upon—a "HART" BATTERY.

For all Low and High Tension Wireless Circuits "HART" BATTERIES mean dependability, constant voltage and reception at its best.

In other words, "HART" BATTERIES are a tip worth knowing when it comes to buying batteries.

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WIRELESS BATTERIES

LOW TENSION TYPES

- "RME" 5. 2 volt, 20/40 amps. 11/10
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- "RME" 9. 6 volt, 40/80 amps. £2 : 9 : 0

HIGH TENSION TYPES

- "RAY" 20 volts 14/8, 30 volts £1 : 2 : 0
- (Any reasonable multiple of these voltages can be used.)

Write Dept. "P.W." for full particulars, and FREE Booklet,
"The Right Way to use Your Wireless Batteries."

HART ACCUMULATOR Co. Ltd.
STRATFORD, LONDON, E.15.



Goodall Ad.

The "Resistor 2"

HAVE YOU BUILT THIS FAMOUS



RESISTANCE-CAPACITY SET?

A complete set of Dubilier Condensers and Resistances for this set costs only 20/6. It comprises:—

- 1, 0.00025 mfd. Condenser, Type 610 with clips.
- 1, 0.001 mfd. Fixed Condenser, Type 610 with series clips.*
- 2, 5M Ω Grid Leaks.
- 1, Duvarileak 0 to 5M Ω
- 1, Fixed Condenser 0.00025 mfd. Type 610.

* For those who already possess a Type 610 condenser of this capacity, this series clip can be obtained for 6d.

Ask your Dealer for these parts or, in case of difficulty write direct to us.



Advt. of the Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, W-3

M.C. 273

RADIO TORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All enquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

As much of the information given in the columns of this paper concerns the most recent developments in the Radio world, some of the arrangements and specialities

described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked: "Patent advice."

Questions and Answers

A "HALE" CIRCUIT WITH H.F. AMPLIFICATION.

G. K. S. (Faringdon, Berks), H. G. D. (Gillingham, Kent), and others.—"Where can I get particulars of a two- or a three-valve set employing the 'Hale' circuit, with a stage of H.F. amplification in front of it?"

Such a circuit was employed in "The Signal Box," a three-valve receiver fully described in "The Wireless Constructor" for May. (Now on sale, price 6d.). The set combines distance-getting powers with an ability to give an enormous volume of undistorted music from the local station.

CAUSE OF FAILING SIGNAL STRENGTH.

J. A. (near Andover, Hants).—"My reception has fallen off this summer far worse than it did last year, and though my one-valve set seems to be in perfect order when taken on to other aerials it does not give any "distance" results worth mentioning when on my own aerial.

Last autumn I moved the mast round to get more height, and now the aerial is well over 40 ft. up. There are several trees growing under it in the present position, and its direction is roughly the same as before. When first erected it certainly gave much better results than now—would the trees be likely to cause a falling off?"

The presence of a leafy tree near to an aerial is often the cause of a loss in signal strength. In winter this loss is very small because the tree is relatively small and dry, but as its foliage grows in summer it may begin to "screen" a neighbouring aerial more and more thoroughly, causing an increasing loss in range and strength. It is very likely that in your case the trees beneath the aerial are the cause of the trouble, for being themselves earthed they "take the earth up into the air," in effect, so reducing the effective height of the aerial. An aerial that is less screened, even if nearer to the ground, might give far better results than the high one with trees below it.

TUNING OF A CRYSTAL SET.

"PUZZLED" (Greenwich, London, S.E.).—"About two months ago we moved from one house in Greenwich to another one about a mile away, and our wireless in the new house is not half so good as it used to be. Formerly we could use two pairs of 'phones in comfort, but now even on one pair it is too weak to be comfortable.

(Continued on page 538.)

LEWCOS

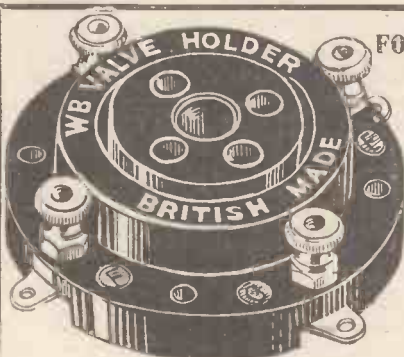
Inductance Coils

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Obtainable from all Radio Dealers. In case of difficulty, write for illustrated leaflet to:

The
LONDON ELECTRIC WIRE COMPANY & SMITHS, LTD.,
 Playhouse Yard, Golden Lane, London, E.C.1.



FOR BEST RESULTS

USE **W.B.**
ANTI-PHONIC
LOW LOSS
VALVE
HOLDERS

PRICE
 With Terminals
2/3

With Tinned
 Soldering Tags
2/-

If unable to obtain from your dealer write direct.

Manufactured by **WHITELEY, BONEHAM & CO., LTD.,**
 Duke Street, MANSFIELD, NOTTS.

BEST for ANY SET

Do you want a dry cell L.T. battery for your new "Portable"? Ask your dealer for the COLUMBIA Radio "A" Cell. Do you want a reliable H.T. Battery for your big set at home? Ask for a COLUMBIA "B" Battery.

No matter what your requirements, there is a COLUMBIA Battery to meet your very need. A COLUMBIA Battery which shilling for shilling will positively give you longer—and better—service than any other battery manufactured.

Columbia

High Capacity and "Layerbilt"

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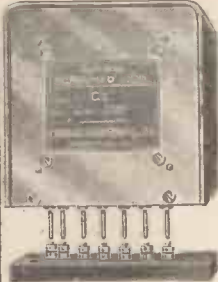
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Wireless Components

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Prices include complete screened coil and base.
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- CENTROID fixed resistors complete with base. Any value - - - - 1/- "

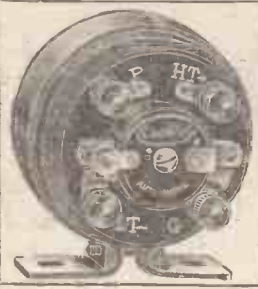
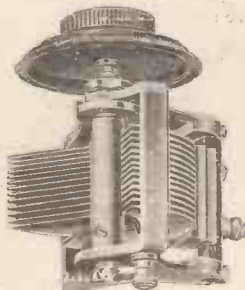
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| Die Cast. | Low Loss. | Square Law | |
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| SINGLE | - - - | 10/- | each |
| DUAL | - - - | 21/- | " |
| TWO GANG | - - - | 22/- | " |
| THREE | - - - | 33/- | " |

Two and three gang are fitted with additional balancing condensers.

Obtainable through dealers or direct from manufacturers

The Camden Engineering Co., Ltd.
Bayham Place, Camden Town, N.W.1



1 1/2 WATMEL AUTO CHOKE PRODUCED AS EVIDENCE

Watmel

CROSS-EXAMINED

ACCUSED OF SELLING WELL-MADE COMPONENTS.

VERDICT FOR DEFENDANT.

As a sequel to the recent increase of cheaply priced wireless components. In the Radio Courts Watmel Wireless Co., Ltd., were accused of selling extremely well made wireless components, thus raising their prices above those of many other firms, to the detriment of purchasers' bank balances.

After the Prosecution had outlined the case the Counsel for the Defence rose to answer the charge. He said that his client had never received a single complaint of poor workmanship or bad results. His client's policy had been and will always be, he emphasised, that quality should predominate over price (chipping from wireless enthusiasts interrupted the speaker here, but was promptly subdued). Recently, Counsel explained, Watmel had installed very-expensive machinery in order to still further improve the workmanship, but this did not result in increased prices.

Witnesses called for Defence stated that they had used Watmel components in their sets for years and were thoroughly satisfied with their performance. They would never again be attracted by cheaper prices into buying inferior components. Many exhibits were produced in evidence. A noteworthy one was the 1 1/2 Watmel Auto Choke, which was shown with several cheaper makes. The superior workmanship and design were pointed out to the judge, who nodded his head sagely and requested that a specimen should be sent to his home. After sworn statements of Watmel's superior results were made by technical experts, the jury gave the verdict to defendants without retiring. (Loud applause was heard.) The foreman of the jury added a rider to the effect that the jury were greatly impressed by Defendant's evidence, and hoped that every wireless-enthusiast would use Watmel in future for the sake of his set, his soul, and his purse.

From your dealer or direct from—

THE WATMEL WIRELESS CO., LTD.,
332a, Goswell Road, London, E.C.1 Telephone: Clerkenwell 7900.

Leaves, Yorks, and Cheshire Representative:

Mr. J. B. LEVEE, 23, Hartley Street, Levenshulme, Manchester.
Telephone: 475 Heaton Moor.

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The ARGOSY

Now on Sale. Buy a Copy TO-DAY. 1/-

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 536.)



A Guide to Good Reading

T.P.'S and **CASSELL'S WEEKLY** is an inspiring and instructive journal of everything that matters in life and letters of to-day—a kindly guide to richer and fuller knowledge. It will tell you what to read and when to read it. Leaders of modern thought, famous writers, and great publicists, all contribute to its pages. It is a paper of the highest educational value. Buy it regularly.



Edited by The Right Hon TPO'Connor MF
Every Saturday, 2d.

"The set is just a simple crystal receiver which was made by a friend. Formerly the best place to set the dial was 81 deg., but now it is 100 (right round as far as the dial will go). Inside is a coil wound on a tube. Is there any simple way of improving the set without much expense? The earth lead is now very short, and the new aerial is shorter than the old one, but it is as long as the property will allow it to be, and it is higher than the one we had before."

Apparently all that is wrong is that the set is not tuning properly with the new aerial. It appears to need a larger coil, or more turns on the present one; but a simple way of obtaining the same effect is to use a small fixed condenser to increase the wavelength. Buy a fixed condenser marked .0002 (it will cost only a shilling, or thereabouts) and connect one side of this to the aerial terminal, and the other side to the earth terminal. Then re-tune, and probably you will find that the set has regained most or all of its former strength.

UNABLE TO NEUTRALISE.

S. T. D. (Richmond, Yorks).—"My four-valve set (H.F., Det., and 2 L.F.) gives fairly good results, but will not neutralise according to the

THE TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an unrivalled service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you, free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order completely to solve your problems.

directions. I have bought two different neutralising condensers, and both act their best when "all out," but neither has a really sharp minimum position. One of the neutralising condensers has small vanes, and I have been told that I shall have to cut one of the vanes off to get a lower capacity. Will this be O.K., or is there any other way of overcoming the difficulty?"

The capacity may be reduced by removing one of the vanes from the condenser, and this can often be done by disassembling it, without actually cutting the plates.

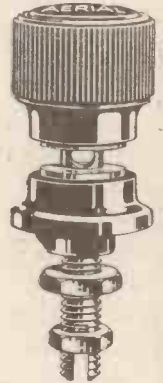
Alternatively, you might try connecting the spare neutralising condenser in series with the other one, though in this case the wiring must be kept very short and the leads to the neutralising condensers spaced as far as possible from the neighbouring components and wiring.

Yet another plan is to increase the actual grid-to-plate capacity, so as to bring it within the range of the neutralising condenser. For this purpose, all that is required is a short lead of Glazite or other well-insulated wire on the grid terminal of the valve holder, and another short lead on the plate-terminal. Three or four inches on each terminal is ample, and these leads should then be twisted together

(Continued on next page.)

BELLING-LEE TERMINALS

Recommended
by
Mullard
for their
famous
P.M
Circuits



Patent No. 248921.
Regd. Design No. 715424.

Belling-Lee terminals are included in all the famous P.M. circuits described in "Radio for the Million." In addition the Belling-Lee terminal is used by the manufacturers of all the best battery eliminators, and embodies the essentials which make the perfect terminal Standard Model (Bakelite-insulated)

(Type B) 9d. each.
Standard Model (Non-insulated)
(Type M) 6d. each.

Illustrated Catalogue free on request.

If you cannot get these at your dealer's, send your order to us enclosing his name and address.

BELLING-LEE TERMINALS

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CONSTRUCT YOUR WIRELESS CABINET

with one of our Cabinet Sets, only screwdriver needed. Set, Jacobean oak, for cabinet 12 x 8 x 8 ins., 12/6, carriage paid. Cash with order. For other sizes and prices, write **ATKINSON & SPURGEON**, 168, Morning Lane, Hackney, LONDON, E.9.

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THE DIX-ONEMETER

continues its victorious career and has well earned its title of "The Rolls-Royce of Radio Testers."

A well-known expert who uses one writes: "May I express my utmost satisfaction with my Dix-Onemeter which is really a most superb instrument which I shall never cease to commend as it has already established its superiority over several instruments costing more than double the price." The Onemeter in case 55/- Multipliers 6/6 each. Send for free Booklet.

RELAYS

We have the finest Distant Control Switch for switching your set on or off from any room. Three types are stocked: H.T. or L.T. Control and the Master Spring-drive. The H.T. is in the Loud Speaker—Anode circuit; the L.T. is fed off L.T. Batt. and takes 6 m/a or the tenth of one valve to operate. The Master takes 4 volts for the fraction of a second and at the moment of operation only. Either type 15/- each and ready to work. 4-pin plug and socket, with control switch, 4/- only. Weston Moving Coil Relays usually £3 10/-, our Sale price 25/-.

APPARATUS of the highest grade by leading makers at a tenth of cost. Send us your kind inquiries and we shall certainly find something to meet your requirements. We carry large stocks and can still supply many lines advertised at bargain prices. If you cannot call at our showrooms, send 4d. for our elaborately illustrated catalogue to

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PERMANENT DETECTOR**
For Panel or One-Hole Fixing.
With Detachable Cups for Refills.

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MORE BROKEN GLASSES**

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Tested and Guaranteed on Broadcasting.

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HEADPHONES REPAIRED
Rewound and re-magnetised 4/- per pair. Loud Speakers repaired 4/-; Transformers re-wound 5/- each. All work guaranteed and tested before delivery. Write for Trade Prices. Phone: Clerk 1795.
MASON & CO., 44, East Rd., City Rd., N.1.

PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from previous page.)

—thus acting as a very small fixed condenser: (Needless to say, it is important to keep the wires insulated from each other, and not allow them to touch.)

ADVANTAGES OF LOOSE COUPLING.

R. D. R. (Southampton).—"I understand that besides the advantage of greater selectivity, a coupled aerial arrangement gives an increased tuning range for any stated tuning condenser, as compared with a direct-coupled one. Is this so?"

Yes, it is true that, apart from other advantages, the tuning range is increased by means of a loose-coupled aerial.

VALVES AND SCREENED COILS.

The primary and neutralising windings of most of the standard screened coils and OTHER TYPES OF INTERVAL COUPLING UNITS were designed primarily to suit the more freely-oscillating valves of the 6-volt range (a few examples are the D.E. 5b, S.T. 61, P.M. 5X, H. 512, D.E. 8 H.F. etc.), and it sometimes happens that others, notably the 2-volt types, may lead to difficulties and poor signals. In such cases the use of at least 90 volts H.T. will sometimes help materially, and it is also worth while to try the effect of extra capacity between the plate and grid of each H.F. valve. Connect an ordinary neutralising condenser between these points and set it to about half its total capacity. Then neutralise with the neutralising condensers proper in the usual way.

CALCULATING CONDENSER IMPEDANCE.

"FILADYNE EXPERIMENTER" (Hayward's Heath, Sussex).—"For carrying out some experiments with the Filadyne circuit, I should like to be able to calculate the impedance of a fixed condenser. How can this be ascertained?"

The formula for calculating the impedance (Z) of a condenser is

Z = 1 / (2π f C)

where f = the frequency (number of cycles per second),

C = the capacity of the condenser in farads,

and π = 3.14159.

It will be seen that frequency plays an important part in the result, showing that in a receiving set a condenser's impedance depends partly upon the wave-length that is being received.

As the practical application of the formula may not be perfectly clear, the following example shows how to find the impedance of a .005 condenser when working at 300 metres.

Translating the above formula into practical terms, Z will be in ohms, and π = 3.14159, 2π will be approximately 6.28. As a wave-length of 300 metres represents a frequency of one million (as other waves travel 300,000,000 metres per second); and, finally, it should be noted that the condenser value (C) must be in farads, not microfarads.

The equation thus becomes

Z (in ohms) = 1 / (6.28 x 1,000,000 x .000000005)

Simplifying this, we get

Z (ohms) = 1 / (6.28 x .005) = .0314 = 31.8 ohms.

This, then, would be the impedance at the frequency named, and, from the particulars given, other values of condenser and frequency may be worked out at will.

READERS' ADDRESSES.

Will the following readers, who have sent letters with insufficient addresses, please communicate again with the Technical Query Department?

S. D. Ashworth, P. Flexen, M. C. Ward, — Coldwell, H. C. Elliott, T. R. Parry, J. S. Laker, M. J. Caton, A. C. Smith, J. G. Wood, H. Youles, W. S. Purcell, A. Perkins, A. W. Lloyd, W. Staples, A. F. Fitch.

(Continued on next page.)

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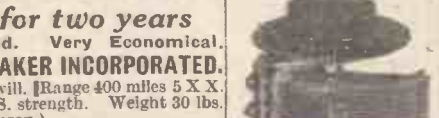
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

SAFETY FIRST.

J. S. E. (Plumstead, Woolwich, London, S.E.)—"Although I have fitted an earthing switch to my aerial, which is always connected to earth (outside the house) when the loud speaker is not in use, my wife is still nervous of thundery weather. Is there any other precaution I can take? Frankly, I do not think there can be any risk at all, as the telephone wires have never given any trouble, and they are longer and just as high as the aerial. But if there is any other precaution I can adopt, I should like to take it in order to give an additional feeling of security."

Besides the earthing switch, you can fit a "lightning-arrester" or "earth-arrester" device, which acts automatically and is always in circuit, whether the set is in use or not.

Several varieties are on the market, the principle on which they work being as follows:

Two terminals are provided, one being connected to the existing aerial and the other to the existing earth lead. When connected up the instrument almost, but not quite, joins the aerial to the earth, leaving a very small air-gap interposed between these two.

Any wireless currents flowing in the aerial cannot cross this air-gap, and they are thus passed through the leads to the set in the ordinary way. But if the aerial became suddenly charged during a storm, the resultant heavy current would easily bridge and spark across the intervening gap, rather than pass along the comparatively long pathway provided by the coil inside the set.

H.T. FOR THREE-VALVER.

"IGNORAMUS" (nr. Pelaw).—"Will dry batteries of the flash-lamp type do for H.T. just as well as the more expensive large batteries? I have been told by a friend who uses them that flash-lamps are just as good, but the dealer who sold me the valves strongly advised me against the small cells, saying they last no time at all. The set is a nice three-valver, and I don't want to 'spoil the ship for a ha'porth of tar,' or to throw money away unnecessarily. Which type do you recommend?"

Probably your friend's good opinion of flash-lamp cells is due to the fact that he uses them for a one-valve or possibly a two-valve set. By using a three-valver you will need more H.T. current than he does, and the cells that give good service in his case would be unsuitable in yours.

We recommend the use of a double or treble-capacity H.T. battery, as advised by the dealer.

TECHNICAL NOTES.

(Continued from page 524.)

mentioned above, it is desirable to use coils which have as little external field as possible: there are several such types of coil now available, but I will deal with this matter in more detail on another occasion.

CORRESPONDENCE.

(Continued from page 530.)

(Jan. 30th.) I got a fine concert from Leipzig; a Viennese play from Hamburg; the Fire Music from the "Valkyrie" (from an unknown station); and also a dramatic recital from some place, sports news, etc.

Last Sunday I started at 11 a.m. with the gramophone records from Radio-Paris; the service and sermon, which I quite enjoyed (I am, by the way, a French teacher), and the midday concert. In the evening I received about five different foreign programmes, including, I believe, an orchestral concert from Cologne (through the Langenberg station) at 7.15 at very good loud-speaker strength; from Leipzig I also heard the talk on "Einstein's Theory."

I also receive the Saturday midday concerts from Radio-Paris.

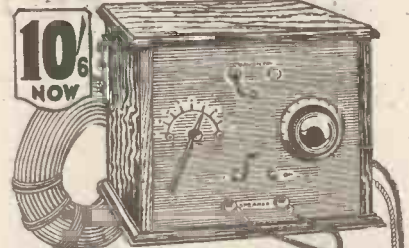
I think you will agree that this is not a bad performance, and that this circuit is one which can be thoroughly recommended. Thank you!

Yours faithfully,

A. O. NORTHFIELD.

Elm Cottage, Holly Walk, Enfield Town.

GRAVES 2-VALVE LOUD SPEAKER BARGAIN.

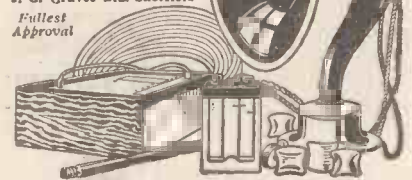


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Demand a big filament, a tough filament—a filament that cannot be broken except by the very roughest handling . . .

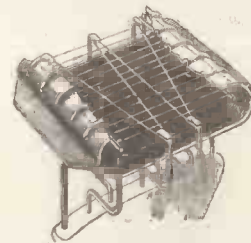
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