

A NEW CONSTANT-REACTION CIRCUIT (See Page 691.)

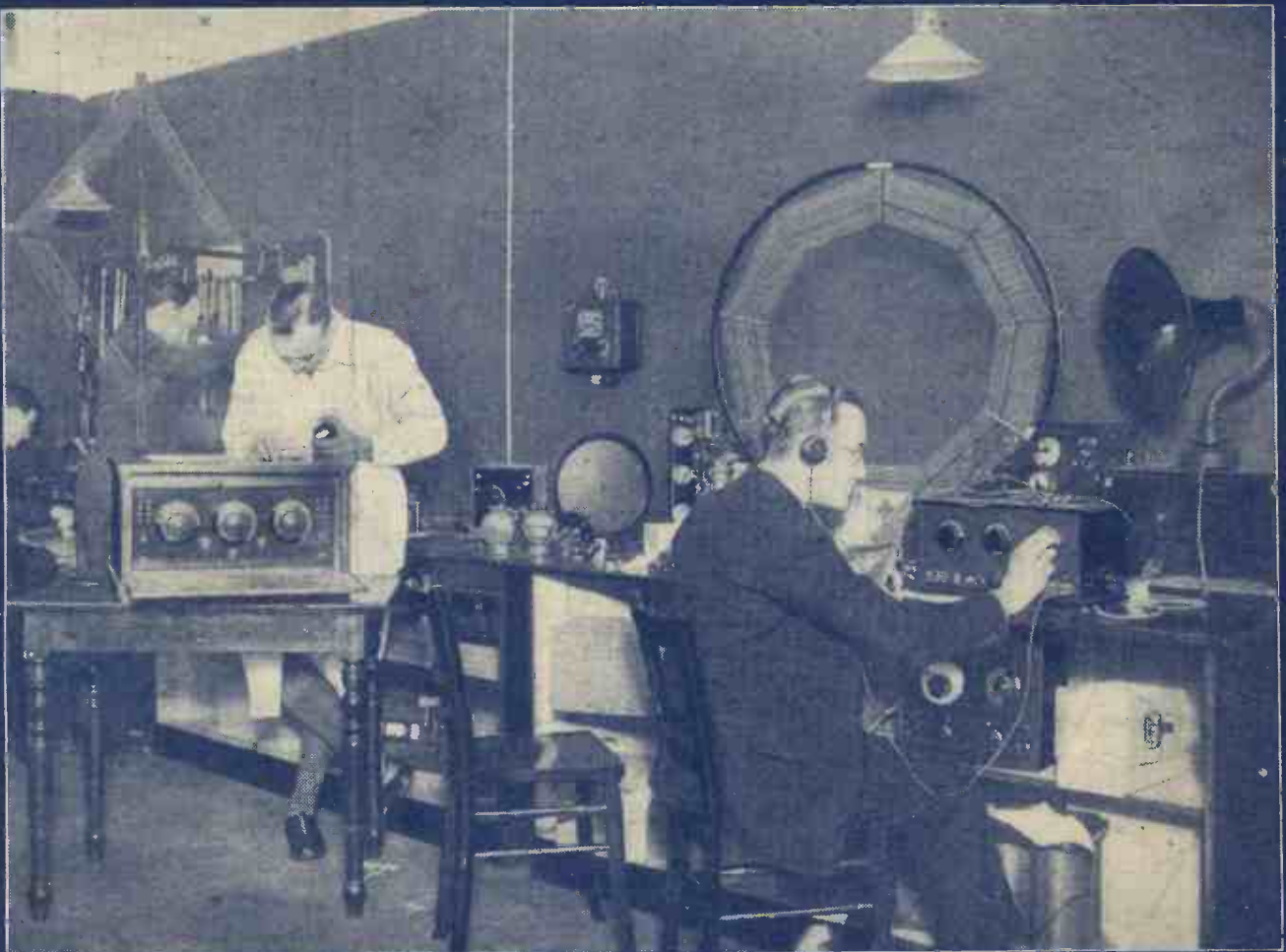
Popular Wireless

Every Thursday
PRICE
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INCORPORATING "WIRELESS"

December 3rd, 1927.



Special Features In This Issue

Measuring Your Eliminator Voltage. H.T. Economy

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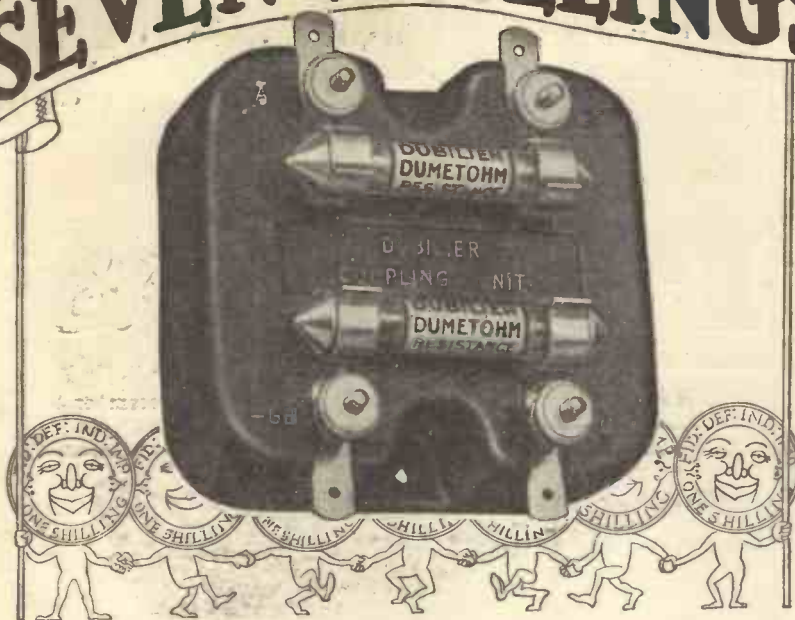
THE "PROGRESSIVE" TWO

The R.S.G.B. and "Q.S.T."

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An outstanding success

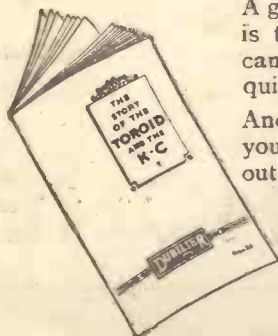
Ample volume and clear, distortionless reception have delighted the thousands of users of the Dubilier R.C. Coupling Unit.

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DUBILIER DICTA



No. 3.

★

Several people have written to ask us whether the Dumetohm will lose its resistance "if the air is allowed to get in." The answer is, of course, that the air was never taken out. The Dumetohm does not depend upon atmospheric pressure, negative or otherwise, for its efficient working, nor are climatic changes likely to affect it.

★

Incidentally, since Messrs. A. C. Cossor included it in the specification of their most successful set "The Melody Maker," the popularity of the Dumetohm has gone up still further, and, if final proof of this popularity be required, it is surely to be found in the sincerest form of all flatteries which have lately been lavished on this wonderful little resistance.

★

Whilst on the subject of Resistances, have you a selection of Dubilier Filament Resistors by you? If you do any experimental work you will find them invaluable. They only cost 1/- each and they clip neatly into the Dumetohm Holder, which also costs 1/-.

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★

Perhaps you are using four 6-volt valves and want to put in a 2-volt H.F. valve to compare it with the one in use. In that case you clip in a Resistor of the value necessary to bring down the current from your 6-volt accumulator to the normal filament consumption of your 2-volt valve.

★

It is easy to calculate the Resistor to use, but for convenience we reproduce two charts on p. 16 of our Catalogue which give the information in a handy form. Remember to choose a Resistor which will pass a current that the filament can handle in safety.

Advt. of The Dubilier Condenser Co. (1925) Ltd., Ducon Works, North Acton, London, W.3.

TC80

FREE CONSTRUCTIONAL BOOKLET

including blue print and full details will be supplied for any one of these receivers. Booklets, including blue print of the other five receivers, 6d. each.

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For A.C. Mains

- K.1. 3-valve receiver employing the famous K.L.I. valves.
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For D.C. Mains

- D.P.1. 3-valve receiver—simple to construct.
D.P.2. Similar to D.P.1, but gives greater range and selectivity by means of a neutralised H.F. stage.

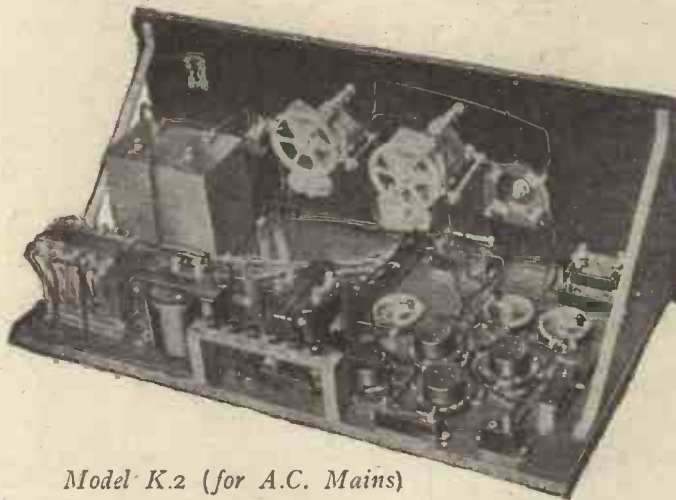
If you want distance

there are two special circuits incorporating the Marconi S625 Shielded Valve.

T.1. 4-valve receiver, including 1 H.F. stage, with S625 valve.

T.2. 5-valve. Two H.F. stages, with S625 valves. Stations hundreds of miles away can be tuned in with complete stability.

For
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build this battery-less receiver



Model K.2 (for A.C. Mains)

BUILD for yourself a receiver that needs no batteries—no accumulators; that costs next to nothing to run; that will *always* spring to life at the turn of a switch. Build now from the *free* Marconiphone circuits. Full constructional details and full-size wiring plan are provided. You cannot go wrong.

The receiver illustrated—the K.2, a 4-valver, in addition to operating entirely from A.C. Mains, is fully as efficient as the best four-valve circuits. And remember, in addition to taking all maintenance *worries* from you, it also lightens maintenance *costs* to an amazing and welcome degree. The K.2, used every day for a year, costs, at most, 35/-, and as little as 10/- or less if a power supply is available. Compare this with the annual cost of H.T. batteries and accumulator charging.

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THIS YEAR'S SOLODYNE.

First details of a New Solodyne Set. Special and exclusive arrangements with Mr. John Scott-Taggart, A.M.I.E.E., F.Inst.P., have been made for the publication of details about a New Solodyne Set. Dozens of other fine features also appear in the "MODERN WIRELESS" CHRISTMAS NUMBER—features which will appeal to every amateur.

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"Isn't it clear? Wonderful, eh?
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Come on--shake a leg there!"

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"That's all right: You can't bust
Ediswan Valves!"

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Have you made the New R.C. Threesome—the new model brings in many additional stations with all the quality of the original receiver. Two hours work. 50/- for parts. Only 5 simple connections. Anyone can make it. But you must use Ediswan valves to get out of the set all it is planned to do.

EDISWAN VALVES

Clearer
Strongest
Last the Longest
A type for every purpose



EDISWAN

NEW R.C. THREESOME

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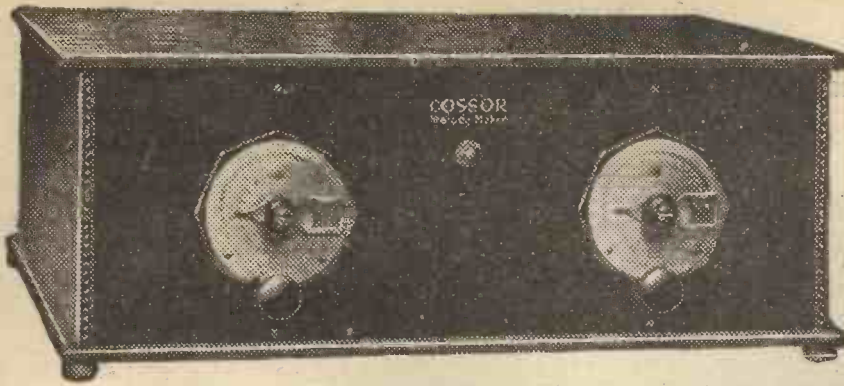
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Please send, post free, presentation copies of the New R.C. Threesome Instruction Book and Blue Print.

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V.71



THE "Melody Maker" OWES ITS SENSATIONAL SUCCESS TO ITS COSSOR VALVES

NOT since Broadcasting began has there been such an astounding success as the wonderful Cossor "Melody Maker." Tens of thousands have already been built—manufacturers of components specified are all working at top speed to keep pace with the phenomenal demand. Many shops have a waiting list of customers wanting to buy the parts for the Cossor "Melody Maker." It's the sensation of the season. And a large share of this success is due to its Cossor Valves. Without Cossor Valves there could have been no Cossor "Melody Maker." No matter which type of Set you are using you'll get better results with Cossor Valves.

FREE

Send a postcard for a copy of the full size chart "How to build the wonderful Cossor 'Melody Maker.'" As simple as Meccano. No soldering. Every wire shown full size, numbered and bent to shape. Impossible to go wrong. Success guaranteed. Build it in an evening. Gets Broadcasting Dept. P.W. countries. Mark your postcard London, N.5. A.C. Cossor, Ltd., Highbury Grove, London, N.5.

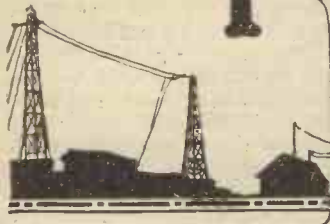


FOR YOUR POCKET'S SAKE, DEMAND

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—the valve which serves you longest

Popular Wireless



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RADIO NOTES AND NEWS.

Pure Brass—The All-Black Route—PCJJ—Broadcasting Times—Transmitting Notes—
 An Astounding Admission—Less Than Nothing.

Pure Brass.

FOR pure untarnishable brass I recommend you to a gentleman whose letter I have seen in a North Country newspaper. He has a crystal set, but threatens to let his licence lapse because of the behaviour of niggardly valve-set owners who are low-down enough to tune away from the local station, thus depriving him of the benefits of re-radiation. The remedy is the "P. W." "Every Purpose."

The All-Black Route.

W. H. B. (Heathfield), who gets Sydney (N.S.W.) on the above set, which he votes "the best ever," winds up his letter with a poser. If all his questions are equally nasty, I fear he will be hounded out of society. "Which way round does Sydney come?" It would take a cleverer man than Ariel to say, but my understanding is that it comes all ways at once, but so much more strongly over that part of the earth which is in darkness than the other ways don't count. Hence, generally speaking, it comes round one way by day and the opposite way by night.

The Radio Car Returns.

GLAD to hear that Captain L. F. Plugge has returned safely from his motor tour through France, Portugal, and Spain. A good example of the advantage of a radio-fitted car was supplied by the fact that whilst *en route* he picked up an S.O.S. for one of his party whose father was seriously ill, and who was thus warned to return without the delay which, but for the radio, would have occurred. Captain Plugge thinks the Portuguese roads need plugging. They do. They are simply a string of pot-holes joined by mud and stones.

The League and Radio.

IT is not surprising that the League of Nations has felt the need of its own wireless station, radio being such a fine instrument for propaganda. I understand that the Swiss Marconi Company has decided to build a new high-power station, 50 kilowatts to the anodes, capable of reaching all places in Europe, North Africa and the East. I expect this will interest ex-Uncle Arthur R. Burrows, who is now posted in Geneva.

PCJJ

NOW that this famous station is being dismantled and re-erected at Hilversum, a brief review of its work may not be amiss, for it has certainly made radio history and given the B.B.C. the jog of its life. It began by working on 30.2 metres, when Australia spoke very well of its signals. Then, on May 20th, 1927, it had the audacity to relay Daventry, its signals being well received in Australia, New Zealand, India and South Africa.

The Great Debt.

PCJJ transmitted a special Beethoven programme which was received all over the world and was even relayed by other stations. On March 11th, 1927, it established telephonic communication with Bandoeng, Java, and on May 31st, 1927,

Queen Wilhelmina and Princess Juliana addressed the Dutch Indies through PCJJ. Finally, on August 14th, 1927, the Australian High Commissioner in London spoke to Australia through Eindhoven, where the Philips' experimental station was at that time. But the great debt owing to PCJJ is that it woke up the B.B.C. with a start, because it showed what could be done.

News from Ireland.

OFFICIAL figures show that the value of Irish imports of sets and parts for the half-year ending June 30th was £35,307, as against £58,662 for the same period last year. Of these imports England supplied £33,730 and Northern Ireland £549.

(Continued on next page.)

WIRELESS ON AN INLAND WATERWAY.



Mr. Percival Westerman (right), the author of many popular sea stories, has radio fitted upon the barge in which he traverses the inland waterways.

NOTES AND NEWS.

(Continued from previous page.)

The Washington Conference.

I HAVE received news that the Conference decided to abolish spark transmitters.

I do not know what period will be allowed, but anyhow, it is good news for many Morse-haunted listeners. The wavebands allotted to amateur transmitters are (in metres): 150 to 174.927; 75 to 85.714; 41.096 to 42.857; 20.833 to 21.429; 10 to 10.714; 5 to 5.37. The band 0 to 5 is allotted to no one in particular.

Broadcasting Times.

IT is extremely difficult to get information about short-wave transmission times, probably because so many of the stations are experimental. However, here goes! Cincinnati, W L W, 52.02. Relays programme at 11.5 A.M. G.M.T. 2 X A D, 21.98, Tuesday, 9 to 9.40 A.M. Also transmits evening programme of W G Y on Sunday, Monday, Wednesday and Friday. Rocky Point, 2 X G, 16.02, Monday and Friday, after 5 P.M. Radio Malabar, A N H, 17.3, Monday, Wednesday Friday, 7 A.M. to noon; Tuesday, Thursday, Saturday, noon to 5 P.M. (E H 9 OC relays Berne programmes at 7.30 P.M. and 9.45 P.M.)

Station News.

A NEW station at Laibach, Jugo-Slavia, is expected to be ready by Easter.

In due time you can Laibach and tune for it. In order to minimise the interference from Australian stations and the new high-power station at Wellington, new wave-lengths have been allocated to the New Zealand broadcasting stations, as follow: 1 Y A, 333 metres; 2 Y A, 420 metres; 3 Y A, 306 metres; 4 Y A, 363 metres.

North London Club.

A wireless club is to be formed at the Holloway Literary Evening Institute, Holloway County Secondary School, Hilldrop Road, Camden Town, N.7, meeting on Mondays at 7.30 p.m., and conducted by Capt. Jack Frost, formerly of the B.B.C. Membership fee, 4s., November to Easter. This is going to be a live affair, with lantern lectures and demonstrations galore, and will look after beginners as well as experts. So pack up your radio troubles in your old kit bag—and go to Holloway.

Birmingham Club.

A WIRELESS society, "Slade Radio," a branch of the Wireless League, has been formed at Erdington. Membership includes that of Wireless League. An experimental station is being provided, besides lectures and demonstrations. Hon. Sec., Mr. H. Clews, 52, St. Thomas Road, Erdington, Birmingham.

Another Society Note.

THE Southport and District Radio Society (Hon. Sec., Mr. E. C. Wilson, 10, Hampton Road, Southport) held its third annual exhibition from November 7th–November 12th. Somehow or other I did not receive sufficient notice of this to permit me to publish the news in advance. Club secretaries will take warning by this, and let me know about their special "doings" as far in advance as possible. This club is not a dull emitter by any means,

and judging by its exhibition programme it is run by what Uncle Sam would call "go getters." The fee is 5/- per annum and the present session alone is worth double.

Transmitting Notes.

STATION 6 Y F is now on the ether, 45 metres. The owner would welcome reports, particularly about his "keying chirp." Address, 6 Y F, 38, Barrow Hill Road, St. John's Wood, N.W.8. Mr. J. N. Roe, "Mirydon," Ridgeway Road, Farnham, Surrey, is now operating Radio G-2 B U W on an artificial aerial. He is a nice man, because he says he reads "Notes and News" first, and because he wants to help anybody with tests, especially on short waves. On a modified "Simmonds" he gets 2 M E and 2 F C, at R 5 in the phones.

Changed Call-Signal.

SIR. H. T. HUMPHRIES, Carrick House, 7, Elmwood Road, Herne Hill, S.E.24, states that he has changed his call-signal from 2 Z W X to 6 Q J. He trans-

SHORT WAVES.

"How to obtain volume on your wireless." Place a book on it.—"Daily Mirror."

A PICK-ME-UP.

"I'm feeling very run down," said the accumulator.

"Well, come and have a spot," said the crystal.

Wireless beats time, not with the baton, but by the variation of the clock every time listeners in Great Britain hear the relay of a programme from Australia.—"News of the World."

Dear Old Lady (writing to the B.B.C.): "... and will you please send me the pamphlet telling me how to osculate."—"Weekly Record and Mail."

THE BLESSINGS OF RADIO.

An intelligent appreciation of radio is shown in a letter received recently by the B.B.C.: "And the classical music is so soothing. Grandma sleeps peacefully through it every evening, so I do not have to stay with her but can go out for a game of billiards."

Once people who talked to themselves were thought to be evincing the first signs of insanity. Nowadays they're known as radio lecturers.

A STANDING BUY.

Teacher: "If your father bought a sixty-dollar radio set on the instalment plan, and paid off two dollars a week, how long would it take him to pay it off?"

Jimmy: "Ten years."

Teacher: "Sit down, you don't know the lesson."

Jimmy: "You don't know my father!"—"Radio News."

A thought for to-day: To be successful in life you must keep on climbing, and when you have reached the top of the ladder you will probably remember you left the aerial wire down on the ground.

mits on metres 45, 90, 150 and 200 and will be pleased to arrange tests with any other transmitter in the British Isles.

Correct Dress for Amateurs.

A WRITER of wireless notes in a very well-known "daily," in dealing with "hand-capacity" effects, recommends the wearing of rubber gloves when tuning. This is very old-fashioned. Everyone knows that the proper costume is a straw hat, morning coat, flannel bags, carpet slippers and calabash pipe; spats optional. But, joking apart, for the information of technical readers I would ask my friend, who is, I see, an A.Rad.A.—nothing to do with radishes—why he prefers to use a rubber

dielectric for his "hand capacity" rather than the more usual dielectric of air. It's much more expensive and the results are no better.

Less than Nothing.

JUST one more technical hint, this time from a Leeds paper. The expert, trying to explain an oscillating current, says, "That is how the current continues. From zero, it continues its progress until it reaches its lowest power (minimum potential), which is just equal and opposite in value to its highest power." The italics are mine, because I want you to note that when the current has a minimum value, lower than zero, it is equal in power to its highest power. Gentlemen, bare your heads, for this is a miracle. Zero will have to pack up and go out of business.

Three Items to Note.

DECEMBER 2nd, Comic opera, "Rose of Persia," by Sullivan. 2 L O and 5 X X. December 6th, A party of the Victorian days, from Birmingham. Shades of musical chairs, Family Coach and Postman's Knock! December 7th, The opera, "The Travelling Companion," by C. Villiers Stanford, from Cardiff.

An Astounding Admission.

WHEN I read that, speaking at Manchester on November 10th, Sir John Reith admitted that the "Children's Hour" and Variety Entertainments (by the B.B.C.) are "dreadful," I oscillated so violently that my equilibrium was half a degree to starboard for several days. I hope Sir John was correctly reported and that his utterance is proof of heart-searching by the B.B.C.

The Public Knows.

INTERESTING results have come from a questionnaire circulated to listeners in America, with the object of finding out their favourite composer and type of music. Beethoven was top of the list and Schubert second; the third was Victor Herbert, an American composer. Well, if a public that puts Beethoven first puts Herbert third we ought to hear Herbert. Has the B.B.C. ever broadcast any of his work? The overture to "Tannhauser" came first for the second question, "Poet and Peasant" (Suppe) second, with "Marche Militaire" (Schubert) third. No English composer was mentioned, though "H.M.S. Pinafore" was ninth of ten favourite pieces.

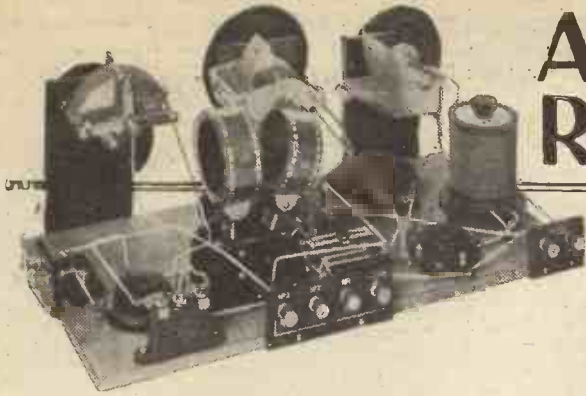
American Radio Fun.

FROM "Radio News." Neighbour: "How many controls are there on your radio set?" Owner: "Three; mother-in-law, wife, and daughter." And again. Sonny: "Daddy, mother wants you to look at a spider's web before she brushes it away." Daddy: "What's wonderful about it?" Sonny: "She's afraid it's a part of your radio set."

Talks from Paris.

THE University Extension of the "Institut Radiophonique," Paris, has arranged a weekly talk from Eiffel Tower and P.T.T. on "New Books in English," given by Miss Golda M. Goldman. As these talks are under the auspices of the Sorbonne they are almost certain to be worth while, and may repay you for troubling to pick up Paris. The talks are in English. ARIEL.

A NEW CONSTANT-REACTION CIRCUIT



Mr. P. W. Harris here gives the first published description of a new and very interesting circuit. It has been tested thoroughly and would appear to be the most practical solution of the problem of "constant sensitivity" yet brought forward. Next week a simple two-valve incorporating this novel scheme will be detailed in full.

By PERCY W. HARRIS, M.I.R.E.

EVER since the valuable properties of reaction were first made known there has been a constant endeavour to evolve a circuit which would give constant reaction over the whole tuning scale, in other words, a circuit in which a reaction setting for maximum sensitiveness made

method. It is the result of a number of experiments conducted to find methods of applying the new high-magnification R.C. valve to high-frequency work. An article on this subject has appeared in POPULAR WIRELESS, No. 266, under the title, "Bringing in Daventry and Co." Here I

showed that a very good measure of success was obtainable on the Daventry Range and that distinct amplification, although of a smaller order, was also obtainable on the broadcast range.

If readers will refer to this article they will find a detailed description of experiments with reaction control from the plate of the detector valve

with only one tuning condenser and a reaction scheme which gives constant reaction control over the whole tuning band. This means, of course, that we have now the true single condenser, single-dial set, including a stage of high frequency—a most desirable state of affairs.

The circuit itself, for which a patent application has been filed, is shown in Fig. 1. It is made up in this case, as a three-valve set. The high-frequency valve is coupled to the aerial with a standard six-pin Reinartz transformer, reaction being obtained with the aid of the winding L_3 , and the condenser C_2 . This high-frequency valve is coupled to the detector valve by the resistance R_3 , and condenser C_3 , the grid leak R_1 being joined to the positive leg of the valve in the usual way. Following the detector valve we have a radio-frequency choke, anode resistance R_4 , and coupling condenser C_5 , with the grid leak R_2 .

Constant Sensitivity.

The interesting part of this circuit is, of course, that which gives the constant reaction coupling. This is the combination of condenser C_3 joining the plate of the detector valve to the grid of the high-frequency valve and the condenser C_2 , with the winding L_3 . Ignoring the coupling given by the condenser C_3 , and considering only the ordinary reaction control on the high-frequency valve, consisting of the condenser C_2 and the coil L_3 , we shall find that if the circuit is arranged so as to be just on the oscillation point when the condenser C_1 is at its minimum, a steady

(Continued on next page.)

at any one point of the tuning scale would remain unchanged for any other tuning position.

With all ordinary reaction circuits, more reaction is required at the top of the tuning scale than at the bottom, and as we increase the wave-length setting of our receiver, we must steadily increase the reaction coupling to maintain the same sensitivity.

Although many attempts have been made to evolve constant reaction circuits comparatively few have had any practical value. Certain mechanical arrangements in which the coupling between the reaction coil and the grid coil has been continuously varied as the tuning condenser spindle is turned, have proved fairly successful, but require special apparatus and have been none too easy to manufacture.

Resistance Coupling.

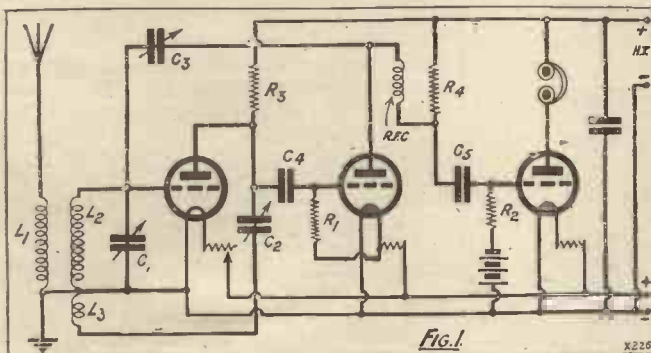
One of the most successful of the non-mechanical schemes is that put forward by Loftin and White, and previously described in this journal. In this, the increasing efficiency of capacitive coupling with increase of wave-length is balanced against the decreasing efficiency of inductive coupling with increase of wave-length, and a fairly constant feed-back of energy over the whole scale can be obtained.

The Loftin-White constant-reaction scheme, although giving great promise when first tried, has proved in practice to be rather troublesome and has not achieved any great popularity.

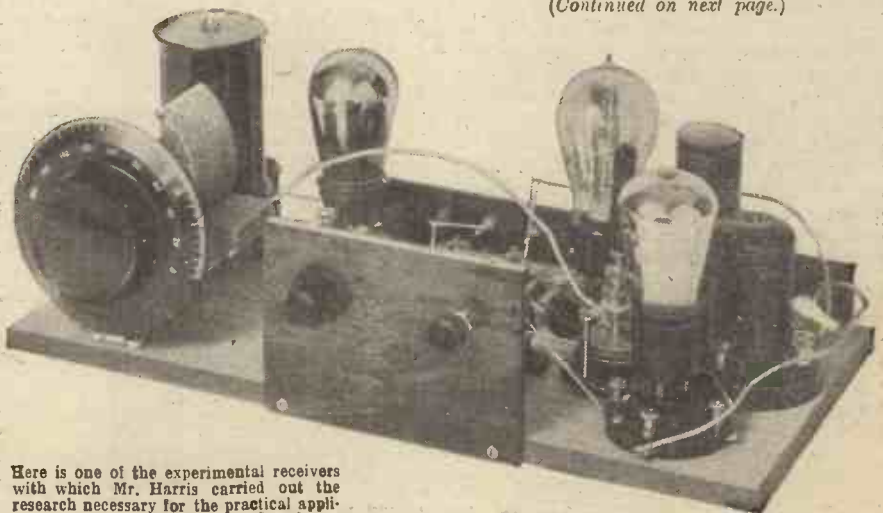
My new constant-reaction scheme is quite different from the Loftin and White

to the grid circuit of the high-frequency valve, extremely small capacities being sufficient to feed back the energy required to produce oscillation.

The continuance of these experiments with the object of finding some method of obtaining sufficient feed-back to produce smoothly-controlled reaction on the broadcast band has had very interesting results, and has led to a new circuit being evolved using a high-frequency stage, and a detector (followed, of course, by one or two stages of note magnification, if desired),



Here is one of the experimental receivers with which Mr. Harris carried out the research necessary for the practical application of his invention.



A NEW CONSTANT-REACTION CIRCUIT.

(Continued from previous page.)

increase of capacity of C_2 will be required to bring the set to the point just below oscillation as we increase the reading of C_1 . Briefly put, we can say that we must increase reaction as we increase wave-length for this circuit.

Now consider the radio-frequency coupling produced by the resistance R_3 and the condenser C_4 . It is well known that the efficiency of resistance coupling goes up as we increase the wave-length. We shall, therefore, get a greater step up in amplification as we increase the wave-length to which the set is tuned, the sole tuning control in this case being the condenser C_1 in the first grid circuit.

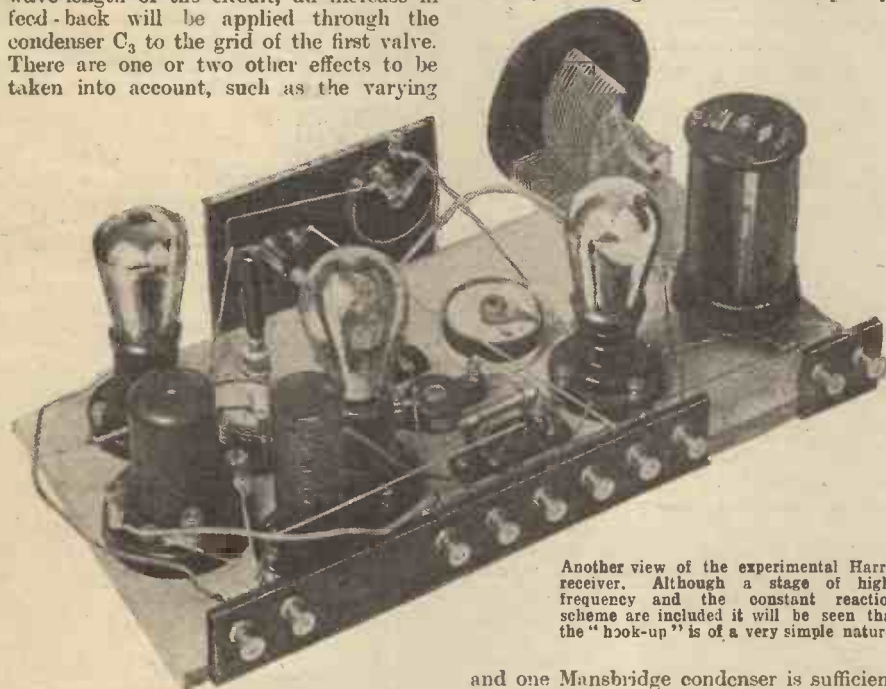
For a given setting of C_3 there will be a certain amount of feed-back from the detector to the first valve. Owing to the increase of amplification as we increase the wave-length of the circuit, an increase in feed-back will be applied through the condenser C_3 to the grid of the first valve. There are one or two other effects to be taken into account, such as the varying

It is not possible to use such an R.C. unit for the radio-frequency stage, as the value of the coupling condenser in such a unit is designed for audio-frequency work and not for radio-frequency coupling. R_3 can be a $\frac{1}{2}$ -megohm grid leak, and R_1 a 2-megohm leak, while C_1 can be the usual .0003 mfd. grid condenser.

L_1 , L_2 and L_3 together, form a standard six-pin Reinartz transformer for the lower broadcast band, and the condenser C_3 should be a smoothly adjustable neutrodyne with a very low minimum. C_2 should be a .0001 mfd. maximum variable condenser, one of the midjet types suiting excellently for this purpose, although the maximum value of some of the neutralising condensers will be sufficient for this.

L.F. Easily Added.

The condenser C_1 should have a value of .0005 mfd., and both first and second valves should be of the R.C. type. The third valve should be a small power valve or better, a super-power valve, if you have very loud signals to deal with. Only one high-tension tapping is required for such a circuit, which, again, makes for simplicity,



Another view of the experimental Harris receiver. Although a stage of high-frequency and the constant reaction scheme are included it will be seen that the "hook-up" is of a very simple nature.

reactance of C_3 , but these do not substantially effect the general working.

If, now, we adjust the values of C_2 and C_3 so that the increase of feed-back by one is balanced by the decrease of feed-back of the other, we shall have achieved constant reaction. This is what we do. Such an adjustment is quite simple to effect in practice, as will be explained later. The result is that we have a sharp tuning circuit possessing high selectivity and sensitivity, with a single-tuning control, using no ganged condenser or other complication.

Low Cost.

If the set is made up with a resistance-coupled audio-frequency stage, as well as resistance-coupled radio-frequency stage, the cost is extremely low, for the resistances R_3 and R_4 need only be $\frac{1}{2}$ -megohm grid leaks of good quality. In fact, the resistance R_4 , condenser C_5 , and grid leak R_2 can, in combination, be one of the very inexpensive R.C. units now sold,

and one Mansbridge condenser is sufficient to shunt the battery.

A few experiments with a set which can easily be made up on a board in an experimental form, and will soon show the remarkable capabilities of the set. The experimental board used for trying out the arrangement described is shown in the photographs, although it is not wired up in the final form which has been discovered to be best. A theoretical diagram of how to connect up your components is given in Fig. 1, and having grasped the principle readers may like to devise sundry modifications to suit their own conditions. Very shortly I will give you a design for a finished set, using this circuit.

Of course, it is a simple matter to add a further stage of note magnification to the circuit given, and this should preferably be transformer coupled. It is not recommended to follow the detector-valve arrangement with transformer coupling, as it is obviously advisable to use a high-impedance R.C. valve for the detector,

MAKING RADIO CABINETS.

THE problem of making cabinets for wireless sets and other apparatus is not easily solved, for when made the trouble is not ended—how is it to be finished, what varnish, what stain?

I always make my cabinets from $\frac{1}{4}$ -in. mahogany. This wood I find is most suitable, being not too hard to work with ease and yet capable of taking a nice finish. The corners are halved, glued and nailed with oval brads which can be punched out of sight. The reader will know what he should make the length of the pieces of wood which are to form the sides of the cabinet. The bottom piece of wood is made $\frac{1}{4}$ -in. bigger all round than the bottom of the cabinet, and the edges are bevelled before fixing. It is advisable to smooth all the faces and edges, that will be exposed, with fairly coarse glass-paper before assembling. When the glue has set hard, the corners are trimmed first with a rasp and then with a file, the nails punched below the surface, and the holes stopped with bees-wax. Finally, the whole is smoothed with fine glasspaper.

Finishing Off.

The first coat to be given is one of gold size, obtainable at any paint merchants. This brings the colour of the wood out and fills in the pores of the wood. When this is hard the cabinet is smoothed with the fine glasspaper again, and another coat of the size given. This is followed by two coats of colourless varnish, the wood being smoothed before each coat.

Mahogany treated thus will have a light brown colour and a good surface. It will not have the dark "japanned" look of the bought cabinet. If the reader desires to darken the wood, a coat of stain (black enamel diluted with turps put on very thinly will do) should be applied before the gold size.

C. M. B.

R.C. & SELECTIVITY

PROBABLY not many realise that the use of resistance-capacity amplification after the detector valve (in sets which incorporate no H.F.) materially improves selectivity. One sometimes finds a set with a very high magnification valve as detector (on account of the use of resistance-capacity amplification) which, with a direct-coupled aerial and no reaction, is more selective than the average oscillating detector. This is, of course, on account of the very high grid-to-filament impedance of valves of this type, which therefore constitutes a much smaller source of damping across the secondary or A.T.I.

It often pays to change the first L.F. from transformer to resistance coupling, simply so that one can profitably use one of these high-impedance valves (60,000 ohms or so) and obtain the resultant improvement in selectivity.

L. H. T.

THE "PROGRESSIVE" TWO.

(Continued from previous page.)

readers are achieved with the simplest of apparatus.

However, with one stage of high-frequency amplification, problems which have to be faced in the case of multi-stage amplifiers do not have to be taken into consideration. Stray capacities and weird coupling effects are seldom troublesome, and stability does not have to be obtained by the sacrifice of sensitivity. And the circuit employed in our two-valve "Progressive" is a happy one judged from these angles, inasmuch as the plates of both the valves are isolated from the common H.T. supply by the interposition of H.F. chokes necessary for quite another purpose. This is going to help us considerably on our L.F. side, too, and will make for purity of reproduction.

WIRING INSTRUCTIONS.

Join a flexible lead to one terminal of .0002 mfd. fixed condenser (19).

Join one terminal of new H.F. choke to H.T. + terminal (20).

Join one terminal of new .0005 mfd. variable condenser to one side of new coil holder (21).

Join same side of new coil holder to grid socket of new valve holder (22).

Join one filament socket of new valve holder to terminal of filament resistor nearest other valve holder (23).

Join remaining side of H.F. choke to remaining side of .0002 mfd. fixed condenser (24), this same side of fixed condenser is then connected to plate socket of valve holder (25). (In such cases the one piece of wire can be carried on to make the two leads.)

Join the Earth terminal to remaining filament socket of new valve holder (26) and carry lead on from this point to remaining side of new .0005 mfd. variable (27).

Join a short lead (28) to other side of new coil holder and to lead No. 27.

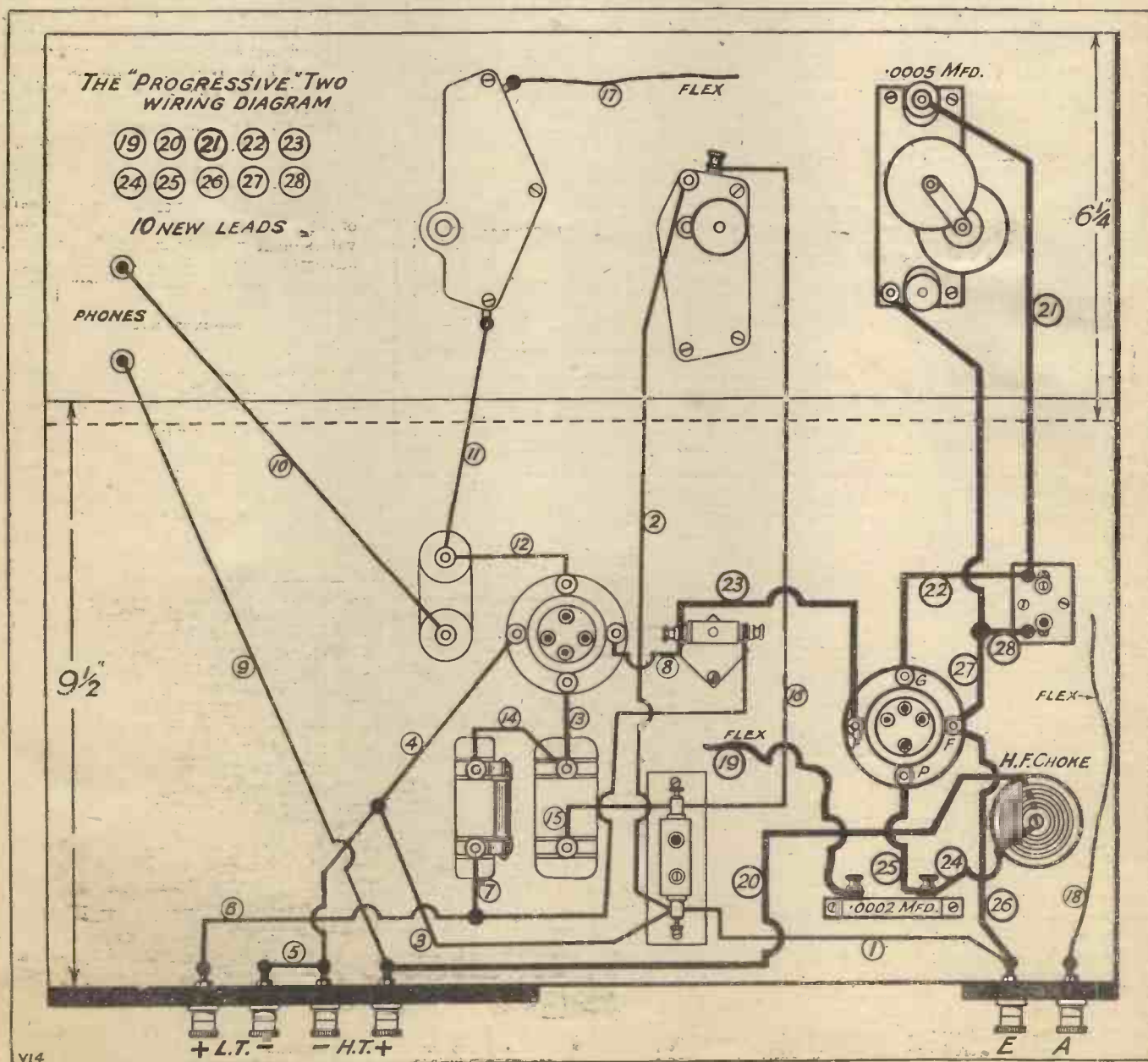
You will not require much stuff for this H.F. stage. Another .0005 mfd. variable condenser is required, and this should preferably be fitted with a slow-motion control. Then one more H.F. choke is needed, and this can be of any good make. The baseboard-mounting coil holder, valve holder and .0002 mfd. fixed condenser complete the list and are items of a very simple, straightforward nature.

Very Simple Task.

Constructionally speaking, this week's labours are so easy that you will almost be able to carry on without any further assistance than that provided by the diagrams and photographs. One light and interesting evening's work should see the task comfortably concluded.

One hole must be bored in the panel for the variable condenser in the position indicated in the appropriate diagram. Now I must point out here that if you buy condensers of a different type to those used in the photographed set, it may be necessary to vary the

(Continued on next page.)



THE "PROGRESSIVE" TWO.

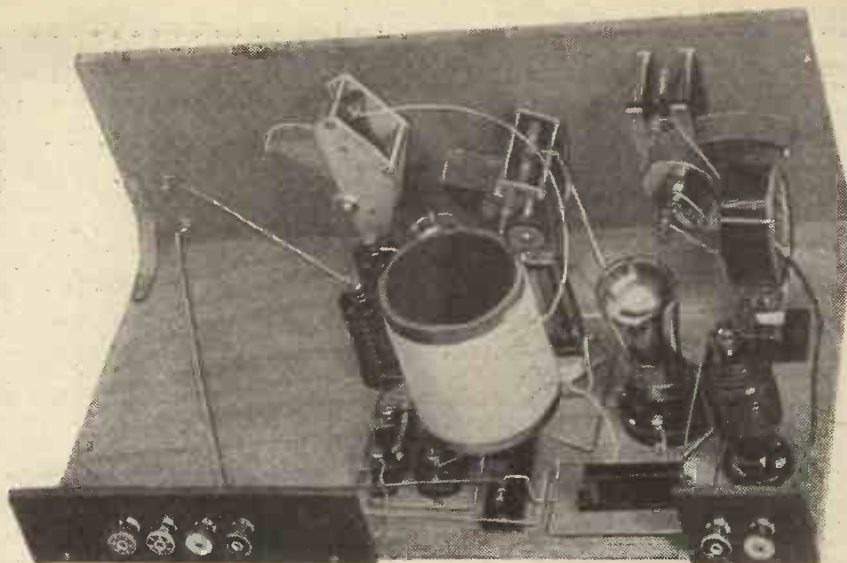
(Continued from previous page.)

panel drilling slightly in order to retain uniformity. But you will see this for yourselves. The only essential thing to note here is that the vanes of the variables must clear the adjacent variables by at least an inch and must also clear the wiring and any of the other components.

Having fixed the new variable in position, the other four new components can be screwed down on the baseboard in the approximate positions shown in the photographs.

The New Leads.

You will notice that the wiring diagram has been drawn so that the additional components and wiring stand out much blacker than the existing parts. The numbers carry straight on. No. 18, the flexible lead attached to the aerial terminal, remains so connected, but this will be joined to the aerial coil instead of to what now becomes the grid coil. A new flexible



Here the "Progressive" Two is shown with its coils and valves in position.

wiring diagram as the leads are joined up, for by so doing you will automatically be checking your work.

You will want another coil to occupy the

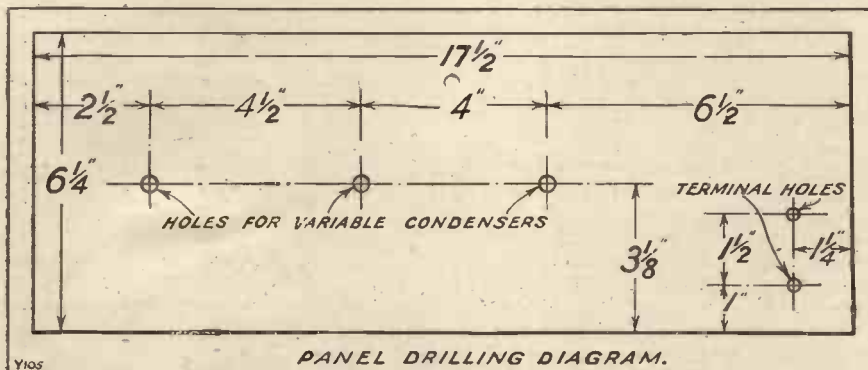
spiderweb coil can be wound by the constructor himself quite easily. A tapping should be taken at a central point. It may be found that the flexible lead is rather long now that it is taken to a somewhat nearer point. In this case it can, of course, be shortened.

Now for the operational details of this two-valver. The same H.T. and L.T. will be O.K. and a similar sort of valve to that used in the detector will prove quite suitable. This, you will remember, was an H.F. valve of not too high an impedance. One of these valves ranging around 20,000 ohms function admirably. These are generally designated as "H.F. and Detector" on their boxes.

Operating Notes.

You may find that the set will oscillate somewhat easier now that the H.F. stage is added, and it may prove necessary to lower the lead from the reaction control variable to the tapping on the grid coil third or fourth from the top. Also, the H.T. may, with advantage, be lowered slightly.

(Continued on page 727.)



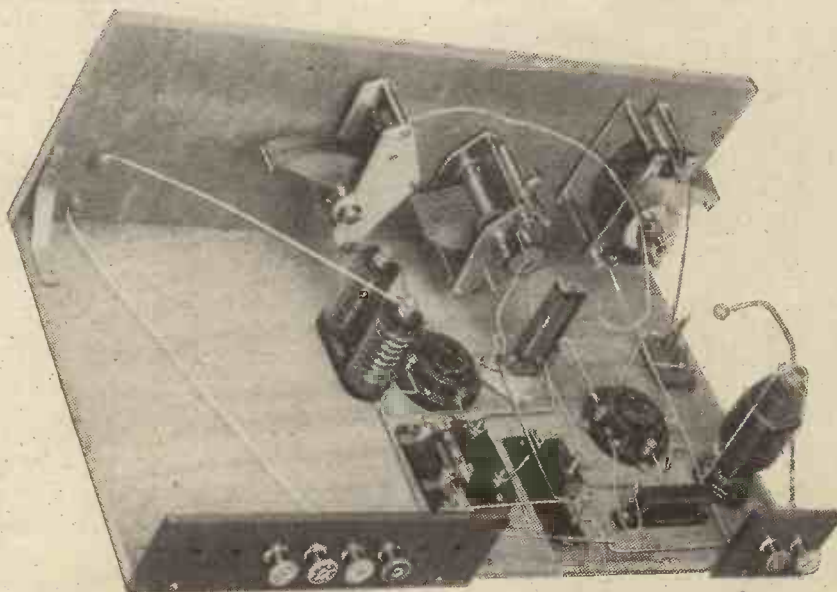
(shown as No. 19) is joined to one terminal of the .0002 mfd. fixed condenser and this is connected to one of those points on what is now the grid coil and to which formerly the No. 18 lead was taken. I hope I have made this quite clear, because this is the only point which can possibly cause confusion.

The one filament resistor is going to be made to serve both the valves, so that a lead (No. 23) is taken from one of the filament sockets of the new valve holder to one terminal of the filament resistor. No. 27 lead, which joins one terminal of the variable condenser to the other filament socket of the valve holder, carries on as No. 26 lead to the earth terminal. The earth terminal is joined via another lead to the H.T. minus terminal, and in this way the filament circuit of the H.F. valve is completed with an economy in leads.

The longest lead is No. 20 and as this carries high-tension current, care should be taken that it is clear of everything else on its route and has, in the bargain, nice margins. Make sure that even should the set receive a heavy blow, this lead will not sway into contact with anything, more especially other leads connected with either of the L.T. terminals. Again, I would advise you to keep the wiring low down, but not so low that it touches the baseboard. Low wiring is both neater and safer.

Don't forget to cross out the appropriate numbers in the left-hand corner of the

new coil holder. A Lissen "X" No. 60 or an "Atlas" No. 60 tapped coil will cover the lower wave-band while 5 X X coils in both types are available. The flexible lead joined to the aerial terminal is taken to the terminal fitted on the aerial coil. A 60-turn



You should compare this week's photographs with those of the "Progressive" One in order clearly to identify the new components.

CURRENT TOPICS.

THE R.S.G.B. AND "Q.S.T."

An Explanation—The Position of the Wireless Societies.

By THE EDITOR.

THE Secretary-Editor of the Radio Society of Great Britain has forwarded us the November issue of the T. & R. Bulletin. He draws our attention to the editorial published in this number, which he hopes will clear up the matter on which an article in "Q.S.T." gave rise to discussion some weeks ago.

The editorial points out that in the first place it must be clearly understood that the British delegates to the conference at Washington were Government officials and, as such, their utterances and representations are those which might be expected from official sources. The British amateur had no place in the delegation, and was not invited to submit his views.

"Sadly Misinformed."

It appears that the President of the Society was assured by the Postmaster-General's department that the needs of British amateurs would be borne in mind at the Conference. The editorial seems to support the view that even if a British amateur of the Radio Society of Great Britain had wanted to attend the Conference he could not have done so.

We have no means at the moment of checking this view, but we feel sure that, just as Captain Eckersley visited the Conference in an advisory capacity, so could a member of the Radio Society of Great Britain have attended the Conference in an unofficial but advisory capacity.

As it is, the T. & R. Bulletin editorial states that eventually it was agreed that Mr. Warner, secretary of the International Amateur Radio League, and Mr. Maxim, the president of the League, should represent British amateurs at the Conference.

The editorial continues as follows:

"What cannot be understood, however, are the statements made by the British delegates at the preliminary meeting in Canada, which is reported by Mr. Warner in his editorial. As predicted by Mr. Warner, the affected ignorance of the delegation as regards the strength of amateur radio in America and at home here 'fair makes our hair stand on end.' We know that copies of the Bulletin find their way into the office of the Postmaster-General and his assistants, and for the delegates to display such ignorance merely proves that the delegation has been sadly misinformed as to the position both here and abroad."

R.S.G.B.'s Explanation.

"The blame for such a position entirely rests with the authorities responsible, for nobody who has lived in this country for the past ten years and who has been associated with radio can possibly have failed to note the influence of the amateur on the progress of the art."

That, briefly, is the explanation offered by the T. & R. Bulletin, published by the Radio Society of Great Britain, as to the

reason why British amateurs were not represented at the Conference.

We do not consider that the explanation fully exculpates the Radio Society of Great Britain. If their request for permission to attend the Conference officially was denied, then why in the name of—amateur radio, let us say—did they not have the sense to drag the matter out into the light of day?

If the Post Office has bamboozled the Radio Society of Great Britain into the acceptance of the view that the British delegates chiefly sent by the Post Office were sufficient to deal with matters at the Conference, then the Radio Society of Great Britain took this dictum very quietly, for it is the first we have heard about it—and, we venture to say, the first the general public have heard about it, and that includes many thousands of amateurs.

Not Strong Enough.

The trouble is that the Radio Society of Great Britain is not strong enough and not alive enough to press home its justifiable claims; and, in any case, the British Postmaster-General has no power to prevent a member of the Radio Society of Great Britain from being present at the Conference, where a competent man in informal talks with the other delegates could have done far more to make known the real position of the British amateur and his needs than an American amateur temporarily invested with the right to speak on behalf of British amateurs.

As this article is written we learn that the Wireless League and the Wireless Association have amalgamated. That is good news; it would be even better news if the Radio Association and the Wireless League joined up with the R.S.G.B.; or if these societies were put into the melting-pot, re-cast, and a new and energetic society created.

Even with the necessary funds, we doubt whether the R.S.G.B. is competent to represent the British amateur movement. Its work, so far, has been for the few: undue emphasis has been laid on the amateur transmitter.

and there has grown up a sort of legend that the only *bona fide* experimenter in radio is the man who has a transmitter.

Nothing of the sort. There are many thousands of *bona fide* experimenters who do not own transmitting stations—and they are not catered for, in an adequate way, by any existing society.

Amalgamation Wanted.

Insurance policies, legal advice, etc., are no doubt very useful items in the service list of a wireless society, but by no means of paramount importance; and as there are competitive societies, each having its own methods and each claiming to represent the listener and the amateur, the result is a lack of unity among amateurs and a weak defence when dealing with questions of real importance to the status and privileges of amateurs.

We hope that the R.S.G.B., as the oldest wireless society, will take the lead in this matter, and will open up negotiations with the Wireless League and the Radio Association with a view to complete amalgamation. United they might be of some use, divided, they never will be.

Complete Re-casting Required.

We suggest a round table conference and the re-casting of the R.S.G.B., followed by an intensive campaign for the greater enlargement of the membership list, and a consequent increase in the vitality, strength and importance of the executive committee.

We offer to help to the best of our ability, and the editorial pages of "P.W." and its contemporaries published at this office will be open to the council of the R.S.G.B. for the purposes of making known any attempt to be made to make the R.S.G.B. a real and useful force existing for the avowed object of serving the British amateur.



One of our leading amateur experimenters, Mr. Gerald Marcuse, of 2 N M fame.



"Why I Don't Broadcast!"

An interesting explanation and a few words about Broadcasting in general by CHALIAPINE, the great Russian basso, in an interview with "Ariel."

CHALIAPINE is, admittedly, one of the biggest musical attractions in the world. For this there are at least two reasons. In the first place he is certainly the greatest bass vocalist which this generation has produced and, secondly, he is a unique personality—a much-talked-of figure whom everybody wants to see and hear; a man whose name is enough to attract thousands and thousands of people who could not really be included in the category of music-lovers.

Mr. Cochran has told me so. The London manager of the Gramophone Company has told me so. And their judgment should be good enough for anyone. But, apparently, it isn't good enough for the B.B.C.

Only once in the whole history of broadcasting in this country has Chaliapine stood before the microphone, and that over two years ago, in 1925.

"Why is that?" I asked Chaliapine, when I talked with him the other day.

He smiled whimsically.

"There is a very simple reason, my friend," he replied. "Once here in your London I broadcast. It was two years ago, and I did it because they asked me to. I have not sung at Savoy Hill again just because I have not been asked again. To you, perhaps, it may sound incredible, but it is just the truth."

It is a simple reason, indeed, but one which raises an even more perplexing problem. Why have the B.B.C. not invited Chaliapine to broadcast again this year when his name has been on the lips of everyone in the country—when every newspaper has been full of his praises, and when he had been in London for quite a lengthy visit?

After Due Consideration

B.B.C. programmes, as we have been informed, ad nauseam, are compiled after the programmes' committee have duly taken into consideration the written demands of their correspondents. Are they really going to tell us that a good proportion of writers during the days following Chaliapine's broadcast in 1925 did not enthuse over his singing and ask for more? Would they have us believe that at least a hundred—perhaps a thousand—requests for another wireless broadcast by Chaliapine have not been received recently, following his tremendous success at the Albert Hall? Has it never struck them that there are a million listeners who would like to hear this famous vocalist on the radio better than any other concert or opera artiste in the world?

"Ah," Savoy Hill might object, "his fee would be too big. We daren't invite him because we know we shouldn't be able to afford to include him in our programmes."

Not Wanted?

I do not propose to deal with the question of how much the B.B.C. can afford without going into bankruptcy, and it does not arise as far as Chaliapine is concerned.

"But no," he said to me, "the question of fee would not be an insurmountable objection to my broadcasting, I am quite sure. I should not ask anything colossal."



Chaliapine, the great Russian singer.

All I should ask would be a fair remuneration, based on the value of my services. I am always prepared to be reasonable and friendly. I want as many as possible of my British public to hear me sing, and I realise that they can't all come to my few concerts.

"But the reason I have not been asked to broadcast—perhaps that is something I can tell you without too much guessing. When I was first asked to sing in 1925, then the wireless people needed me. They needed my name and the name of every big musician and singer they could get in order to convince the people of this country that broadcast music was *real music*, and not just a 'stunt,' as you say."

"I helped them gladly, and many of my fellow artistes helped them, too. But now we are not needed to attract people to listen-in. We have served our purpose, and are no longer wanted."

"In those days broadcasting was being run by a private company, which depended for its existence upon the pleasure of the people. It had to give them what they wanted or else close down altogether. But now your broadcasting is a government monopoly, and who shall convince me that that corporation really care very much about what the people *want* to hear?"

"If they had one, or perhaps two, other companies competing with them, should I have been asked to sing? Yes, and by all three. But that is not the way of monopolists."

"Listen to what we give you," they say. "We know what is best for you to hear, and what is most convenient for us to give you. If you don't like it, then don't listen at all." The B.B.C. is a government department now, and whoever heard of a government department who cared anything about music or art—or very much for the wishes of the people?

Poor Results.

"Some may think it is a little unkind of me to say that. But it is the truth as I see it. And I do not complain—ah, no! Perhaps I, and other artistes like me, can do something for the B.B.C., but what can they do for us?"

"Can they enhance our reputations? Can they make us more popular? They can't, and I doubt if it is to the advantage of any established artiste to appear before the microphone at all. It may be that transmission as good as possible is made from Savoy Hill, but what of the sets upon which our voices are received at the other end? If I could hear my own singing through some of the loud speakers and headphones I know of, I might say: 'So that is Chaliapine! Is that the voice of which everyone is talking? I don't think so much of him; I shall not go to his concert.'"

"For myself, I have nothing to say against broadcasting as broadcasting. It is one of the most wonderful and amazing things in this wonderful world. In the right hands it would do so much good both for music and music-lovers. One day it may. But as a government department, think you? Ah, my friend, no wonder so many people are dissatisfied with your broadcasting."

TECHNICAL NOTES

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

DETECTOR METHODS

GRID LEAK OR ANODE—LOFTIN-WHITE COMPONENTS—CINEMA BROADCASTS—RADIO BEAMS.

WHICH is the best method of valve rectification? This is a question which has always been a favourite subject of discussion amongst experimenters.

There is no doubt that the most popular form at present is the grid-leak method of rectification, as this produces the loudest signals. The grid-leak method, however, suffers from the fact that it readily introduces distortion which, of course, is particularly undesirable for the reception of telephony.

Anode rectification (or lower-bend rectification, as it is sometimes called), gives better signals, although, as mentioned above, the strength of the signals is apt to be somewhat less than with grid-leak rectification.

Where high-frequency amplification is used it is probably better to use anode rectification, thus ensuring the better quality of the signals. Any loss in signal strength may then easily be made up by the little extra high-frequency amplification.

Grid Leak or Anode.

It is a comparatively simple matter to change over from the grid-leak rectification to the anode rectification. For simplicity we will suppose that the set is a single-valve set. The grid leak and condenser should be removed and the aerial end of the tuning coil connected direct to the grid of the valve. A potentiometer of, say, 300 ohms should be connected across the low-tension battery, and two extra terminals should be provided on the panel.

The earth terminal should be disconnected from the low-tension (positive or negative, whichever it may be), and one of the two extra terminals should be connected to earth. The other extra terminal should be connected to the potentiometer.

A grid-bias battery should then be connected to the two extra terminals, the positive of the grid-bias battery being connected to that terminal which goes to the slider of the potentiometer, and the negative terminal (wander plug) to the other terminal which, as mentioned above, goes to earth.

It will be necessary, of course, to try different tappings of the grid bias, or different maximum values of grid-bias battery, in order to obtain the best results.

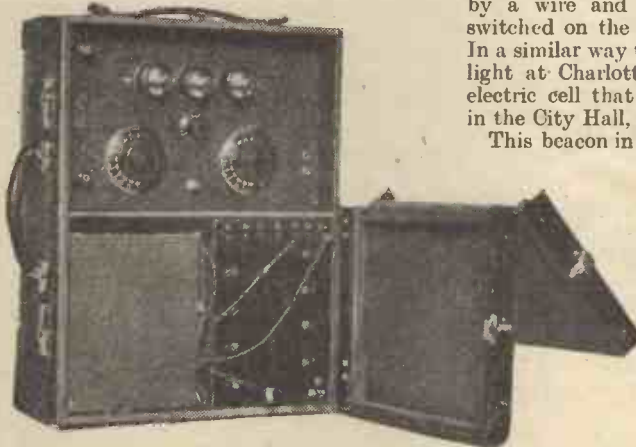
Liquid Condenser.

I see the "mercury condenser" which I described in these Notes some time ago, and which appeared for a short time on the American market, is now advertised in the German radio journals. This condenser uses mercury as one electrode and into this dips a vane (or vanes) coated with a very thin layer of insulating material such as celluloid or shellac varnish. The mercury lies at the bottom of the containing cell, and as the vane is rotated it dips more and more

into the mercury and so the capacity is increased. Owing to the fact that the mercury makes contact with the outer surface of the di-electric without friction, it is quite possible to use an extremely thin layer of di-electric, and consequently a mercury condenser of given electrostatic capacity may be made to occupy much less bulk than a condenser of the same capacity but of the conventional air-spaced type. The di-electric, in the German "quick-silver" condenser is only 3-100th of a millimeter in thickness. The condenser is very light in weight and the price (in Berlin) is 15 marks.

Loftin-White Components.

Those of you who have made up and experimented with the Loftin-White circuit will be interested to know that in view of the



A popular portable German receiver, with two carrying straps and accessible controls.

great popularity of this circuit, especially in the United States, special Loftin-White components are now available in commercial form.

A special set of three coils can be had, the aerial-coupling coil and two inter-stage coupling coils. The aerial-coupling coil comprises primary and secondary windings which are fixed in their coupling relation, mounted on a thin bakelite strip which also carries lug terminals for soldering. The windings themselves consist of silk-covered copper wire which is wound upon a "former" and then impregnated with a cellulose dope. The "former" is then removed and leaves a coil the efficiency of which is high, owing to the fact that a very small amount of di-electric material is used.

Accurate Adjustment.

The two high-frequency transformer units are wound in a similar way, but each is equipped with a mechanical device which permits variation of the coupling between the primary and secondary. This variation is controlled by hand and the coupling may

be adjusted with extreme accuracy. In the Loftin-White receiver the coupling adjustments need be made once only. These transformers are made capable of accurate adjustment so that they may be simultaneously tuned by means of a tandem condenser. This means that for practical purposes their inductance values may be made accurately equal.

The terminals are in the form of soldering lugs, as already mentioned, and these lugs are mounted upon the bakelite strips which also serve the purpose of supports for the coils themselves.

The three units thus furnish the complete coil equipment for the Loftin-White circuit, which includes two stages of tuned high-frequency amplification and a tuned detector-input circuit.

Photo-electric Relay.

How an almost infinitesimal amount of power may be used by means of a relay system to control an enormously greater power was lately demonstrated in an interesting test carried out in New York. By means of a photo-electric cell, a flashlight of one candle power caused the switching on of a great searchlight at Charlottesville, in Virginia, of nearly one-and-a-half-million candle power. When the flashlight beam fell upon the light-sensitive cell, an electric current was sent by a wire and actuated a relay, which switched on the power for the searchlight. In a similar way the first glow of the searchlight at Charlottesville operated a photo-electric cell that switched on a flood-light in the City Hall, in New York City.

This beacon in Charlottesville is intended as a guide for aeroplanes and is believed to be the largest searchlight ever constructed.

Cinema Broadcasts.

A method has been perfected in Germany for combining movies with radio for the purpose of illustrating broadcast lectures. In each theatre or other building where the broadcast lecture

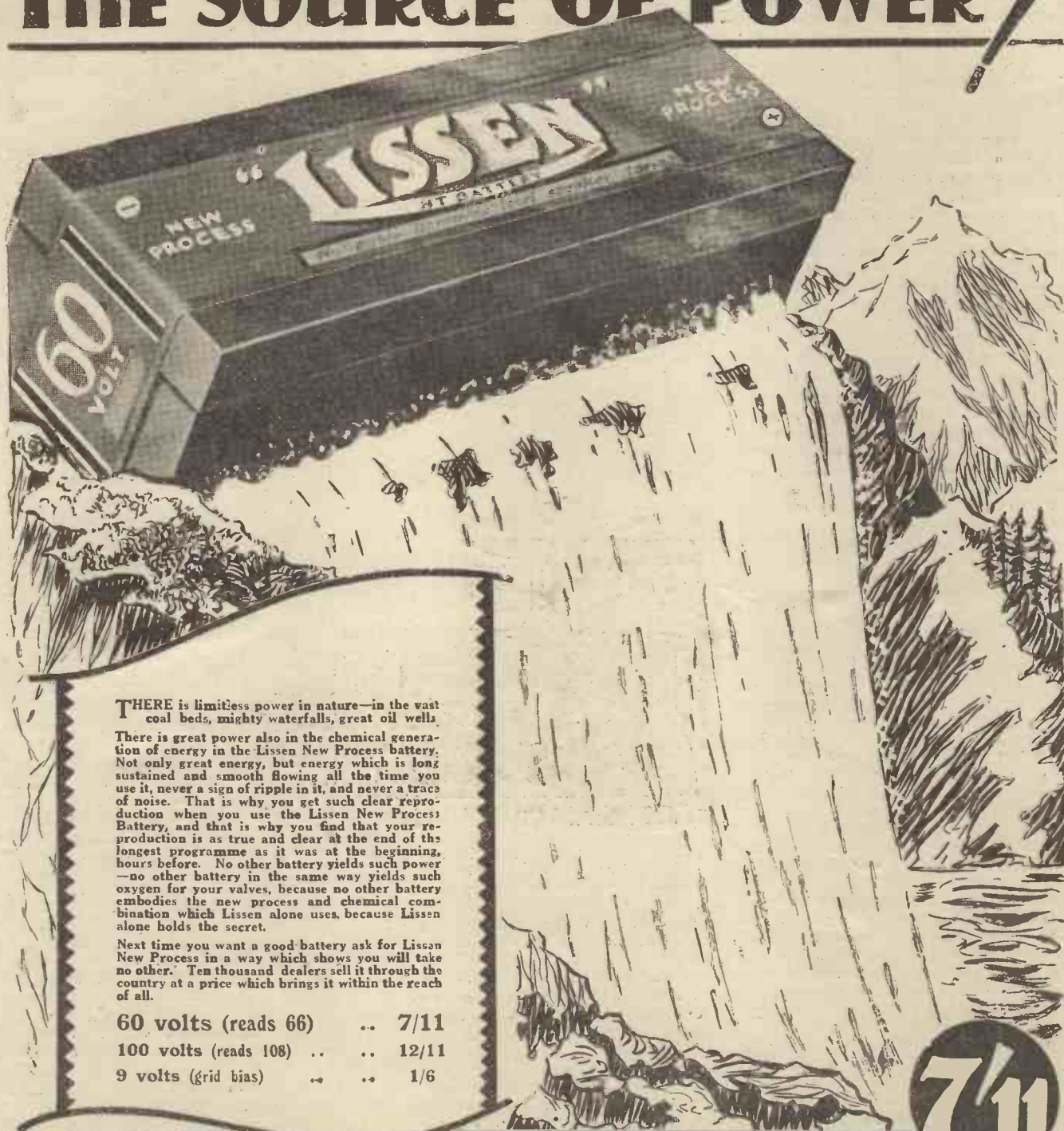
is to be heard, the films are run through a projector which is driven by a motor synchronised with the other motors in the system. The lecturer watches one of the cinema displays, or a private cinema display in his own studio, and times his remarks (which are being broadcast) in accordance with the progress of the film. The system amounts, in short, to the synchronising or simultaneous display of the same film in different theatres or halls and the broadcasting of the lecture or commentary to correspond.

Radio Beams.

Apropos the searchlight beacon for the guidance of aeroplanes as mentioned above, I see that the radio beacon system for use in aerial navigation has been progressing under the auspices of the U.S. Bureau of Standards, and the system now incorporates three main radio devices. The first of these is the directed radio beam, which sends out a special type of radio beam by which air pilots are able to follow their courses in fog

(Continued on page 728.)

THE SOURCE OF POWER



THERE is limitless power in nature—in the vast coal beds, mighty waterfalls, great oil wells.

There is great power also in the chemical generation of energy in the Lissen New Process battery. Not only great energy, but energy which is long sustained and smooth flowing all the time you use it, never a sign of ripple in it, and never a trace of noise. That is why you get such clear reproduction when you use the Lissen New Process Battery, and that is why you find that your reproduction is as true and clear at the end of the longest programme as it was at the beginning, hours before. No other battery yields such power—no other battery in the same way yields such oxygen for your valves, because no other battery embodies the new process and chemical combination which Lissen alone uses, because Lissen alone holds the secret.

Next time you want a good battery ask for Lissen New Process in a way which shows you will take no other. Ten thousand dealers sell it through the country at a price which brings it within the reach of all.

60 volts (reads 66)	..	7/11
100 volts (reads 108)	..	12/11
9 volts (grid bias)	..	1/6

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LISSEN LIMITED, 8-16, Friars Lane, Richmond, Surrey.

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L.516

BRITISH BROADCASTING.

No. 5.—SAVOY HILL AND THE PUBLIC.

By THE EDITOR.

THE B.B.C. professes to take endless pains to test and gauge public opinion on programmes. The general view is that Savoy Hill is making heavy weather out of a comparatively simple problem. But let us begin by examining the various processes employed by Savoy Hill.

First of all there are the letters from listeners—always numerous both in London and in the country stations. It is understood that as many as ten thousand letters a week are addressed to the B.B.C. on programme matters. It is not surprising that the B.B.C. attempts to make capital out of this tremendous volume of correspondence. For one thing, there is a gratifying preponderance of satisfaction and adulation. For another thing, there is such a diversity of view, such degrees of praise and blame for every item in the programmes, that there is at hand enough evidence for almost any case to be convincingly supported.

If talks are attacked, the B.B.C. can trot out correspondence statistics in defence. If symphony music is attacked, equally strong refutation is taken from the letter-bag. If religion is attacked, then the answer of the correspondents is literally annihilating.

The B.B.C. keeps on saying that religious broadcasts get more appreciative comments from listeners than does any other item in the programmes. This means that more people write in insistently about the religious services than about jazz, for instance.

Alternative Sunday Programmes?

And it is precisely on this ground of the alleged popularity of the Sunday services that we discover the danger and weakness of trusting too much to letters from listeners. Religious services have a specialist audience—no doubt considerable in extent, but also notoriously keen and coherent.

In other words, nearly everyone who likes the religious broadcasting is so keen about it that he or she is ready to write and say so. This does not mean, however, that the vast majority of listeners, while ready to tolerate and occasionally to enjoy religious broadcasting, do not wish to be provided with a suitable alternative to religious services. This principle of an alternative to religion the B.B.C. will not concede, in the belief that the denial is in accordance with public opinion. If correspondence can be invoked to justify such a policy, then correspondence is *not* an infallible guide.

If the B.B.C. fails to find justification in correspondence, they are apt to invoke the aid of the Press in support of any particular line of action. But it is notable that they almost always refer to the *lay* Press rather than to the *specialist* Press.

Now, the *lay* Press looks upon broadcasting chiefly as a potential menace, and quite secondarily as a source of useful news. The bulk of the comment in the *lay* Press is, in fact, vitiated by policy considerations or by some kind of control from the B.B.C.

It is clear, therefore, that the B.B.C. cannot claim to be consulting public opinion effectively by a tendentious interpretation of *lay* Press comment on broadcasting.

I was extremely interested in following the progress of the experiment with professional critics undertaken last year by the B.B.C. In theory this has much to be said for it. The idea was to secure weekly reports from a group of representatives of the main classes of listeners. These were to be paid and were to listen regularly. The consensus of their reports was to be regarded as a fair appraisal of current public opinion. The plan was worked for a year.

Although for a time the B.B.C. pretended



A "Spanspace" Three built by one of our Bristol readers. This set has proved very popular.

to regard it as a success, it abandoned this attitude in the face of repeated evidence of its failure. The professional critics listening regularly produced nothing upon which any programme policy could be built. The very fact that they were successfully balanced meant that their opinions and their judgments cancelled each other out. The experiment was reluctantly abandoned some months ago.

Parliament No Solution.

The third instrument for registering public opinion is the Wireless Organisations Advisory Committee, which, under the able guidance of Captain Ian Fraser, meets monthly at Savoy Hill. This committee nominally represents all the recognised societies of listeners and experimenters. Its pretention to be a "listeners' committee" in the sense that it reflects the average opinion of millions of listeners has been seriously challenged, and with a measure of justification.

The total active constituency composed by the paying members of the societies concerned would not be greater than fifty thousand, but the unexpected fact emerges that this committee has been of real value in keeping the B.B.C. on the right lines

on at least some programme matters. It would not be an exaggeration to say that if this committee were strengthened by the addition of a few representatives of the technical wireless Press it would go a very long way to establish effective and continuous contact between the B.B.C. and listeners generally.

What, then, is the essence of the problem which has caused so much anxiety at Savoy Hill and so much speculation generally? Looked at from the representative angle, the only solution of the problem is Parliament itself.

The new constitution of the B.B.C. was designed so that the ultimate responsibility for the broadcasting service would reside in Parliament. In the representative sense the House of Commons is the nearest possible approach to the ideal listeners' committee. But, unfortunately, two factors intervene to prevent the House from playing this new rôle. The first is that there is no time. The second is that barely ten per cent of M.P.'s either care or know anything at all about broadcasting.

Unfulfilled Promises.

Therefore, Parliament offers no solution, nor can any solution be found from the representative angle. The combined membership of wireless and listeners' societies is negligible. Plebiscites are inconclusive. Their only uniformity is their failure to attract general interest or to inspire general confidence.

The fact is that the representative angle is the wrong one. The reason why the Wireless Organisations Advisory Committee is helpful is not because it represents societies, but because it is made up of a group of common-sense individuals ready to approach programme problems with a fresh outlook. The essence of the problem of gauging public opinion is the intelligent consultation of commonsense. The B.B.C. need seek no mysterious or elaborate machinery. The man-in-the-street is not hidden in an inexplorable labyrinth, nor is he too coy to resist all advances.

While I am on this subject of public opinion, I must add something on a strange development of B.B.C. activity. Were we all to form our opinions of broadcasting from what we read of the B.B.C. in its own newspapers and in the *lay* Press I venture to think that the voice of hostile criticism would never be raised. The B.B.C. propounds, outlines, and explains its programme policy in a most convincing and reassuring manner.

The basic principles advanced are invariably sound and usually agreeable. The contrast programmes from 5 G B, for instance, were admirably explained, and initiated with the customary torrent of adulation from the *lay* Press.

But those of us whose business it is to examine the actual results of B.B.C. policy find many a slip in performance. The superlative claims of policy announcements are not fulfilled. Either these claims should have been modified or the standard of performance improved.

The B.B.C. would be well advised to guard against any increase of the gap between promise and performance. I am optimistic enough and confident enough of the ability of the B.B.C. to believe that the gap may be considerably reduced, not by restraining the exponents of policy, but rather by improving the standard of output.



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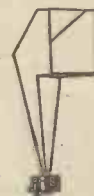
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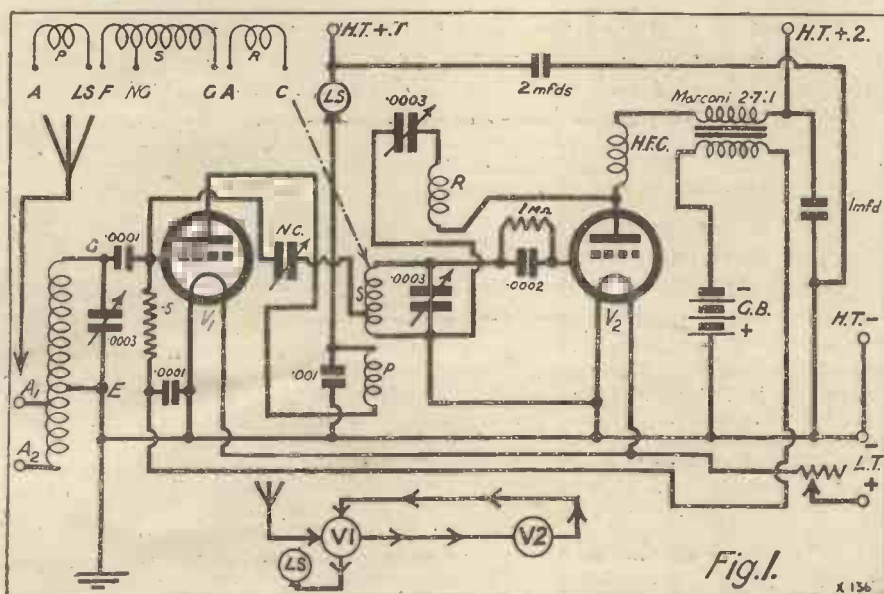
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Are Reflex Circuits Fundamentally Unsound?

In this article some definite opinions on the subject are offered, and these are naturally very interesting in view of present-day knowledge.

By W. JAMES.



made up a reflex set, were, it would appear, soon divided into two camps. On the one hand were those who felt thoroughly satisfied; on the other, those who did not hesitate to condemn them. To the satisfied users I have nothing to say beyond this—in those days loud speakers were bad, power valves were expensive and bad quality was acceptable to many.

I am sorry for those who made up what turned out to be nothing but a faulty design, and who decided to turn their back on reflex sets for ever, for I believe that in so doing they have denied themselves a good deal of pleasure.

Two New Circuits.

A good reflex set is a most interesting affair, even if one can hardly claim for it in these days of reasonably priced valves the virtue of economy.

The point is this, that we have to admit that many of the reflex sets described in the papers some time ago, were very unsatis-

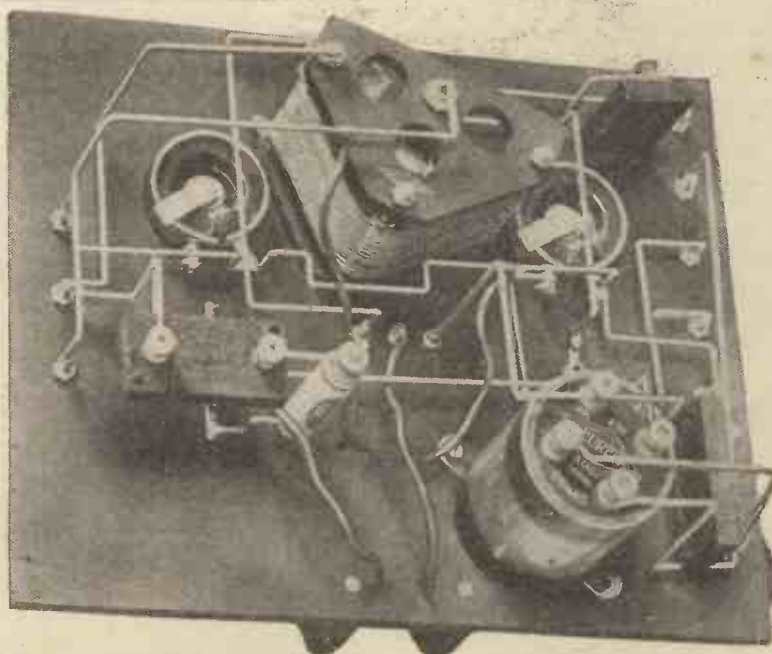
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A FEW years ago many people used to say there was nothing quite so nice as a good reflex receiver, although one must admit that possibly an equally large number condemned them, saying they would not have one at any price. Of late very few reflex receivers have been described in the technical papers; and when they are described no great enthusiasm seems to be aroused, which surely is a pity, for to a few of the keener experimenters there is nothing like a good reflex set, considered purely from the point of view of economy.

Unreliable Sets.

It will, therefore, be interesting to consider for a moment whether all reflex circuits are fundamentally unsound. We may as well begin our inquiry by going back to the time when reflex circuits were first introduced to the public, when, in fact, reflex receivers were being pushed as the only sets worth having. Some of us knew at the time what many know to-day, that the majority of the reflex sets described were horrid, nasty things. Chronic instability, buzzing noises, and wretched quality were the main characteristics of such sets, which one regrets to say were described in numbers.

Readers of the papers concerned who



The earlier reflex receivers incorporated very straightforward circuits. The one above merely had a crystal detector and primary of an L.F. transformer connected across an anode-tuning coil. The secondary of the transformer was included in the grid circuit of the valve.

Met-Vick Components make the most of a Set

WHETHER you are building the Met-Vick three or four Valve Sets or any other set, you cannot fail to get successful and satisfactory results if your components are Met-Vick. Most of the lines shown here are already well known amongst enthusiastic constructors and listeners; yet for those who have not yet used "Cosmos" Components, here are some details:—

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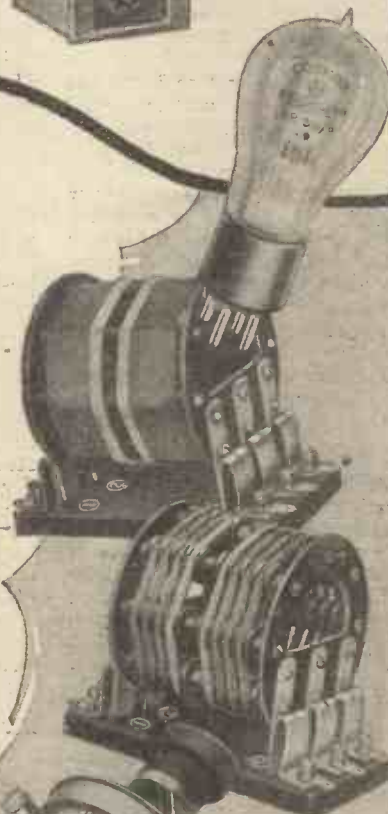
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BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Impromptu Concert at Manchester—Microphone Again in Danger—A Two-Piano Speciality—The Wireless Singers Again—Bristol Opera for Cardiff—The Growing Generation—Mr. Punch Disclosed—Sailors' Community Singing—Ireland's First Theatre Broadcast—Miss Bondfield to Broadcast.

Impromptu Concert at Manchester.

SOME time ago four of the most prominent musicians in Manchester met at the local studio, and over a cup of tea played or sang or talked, according to inclination. So successful was their programme that another is to be given in the same informal and impromptu manner to-morrow, Sunday, December 4th.

On that occasion five musicians will meet in the studio, namely Kathleen Moorhouse, a gifted young 'cellist, Leonard Hirsch, principal second violin in the Hallé Orchestra and a member of the Catterall String Quartet, Alec Whittaker, who at the age of twenty-two found himself the principal oboist in the Hallé Orchestra, and Elsie Boardman, contralto, who distinguished herself in the rôle of "Carmen" at the recent Manchester performance. There will also be piano solos by Eric Fogg, the station accompanist, who was last year married to Miss Moorhouse.

Microphone Again in Danger.

The last occasion on which the Glasgow Gaelic Musical Association gave a performance from the local studio the announcer had to stop some of the impromptu dancing which began when a piper struck up, as the vibration caused the microphone to suffer internal complications. The Association is giving another "Gaelic Evening" on Tuesday, December 6th, when the various items—part songs, mouth music for dancing and bagpipe selections—will be introduced by Mr. J. N. McConochie.

A Two-Piano Speciality.

Ethel Bartlett and Rae Robertson, two of the best-known two-piano artistes in London, are giving a short programme of their interesting and varied repertoire during the London programme on Tuesday, December 6th. In the same recital Sarah Fischer will sing some of the dainty folk songs of which she is so ideal an interpreter.

The Wireless Singers Again.

Since their formation some months ago the Wireless Singers, as a vocal combination, have become recognised as one of the most efficient and attractive organisations of their kind in this country. They are trained by Mr. Stanford Robinson, chorus master at 2 L.O., and consist of eight performers, i.e. a double quartet. The little programme of madrigals which they are giving in the London studio on Wednesday, December 7th, is certain to find a welcome place in the programmes.

Bristol Opera for Cardiff.

Cardiff Station will relay an important broadcast of the Bristol opera season on Wednesday, December 7th, from the Victoria Rooms, Clifton, Bristol. The work chosen is "The Travelling Companion," by Charles Villiers Stanford, and the

principals are Stuart Wilson, Arthur Cranmer, Johnson Douglas, Louise Trenton, Dorothy D'Orsay, Judy Skinner, and Leyland White.

The Growing Generation.

Those who can listen during the afternoons should not miss the last talk in the series on "The Growing Generation," which is to be given on Thursday, December 15th, by Mr. Alec Patterson, one of the Prison Commissioners. Mr. Patterson is mainly responsible for boys in Borstal Homes, and has just published a little pamphlet containing some biographies of



The new mechanised Army finds radio the most rapid and reliable means of communication between units.

these youths, under the title of "A Bad Start and a Good Finish." Recently he made an effort to raise funds to build a chapel for the boys of Borstal, which it is proposed shall be dedicated to the memory of those who passed through the various Borstal establishments and made good in the war.

Mr. Punch Disclosed.

The true history of Mr. Punch and his lamented wife Judy and the other members of their family form quite an attractive item in the programme from London and other stations on Friday, December 16th. The entertainment, which has been devised by Mr. W. S. Meadmore and Mr. L. de G. Sieveking and will be presented by them in co-operation, introduces an actual Punch and Judy performance by one of the oldest showmen at the game.

The average listener probably knows nothing of the history of this famous character, who was originally a hunch-backed Italian actor whose performances became so famous that the puppet-shows, for which Italy is famous, imitated and perpetuated him in the show which still makes the whole world laugh.

John Daniel : Gorilla.

The adventures of the famous gorilla, John Daniel, who for some time lived with his owner in aristocratic Sloane Street, and whose premature death soon after being taken across the Atlantic, forms one of the most interesting animal stories of recent times. Gorillas seldom survive long in captivity, and few people have had such opportunities of studying their ways in their native haunts as Dr. Neville Sharp, who recently returned from an expedition to Central Africa. Dr. Sharp is giving a talk on his observations of these animals on Saturday, December 17th, and it will be broadcast from most stations.

Sailors' Community Singing.

Community singing by an audience composed entirely of sailormen will be relayed from the John Cory Sailors' Rest at Cardiff and broadcast to Welsh listeners on Wednesday, December 14th. The concert is being arranged under the auspices of the British Sailors' Society by Mr. Oliver S. Hopkins, the Port Missionary, and the programme will also include items by Will Griffiths (entertainer) and the Madame Ben

Davies' Ladies' Choir, which will lead the audience in popular old songs such as "The Old Folks at Home."

Ireland's First Theatre Broadcast.

The first theatre broadcast in Ireland takes place on Tuesday, December 13th, when at 8 p.m. listeners to Belfast and the Dublin stations will hear half an hour's entertainment relayed from the Empire Theatre, Belfast. The programme will consist of excerpts from "Hip, Hip, Hoo- Radio!" a stage revue adapted from the Radio Revue of the same name and presented entirely

by broadcast artistes.

The principals are Grace Ivell and Vivian Worth, Kitty Murphy, Marian Wright, Dorothy Camlin, Richard Hayward, J. R. Mageean, Jack Chambers, Kenneth Coffey and Jack Gavin, all of whom, with the exception of Grace Ivell and Vivian Worth, "graduated" from 2 B.E.

Miss Bondfield to Broadcast.

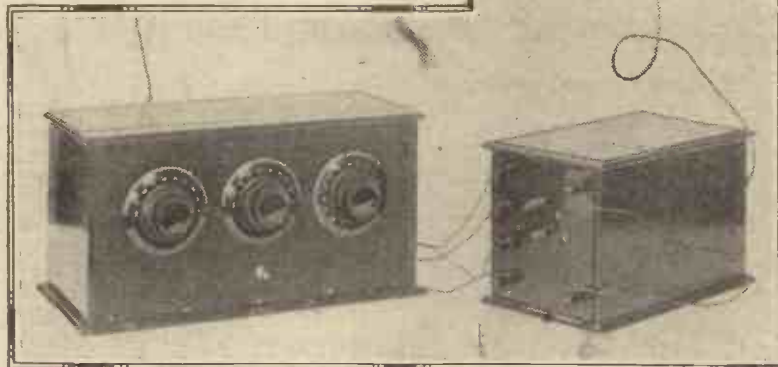
Miss Margaret Bondfield, M.P., who is probably the most distinguished woman member of the Labour Party, and who during Mr. Ramsay MacDonald's Government was Parliamentary Secretary to the Minister of Labour, is giving a talk in the London studio on Tuesday, December 13th, on the new Hostel which has just been opened at Market Harborough by the Overseas Settlement Department and the Commonwealth Government of Australia.

The Hostel is intended for the use of women who know little or nothing of household work, but who wish to settle in Australia and to whom the course at the Hostel is imperative before they are eligible for a free passage to "down under" under the Empire Settlement Act.

MEASURING YOUR ELIMINATOR VOLTAGE

An ordinary voltmeter is useless with a mains H.T. unit, but voltages can be determined in quite a simple manner if you know the way to go about it.

By G. P. KENDALL, B.Sc.



THERE can be little doubt that the set of the future will be operated entirely from the electric mains, both L.T. and H.T. being provided by suitable eliminator circuits, and batteries will remain merely for the use of those unlucky people who have no electric light laid on. The reasons for the inevitability of the change are mainly that batteries, with their charging, renewals, and variations of voltage, not to mention their noisiness at times, are found by most people to be a nuisance, and, further, that the modern tendency in loud-speaker work is all in the direction of larger and larger power valves and higher and higher anode voltages, and here batteries, even the largest, are of little use.

Measurement Difficulties.

The change, then, is one which must come sooner or later, and the wise man is undoubtedly he who is changing over now, and reaping the advantages of no-trouble operation, even if he does not yet feel justified in launching out into the latest thing in super-power amplifying circuits for working his loud speaker. The change-over, so far as the H.T. supply is concerned, is really a very much simpler affair than most people imagine, especially with an A.C. supply, but there are one or two practical difficulties which must be overcome before the use of an eliminator becomes entirely satisfactory.

One of the most obstinate of these difficulties is that of measuring or estimating the actual H.T. voltages being applied to the various terminals of the set, and until it is overcome one is working in the dark in a very undesirable fashion.

The difficulty lies in the fact that the ordinary voltmeter is useless with an eliminator, for the reason that its resistance

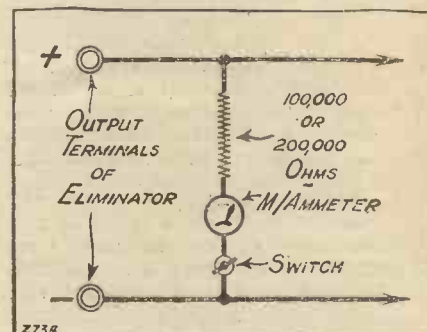
is low, and the current which it draws is large enough to produce extra voltage drops in the eliminator circuits which completely upset the working conditions and make the reading which is obtained quite valueless.

Voltmeters of a type capable of giving accurate indications can be obtained, of course, but their high cost puts them out of reach for ordinary purposes, and most people have to fall back on the crude method of estimating the voltage by calculating the voltage drop across the resistance used in the eliminator to reduce the pressure, using for the purpose a knowledge of the currents flowing, this being obtained by the use of a milliammeter. The process is always troublesome, and in some cases cannot be carried out at all because the values of the resistances in the eliminator are not known.

A Simple Solution.

It is far preferable to be able to read the voltage directly by means of an instrument, and a simple scheme for doing this has now been adopted in the "P.W." Research Department, which enables it to be done with the aid of a special resistance and a milliammeter of a type which need not be at all costly if a very high degree of accuracy is not required. There is no particular novelty in the method, which employs simple and well-known principles, but it does not

appear to have occurred to anyone to apply it to the solution of this particular problem before, possibly because it was not realised that the necessary special resistance was ready to hand in the form of a cheap standard wireless component.



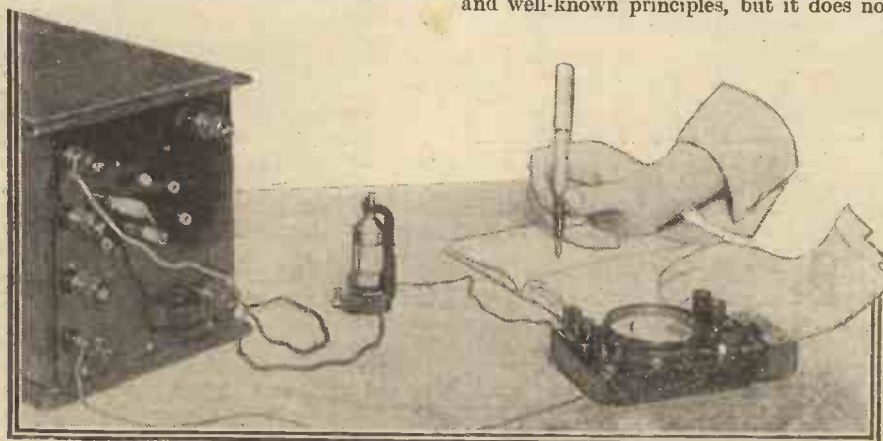
Briefly, the method is this: A high resistance of accurately known value is connected across the H.T. terminals, and in series with this is placed a milliammeter with a suitable scale to measure the current flowing. Then, by the simple application of Ohm's Law the voltage can be determined, the arithmetic involved being of a trifling nature if the value of the high resistance has been wisely chosen.

Simple Arithmetic.

An example will make this clear. Suppose that the resistance is of 100,000 ohms: a voltage of 100 across this will produce a current of 1 milliamp, 50 volts will give a current of .5 milliamp, 40 volts one of .4 milliamp, 25 volts one of .25 milliamp, and so on. It will be noticed that there is a very simple relation between these figures; the figure for the current is exactly one-hundredth of that for the voltage. Obviously, then, all that we need do is to read the current flowing in milliamperes and multiply this by a hundred to get the H.T. voltage.

When this scheme is used the current drawn is quite small, as has been seen, and with many eliminators it will only produce quite a slight change in voltage when the

(Continued on next page.)



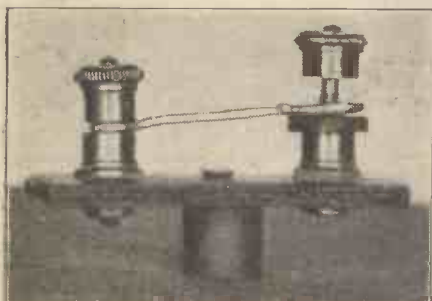
A reading being taken with a milliammeter and resistance, as described in the accompanying article.

SIMPLE SWITCHES.

An ingenious improvisation which can be carried out very cheaply and easily.

By HUMPHREY PURCELL.

THE types of switch on the market are legion. There are rotary switches, push-pull switches, throw-over switches, and switches that are combined with rheostats and tuning units and what not. Most of them are excellent, and even



Two terminals, a strip of fibre and a short piece of wire are the main items required.

where a rubbing contact is provided, it is seldom that any trouble arises. They serve so simple a purpose that there could be no excuse for inefficiency, and for the same reason even the best of them functions no better than a simple home-made device.

Primitive Types.

The simplest home-made switch is that which consists of two terminals and a piece of wire, the wire being inserted between the terminals for the ON position, and

disconnected from one or both of the terminals for the OFF position. The wire may be stiff or flexible, and the terminals may be of the pillar type or the telephone type, mounted on the panel or above the baseboard, or they may be the terminals of large components such as variable condensers or resistances or L.F. transformers. If "Clix" terminals, or valve sockets, are used, the moving wire may be connected at will to any one of a number of points. There may be more than one connecting wire.

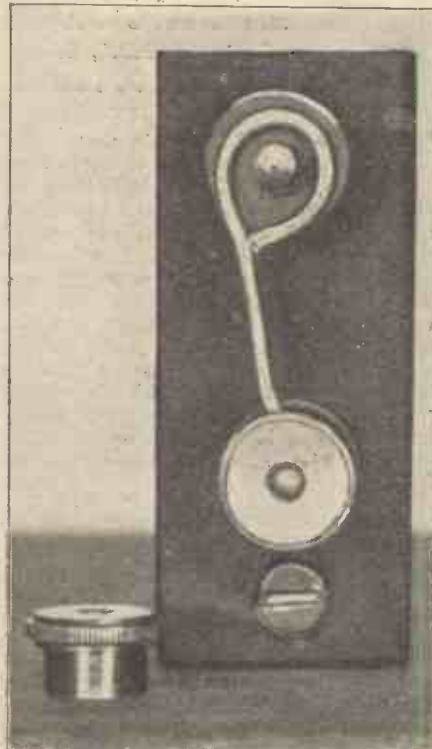
A Practical Scheme.

The only objection to these devices is that when the switch serves an ON-OFF purpose, either a spare disconnected terminal must be provided, or the connecting wire must be removed, or left hanging loose. The photographs herewith indicate a method of getting over this difficulty.

Two terminals of the pillar variety are mounted on the panel, or on a short strip of ebonite. These should have fairly large heads, and on one of them the portion of the threaded rod above the base should not be too short. On this terminal a small disc of fibre or thin ebonite is inserted just above the base. A piece of No. 16 tinned copper wire is then bent so that it is clamped securely in one terminal (pliers being used to tighten the head). This is the terminal which does not contain the fibre disc. On the other terminal the wire lies on top of

the fibre in a loop which encircles but does not touch the central threaded rod.

It will be seen that when the head of the second terminal is loosened, the connecting wire touches the fibre disc but does not make contact with any part of the brass-work. The switch is thus in the OFF position. A turn or two of the head of the terminal will force it down on to the wire, and contact will be established. Connections are made to soldering tags on the other side of the panel or ebonite strip.



One terminal remains screwed tightly down, the other being used to provide the switching action.

MEASURING YOUR ELIMINATOR VOLTAGE.

(Continued from previous page.)

"voltmeter" is connected or disconnected. In the case of the tapping for the L.F. valves, for example, where the current flowing to the set will be fairly large, the effect of the extra current drawn by the "voltmeter" will be quite negligible.

There will be cases, however, where even this small current will be undesirable, and it is therefore recommended that it be cut down still further by the use of a higher resistance, 200,000 ohms being a convenient value. When this is used it will be necessary to multiply the milliammeter readings by 200 to get the H.T. voltage. If this proves troublesome, simply make yourself out a table like the one shown in the next column, and keep it handy for reference.

Type of Meter Required.

With this table at hand it is quite easy to read off intermediate voltages, assuming that the milliammeter has a sufficiently finely-divided scale.

This latter point brings us to the first of the practical details concerned, namely,

Milliammeter Reading.	Equivalent H.T. Voltage.
.1	20
.15	30
.2	40
.25	50
.3	60
.35	70
.4	80
.45	90
.5	100
.55	110
.6	120
.65	130
.7	140
.75	150

the type of meter to use. What is wanted is an instrument with as large and open a scale as you consider yourself justified in affording, the scale to run from zero to one milliamp for preference.

Higher readings are unnecessary (the table will show you why), and to use a meter reading up to, say, 5 milliamps merely means that the scale will be very crowded and difficult to read. Evidently, then, it will pay to get a low reading meter specially for this work, but it need not be a very expensive one, since a very high standard of accuracy is not really required.

The special resistance can be dismissed very briefly: an ordinary anode resistance is used, several of the larger manufacturers being prepared to supply these to a certain definite standard of accuracy if this is specified when ordering. Messrs. R. I. and Varley, for example, will supply their standard wire-wound resistance to an accuracy of one per cent (or even nearer if desired), and this is quite close enough for all ordinary purposes.

An Exception.

A final point: In most cases you will find that the current drawn by this "voltmeter" is not large enough to have much effect on the H.T. voltage when the meter is put across the terminals, but an exception may be found in the case of a positive tapping supplying quite a small current, perhaps to a detector valve operating on the anode-bend principle.

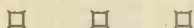
So long as the currents involved are reasonably large, the device is quite sufficiently accurate, but this point should be borne in mind. Fortunately, however, it is not of great importance, since it is easy to adjust the voltage on a detector to the right value by audible indications without using a voltmeter at all. It is really in dealing with the H.F. and L.F. valves that the meter is so valuable.

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This new Amplion Cone is designed for hanging from a picture rail or other suitable support, placing it out of harm's way and in the most convenient and efficient position.



The rim is a dark, chocolate-coloured moulding with cone tinted to match. A heavy silk cord is fitted.

Separate adjustments to cone and unit.

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Hanging Type A.C.2

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Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1.

WERE ~~2/1~~ NOW

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Circuit and wiring diagram **FREE** in every box containing the **L. & P. Two-way Coil Tuner**. Obtainable from all good Wireless shops or direct from

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The L. & P. Variohm—the finest Resistor money can buy—is included in above estimate.



Zero to 10 ohms. Scaled, with off position. 4/-

REFINEMENT  IN RADIO

RADIO IN NEW ZEALAND.

The Editor, POPULAR WIRELESS.

Dear Sir,—You may welcome a letter from a distant reader, having been here about nine months. I feel compelled to write these few lines on N.Z. radio.

On the 16th of July last, 2YA (Wellington) was officially opened, to the delight of the fans. It is working on 420 metres, with an aerial output of 5,000 watts, quite a change from 100 watts, which was the power of the old station, 2YK. Of course, the programmes are not of the standard that London and the Continentals put out.

I am at present using a five-valve receiver with much success, getting Australian stations on the loud speaker, the nearest being 2BL and 2FC (Sydney), a distance of 1,250 miles, and all the N.Z. stations—1YA (Auckland), 333 metres, 500 watts, 300 miles; 3YA (Christchurch), 306 metres, 500 watts, 200 miles; 4YA (Dunedin), 453 metres, 500 to 750 watts, 375 miles. A slight difference to picking up the Continentals with their thousands of watts. Fading is very bad here, and in town electrical interference is terrific, mostly caused by the overhead lighting system.

I have read with much interest your articles on Empire broadcasting, and my opinion is that some enterprising radio firm should have taken the matter up if it was only for the advertising they would have got, because since Philip's started this short-wave business their name has become a household word with the fans. I am at present working at a distributing agents for Philip's, and I guess by the quantity of valves, chargers and speakers that pass through our hands, for such a small population, they must well exceed the sales of any other manufacturer. British radio is poorly represented in the way of multi-valve sets, which seem very popular here, owing to the great distance of our neighbour, Australia. The majority of sets, and components are Yankee, although the Brownie crystal sets are very popular just now. It is true there are some agents for British goods, but they give a very poor display. I don't like to be personal, but, taking (....)'s agent as an example, they do not stock half the goods manufactured by (....), and I am sorry to say it is inferior quality to that purchased in London; at least, the articles I purchased were.

It may interest you to know that a receiver licence is 30s. a year, and a dealer's licence is £7 or thereabouts; also, that howling sets are banned, dealers have to submit new sets to the Post and Telegraph Department for examination, but nevertheless there are some howlers.

Well, I think this is all the news for now, wishing your papers every success in the future.

Yours truly,
L. BEASLEY.

Wellington, New Zealand.

IMPERFECT R.C.

The Editor, POPULAR WIRELESS.

Dear Sir,—Since the controversy regarding the relative merits of resistance and transformer coupling is still continuing in your columns, perhaps I may be permitted to contribute a personal experience.

I went recently to see a friend who has just installed a "Kone" speaker, and who had made it perfectly clear to me that the detector and amplifier to operate it were to be as near perfection as possible. We had, in fact, worked out together a complete receiver to give straight-line amplification from 20 to well over 5,000 cycles, which was to end with a 1,200 ohm output (2 L.S.5a's in parallel), to ensure plenty of low notes.

As soon as I came in he asked me, "Well, how do you like it?" I listened for a moment, and then, without seeing the set, asked, "But why in thunder are you using a transformer?" "Chiefly," he replied, "to see if you could detect it without direct comparison with resistance coupling." And he then proceeded to remove the transformer and replace it, much to the relief of my ears, by a resistance.

The transformer he was using is made by one of the best-known wireless firms in the world, and is "guaranteed distortionless" by them; moreover, it was being used after a valve of the lowest impedance that was possible while still keeping short of the maximum safe primary current permitted by the makers.

The fact that the distortion introduced by the transformer was so completely unmistakable without any standard of comparison seems to me absolutely irrefutable proof that even the best transformer cannot approach the quality given by a properly-designed resistance amplifier. There are, however, two reasons why the opposite opinion is held by many people.

The first of these is that properly-designed resistance amplifiers are not common, while badly-designed ones are legion. One of the best-known and most widely-advertised commercial R.C.C. units, when used with the valves recommended, gives quality far inferior to that of a really good transformer, the cut-off on both high and low notes being very bad indeed. Obviously the makers have thrown away high notes with both hands in the endeavour to get high amplification per stage, and then, finding the tone "woolly," have deliberately cut low notes (by juggling with the grid condenser) to get the average pitch about right. The result is that only middle notes remain, so that music becomes a horrible travesty of its real self.

CORRESPONDENCE.

RADIO IN
NEW ZEALAND.IMPERFECT R.C.—
RECEPTION IN EGYPT.

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.

Most users of resistance amplifiers are as far from perfect quality as those who use transformers, so why wonder that so many still stick to the transformer, which offers fewer pitfalls to the unwary!

The other point is that unless the loud speaker is fairly good, small differences in quality due to changes in the amplifier are not apparent. It is pure waste of time to design an amplifier for a horn speaker; any collection of odd parts, moderately intelligently used, will give quality better than such a speaker can reproduce, so that improvements over this are simply not heard. Most of the diaphragm or cone type, even, cannot discriminate between the best possible transformer amplifier and a nearly perfect resistance amplifier. But this is no reason for keeping the transformers, but only for getting a better speaker.

Yours, etc.,

A. L. M. SOWERBY (M.Sc.).

London, W.2.

RECEPTION IN EGYPT.

The Editor, POPULAR WIRELESS.

Dear Sir,—In your issue of POPULAR WIRELESS for October 1st, you publish a letter from a Turkish reader resident in Constantinople, giving the results he had obtained using a five-valve set with three stages of high frequency.

I thought that you might perhaps be interested in a report concerning reception here at Aboukir. Using a four-valve receiver—1 high frequency, detector, and 2 low frequency—of which I only employ the first three valves on account of the second low-frequency stage so greatly amplifying atmospherics, I regularly receive the following stations:

	Strength.
Daventry (5 G B)	R.8.
Daventry (5 X X)	R.6.
Moscow	R.8.
Stamboul (our "local" station—distant 380 miles)	R.9.
Vienna	R.8.
Naples	R.7.
Paris (1760 metres)	R.6.
Rome	R.6.
Langenberg	R.4.
Koenigsyusterhausen	R.5.
Berlin	R.5.

(All above on 'phones.)

There are dozens of other stations that I receive at irregular intervals. For instance, some time ago I tuned in an English (or Irish) station somewhere about 300 metres—a gentleman singing "Mother Machree," the enunciation was perfect—it was a night particularly free from atmospherics, I remember. It would be somewhere about the middle of September. Atmospherics are our bugbear out here. Some nights they are so bad that one can hear nothing, even from our "local" station, Stamboul. To-night I have just tuned in to a very powerful station—and an utter stranger to me—whose wave-length, carefully measured, appears to be 1725 metres. The programme up till now has comprised nothing but speeches in a quite strange language, and apparently in a public hall, as the sound of applause can be heard. The strength—on three valves—is about R.8, so it must be a pretty powerful station. It is not Paris (1760), as not a word of French has been spoken.

Wishing you a very deserved success,

Yours very sincerely,

GEO. BRUCE OSWALD.

Royal Air Force Depot, Aboukir,
Alexandria, Egypt.

"DETECTING DISTORTION."

The Editor, POPULAR WIRELESS.

Dear Sir,—In connection with Mr. W. James' article on Detecting Distortion in a recent number of POPULAR WIRELESS, perhaps the results of some aural tests which I recently carried out would be of interest to some of your readers, particularly as they seem to point the way to considerable economies of H.T. current.

In the end, it is the ear which has to be satisfied with the quality of reproduction, and while it is impossible accurately to judge the quality of ordinary music by ear, yet if a very nearly pure note can be applied to the loud speaker and its strength suddenly increased, any serious distortion of the loud note in comparison with the softer one is readily detected.

I have set up an audio-frequency generator which will produce, as I believe, a very nearly pure musical note of any frequency. Experimenting as outlined in the previous paragraph, the conclusion I come to is as follows: The smallest flow of grid current introduces clearly audible harmonics, whereas a considerable amount of bottom-bend rectification can be allowed without any noticeable change in the purity of the sound produced.

I am now using 36 volts grid bias on a D.E.5A valve with only 120 volts H.T., the anode current being about 3 milliamps or less, and I can get louder and purer signals than when I was using 20 volts bias (which is in itself greater, I believe, than is usually recommended for this valve) and twice as much anode current. On loud bass notes the anode current will increase by 2 or 3 milliamps but no detectable distortion results.

The power valve is preceded by a Ferranti A.F.3 transformer and followed by an output transformer of the same make, feeding a cone type Lissensola-driven speaker.

I should be interested to know whether any other of your readers get similar results by using high values of grid bias.

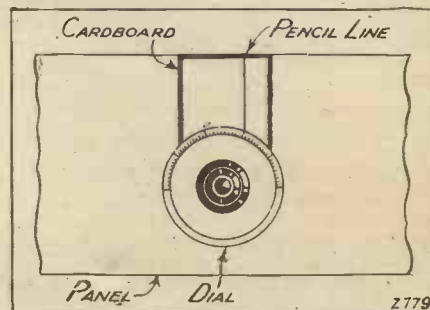
Yours faithfully,
A. K. G.

Blundellsands,
Lancashire.A DIAL
INDICATOR.

By M. B.

A SIMPLE dial indicator can be made from a piece of stiff, white paper.

The paper is stuck on the panel so that it comes just above the dial edge (see below). A pencil line is drawn down the middle of this paper. It is found that the black line shows up very well against the white paper.



A BATTERY TIP.

ALWAYS place your accumulators on an old book or on a piece of wood. There is always a lot of loose acid knocking about at a charging station, and however carefully the cells are wiped there is a possibility that a very fine film of acid may be left. Sulphuric acid is extremely corrosive, and it does not take much of it to ruin an expensive carpet or damage the inside of a radio-set cabinet.

However, if the accumulator is always stood on something, preferably an old magazine, stray acid will not be able to cause damage.

H. T. ECONOMY.

HOW LONG SHOULD THE H.T. BATTERY LAST?

A PRACTICAL ARTICLE ON AN IMPORTANT SUBJECT.

By PERCY W. HARRIS, M.I.R.E.

WHEN should we discard dry high-tension batteries and why? What is the end of their useful life? Probably nine people out of ten use dry batteries for their high-tension supply, and anything that can be done for economy in this direction is well worth consideration.

Firstly, then, on the question of discarding the batteries. It is not merely the drop in voltage that causes us to discard batteries. One of the chief reasons is that a three or four-valve set operating from a common high-tension dry battery becomes unstable, tending to howl, and gives distorted reproduction after a time. We therefore conclude that as the signal strength has gone down at the same time, that a new battery is required, and on discarding the old one and putting a new one in place, we immediately get a return to our original volume and quality.

High Internal Resistance.

Now, as a battery gets older its internal resistance goes up and this causes a drop in voltage. We will assume that we have a battery which, when new, gives 120 volts. When this has dropped to 90 volts we get all the troubles above referred to. It is easy to prove that it is not merely the drop in voltage that is the trouble, for if we take off the old battery now giving 90 volts on load and substitute for it a new 90-volt high-tension battery, we shall find that, save, perhaps, for a reduction in volume and a little blasting on the very loud tones, the reproduction is almost as good as before, and certainly there is none of that distortion and tendency to howl which characterised the set with the old battery.

What, then, is the reason? Simply this, that the relatively high resistance of the battery, being common to each valve circuit, forms a coupling between these circuits and produces unwanted inter-action effects. In fact, many sets with high frequency are found to oscillate badly on an old battery, whereas, with a new one they are perfectly stable. This common battery coupling is a very frequent cause of trouble.

Causes Coupling Effects.

Let us imagine, then, that we have just discarded a 120-volt battery which has dropped to 90 volts and installed a new 120-volt in place of the old one. The results are, at the moment, good, and will remain reasonably good until the voltage drops to round about the figure at which the old one gave trouble. What are we going to do with our old batteries? "It's no use keeping them," you say!

Not at all! A few minutes consideration will show that not only can we make use of these batteries, but that we can cause them to effect economy in our general high-tension consumption.

Some experiments I performed a little while ago indicated quite clearly that if first-class quality is sought in every regard

separate high-tension batteries for each valve are an advantage. The reason of course, is that if each valve has its own high-tension supply from a separate battery, there is no resistance common to all the valve circuits, so that no matter how high the resistance of the battery, so long as the current supply is available for it at the voltage we desire, it does not matter what its internal resistance may be.

Returning now to our set with the new high-tension battery, which is serving as a common battery to several valves. Quite likely one or more of the valves in your set is resistance-capacity coupled, taking, individually, very little in the way of plate current. The demand of these valves is so small that the drain on the battery is negligible. Take your old battery which now gives 90 volts and place in series with it any other old battery you may have which will give 20 or 30 volts more, and you will obtain a high-tension supply at 120 volts—with a very high internal resistance, it is true—but quite capable of giving you the current you require for the R.C. valve at 120 volts.

Two advantages will follow from this arrangement. Firstly, you will reduce the drain on the main battery by a small amount, and secondly, which is much more important, the R.C. valve will not have even the slightest battery coupling with the other valve or valves.

To Eliminate the Trouble.

Most experimenters have a number of old batteries on hand, and if in a set you are able to bring together your old batteries so that you get a separate high-tension supply for each valve, leaving the new battery to supply the output valve, you will get a distinct improvement in quality, and you will be able to run the new battery for considerably longer than would otherwise be the case.

To prove this, I recently ran a set continually for six weeks after a common high-tension battery had been discarded through the production of distortion from common battery coupling, using old high-tension batteries to give a separate supply.

This completely removed the distortion, and I got a further run of life (1) out of a battery which would otherwise have been discarded, and (2) out of a battery which had already been discarded.

Another way in which you can economise in high-tension supply from your batteries is to be careful in choosing your valves. Many good modern

low-frequency transformers work better with what is generally termed a "high-frequency" valve (having an impedance of 15,000 to 25,000 ohms) than with a general-purpose for the detector valve, having an impedance of 7,000 or 8,000 ohms. The high-frequency valve, in such circumstances, will take less current from your high-tension battery as well as giving better results in reproduction and volume.

The difference, however, is not so great as might at first be imagined, for it might be thought, for example, that a valve of 21,000-ohm impedance would take only a third of the current of one of, say, 7,000 ohms when used as a detector valve. When it is remembered that invariably a positive bias is placed on the grid of the detector valve and that it is not worked at zero potential, it will be realised that there is not so big a difference as might

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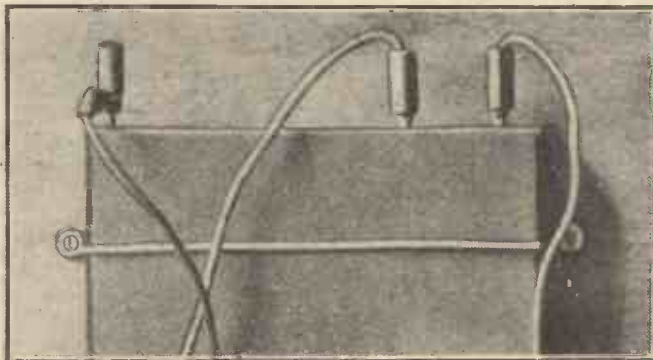
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otherwise be thought. However, the difference is worth while if you are trying to obtain economy in high-tension current.

Use Large Batteries.

The biggest economy of all, of course, is making sure that one uses an adequate size of high-tension battery for the set to which it is connected. A set that has three or four valves is very extravagant to run on the small size of high-tension batteries. The larger sizes are more expensive as to first cost, but much cheaper in their "cost per hour." Obviously, one should calculate one's high-tension expenditure according to the period of time over which the battery is used. A ten-shilling battery which lasts, say, nine months is much cheaper than a five-shilling battery which would only last three.

This point, however, has been stressed on many occasions, and I do not think the same number of experimenters have realised the really useful economy named at the beginning of this article—the use of old high-tension batteries in series and as separate supplies for each individual valve.



The grid-bias battery plays a large part in the cutting down of plate current, besides making for pure reproduction.

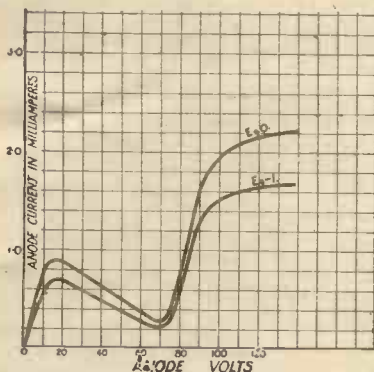
MARCONI SHIELDED VALVE Type S.625

The principal feature of the Marconi Shielded Valve Type S.625 is its elimination of all capacity effects between grid and plate. It thus opens up a new era in high-frequency amplification.

In practice, this valve gives an amplification of 30 to 50 per stage with absolute efficiency and complete stability over a wide band of wave-lengths.

The second grid of type S.625 overcomes the capacity effects between grid and plate, thus preventing the 'feed back' of energy which causes oscillation in an ordinary valve.

Moreover, the arrangement of the electrodes and leads makes it possible to use very simple and effective circuits. Approximately 120 volts of high tension may be applied to the anode and, owing to the great magnification and consequent large high frequency input to the detector valve, anode bend rectification may be used.



APPROXIMATE DATA—Filament Volts 6.0 max. Filament Current 0.25 max. Anode volts 120 max. Magnification factor and impedance values vary, but under typical conditions, are as follows;

Screening grid volts - 80
Grid Volts - 0
Magnification factor - 110
Impedance - 175,000 ohms.

Price
22/6



Getting at the root of it



To get rid of the thistles in the delphiniums you don't cut them back with a pair of nail scissors—you grub them out by the roots.

To eliminate grid-anode reaction effects from high-frequency amplification circuits, it's no good fiddling about with neutralisation condensers.

Go to the root of the matter. *Neutralise inside the valve.* Use the Marconi Shielded Valve Type S.625.

Like every other Marconi Valve, the S.625 knows its job and does it—just because it was designed and made for it.

A Marconi Valve always is designed and made—it never just happens. Try Marconi and see—or rather, LISTEN.

A full description of Marconi Valves, Marconi Sets, etc., is to be found in an amusing but informative free booklet called "Back Chat" just published. To secure your copy send off the coupon below at once.

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I do everything that a valve should do

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London, W.1.
Please send me a copy
of "Back Chat."
Thank you

Name _____
Address _____
County _____

FW9



Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department 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 NOVEL COIL-HOLDER.

ALTHOUGH there are rumours to the effect that there are to be considerable wave-length changes, it would appear to be definite that 5XX (Daventry) is to carry on, more or less indefinitely, at 1,600 metres. In some respects this is good news, but from the point of view of set design it means that in the future we are still to be faced with the problem of switching from the high to low range. As a means of doing this the London & Provincial Radio Company, Ltd., have produced a novel version of their scaled reaction two-way coil holder. The moving and fixed portions of this each carry two complete coil sockets. These are arranged at such angles that two pairs of coils can be accommodated.

By means of simple switching either pair can be brought in or out circuit as desired. This ingenious coil holder will take practi-

cally any size of coil and, owing to a careful design, is not bulky or awkward in appearance even when it has the coils fixed in position. The advantages of having the separate coils both for aerial and reaction are, of course, obvious, and they are efficiently disposed of in this L. & P. Coil Holder. As we have already indicated, the holder incorporates the scaled movement and this enables calibration to be carried out.

The geared movement is quite a good one and the component seems to be a sound mechanical job. The price of this L. & P. "High-Low" is 14s. 6d.

Another new component due to the L. & P. people is the Variohm. This is a baseboard-mounting filament rheostat. It is not unlike an edgewise-mounted fixed condenser in appearance. The adjustment is carried out by means of a small bead which runs up and down a slit in the top.

Along this aperture is moulded a scale which enables definite resistance settings to be obtained.

The adjustment is smooth and we note that an "off" position is provided. The resistance range of the Variohm, which we have had under test, is stated to be 0 to 10 ohms, and we found that this was a very close approximation of the component's actual characteristic. The Variohm is a neat, well-designed and well-made little component and retails at 4s.

NEW "COSMOS" COMPONENTS.

Some very interesting new components recently arrived from Metro-Vick Supplies. Included in these were a number of the A.C. valves. These Cosmos A.C. valves operate directly from A.C. mains. They have indirectly heated cathodes. The "raw" A.C. is taken to a heater which transmits its heat to a small metal tube coated with a mixture of oxides of two comparatively rare metals and from this the electrons are emitted. A particular feature of the Cosmos A.C. valves is that they can easily be adapted to operate in any existing sets without wiring alterations.

For this purpose special five-pin cap adaptors are available and these are of quite a simple nature and comparatively inexpensive. The type A.C. Green Spot has the following characteristics: Heater voltage, 4; Heater current, 1 amp.; amplification factor, 35; anode impedance at 120 volts H.T., 17,500 ohms, mutual conductance at 120 volts H.T., 2 milliamps per volt. The price is 22s. 6d. The very high amplification at a moderate impedance,

(Continued on page 716.)

Don't treat your Valves like an Ass!

THE overburdening of Valves is so common, that the Ashley Resistor method of prevention when adopted, not only takes the extra load from the battery but relieves the burden of anxiety on the minds of those who may have to foot the bill for replacements.

And similarly, each of the other Ashley components perform their various functions reliably in the Home Set, so that nothing will go amiss in the absence of the person whose pet it may happen to be.

If your dealer cannot supply we send post free.

RESISTOR AND BASE
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State particulars of valve for which Resistor is required when ordering.

MULTIPLE FIXED CONDENSER
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15 various capacities from the one unit.

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Neatest and most reliable at lowest price obtainable.

Two fully descriptive leaflets will be sent on request.

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GUARANTEED COMPONENTS

Get better performance for a LONGER PERIOD



THE wonderful filament of specially treated nickel possesses certain properties (essential to the perfect functioning of a valve) possessed by no other metal. That is why, when these valves are used, broadcast programmes become uncannily real, and are endowed with an atmosphere which has hitherto been lacking. This re-creation of the transmissions is yours simply by changing over to these modern valves. It is surely good to get these results. It is still better to know you can keep them. You can, too—for a considerably longer period than with any other valve.

No doubt exists as to the superiority of B.T.H. Nickel Filament Valves, but we ask you to satisfy yourself by trying them in your set. Your ear will do the rest.

B 210 H	B 210 L	B 215 P
R.C. and H.F.	General Purpose.	Power Amplifying
Fil. Volts 2	Fil. Volts 2	Fil. Volts 2
Fil. Amps. 0.10	Fil. Amps. 0.10	Fil. Amps. 0.15
Max H.T. Volts 150	Max H.T. Volts 120	Max H.T. Volts 120
10s. 6d.	10s. 6d.	12s. 6d.

The above prices are applicable in Great Britain and Northern Ireland only.

Your dealer holds adequate stocks of these valves.



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The simplicity of the Efescaphone One Dial Receiver and its extraordinary results make it an Ideal Set for the man who is interested in Wireless as an entertainment rather than a hobby. Its ease of tuning by a single slow motion dial renders it suitable for quite non-technical users, while at the same time it is capable in practised hands of performance equal to much more complicated sets. In order to bring the Set within the reach of all we have inaugurated a Hire Purchase System whereby payment may be spread over 12 months. The equipment is supplied complete and the best material only is employed. Standard British Valves form part of the equipment.

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complete with Batteries, Battery Cable, Phones, Aerial Equipment, P.M. Valves and Puravox Loud Speaker, including Royalties.

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APPARATUS TESTED.

(Continued from page 714.)

giving the extremely favourable mutual conductance figure, is a special feature of these A.C. valves, and one which gives them definite advantages.

The Green Spot is an all-purpose valve, and makes an excellent high-frequency amplifier, detector or first low-frequency magnifier. It gives very good results in any one of these positions. In comparison with ordinary valves we can almost say that it gives abnormally good results. Considerable amplification with freedom from microphonic noises and perfect stability is possible. The A.C. Red Spot is a power valve. The characteristics of this type are as follows: heater voltage, 4; heater current, 1 amp.; amplification factor, 10; anode impedance at 120 volts H.T., 3,000 ohms; and at 180 volts H.T., 2,500 ohms; mutual conductance at 120 volts H.T., 3.5 milliamperes per volt, and at 180 volts H.T., 4 milliamperes per volt. The price of this is also 22s. 6d.

Here we have a tremendous "slope," and one that in the usual way is not approachable. Needless to say this is a very great advantage, particularly for a valve of the power type, and considerable magnification can be obtained while a very excellent degree of grid swing can be handled. The makers claim that this valve requires only half the input to give the same output as the best battery-operated

valve, and our tests would seem to indicate that their claim is by no means exaggerated.

In fact, we were considerably impressed by the operation of both of these Cosmos Shortpath A.C. valves. They conclusively

prove that there is nothing to be lost and everything to be gained by changing over from batteries to the mains.

In regard to the H.T. supply, the Metro-Vick people supply an excellent full-wave rectifier, the S.P. 42/U. Operated at 4 volts and taking two amperes, this valve enables a D.C. output to be obtained of 50 milliamperes, which is quite sufficient for any but a very elaborate outfit, and it will stand up to 250 volts R.M.S. per anode. The price of the S.P. 42/U is 22s. 6d.

We have had a receiver in operation using these Cosmos valves throughout and deriving both its L.T. and H.T. from the mains, and its performance was well above the average in respect of both sensitivity and purity of reproduction. The Metro-Vick people supply all the necessary transformers, etc., at very reasonable prices. There is a complete L.T. battery eliminator

for these A.C. valves at £2 10s.

The output is 5 amperes at 4 volts.

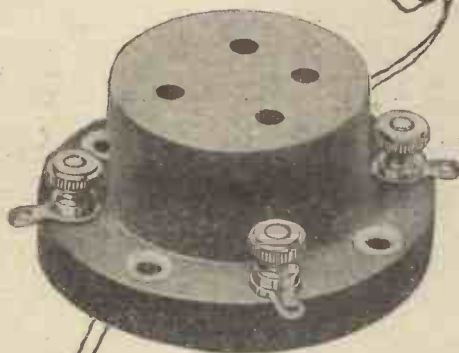
As the makers say: "This unit may be regarded as a substitute for the accumulator as used with the ordinary type of valve." The instrument is contained in a neat case with a crystalline finish, and is fitted with ten feet of flexible cable and an adaptor for plugging into a lamp holder. There are two types available one for 100 to 110 volt mains and the other for 200 to 240 volts. Either will operate at any periodicity from

40 to 100. This unit, as with all the Metro-Vick mains supply apparatus is designed in such a way that it can be safely operated by inexpert listeners.



A short-wave set designed to the special order of the Sudan Government by the R.I. and Varley Co., Ltd. Its purpose is to receive radio time signals for checking chronometers.

Why the Redfern Pneumatic Valve Holder supersedes all other designs



Patent No. 269,388

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AND
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REDFERN'S RUBBER WORKS LIMITED,
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Will you gag the Christmas Programmes?

Christmas Eve!—everything overhauled—batteries re-charged—lovely new (expensive) loud speaker that can also be used as a pipe rack—"NOW WE'RE READY ready ready"

"I think we'd better play 'Hunt the Slipper,' Aunt, as you suggested, I'm afraid the atmospherics" (and he can't even hear the atmospherics).

Not a bad set on the whole, but what are a couple of headphones amongst so many (fifteen all told and the twins) now that speaker has again become a pipe rack.

ETHOVOX

The happiest homes this Christmas (from the wireless point of view) will be the ETHOVOX homes—where the loud speaker looks like and speaks like a loud speaker.

And a round £3 will buy it—"this speaker that first made wireless popular." Go to your dealer NOW or come to our SHOWROOMS—15, BEDFORD STREET, STRAND, for a demonstration.



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Compare our prices with those of other well-known valves and see what you save. Metal Valves are used in many Broadcasting stations *exclusively*, which is proof of their superiority, for Radio Station Engineers know from experience which valves are best.

Unlike some valves which only function efficiently when used on certain circuits, Metal Valves are designed to suit *all* circuits, and will get the best out of your set. Try

MÉTAL RADIO VALVES

Dull Emitter, Type C.L. 124, Loud Speaker Power Amplifier, L.T. 4 volts, 0.12 amp., H.T. 40 to 100 volts. Price 8/6
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OTHER TYPES IN LIST.

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JOHN RAE, LIMITED,
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RADIOTORIAL

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

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 inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. 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.

QUESTIONS AND ANSWERS.

BISCUIT TIN FOR SCREEN ?

J. W. E. H. (Nr. Belfast).—"I intend to build a set employing the circuit of the "Cube-Screen" Three, given in "P.W." No. 280,

page 329, but using a cabinet large enough to give plenty of room for modifications of lay-out. In connection with this circuit, could a small biscuit tin be used instead of a cube screen ?"

No. The magnetic properties of an ordinary biscuit tin would be quite fatal to its effective use as a screen in any circuit of this type.

HOLES IN ACCUMULATOR CAPS.

"DUNNO" (Redditch).—"What is the purpose of the holes in the little caps that fit into the tops of accumulators ? Does it matter if they get stopped up ?"

An active accumulator discharges a good deal of gas, especially when it is being charged, and the holes are there to allow this to escape. They should certainly be kept open, for the pressure of gas in a cell is sometimes quite considerable, and might be sufficient to cause the cell to burst if no outlet is provided for it.

SPARK WHEN CONNECTING UP THE H.T.

P. G. (Stepney Green, London, E.).—"What puzzles me is that even before the filaments are alight I get a little spark when plugging in the H.T. battery lead. The

set seems to work all right—in fact, I am very pleased with it—but I can't understand a current flowing, as shown by the spark, when there is no valve alight. What is wrong ?

Nothing is wrong if, as we expect, you have a large, fixed condenser shunted across the H.T. The current flow that is puzzling you is simply due to the fact that every time you plug in, this "reservoir" condenser is charged up. When the set is switched off the charge slowly dissipates, so that the next time you connect up again another charging current flows for a moment, thus causing another spark.

THE CARE OF AN ACCUMULATOR.

R. P. (Cheltenham, Glos.).—"My accumulator stands in a corner beside the fireplace, and although I have only had it two or three months, the acid seems to be running low. Can I put tap water in ?"

There is no doubt that you can put tap water in an accumulator, in just the same way that you can put your money into a pocket which has a hole in the bottom. But if you take our advice you will do neither. There are more ways than one of losing money, and one of the most certain is to treat an accumulator badly. To get the best from such an accessory you must treat it in accordance with the makers' instructions, and in nearly all cases you will find that the makers definitely recommend the use of distilled water and not tap water for refilling an accumulator.

We notice, too, that you stand the battery near the fireplace, which would account for the electrolyte evaporating quickly. This again is directly at variance with the advice given by the manufacturers, who state that the cells should be "kept in a cool place." Although the average accumulator will stand a lot of misuse, we are afraid that you are not giving yours a fair chance, and we recommend you to adhere to the makers' instructions as closely as possible.

If you have lost or mislaid these, no doubt your dealer would be able to help you, or you could obtain them direct from the manufacturers of the battery.

OVERHAULING A LOUD SPEAKER.

"TOMMY" (Coventry, War.).—"I have had my loud speaker in use for just over two years, and although I do not use it very much (Continued on page 720.)"



For the Cossor Melody Maker

REDFERN'S
NEW SIZE

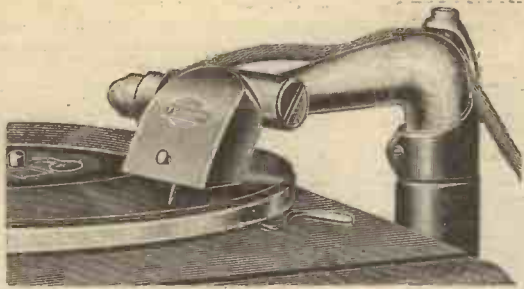
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COIL FORMER**

7" LONG 4" OUTSIDE DIAMETER

Your Dealer can supply you
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REDFERNS RUBBER WORKS LTD., HYDE, CHESHIRE

PRICE
3'3
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A new field of experiment for you!

That old gramophone you have got tired of can be made to give reproduction many times better than it ever did before and all for a very small outlay.

Merely replace the soundbox with the

IGRANIC FACENT PHONOVOX

and connect to the amplifier and loudspeaker of your wireless set. The result is far better quality than either of them gave alone. What it amounts to is that you obtain electrical reproduction such as is being used in all de-luxe gramophones. Get the Phonovox for Christmas and provide excellent quality dance music for the family. Remember the volume is only limited by the capacity of your amplifier.

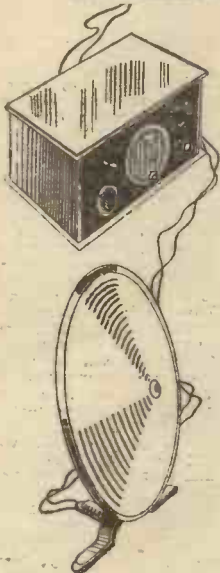
THE PHONOVOX, Price 37/6

The following are optional:—

Plug Adaptor, 5/- Volume Control, 7/6

Send for List No. R.70 for further particulars. The range of Igranic Radio Devices is the most complete in the world and they are always stocked by reputable dealers. All reports received by us of difficulty in obtaining them receive immediate attention.

IGRANIC ELECTRIC CO., LTD.,
149, Queen Victoria Street, London, E.C.4
Works: BEDFORD.



TWO WONDERFUL LOUD SPEAKER SETS

These wonderful instruments incorporate all 1928 improvements, and are the finest sets money can buy.

22 STATIONS on the two-valve and 46 STATIONS on the three-valve have actually been received, and most of these at good volume on the loud speaker.

The latest all-wave tuner is used, thus eliminating coils entirely, and any amateur can build these sets in two hours.

NO SOLDERING—NO DRILLING—NO COILS TO CHANGE.

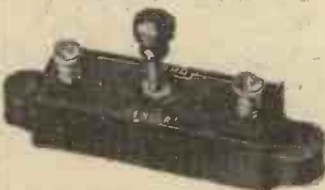
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Price from 2/6



5 capacity ranges, and each in Baseboard and Panel models.

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FORMO-DENSER

A sound variable condenser which fills a long-felt want. Specially designed to take the place of the hitherto generally used Fixed Condenser. For use as:

Neutralising Condenser
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Grid Condenser
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BUY FORMO HANDBOOK. Practical Circuits Blueprints of two sets, etc., 1/6.

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RECUPERATING AGENT

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DRY BATTERIES

THE proof of a Dry Battery is the number of hours of efficient service you can get out of it for the money you spend. We are confident of the result if you rely on a Hellesen Dry Battery for your H.T. Supply.

Get a smooth uniform H.T. Supply at the minimum cost per hour from a sealed genuine Hellesen H.T. Battery with the quadruple insulation and the No. 7 Recuperating Agent.

60-volt "WIRIN" 12/6

99-volt "WIRUP" 21/-

(Postage Extra.)

All types, voltages, etc., in Double and Treble capacities for H.T. and L.T. Supply. Ask your dealer for the type to suit your set and get the maximum service, or write us for full particulars.

Obtainable at all Radio, Electrical and General Stores, Harrods, Selfridges, etc., or direct from

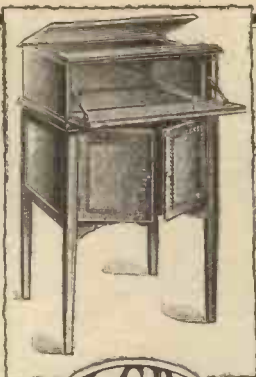
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They Last Longer



"The picture on the box"

may not be the sign of a good cigar, but a good wireless cabinet is a sure sign of a good set.

Your set deserves a V. C. Bond Cabinet. It will not only add distinction to your room as a piece of furniture, but will add to the efficiency of your apparatus.

Our cabinets are made like that—experts in radio and cabinet-making contribute to the beauty of design and sound construction which has made them so popular.

We have many designs from which you may choose, but we can make one to your special requirements too.

This combined bedroom chair and trouser-press solves the problem of the Christmas gift. It is not only a piece of good furniture, but a personal servant any man would appreciate.

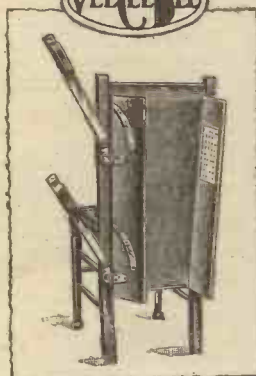
For full illustrated particulars of cabinets and chairs, write or phone to

Actual Manufacturers:

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-0005 Var. Condensers, each 5d. 60-v. H.T. Batteries, M.A.L., 4/11, postage 9d. Flash Lamp Batteries, 4d., per doz., 3/6, postage 9d.

Banana Plugs and Sockets, each 2d. 2-v. Triotron Valves, each 3/6. 2-v. -06 Novak Valves, each 4/- Induction Coils, 35, 1/2; 50, 1/4; 75, 1/6; 100, 1/9; 200, 2/6; 250, 2/9 (centre tapped 6d. extra). 9-v. Grid Bias Batteries, each 1/-. H.P. Chokes, each 4/6. 2 mfd. Condensers, each 2/3. 16-gauge Tinned Wire, 20 ft., 1/6. Aerial Wire, Copper, per lb. 1/-. Red and Black Flex, per yd. 1/4d. 2-v. Triotron Power Valves, each 7/6. Basket Coil Holders, each 9d. Micro-Radio Rheostats, each 1/9. Transformers, per packet, 5d. On-and-Off Switches, each 1/-. Loudspeaker Plugs and Sockets, for room wiring, each 1/6. Flinsolda, per tin, 1/3. Loudspeaker Cords, 1/- Ultra Phones, usually 17/6, now 8/6. Six-Pin Coil Bases, each 1/3. Six-Pin Coil Formers, each 4/- D.C.G. Wire, 16, 18, 20, 8W.G., 1 lb., 8d.; 22, 24, 26, 28, 1/-; 30, 32, 34, 1/3.

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TO CLEAR.
A quantity of 4-v. Power and Ordinary Preat Metal and Electric Valve, price each... **4/-**
COSSOL MELODY MAKER. Write for diagram and prices of parts.
All well-known makes of parts supplied. Lissen, all Valves, Benjamin, Igranite, Formo, Edison Bell, all Loudspeakers. Write for Lists or send order.

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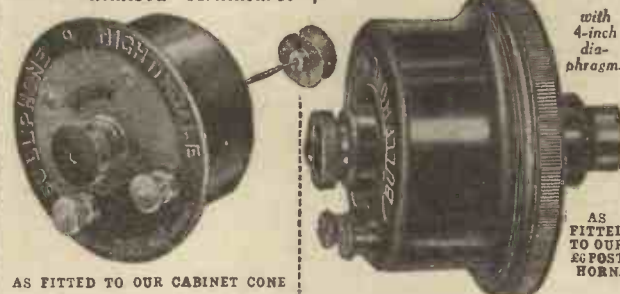
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MAKE YOUR OWN CONE SPEAKER

TWO WONDERFUL UNITS AT ONLY **15/-** EACH

YOU'LL BE SURPRISED!

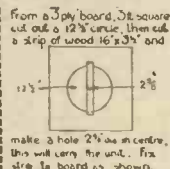
The New Wonder "Nightingale" **GRAMOPHONE CONE UNIT ATTACHMENT** with Balanced Armature.



AS FITTED TO OUR CABINET CONE

with 4-inch diaphragm.

AS FITTED TO OUR POST HORN.



make a hole 2 1/2 inch in centre, this will carry the unit. fix a strip to board as shown.

BULLPHONE DOUBLE PAPER CONE 2/-
Postage 3d extra

Exactly as fitted to our own Speakers.

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud Speakers. Cobalt Magnet guaranteed for all time. Astonishing Results, equal to the most expensive Loud Speakers yet made, are guaranteed with either of these Units.

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CABINET CONE

Size 17 ins. high by 15 ins. in Mahogany. Walnut or Rosewood finish.



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77/6 cash, or **EASY TERMS** 10/- deposit and 12 monthly payments of 6/-

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SEND DEPOSIT NOW—NO REFERENCES—SPEAKER BY RETURN.

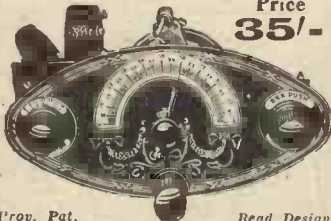
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THE LAMPLUGH PANEL PLATE TUNER UNIT

*The touch of the
Craftsman*



Price
35/-

Prov. Pat.

Regd. Design.

Enables amateurs to construct a highly efficient Receiver equal in appearance to the best factory products. Practically half a set, this Unit consists of a richly-engraved metal panel in black and gold or silver, on which are mounted coils and specially calibrated dial, covering broadcast wavelengths, S.L.T. Slow Motion Condenser and Switch for changing from low to high wavelengths. No chromite panel required, and the Unit can be mounted in any form of Cabinet. Full diagrams supplied for building two- or three-valve sets.

We are receiving by every post eulogistic testimonials, and there is no doubt that this remarkable Unit has come as a boon to the home constructor and fills a long-felt want.



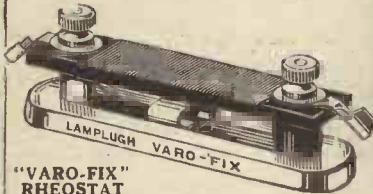
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These new models were the sensation of the recent London Radio Exhibition, representing the last word in Value. Constructed throughout of the very finest material and housed in handsome oak cabinets enclosing all batteries, valves, etc. No loose wires nor coils to change. Extraordinary range and exceptional volume. Prices (set only):

£5 0 0 (2-valve set)

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Excluding Royalty.



"VARO-FIX"
RHEOSTAT

This new model is built on aluminium base carrying special spring slider. Very compact, and can be placed near valve-holders, thereby reducing wiring. 6, 15, or 30 ohms.

1/2 each

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BRITAIN'S
BEST RADIO

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 720.)

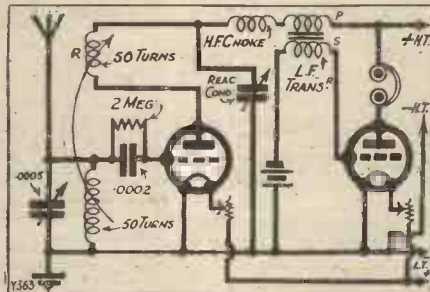
short waves than an ordinary straight one-valve set, but it suffers from the disadvantage that it cannot work equally well upon the longer waves, such as 5 X X uses.

Many other interesting circuits might be named as being specially suitable to particular conditions, but undoubtedly the most popular one-valve circuit is the good old straight circuit, in which the valve acts as a detector with reaction. In average conditions this is sure to give satisfaction, but where the conditions are in any way abnormal, or the requirements are in some way out of the ordinary, expert advice may be obtained from the Technical Query Department, as to the receiver which is most likely to give maximum satisfaction in the special circumstances. (The charge is quite a nominal one, and full particulars are obtainable upon application.)

"TERRIBLE TROUBLE" WITH AN AMPLIFIER.

"TROUBLED" (Abingdon, Berks).—"I am in terrible trouble with my set, and I hope you can help me out, for I don't know what my father will say. We started wireless with a crystal set, and then last year we had a one-valve amplifier in order to get better signals.

A DETECTOR AND LOW-FREQUENCY AMPLIFIER.



The correct connections for a Detector and L.F. receiver with condenser-controlled reaction are shown above.

In the "What is Wrong" diagram last week the H.T. negative terminal, phones, and choke were omitted. The grid-bias-battery was reversed, and there was no H.T. to the plate of the 1st valve, and no L.T. across the filament of the 2nd valve.

This was satisfactory in a way but we could not "reach out," so last month I saved up enough to get the parts to build the Reinartz one-valve set which was given away with "P.W." on October 15th (Blue Print No. 30). With this, I thought, we shall be able to add the amplifier and possibly get Daventry on a loud speaker, as well as reaching out for foreign stations. But I have been bitterly disappointed. When I try to connect up the amplifier to the one-valve set, the L.T. battery wires "spark" when I join up, and if I keep them together more than a minute they start to get quite hot. Evidently something is seriously wrong. What can I do? I am afraid to tell my father about it."

There is no need for you to get into a panic, "Troubled," because you are experiencing quite a common fault, which, fortunately, is very easily remedied. What has happened is this. In the amplifier that you have, the H.T. negative is joined to L.T. positive wire, whilst in the Blue Print (No. 30) set the H.T. negative is joined to L.T. negative. This means that if you connect up all the terminals in the way shown, the L.T. battery is shorting, and consequently will be damaged; but you will find that there is no earthly need to connect up all the terminals. Try connecting up again to the terminals as marked on the instruments, but be sure not to connect a wire to the H.T. negative terminal on the amplifier. Ignore that terminal altogether, and leave it without any connection externally whatever. In all probability you will find that the

(Continued on page 724.)

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In all the finest circuits known "Bretwood" components give highest efficiency.

Here are three of the most popular and essential ones:

GRID LEAK DE LUXE.

The most reliable variable grid leak obtainable. Known and famous the world over. Gives a minute variation from 50,000 ohms to 10 megohms. Panel type, 3 6. Baseboard type, 3 9.

AMPLIFIER. Auto Audio Frequency (functions as a super-choke).

Perfect amplification at all frequencies. Mush and atmospherics practically eliminated. Can be obtained on a 10-day trial. Price 20/-

VALVE HOLDERS. (anti-capacity).

Absolutely no capacity effects—always perfect contact. Three types—Panel mounting, 1/6; Baseboard, 1/9; Anti-Phonic Baseboard mounting, 2/-.

Obtainable from all dealers or from

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(Note our new address.)

HEADPHONES REPAIRED

Rewound and re-magnetised 4/- per pair Loud Speakers repaired, 4/- Transformers rewound 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.

THE PERFECT WET H.T.

Assured with our new Insulating Liner, Jars, 1/3 doz. plain; 1/8 doz. waxed; Special Zines, 1/- doz.; High-Capacity Sacs, 1/6 doz.; Perforated Liners, 4d. doz. Post Free on three dozen Units and over, including special divided carton suitable as a container. Send for sample complete unit, particulars and instructions. We stock Seamless Moulded Cone Parts. Telephones and Loud Speakers re-wound.

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now I have fitted the

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 722.)

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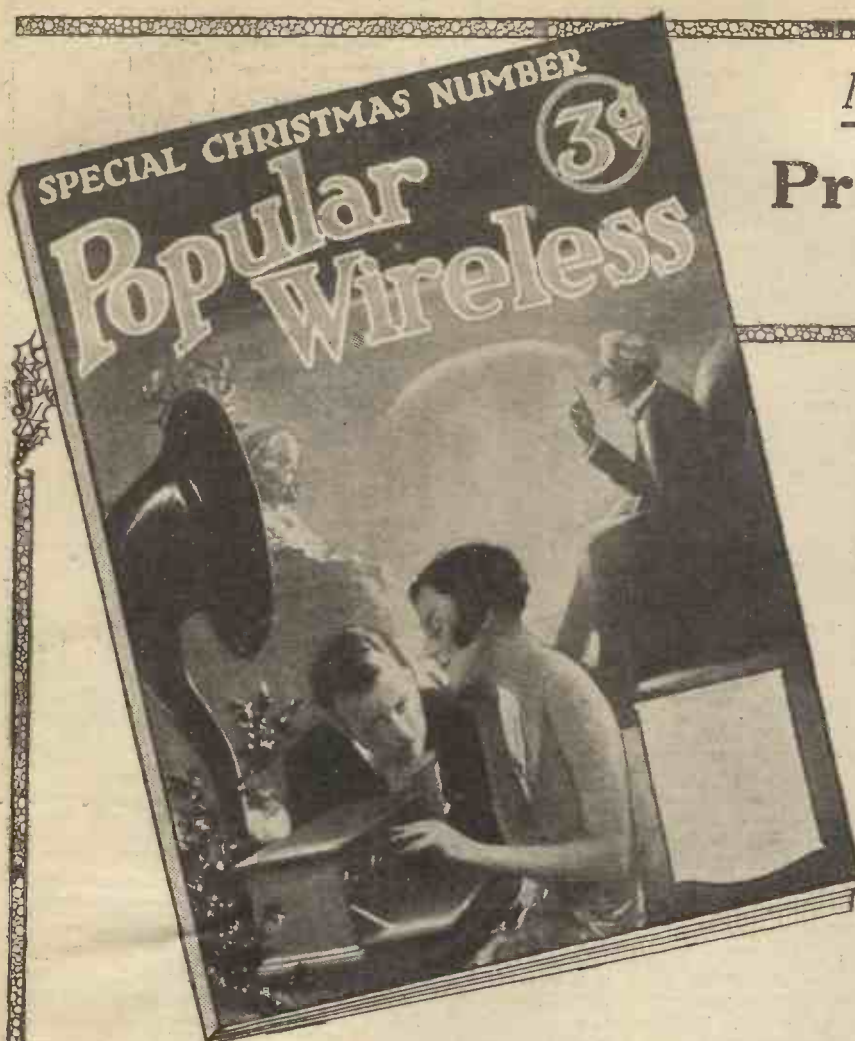
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SHORT-WAVE NOTES.

By W. L. S.

ONE of the strangest features of short-wave work is the extraordinary way in which conditions will change in a comparatively short space of time with absolutely no apparent reason. To take a case in point, Wednesday, November 16th, was one of the best nights for the reception of the United States amateurs that the writer can ever remember. Fourth district stations were coming in well on a two-valve receiver as early as 8 p.m. At 11.30 all districts were audible.

No watch was kept on the Thursday and Friday, but on the Saturday and Sunday it was practically impossible to log an "N U" of any description. It is also interesting to note that last year's "rule" still holds good—namely, that when the N U stations are weak or inaudible, the Brazilians come in very well indeed.

R. C. Coupling Best.

At the time of writing conditions for transatlantic work generally seem very poor, yet 2 X A D on 22 metres, relaying a baseball match, is being received at good loud-speaker strength with three valves.

It is well worth while experimenting with resistance-coupled note magnifiers for short-wave work, as it appears in quite a number of cases that annoying noises resembling artificial atmospherics are extraneous noises picked up direct on the primary of the low-frequency transformer. Suffice it to say that the writer is now using two resistance-coupled stages, giving an amplification very little in excess of that previously obtained with one transformer stage (with a step-up of 4½:1), and although the signals are very slightly stronger than before, a good percentage of the mush has disappeared. A certain type of mush, if one may use the expression, seems to have remained, but there is no doubting the improvement over the old set.

An anode rectifier also improves matters, for a fair percentage of the "mush" is in some cases due simply to a faulty grid condenser or leak on the detector, and accordingly disappears when they are removed.

New French Station?

From the results of the Washington Conference it seems probable that amateurs will in future take rather more interest in the 80- or 90-metre band of wave-lengths. It was only a few nights ago that a real "old stager" remarked to the writer that he had never heard the New Zealand and Australian stations at such a strength as he used to receive them on 90 metres or so, and this is certainly true. Meanwhile a perfectly good band of kilocycles is going begging!

K D K A on approximately 60 metres is another station that has been "coming across" remarkably well during the past few weeks. By 11 p.m. his strength has occasionally been comparable with that of 2 L O! There is also a very powerful French station working on the same wave-length, and the writer would be very glad to hear from readers who have heard this station.

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Only half the weight of others! Only half the size!—Daimon L.T. Battery. No battery of the same size as a Daimon has a lower internal resistance. No battery gives quieter reception or lasts longer. But then, Daimon are made by the oldest battery manufacturers in Europe. Daimon 100 volts, 15/6; Grid Bias (9 volt), 1/10; L.T. 1/10 and 4/- each. In order to meet competition we have now produced the **DAIMON JUNIOR**, 60 volts, 7/11; 100 volts, 12/11. All good dealers or direct to **LOUIS HOLZMAN**, 34, Kingsway, W.C.2. Telephone: Holborn 6209.

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THE NEW

STUTZBERG

M. B. 17. THE SUPER NATURAL CRYSTAL

THE "PROGRESSIVE" TWO.

(Continued from page 695.)

The flexible from the .0002 mfd. fixed condenser should first of all be taken to the second tapping from the bottom of the coil, and when the handling of the set has been thoroughly mastered it can be taken to the lower tapping. This increases the selectivity of the receiver and makes the tuning somewhat keener.

You will find that the original .0005 mfd. variable condenser—which, for clarity, I will in future refer to as the *centre variable*—is much the closer in tuning, and that the aerial tuning variable is somewhat broad in its control. These two variables should be rotated more or less together in the first instance, but as the desired station is heard the reaction condenser and the centre variable can be "balanced," and subsequently the aerial variable adjusted until loudest signals result.

An incidental advantage which results from the use of the H.F. circuit adopted is that the H.F. stage can very easily be cut out in the Progressive set. To do this, all that is necessary is to withdraw the H.F. valve from its socket, disconnect the flexible lead from the grid coil, and take the aerial flexible lead to a tapping on the grid coil instead (as in the case of the "Progressive" One).

The Third Valve.

Very simple, isn't it? And it is also much more efficient than switching.

Now I am going to leave you for a while to get the two valves going properly.

You must not even think about the third valve until you are satisfied that these two valves are giving two-valve results, and that you can handle the receiver with the aplomb of an expert. I want you to be so closely acquainted with the controls of the set that when you do add the third valve, you will be able to tune stations in direct on to the loud speaker. And then, when I have completed the programme and you have hooked up the fourth valve, you will be able to challenge with confidence any average five-valve man to a "station grabbing" contest.

Next time we come to the first L.F. valve which is to be transformer-coupled. You can, if you like, leave this week's work over and connect up the first L.F. before bringing in the H.F. But I do not advise this procedure because it is much more difficult to tell whether an H.F. stage is working really properly when it is tacked on to a two-valver than when it is added to a one-valve set.

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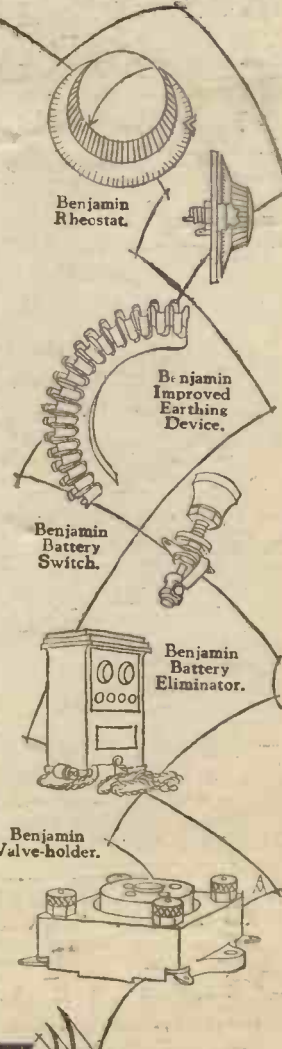
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TECHNICAL NOTES.

(Continued from page 698.)

or in total darkness. The system also makes use of what are called "marker beams" placed at intervals of about 25 miles along the air route, these acting as radio "milestones." In addition to this, radio telephony is used to keep the pilot informed of landing conditions and weather prospects. The control centre is also equipped with receiving apparatus so that messages may be received from aeroplanes which are provided with transmitters.

Microphone versus Ear.

The human ear is remarkably sensitive as an acoustical pick-up device, and until the advent of broadcasting, in fact, until very recently, electrical and suchlike devices for picking up sound were very much inferior to the ear in sensitivity.

With the increasing demands upon the microphone, however, great improvements have been made in pick-up devices, and now the broadcast microphone may even surpass the ear considerably in sensitivity.

A curious example of this was noticed some little time ago, during one of the well-known attempts to broadcast the song of the nightingale. Listeners heard the sound of a bird which was presumed to be some little distance from the microphone, whilst the engineers in charge of operations failed entirely to hear the sound. It is presumable that the microphone picked up the sound, whereas the engineers were unable to do so. The sound picked up by the microphone was, of course, amplified in the usual way and reached the broadcast listeners, although those in charge of operations were even unaware that any song was being received at all.

Socket Power.

With the considerable advances in the design of power-supply devices, for taking the radio power from the electric light, improved components and subsidiary devices have become more and more necessary. One of the essential components, of course, is the smoothing condenser, or set of condensers, and in cases where fairly high output voltages are required, the condensers must be properly designed and constructed if they are not to prove the cause of breakdown trouble.

I notice that one firm is now producing special condensers contained in a metal housing about 4 in. square by 5 in. high, the condenser having a capacity up to 6 mfd., and being provided with stout projecting terminals at the base of the metal container. These condensers are designed for continuous use with direct-current voltages up to 1,000 volts, which makes them particularly useful in high-voltage power units giving output voltages of as much as 300 to 500 volts. It is important that the filter condensers should be capable of withstanding voltages considerably in excess of the rated output, for various reasons, which you will see at once. These condensers are claimed to have a capacity within about 10 per cent of the rated value. They are extremely compact and very small for their electrostatic capacity. The metal container of the condenser is completely filled up with insulating compound so as to seal in the condensers and provide protection from atmospheric and other causes.

Loud-Speaker Improvements.

I suppose most loud-speaker reproducer units are fitted with an adjusting screw for varying the sensitivity. This adjuster is not, however, always an unmixed blessing, for not only is its use, or misuse, frequently responsible for much distortion—which is often blamed upon other parts of the circuit—but also the careless or unskilled use of the adjusting screw may result in permanent damage to the electro-magnetic unit.

An enterprising American manufacturer has placed on the market a very handy and compact loud-speaker unit in which these drawbacks are entirely avoided by the simple process of adjusting the unit once and for all before it is sent out from the factory. As no adjuster screw is provided, it is impossible for the user in ordinary circumstances to interfere with the reproducer in any way.

In addition to being inexpensive, it is provided with an adapter for the outlet tube so that it may be fitted to most existing types of horn.

Personally, I think there is a good deal to be said for this permanently-adjusted type of reproducer, not only because it prevents trouble of all kinds, but because the simplification which results in the manufacture or assembly—by the omission of the adjusting system—permits of it being produced at a distinctly lower price.

A Trouble Saver.

A very simple battery-testing device now being made by the Beede Instrument Company, and known as the "Test-A-Bat," consists of a small "watch" meter with its dial marked into three sections, instead of being calibrated in the usual way. These three sections are respectively labelled "start charge," "O.K." and "stop charge." The meter is provided with two metal brackets by means of which it may be permanently attached to the terminals of a storage battery. There is a small button on the edge of the meter which, when depressed, closes the circuit and gives a reading. The meter is, therefore, always ready for use, but current only flows when the button-switch is depressed. In this way the condition of the battery can always be determined instantly and with a minimum of trouble.

DID YOU KNOW THAT . . .

WHEN a set slowly builds itself up into a tremendous howl the trouble is generally due to the fact that the loud speaker is too close to the set or is pointing directly towards it?

If you are running long leads round the house so that the loud speaker can be used in different rooms, it is a real economy to use a choke-coupled or a transformer-coupled output, to prevent H.T. leakage?

The long contact on a flashlamp cell is the negative, and the short one is the positive?

Distortion due to high-frequency current getting in on the low-frequency side of a receiver may be prevented by the insertion of a high resistance, in series with the grids of low-frequency valves?

ALTERNATIVE PROGRAMMES WITH CERTAINTY



Simply move the switch from, say, Stud C to D, and one programme gives place to another with an ease and certainty which is hardly credible. This new model "A" incorporates a 0005 mfd. variable condenser—in fact, it is almost a complete receiver in itself. All the long-wave programmes are available, and maximum efficiency over the whole range of wave-lengths is assured by the wonderful magnetic reaction operated by means of bevelled gearing.

PRICE COMPLETE £2 7s. 6d.



Model "B"—a really wonderful achievement—is specially designed for neutrodyne work, though, as a matter of fact, so wide is its application that it may well be termed a universal tuner. It embodies the most modern facilities for greater selectivity, H.F. neutralizing, capacity and magnetic reaction. Reinartz and capacity controlled reaction, etc. A simple turn of the switch makes all these advantages equally applicable in the case of both long and short waves.

PRICE COMPLETE £1 17s. 6d.



The popularity of the Standard Retroactive Tuner has steadily grown since it was placed on the market. The ease and certainty with which it enables alternative programmes to be received has still further increased its value as a complete tuning unit which eliminates plug-in coils, and ensures correct and efficient aerial reaction over a very wide wave-length band. No matter what re-distribution of wave-lengths may take place in any future regional scheme, there is no possibility of these Tuners becoming obsolete, owing to the very wide waveband they cover.

PRICE COMPLETE £1 19s. 6d.



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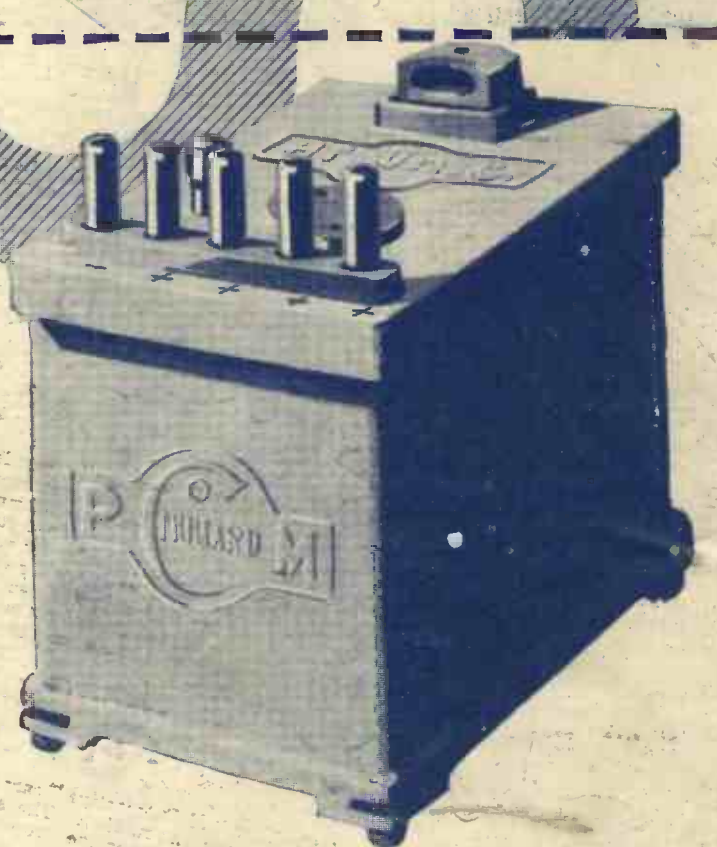
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