

A STANDARDISED WAVE-TRAP (See Page 605.)

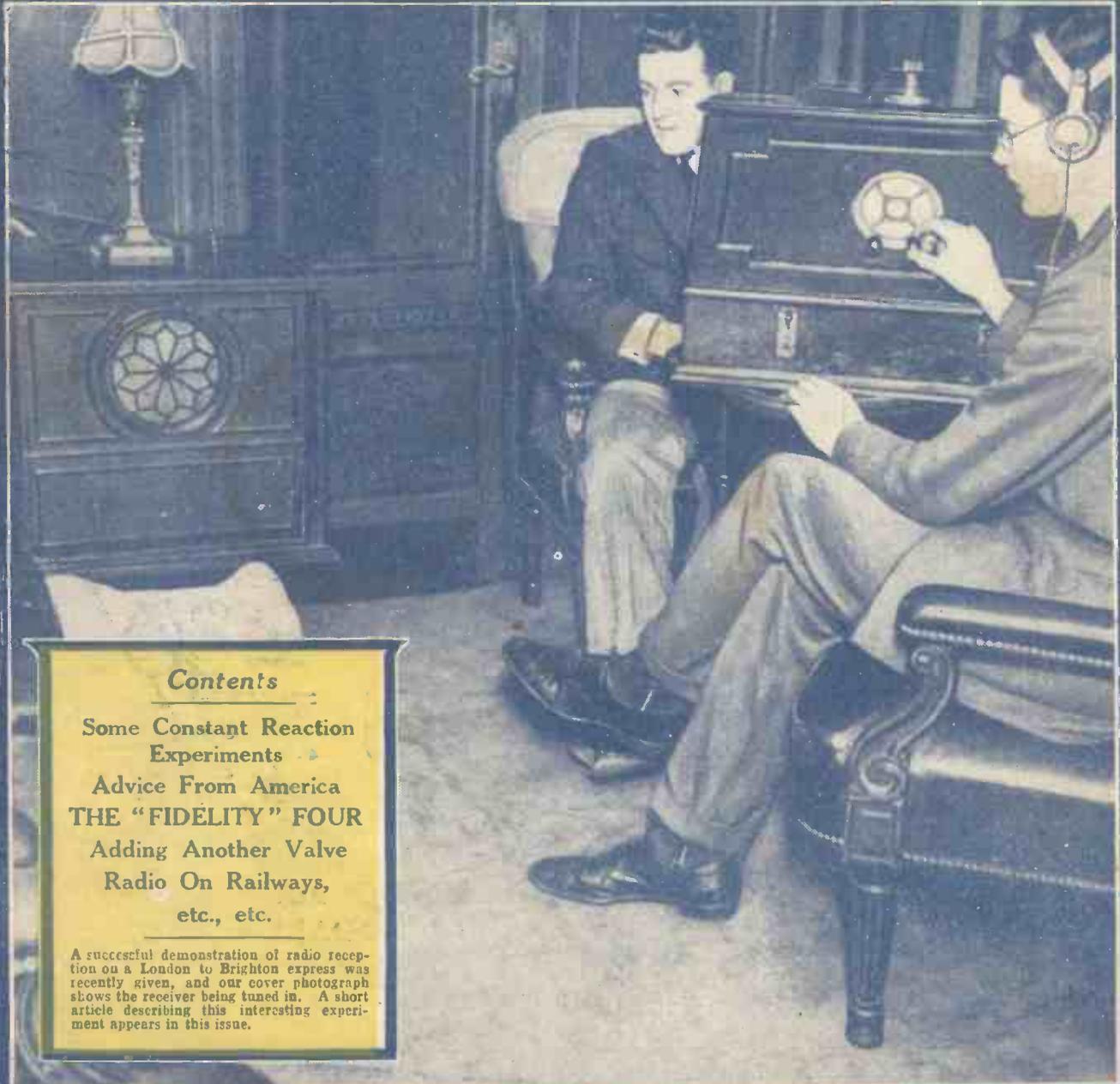
Popular Wireless

Every Thursday
PRICE
3d.

No. 285. Vol. XII.

INCORPORATING "WIRELESS"

November 19th, 1927.



Contents

Some Constant Reaction Experiments

Advice From America

THE "FIDELITY" FOUR

Adding Another Valve

Radio On Railways,

etc., etc.

A successful demonstration of radio reception on a London to Brighton express was recently given, and our cover photograph shows the receiver being tuned in. A short article describing this interesting experiment appears in this issue.



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AS from November 14th, 1927, the prices of the popular capacities of Dubilier Mansbridge Condensers are reduced as shown below.

No difference whatever has been made in the quality of these condensers, the price reduction being purely on account of the wonderful reception which has been afforded to the Dubilier Mansbridge following its production in the handsome bakelite case shown here.

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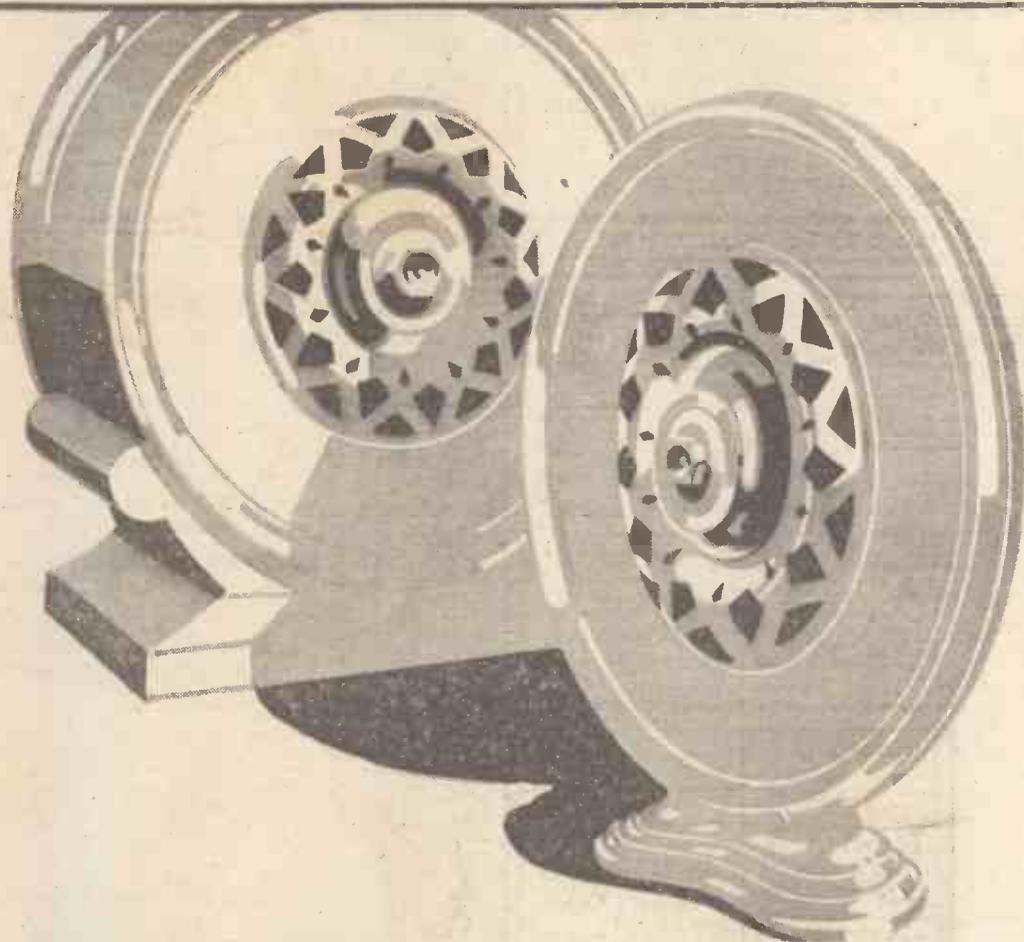
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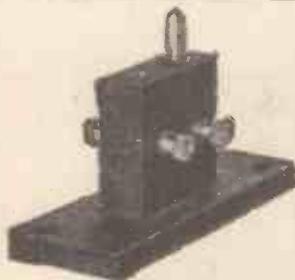
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Small size 10d.

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SINGLE COIL-HOLDER.

Nickel Plated and has Terminals on each side, **1/3** Postage 2d.

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"THE shortest distance between two points" our old friend Euclid tells us, "is a straight line." The plumb line always registers the shortest distance between two points. It is correct—to a minute degree.

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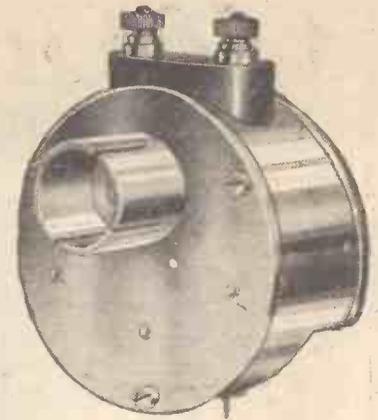
and Coupon brings copy of "How to build your own H.T. Eliminator."

To the Telegraph Condenser Co. Ltd., Wales Farm Road., N. Acton, W.3.
I enclose 3d. in stamps. Please send me a copy of "How to build your own H.T. Eliminator for A.C. or D.C."

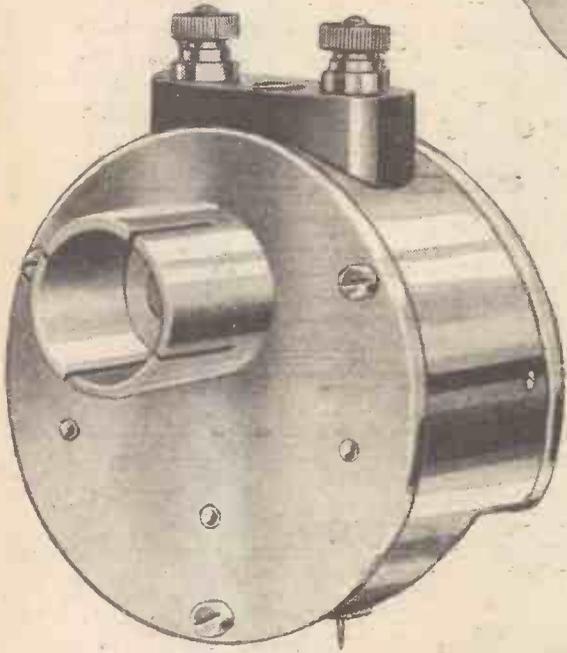
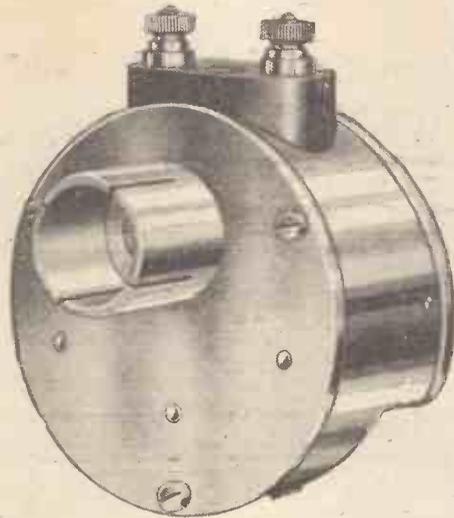
P.W., Nov. 19th.

Name..... Address.....

Overwhelming Success of the Brown Electrical Pickup



Gramophone users hail it as the means to finer reproduction



GOOD news travels swiftly. But rarely can it have travelled faster than the news of the **Brown Electrical Pick-up**. Ere the first announcement of its wonders appeared, the demand began. In snowball fashion it has increased with a swiftness that has exceeded even our wildest hopes.

Small wonder! There never has been such an instrument. Its almost magical powers have completely transformed the gramophone. Fit a **Brown Electrical Pick-up** to your gramophone in place of the ordinary sound box. Connect it to your wireless set and a loud speaker—preferably a **Brown**. Instantly new and finer reproduction will be yours. Purer tone, Tremendously increased volume. Needle scratch nearly eliminated. Controllable volume. Infinitely more lifelike reproduction. Don't labour longer with unsatisfactory gramophone results. Ask your Dealer to demonstrate the wonderful **Brown Electrical Pick-up** to-day. Price £4.

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So great has been the demand for the November issue of **"MODERN WIRELESS"** (now on sale) that another edition has been printed. The Sixpenny Free Book, given away with every issue, has created a wide demand. If you have not secured your copy of **"MODERN WIRELESS,"** with a Free Copy of

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This issue will contain a

FULL-SIZE BLUE PRINT FREE
OF

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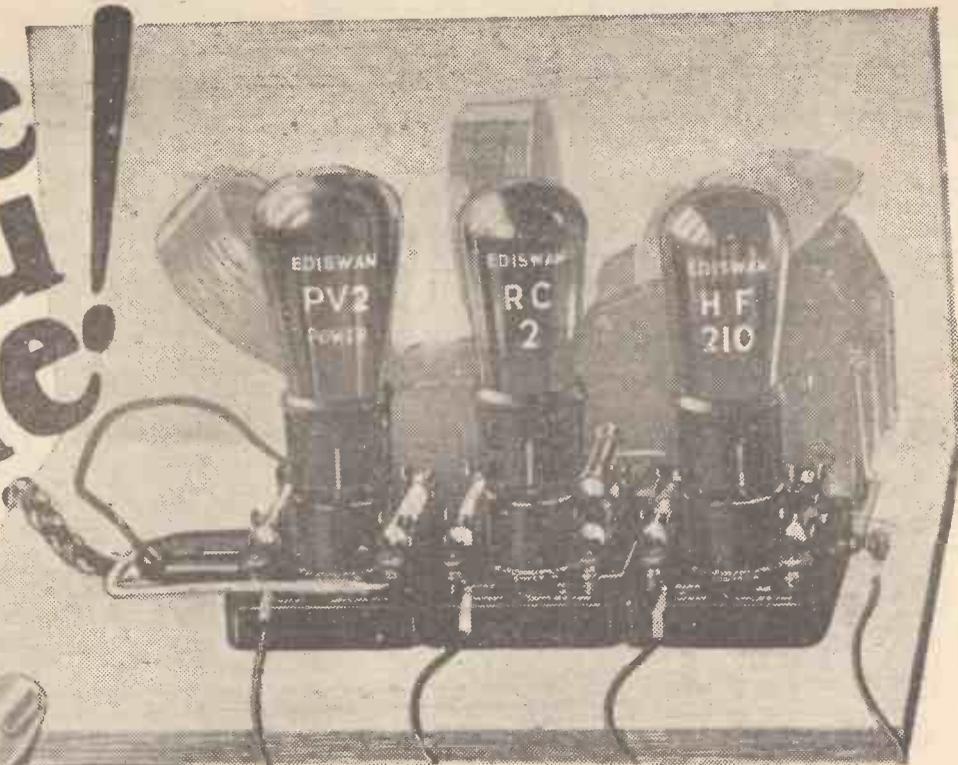
A Four-valver which will attract every Amateur.

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"MODERN WIRELESS"

Special Xmas Double Number.

Here you are!



*"started making it at 6 p.m.
listened in at 8 p.m."*

No other set gives such pleasure as the set you make yourself—especially if you make up this new R.C. Threesome! You need know nothing about radio mechanics to make up this set. Only 5 connections—no soldering—nothing you cannot understand—nothing to go wrong. Two hours with nimble fingers and a screwdriver—and the radio world is at your service.

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The valves essential for the very best results are H.F. 210, R.C. 2 and P.V. 2—three valves from the famous Edison range.

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P.W. 19.11.27.



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DON'T be tied to one Broadcasting Station. Build the wonderful Cossor "Melody Maker" and choose your Radio music from among the best programmes of Europe. Gay Spanish dance tunes—rich melody from Italy—swinging fox-trots from Germany—cheery light opera from France—tuneful music from Holland—all these countries are well within your reach with a Cossor "Melody Maker." It's the sensation of the season. Tens of thousands all over the country have built it. Never before has any Receiver aroused such enthusiasm. By reason of its amazingly simple construction (the new simplified system evolved by Cossor enables anyone without previous Radio knowledge to build it in an evening) and its low cost (the few parts necessary can be bought from any Wireless Dealer) first-class Radio has at last been brought within the reach of thousands hitherto denied its pleasures. Ask your Dealer for a free copy of the full size building plan, "How to build the Cossor 'Melody Maker'" or post the coupon to-day.



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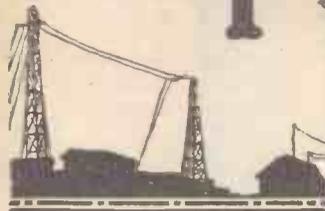
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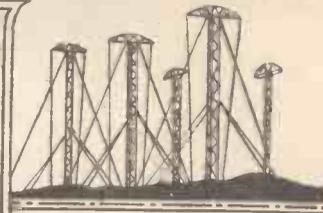
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Popular Wireless



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RADIO NOTES AND NEWS.

Britannia's Waves—The World's Clock—Radio Telepathy—Miss B.B.C.—Spanish Casualties—A Lucky Breakdown—Reception of 2FC.

Concerning Data.

IN a very pleasant letter Capt. H. H. M. (Khartoum, Soudan) suggests that I, in common with other writers about radio, omit essential details, his chief complaint being that when I give data about short-wave transmissions I withhold the dates and times. So I do—when I cannot get them. He mentions Mr. Marcuse, but how can I publish the day and hour when he will next try an Empire broadcast?

A Promise.

CAPT. H. H. M., as with many others in far-off places, cannot spend hours in searching, like those at home. Hence his need for a definite programme is readily understood. But at present many of the most interesting transmissions are not regular or announced very long in advance. However, I will pull a string or two, and if the results warrant, will publish them, editor permitting.

Britannia's Waves.

I WONDER, would 5SW have been working if the B.B.C. had not been joggled? If those in authority at Savoy Hill realised that people like Capt. H. H. M., who are stuck in all sorts of dull and distant spots, are not so keen on "guarantees of service reliability" as they are on getting a little something—any old thing—from home, they would probably have done all this much sooner. Capt. Eckersley, it is said, now dreams of one huge station with beams directed on all the great Empire countries. Yes, yes! But, meanwhile, something to go on with, please.

The World's Clock.

SOME time next month Britain, after years of slumber, will begin to tell the world the right time by wireless, for Rugby will open a service of time signals. The signals will be sent out on 18,740 metres (C.W.) at ten a.m. and six p.m. They will really begin at five minutes to the hour and the first one will be a "dash." Then, at the 56th, 57th, 58th and 59th minutes there will be a "dash," followed by 60 "dots." The 60th minute will be indicated by a "dash." I hope Chicago will not consider this to be a bit of insidious pro-British propaganda intended to corrupt Ingersoll time-pieces!

Radio Telepathy.

I HAVE just come across news of a third telepathy experiment, which was conducted by Dr. G. Murphy of Columbia University, from WJAZ, New York, in March, 1924. Again a wash-out! Only 2,500 reports were examined and all except two were in accordance with the laws of probability, that is to say, the number of correct results tallied with what the "laws" of chance would lead us to expect.

Stale Weather.

FOR reasons best understood by themselves, the B.B.C. have lately begun to give us a nightly report on the weather we have endured during the previous day. That's rubbing it in with a vengeance! But why on earth do they do it? Is it because their weather forecasts are so "hit

and miss," and they wish to broadcast something really reliable?

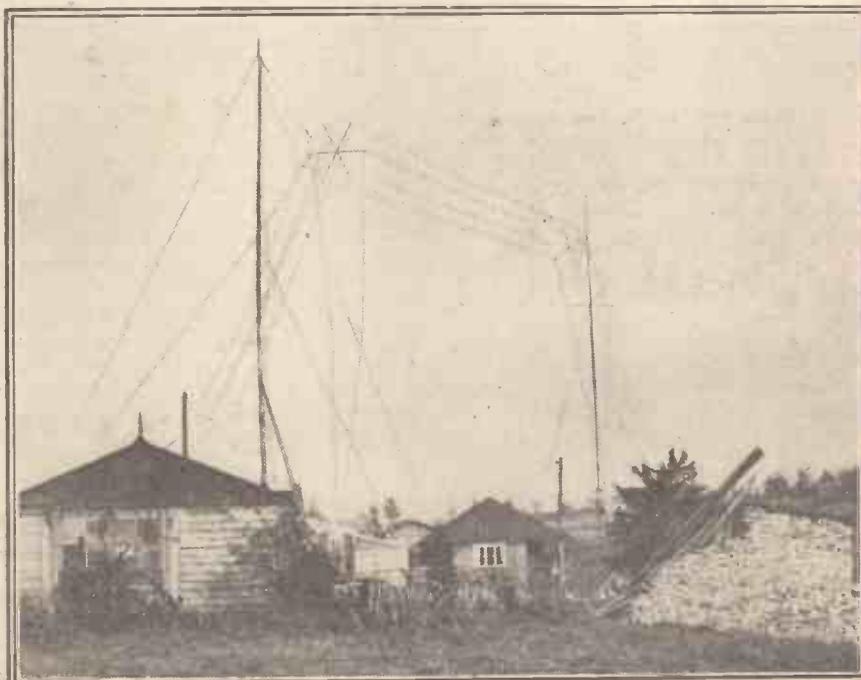
Sweden Becomes Aesthetic.

IN order to avoid the unsightly tangle of aerial wires on the roofs of big apartment houses, they have erected in Gothenburg not a communal aerial but a communal mast. This mast supports a number of aeriels of which each tenant of the apartment house can have one, for a small fee. Very sound idea! And they can all radiate on to each other, thus wasting no signal strength.

A Feather in Our Cap.

AMATEURS have attained definite recognition in the councils of the mighty at last. In a technical sub-committee at the Washington Conference it was agreed
(Continued on next page.)

RADIO IN A COTSWOLD COLONY.



At the Whiteway Colony, in the Cotswolds, there is a gathering of people, who, by growing and making things for themselves, endeavour to reduce the use of money to the lowest possible limit. They apparently find radio a necessity, and, as the photo shows, they have at least one rather imposing aerial, although the cost of the whole outfit need not have been anything but small.

NOTES AND NEWS.

(Continued from previous page.)

that amateur operators (i.e.—transmitters) should have certain narrow bands of wave-lengths set aside for their specific use, evenly distributed throughout the whole radio wave-length range. This is a milestone in the history of the amateur movement, and a tribute to the serious "fans" all over the world.

Old Joke, New Version.

A PATAGONIAN party visited 2 L O. One visitor touched a live wire and immediately began what looked like a new type of war-dance. Another then asked him, "Why all this ceremonial?" He replied "In honour of my grandfather." His pal also touched the wire and began a similar dance. Whereupon the first dancer said, "Why this prodigality of art?" Said the second dancer, "I dance with joy to think that a liar will one day lie where his grandfather now lies."

Miss B.B.C.

OLD John Knox once wrote a pamphlet against what he called the "monstrous regiment of women." That was a bit ungallant of John, who, incidentally, was no misogynist. But the "regiment" seems to hold sway at Savoy Hill, where the ladies outnumber the men. Perhaps that accounts for the strong intellectual bias the programmes are gaining, for there is no doubt that when a lady "gets eddication" she gets it badly—and let's you know it, bless her.

A Mouthful.

GLANCING over a booklet intended to help listeners to identify foreign stations, I was amused to see that Berlin (483.9 metres), calls as follows: "Achtung! Hier die Rundfunksender, Berlin. Auf Wellen" (repeated twice). I suggest they omit the Rundthingummy and say "Here Berlin." Stockholm's call (454.5) is even longer, for besides "Stockholmes Rundradio," the call includes short Swedish folk-songs, played on a spinet! If this sort of thing is not put down we shall have 2 L O's call consisting of "The Messiah" and "1812," with a short selection of chamber noises.

Spanish Casualties.

ALAS! Stations E A J 6 and E A J 12 have been closed down by the Government for not having broadcast a regular programme since April. This leaves Madrid with only Union-Radio, E A J 7 (375 m.) and Radio España, E A J 2 (400 m.). Nothing like clearing away the dead wood! But I fear that radio has fallen rather flat in Spain, and the reason, I think, is that the Spaniard is not domesticated. He seeks his pleasures in the Rambla and the café. In short, he prefers rather to talk than to hear "talks"!

A Painful Experience.

MR. J. KINGHAM, of Blackfriars Road, London, had what he calls the "fascinating but nerve-shattering" experience of picking up the S.O.S. signals of the ill-fated "Principessa Mafalda." It says a lot for the efficiency of the ship's wireless that a casual searcher in London-

could receive those signals loudly, and add another laurel to the wreath of the wireless operator who, true to the traditions of sea-going "Sparks," went down with his ship. He kept his gear in good order and worked it to the last.

Nota Bene.

NOVEMBER 19th: "I Pagliacci," 2 L O and 5 X X. Same date: "Star Variety Programme," Glasgow. November 18th: "R.U.R.," from 5 G B. Don't miss this if you have not heard it. It's clever and will hold you to the finish.

Trade Notes.

READERS may be saved inconvenience if I mention that Messrs. H. W. Sullivan, Ltd., have removed their head office and works to 72, Leo Street, Peckham, S.E. 15. The bulk of American

SHORT WAVES.

It is reported that most American households have at least six wireless sets. We have only one each over here, but that's quite enough to keep father at home while we go to the cinema.

"For ordinary broadcast wave-lengths the sizes of coals for aerial, secondary, and reaction should be Nos. 25, 75, and 50." (Wireless Paper.)

This is a big step towards a solution of that interesting problem—the exact size of a lump of coal.—"Daily News."

THOSE TALKS AGAIN.

Caustic—The wife who said that if she got half as good a supply from the Metropolitan Gas Company as she does from 2 L O, the dinner would never be late.

A necessary invention—A wireless set without a loud speaker (for a married man.)

THIS WEEK'S OSCILLATOR.

Angry Captain of Liner (to passenger): "Why did you strike the radio operator?" Passenger: "I gave him a radio message to send, and he read it."—"Southend Times."

SALESMANSHIP!

"But even if you have no carpets, mate, think how handy this vacuum cleaner would be to clean your vacuum tubes!"

One correspondent writes to say that he frequently gets the station J O A K on his crystal set.

He must think the joke is on us.

Smith: "I say, what kind of battery do you think I ought to use with this set?"

Jones: "Well, I'd suggest a battery of howitzers, old man."

radio imports during June were from Britain. The United Cycle and Motor Traders' Co., 78, Vivian Street, Wellington, New Zealand, wish to secure agencies for reputable British wireless firms. And in India, G. Atherton and Co., of Tower Building, Water Street, Liverpool, can make arrangements for British firms who may not be able to reach that market, they having agencies in all the principal cities.

More Talk.

WITH a flourish, and a booklet, the B.B.C. announce their new series of talks entitled, "What Society Means," by Mr. K. Martin. By the time these Notes appear you will, if you have listened, know whether society means anything. Well, this sort of thing is all very fine for those that like this sort of thing. But how I wish the B.B.C. would have mercy on tired workers and stop trying to compete with text-books and universities. If they would replace their educationalists

with human beings we should be vastly obliged. See the Editor's first article on "British Broadcasting." He has "got them set"!

Hi, Hi!

KINDLY note! On November 24th a great Scotsman is to receive something "free, gratis and for nothing." Sir Harry Lauder is to receive the freedom of the city of Edinburgh and the proceedings will be broadcast from Edinburgh station. Now, surely, this ought to be an Empire broadcast from 5 S W, so that the majority of Scotsmen can hear it.

Listeners' Paradise.

NEWS comes from Bernard Harbour, in the Arctic Circle, that the troopers of the famous Canadian Mounted Police find receiving conditions so perfect there during daylight that they can hear 2 L O and four other B.B.C. stations, besides Paris, Berlin, and Madrid. That's all right, but I should hate to receive a frost-bite while receiving the "Fire Music" from Wagner's opera.

A Lucky Breakdown.

SWITCHING hastily over to a warmer clime, my friends, we learn from Bombay that the broadcasting people missed a snag by the happiest breakdown in the history of the microphone. One September Sunday the stage was set for the transmission of a sermon from the cathedral. As it happened, the preacher had chosen for his subject "Christianity and Mahomedanism." Bang went something—and a beautiful "bloomer" was escaped. I expect it will be a useful lesson to the Director of Programmes.

Our Scientists.

HERE'S a beauty, culled as usual from a Sunday paper's wireless notes. Leading up to the imperfections of loud speakers, my scientist sagely remarks, "What sound may be no one knows, except that it may be carried by the air and, unlike electricity, by wood and other substances." Other substances such as, for examples, copper, and a few other metals, eh? Well, really! This ignorance of elementary physics is deplorable. Fancy all our scientists not knowing what sound is!

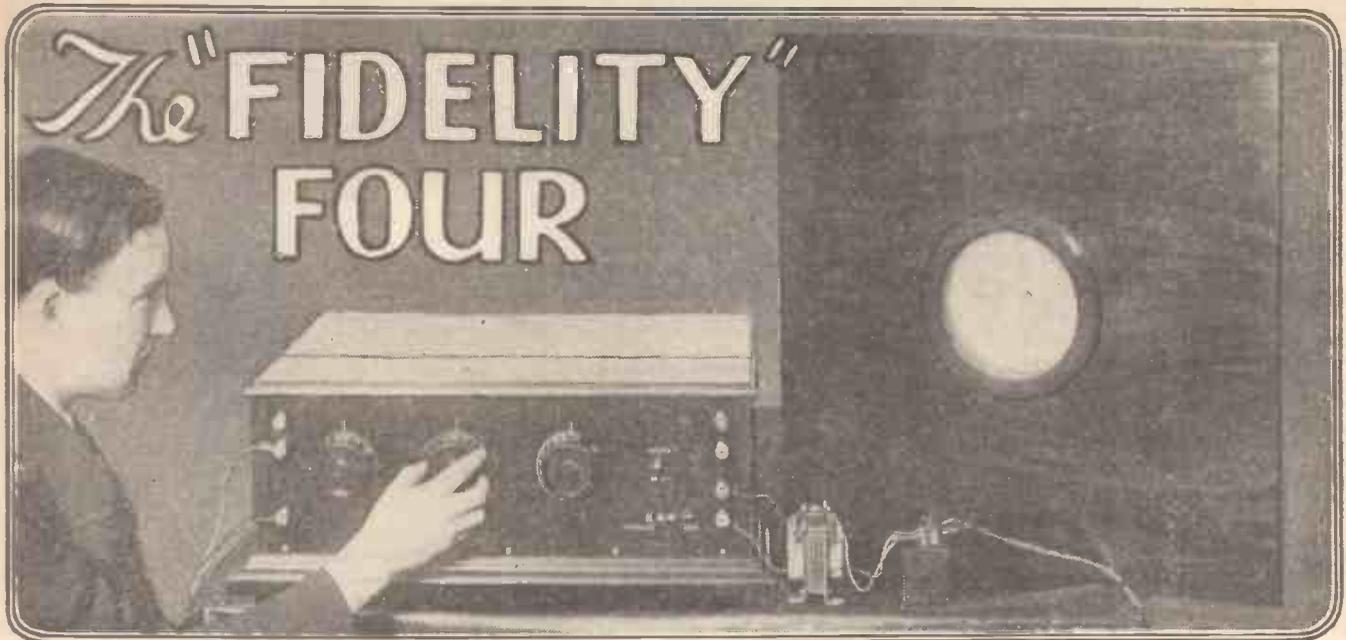
Reception of 2 F C.

REPORTS are to hand from F. G. B. (Ikley); "P.W." Every Purpose 2-Valver; Dr. L. S. (Longfield), on a simple Reinartz detector hooked up to a Marconi A2 two-stage amplifier; A. H. C. and J. H. O. D. (Nr. Bletchley, Leeds), on a Harris "Hale" one-valve and indoor aerial. This was top-hole work! T. G. C. (Muswell Hill, N.10), on that blessed "P.W. Every Purpose Two," upon which he congratulates us. We do the same for him on his good taste in picking a "P.W." set.

Radio Makes Jobs.

THE Australian Government is making a separate radio branch of the P.M.G.'s Department, thus creating a boss job, Chief Inspector, worth from £720 to £792 per annum. A nice, interesting employment, too. Hurry up, some of you, before all these government wireless posts are filled.

ARIEL.



NATURALLY, a moving-coil loud speaker requires a specially constructed set to do it justice, as the receiver must respond equally to all frequencies. In the same way, the well-known "cone" type speakers require good sets to be fully appreciated.

The receiver about to be described includes an L.F. arrangement which was first advised by the B.B.C. In this connection it might be mentioned that the L.F. circuit is quite orthodox, the only claims for originality on the part of the B.B.C. being the values of the various components, all being chosen to respond to frequencies as low as 16 cycles.

L.T. & H.T. Consumption.

For the benefit of those who might rush into constructing the receiver, the writer would like to add a few words of warning.

A specially constructed four-stage receiver which is capable of powerful reception with remarkable faithfulness of reproduction.
 By The "P.W." Constructional Department.

It is not an expensive set to make, but it requires some expensive valves, which take heavy filament currents and high plate potentials. As an illustration let us turn to the last two L.F. valves. These should be of the D.F.A.7 or L.S.5A. type, each taking .8 ampere filament current and nothing less than 200 volts H.T.

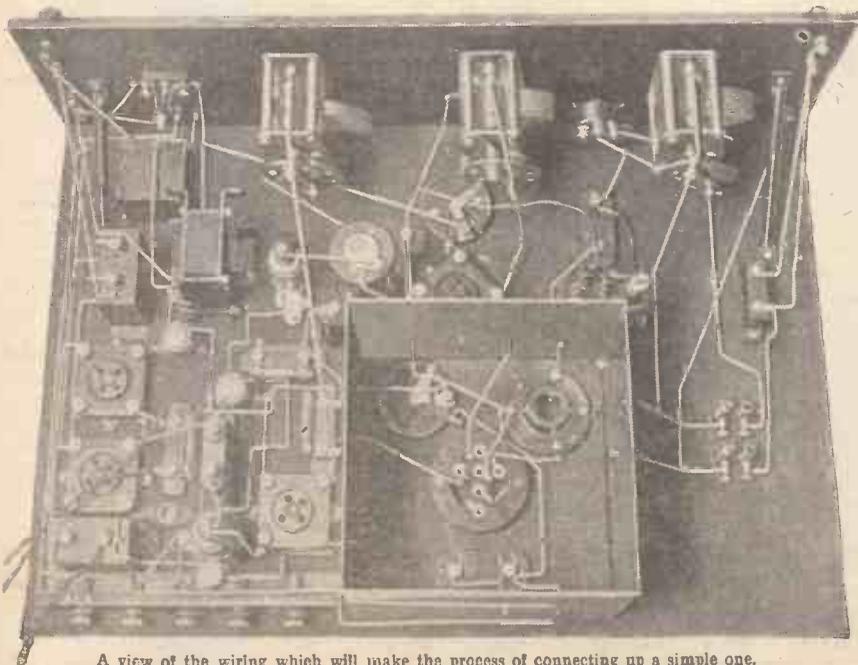
Now, two valves at .8 ampere means 1.6 amperes beside another three .1 amperes for the H.F. detector and first L.F.

valves. So that we have to provide 1.9 amperes at 6 volts—calling for a rather large capacity accumulator if it is to last for any length of time.

Also, on top of this we have to provide the two power valves with 25 milliamperes each at 200 volts H.T. The
(Continued on next page.)

COMPONENTS REQUIRED.

- 1 S.P.D.T. switch (Nesthill).
- 2 Single coil holders (L. & P.).
- 1 Cabinet, 21 in. x 7 in. x 13 3/4 in. deep, complete with panel and baseboard.
- 2 .0005 S.L.F. variable condensers (G.E.C.).
- 1 .0002 S.L.F. variable condenser (G.E.C.).
- 1 400-ohm potentiometer ("Centralab," Rothermel Radio Corp.).
- 1 On-off switch.
- 2 Baseboard rheostats, 7 ohms (Lissen or other good make).
- 3 Fixed resistors, 1 4 ohms, 2 1 ohm each.
- 3 Holders for same (Burndept).
- 3 Grid-leak holders (Dubilier, Lissen, etc.).
- 2 1-meg. grid leaks (Clarke, Dubilier, Lissen, Mullard, etc.).
- 1 .1-meg. grid leak.
- 2 1 mfd. mica condensers (Dubilier, T.C.C., etc.).
- 2 2 mfd. Mansbridge condensers (Ferranti, Mullard, Clarke, Hydra, Dubilier, T.C.C., Lissen, etc.).
- 7 Engraved terminals, markings according to diagram.
- 5 Ordinary terminals.
- 1 Standard screening box (Peto-Scott, Burne-Jones, Efesca, etc.).
- 1 250,000-ohm anode resistance (R.I.-Varley). (Any good make.)
- 1 150,000-ohm anode resistance (R.I.-Varley). (Any good make.)
- 1 20-henry L.F. choke.
- 1 4 mfd. Mansbridge type condenser.
- 1 H.F. choke.
- 5 Anti-phonic valve holders (Benjamin, Burndept, Burne-Jones, Lotus, etc.).
- 1 Flashlamp bulb and holder for fuse.
- 1 6-pin base (Collinson, Peto-Scott, etc.).
- 2 .01 mfd. mica condensers.
- 1 .0002 mfd. mica condenser.
- 1 .0005 mfd. mica condenser.

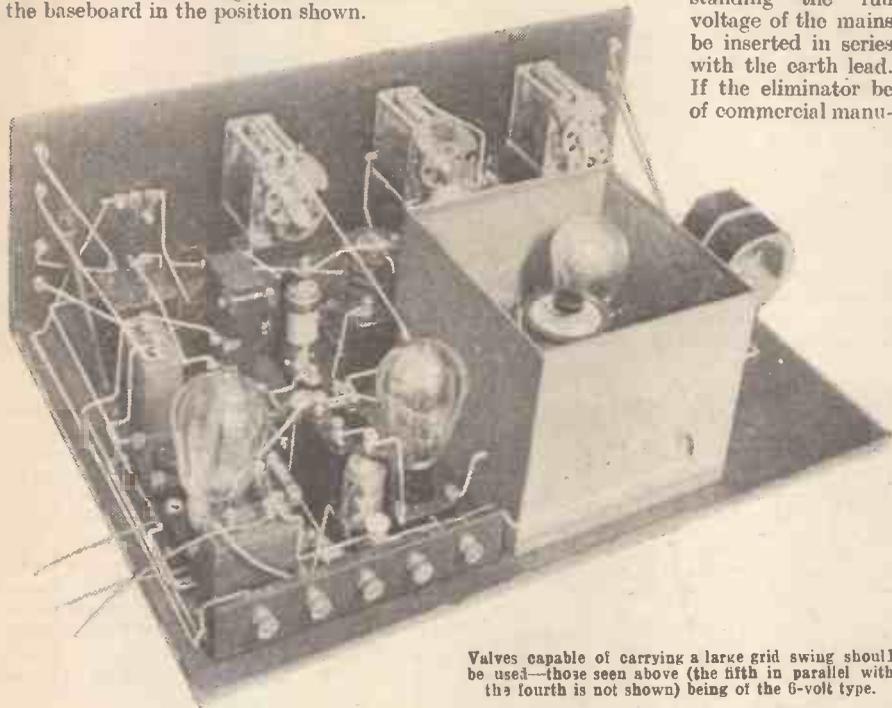


A view of the wiring which will make the process of connecting up a simple one.

THE "FIDELITY" FOUR.

(Continued from previous page.)

A strip of wood $\frac{3}{8}$ in. by $\frac{1}{2}$ in. wide and having a length equal to the terminal board can be used for screwing the latter down on the baseboard in the position shown.



Valves capable of carrying a large grid swing should be used—those seen above (the fifth in parallel with the fourth is not shown) being of the 6-volt type.

Wiring can be carried out with "Glazite" of any suitable colour. To make a neat job of each joint, the glazed covering on the wire can be removed by "paring" round the circumference of the wire with a sharp penknife and then scraping away the covering not required. It is advisable to slip pieces of "Systoflex" over the "Glazite" wherever it is necessary to pass the wire through the holes in the copper box, owing to the tendency of the sharp copper edges of the holes to scrape away the glazed covering. The photographs of the interior of the set give a clear idea of the positions of the pieces of "Systoflex."

Testing Out.

After completing the wiring, it can be checked from the list of point-to-point connections. If everything is satisfactory and no "dry" soldered joints are discovered, the set can be inserted in its cabinet and leads brought out through holes in the back, facing the terminal strip. Similarly, it will be necessary to pass the grid-bias leads to the outside of the cabinet, as it is impossible to accommodate a grid battery of 48 volts or more inside.

Readers will notice two sets of loud-speaker terminals on the front of panel, one pair marked "L.S. + and L.S. -" and the remaining pair "Output + and Output -"

Those marked "L.S." can be joined to a Cone or similar type of loud speaker, the outfit consisting of a 20-henry L.F. choke and a 4 mfd. condenser. "Output" terminals are for experiment, or when it is not desired to utilise the choke circuit, but

a transformer, say, for a moving-coil loud speaker direct in the plate circuits of the last two valves.

For the reception of the local station, the aerial lead can be joined to A₂ and the earth lead to E.

Should the source of H.T. be from D.C. mains, it is essential that a 1 or 2 mfd. Mansbridge condenser capable of withstanding the full voltage of the mains be inserted in series with the earth lead. If the eliminator be of commercial manu-

POINT-TO-POINT CONNECTIONS.

One filament socket of each valve holder to one side of each respective rheostat.

Remaining sides of the rheostats joined together and to the right-hand contact on the L.T. switch.

Left-hand contact on same switch to the L.T. + terminal.

L.T. — terminal to one side of the flashlamp fuse holder, to the remaining filament socket of valve holder V₂, to a screw through the copper box near the valve holder, to one tag of the first 2 mfd. Mansbridge condenser, to G.B. + via a flexible lead, to the remaining filament sockets of the valve holders marked V₄, to one tag of the second 2 mfd. Mansbridge condenser, and to the L.S. + terminal.

H.T. — terminal to the remaining side of the flashlamp fuse holder.

Remaining filament sockets of the valve holders V₁ and V₃ to screw through the copper box adjacent to them.

A₁ terminal to one side of the .0002 mfd. fixed condenser.

A₂ terminal to the remaining side of this condenser and to the socket of primary aerial coil holder.

Plug of primary aerial coil holder to a screw through the copper box and to the Earth terminal on panel.

Plug of secondary aerial coil holder to the grid of V₁ and to the fixed vanes of the .0005 mfd. variable secondary condenser.

Moving vanes of the secondary condenser to the slider of the 400-ohm potentiometer, to one side of the 1st .01 mfd. fixed condenser and to the 4½ volt grid battery (1½ volt tapping), via a flexible lead.

Remaining side of the 1st .01 mfd. fixed condenser to a screw through the copper box and to the G.B. + on the 4½ grid battery via a flexible lead.

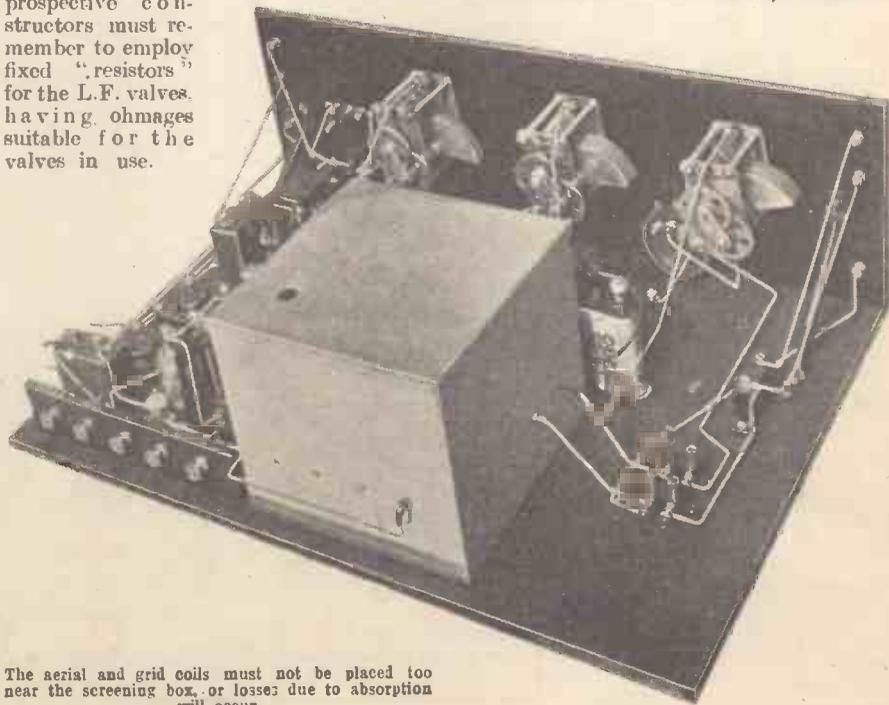
Socket of secondary coil holder to the right-hand terminal on the 400-ohm potentiometer.

(Continued on next page.)

facture it will in all probability include such a condenser.

Use 120 volts on H.T. +1 and the full voltage of the unit on H.T. +2. An eliminator eminently suitable for this set, and arranged to operate from D.C. mains, was described in a recent issue of "P.W."

As a final hint, prospective constructors must remember to employ fixed "resistors" for the L.F. valves, having ohmages suitable for the valves in use.



The aerial and grid coils must not be placed too near the screening box, or losses due to absorption will occur.

THE "FIDELITY" FOUR.

(Continued from previous page.)

Point-to-Point Connections (continued.)

Plate of V_1 to the No. 5 contact on the 6-pin H.F. transformer holder.

No. 3 contact on same base to one side of the 2nd .01 mfd. fixed condenser, to H.T. + 1 terminal, to the remaining tag of the 1st 2 mfd. Mansbridge condenser and to the bottom contact of the 250,000-ohm anode resistance holder.

No. 1 contact on the 6-pin H.F. transformer holder to the grid of V_2 , and to the fixed vanes of the .0005 mfd. H.F. variable reaction condenser (marked H.F.C.).

Moving vanes of this condenser to the No. 2 contact on the 6-pin holder and to the

2nd G.B. — plug on the 4½-volt grid battery, via a flexible lead (3 to 4½ volts tapping).

No. 6 contact on the 6-pin holder to the fixed vanes of the .0002 mfd. variable reaction condenser.

Moving vanes of the reaction condenser to one side of the .0005 mfd. fixed condenser.

The other side of the fixed condenser to plate of V_2 and to the bottom contact on the H.F. choke.

Top contact on choke to the top contact on the 250,000-ohm anode resistance holder, and to one side of the 1st .1 mfd. mica condenser.

Other side of the .1 mfd. mica condenser to one side of each of the grid leak holders $G.L._1$ and $G.L._2$.

Remaining side of $G.L._2$ (.1-meg. grid leak) to the grid of V_3 .

Other side of $G.L._1$ to the G.B. — 1 plug for the 1st L.F. valve.

Plate of V_3 to the top contact of the 150,000-ohm anode resistance holder

and to one side of the 2nd .1 mfd. mica condenser.

Other side of the condenser to the grids of the valve holders marked V_4 and to one side of the grid-leak holder $G.L._3$.

Other side of $G.L._3$ to the G.B. — 2 plug for the last two L.F. valves.

Bottom contact of the 150,000-ohm anode resistance holder to H.T. + 2 terminal, to the remaining tag of the 2nd 2 mfd. Mansbridge condenser, to the bottom contact on the 20-henry L.F. choke and to the "Output + " terminal.

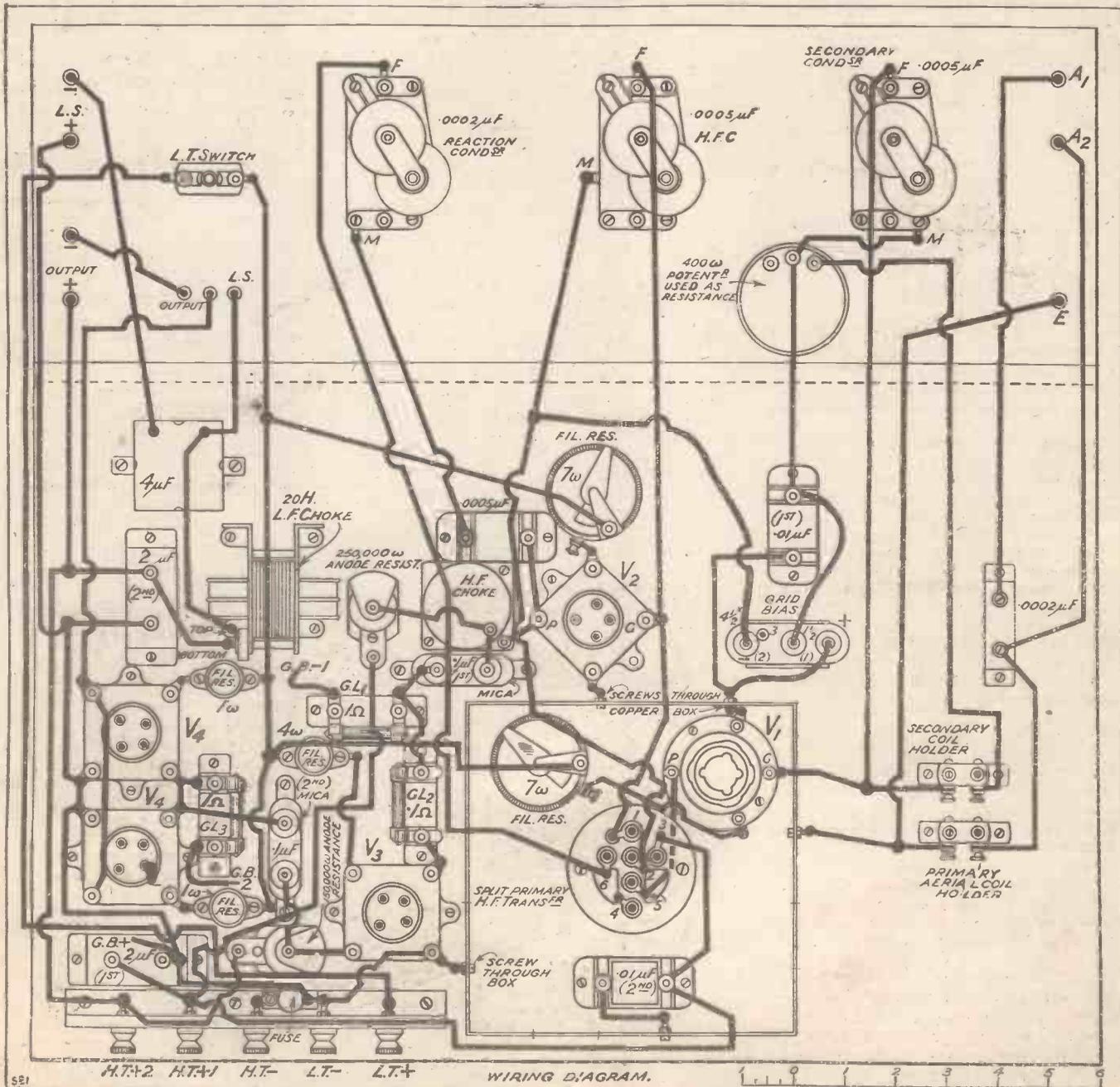
"Output — " terminal to the left-hand contact of the S.P.D.T. switch.

Centre contact of this switch to the plates of the valve holders V_3 .

Right-hand contact of switch to one tag of the 4 mfd. condenser and to the top contact on the 20-henry L.F. choke.

Remaining tag of the 4 mfd. condenser to the L.S. — terminal.

This completes the wiring.

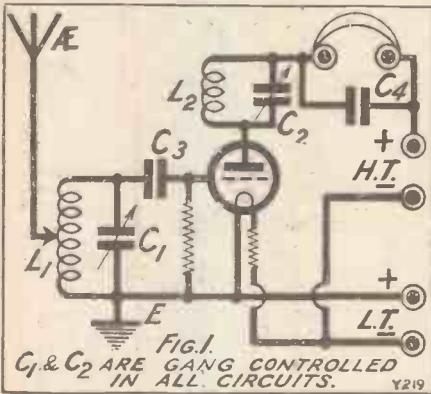


WIRING DIAGRAM.

Some Constant Reaction Experiments

A NUMBER of experiments have recently been described which had for their aim the elimination of one of the most variable of controls in the operation of a wireless receiver—namely, the reaction control.

This applies in particular to receivers in which a detector is followed by several



stages of low-frequency amplification, and most of the circuits of which details so far have been available and which have met with any measure of success are American circuits, such as the Loftin-White, etc.

The question of obtaining constant reaction is one that has interested me for some years, and I have from time to time tried various systems with varying degrees of success. I propose to describe in this article some of my later experiments which have led to the construction of some rather interesting circuits, though without as yet, I fear, entirely solving the question of constant reaction.

Gang Control.

A form of reaction which at one time proved fairly popular, though of recent time it has fallen somewhat into disuse, is what we may call the "tuned plate" type of reaction. This consists of a tuned circuit being connected in series in the anode circuit of the detector valve, but not coupling it to the grid circuit in any way. Actually, of course, such coupling does exist, this being through the inter-electrode capacity of the detector valve itself.

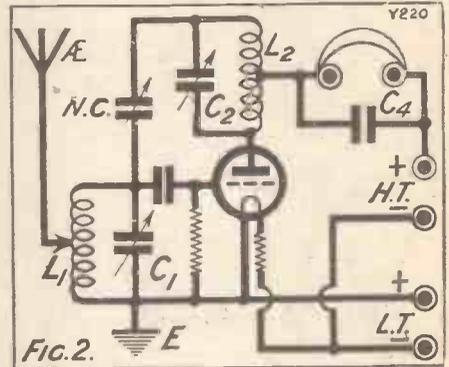
It is found that when the anode circuit is tuned to the incoming frequency the valve will oscillate, so that the tuning condenser of this circuit can be used as the reaction control. Actually it will be found in practice that the set will oscillate some five or ten degrees either side of the actual

With the solution of the problem of constancy in reaction adjustments over a fairly wide range of wavelengths "one-knob" control with simple sets would become a practical proposition. In this article a fruitful line of research in this direction is indicated.

By C. P. ALLINSON, A.M.I.R.E.

tuning point unless fairly heavy damping is present in the detector grid circuit.

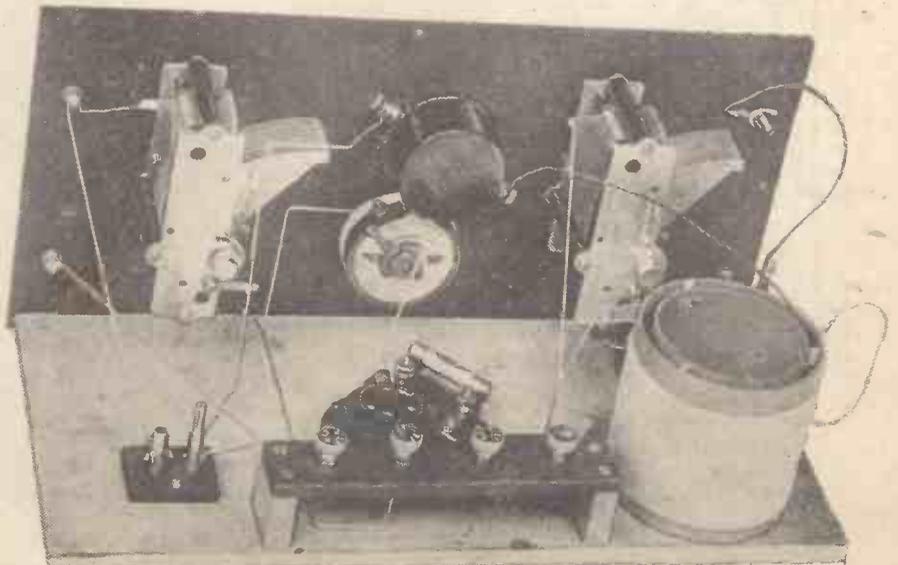
It struck me, therefore, that it ought to be a fairly simple matter, by means of a gang condenser, to tune both grid and reaction circuits at the same time. By introducing damping in some form or another into one of the circuits it might thus be possible to keep the set just off the edge of oscillation over the whole range of the tuning condenser. The circuit shown in Fig. 1 gives the details of the first arrangement to be tried out. The aerial was auto-coupled to the detector valve by means of the coil L₁, a number of tapplings being provided so that the coupling between the aerial and the detector circuit might be varied. In the plate circuit of the detector valve another coil L₂, which was carefully matched with the other one, was tuned by a variable condenser C₂ of equal capacity



to C₁, the two condensers being gang controlled. The telephones were shunted by a fixed condenser C₃ of the usual value of .0005 to .001.

With this circuit, however, it was found that the detector valve oscillated violently as soon as the two circuits, L₁ C₁ and L₂ C₂, were brought exactly into tune; and even when the two inductances were screened, so as to avoid the possibility of any magnetic coupling existing between them and also by introducing a certain amount of damping into the circuit, it was still impossible satisfactorily to control oscillation with this circuit. To do so by lowering the filament

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The Loftin-White system aims at a constancy of reaction by means of a balancing effect between capacity and inductive couplings. The above one-valver incorporates this method.

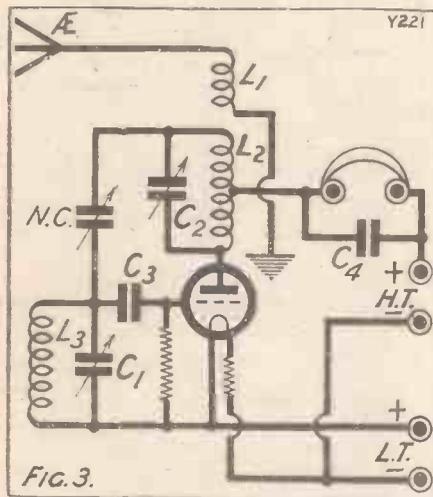
SOME CONSTANT REACTION EXPERIMENTS.

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potential or H.T. voltage was an unsatisfactory way of doing it, since this seriously reduced the efficiency of the rectifying valve, so other methods had to be sought.

A Second Circuit.

The next circuit to be tried is shown in Fig. 2. The anode coil was provided with a centre tap to which the telephones were connected, the other end of the coil being connected to the grid of the detector through a small neutralising condenser marked N.C. in the diagram. The intention was to neutralise the valve until the amount of capacity coupling present was only just sufficient to keep the valve on the edge of oscillation.

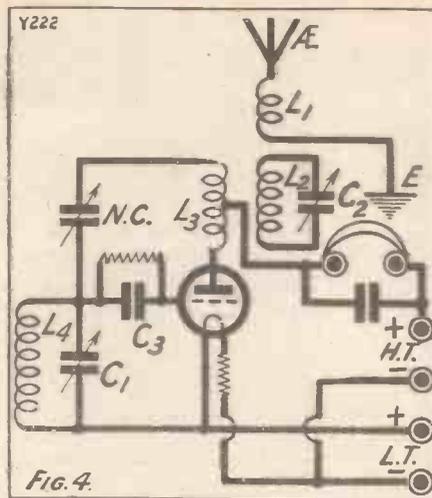


When this circuit was first tried out no shunting condenser was present across the telephones, for in view of the fact that they were connected to the nodal point of L_2 I thought that a condenser of this description should not be necessary. I found, however, that it was impossible to get the set to oscillate satisfactorily unless this condenser was provided, and it was therefore put in as is usual in magnetic or tuned plate reaction circuits.

Fierce Reaction.

First of all the neutralising condenser was carefully adjusted until the set was well away from the oscillation point, after which the two halves of the gang condenser were carefully matched up on the local station for maximum signal strength. In order to assist in doing this a very small indoor aerial was used, so that a small variation in signal strength could be more easily perceived than when using a large outdoor aerial.

The value of the neutralising condenser was then altered until the set was just nicely off the oscillation point and in a sensitive state. It was found, however, that as soon as the tuning was shifted the set either went into oscillation or else went dead, and in order for distant stations to be received the neutralising condenser had to be readjusted continually.



It was also found that using the neutralising condenser to bring the set on to the edge of oscillation very fierce reaction was obtained with a very large degree of backlash. It was therefore necessary to find another way of applying the principle which I had in mind for obtaining constant reaction.

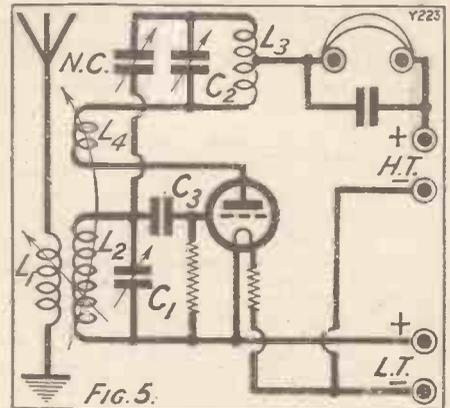
Further Experiments.

On examining the circuit it struck me that there were two forms of damping present in the grid circuit $L_1 C_1$. One introduced by the aerial and the other introduced by the valve itself, since this was being used with leaky grid condenser rectification. I therefore thought that if I removed the aerial damping from the grid circuit and put it in the anode circuit I might obtain a better balance, and the circuit, shown in Fig. 3, was next tried out.

The aerial-earth system was coupled to the tuned anode coil L_3 by means of a small inductance L_1 . The valve was neutralised by the small condenser N.C. until it was just off the oscillation point.

It was found, however, that with this arrangement, the damping which was introduced into the anode circuit by the aerial was too great and the control of reaction became very unsatisfactory. Another trouble, of course, was that of getting

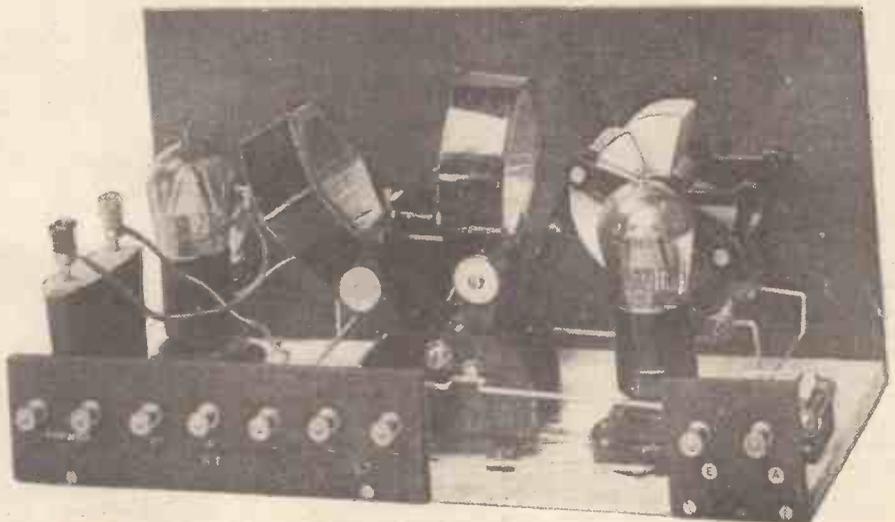
a balance between the two circuits at all dial settings, and it therefore occurred to me to employ a form of coupled trap tuning with the idea, firstly of removing the damping from the anode circuit of the valve itself, and secondly reducing the regenerative action owing to the tuned circuit in the anode circuit of the valve. By this means tighter coupling could be used, since by using less of the neutralising condenser less of the inter-electrode capacity coupling existing in the valve itself would be balanced out. It was hoped that this would make the control of reaction more constant.



The circuit shown in Fig. 4 was therefore the next one to be given a test. The aerial was coupled by a coil L_1 to the trap tuning circuit $L_2 C_2$, this being coupled in turn fairly tightly to a small number of turns which formed the coil L_3 . This was provided with a centre tap, as shown, one end being connected to the anode, and the other end to the grid of the detector valve through a neutralising condenser. Thus the actual coupling between the aerial and anode coils was extremely loose.

It was not found possible, however, to get satisfactory reaction control.

To those who would like to try a new circuit, I would suggest that they experiment with the one shown in Fig. 5. This is a further modification of the Fig. 2 circuit.



This receiver embodies the "swinging-coils" system of inductive reaction coupling.



HAVING analysed the background and the human factors involved in B.B.C. organisation, both in London and in the country, I would now like to set out briefly the present position with regard to the creation and carrying through of programmes.

The Board of Governors, consisting of the Earl of Clarendon (Chairman), Lord Gainford (Vice-Chairman), Mrs. Philip Snowden, Sir Gordon Nairne, and Dr. Montague Rendall, is responsible to the Postmaster-General and to Parliament for

This is the third of a short series of critically constructive articles on British Broadcasting, in which the reader will find an explanation of the origin, development, and evolution of policy of the B.B.C.
 By THE EDITOR.
 3.—Present Position—Governors—Control Board—Programmes—Publications.



A memorable broadcast—the King of Belgium speaking at the Menin Gate ceremony.

the provision of a satisfactory service of broadcasting in England, Scotland, Wales, and Northern Ireland. The Corporation has the concession of a monopoly for ten years, that is assuming good conduct. The P.M.G. still has the power to licence other broadcasters if it becomes apparent to him that the B.B.C. has lost public confidence or that competition would be a good thing.

The Essential Elements.

The privilege of a contingent monopoly places exceptional responsibility on the Governors of the B.B.C. Their revenue is collected for them, and they have wide freedom in its disposition. In the beginning they wisely accepted the advice of the Crawford Committee by taking over the executive of the Company—a body of men and women who had rendered devoted and able service to the cause of British broad-

casting during very difficult and uncertain times.

Let us now consider the essential elements of a satisfactory broadcasting service. First and foremost is light entertainment value. Not merely jazz and variety and third-rate humour: but much of the best light music, well-acted radio comedy, bright revues: all that goes to make life cheery, and to discount progressively the drabness that afflicts the teeming millions of industrial cities. Thus the fundamental constituents of broadcasting are brightness and happiness. Entertainment—four-fifths of the way.

“Never Discuss Programmes.”

Next to brightness and cheeriness, come the higher grades of music and drama, with religion and education following on. But all these second-category constituents should be so arranged as to give absolute priority to the real entertainment side. There is no need for the B.B.C. to search for an elaborate *exposé* of an elaborate programme policy. The subject is perfectly straightforward and simple. Give the listener relaxation, and genuine enjoyment four-fifths of the time: and as long as the other fifth is not wrongly placed it can be made up of non-popular and uplift features.

Thus, the Governors of the B.B.C. are responsible for providing a service which should be eighty per cent good light entertainment. It has already been the subject of comment that none of the Governors had had

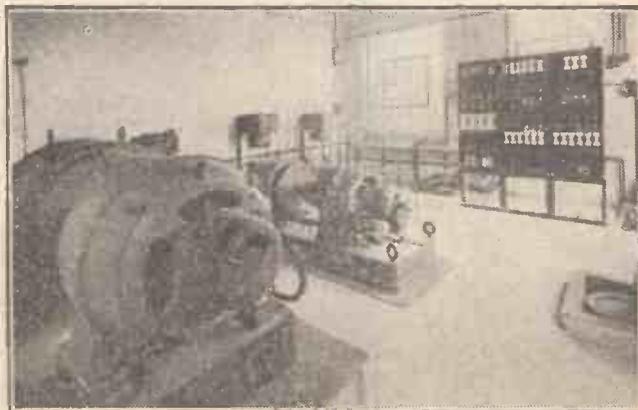
any previous experience with entertainment. There was naturally some curiosity as to what effect their activity would have on the programmes. People also wondered how they would set about their work. The programmes have certainly improved this year: but is it the Governors that have brought this about? Apparently not. One of them is understood to have boasted at a public dinner that although they meet as often as ten times a year, the Governors never discuss programmes: always “larger questions” of policy and administration. This is probably an exaggerated account of a facetious remark: but it would appear at least as if programmes were not the main subject of discussion at B.B.C. Board meetings. This is defect number one.

Who Does the Work?

Now, if the Governors leave programmes alone, who does look after them? The next body in order of importance is known as the Control Board—a kind of informal committee of heads of departments with the Director-General and Controller.

The first official information about this mysterious body is contained in the recently published B.B.C. Handbook. Well, surely we have at last uncovered those who work out our daily wireless fare. Not a bit of it. It did not need the euphemism of the Handbook to disclose the fact that programmes are rarely if ever mentioned at the Control Board. There again the deliberations are about “grave and far-reaching questions of policy and administration.” Still no programmes, and yet

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A general view of the generator-room at the Daventry Experimental Station, 5GB.

BRITISH BROADCASTING.

(Continued from previous page.)

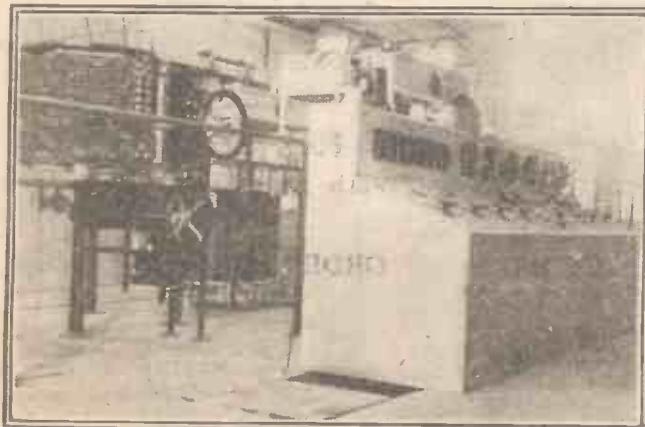
the whole purpose of the organisation is to make and distribute programmes. So we turn elsewhere for the people who do the work.

The actual programme toilers come far down in the hierarchal scale at Savoy Hill. Here is a list of them: K. A. Wright, B. E. Nicholls, R. E. Jeffrey, V. Willington, Percy Pitt, Millar-Craig, G. Tillett, and a few others. These taken with announcers and station directors elsewhere are the people who do the work of the B.B.C. Defect number two at Savoy Hill is failure to give the real programme workers the emoluments and recognition they deserve. Money spent on superimposed bureaucracy might be better spent on increasing the salaries of the real programme makers. Anyway, what are the "grave problems of policy and administration" that do not bear upon programmes?

Defect number three is failure to recognise the overwhelming importance of a stronger and more discriminating Outside Broadcast department. The B.B.C. should keep half a dozen flying squads standing-by to take advantage of occasions for really important topical broadcasts at a moment's notice. Here is a department of the work which should be freed forthwith from the dead hand of red tape.

New Ideas Wanted.

Defect number four, arising from the stabilisation of organisation, is lack of sympathy with new ideas and novelties. There is a growing disposition to kill new suggestions, thereby discouraging the more original members of the staff. Genius has a diminishing chance. Those in authority now at Savoy Hill rather pride themselves on the "straightness" of their programme curve. "Peaks" have disappeared: but it is alleged that the general average has so improved that the "peaks" need not be missed. This is wrong psychologically, and one is surprised to see the doctrine explicitly advanced in the programme policy article of the B.B.C. Handbook. "Peaks" must be given even at the expense of the average standard. There should be a special section of the programme department at Savoy Hill engaged on nothing else but the production of peaks.



The serial tuning unit at Daventry (5 X X) is shown to the left of the main control table.

Lord Birkenhead has likened the power of Sir John Reith to that of Mussolini. It is undoubtedly very great, but it could be much greater if there were a reassessment of values at Savoy Hill. What is needed most of all is definite recognition of the overwhelming importance of light entertainment.

Organisation should not be allowed to expand *qua* organisation; it should be



For outside broadcasts, such as football matches, the amplifiers are housed in a lorry and the microphone in a sound-proof hut.

arranged more simply and with a constant realisation that the only thing that matters (apart from technicalities) in a broadcasting concern is the programmes. Given this new feeling and adjustment of standpoint, the B.B.C. would enjoy a new lease of rapid expansion in revenue and popularity. There would be no revival of discussion of the saturation point of licences until after the four-million mark had been passed.

There is another point, not worthy, perhaps, of being listed with the main criticisms, but still deserving serious consideration separately. It is common knowledge that the B.B.C. make up their programmes about two months ahead of performance, and that subsequent alterations are confined to a minimum. Cross-examination reveals that the alleged necessity of printing all the programmes in advance accurately and exclusively in the official organ is the main reason for this prolonged delay in production.

Too Rigid

No set of programmes that remains rigidly unalterable for a whole six or seven weeks can be wholly satisfactory. It follows, therefore, that the B.B.C. sacrifice programme values in order to help their publications. And why should they be publishers as well as broadcasters?

The reason is not hard to find. The P.M.G. sits on so much of the licence revenue that the B.B.C. are bound to dabble in publishing in order to recruit their programme revenue. It is a kind of vicious circle. And its cause should be removed. The B.B.C. should be given all the licence revenue except the actual amount required for collection. Then the publishing activities of the B.B.C. should be closely circumscribed, programme information given to all to publish, and programmes relieved of the burden of rigidity now imposed by publication requirements.

Still Room for Improvement.

The frankness of these articles should not be mistaken for truculence. I began by remarking that the B.B.C. suffered more from adulation than from condemnation. My purpose is to avoid both. I know—we all know—that we have a right to be proud of the B.B.C. It is a wonderful "show" in many ways, and it contains a splendidly able and devoted band of public servants. It is because we want to make it still better than any other broadcasting organisation in the world that I offer these constructive suggestions.

A CHEAP AND EFFICIENT EARTH.

THERE are many methods of arranging an efficient earth, but the disadvantage of most of them is that no provision is made for keeping the soil under the electrode moist and in good conductive condition. One of the most easy earths to "construct" does not possess this disadvantage at all.

The only necessary material is about six feet of the thin copper tubing used by gas companies for "remote control" of bypass burners. It is about a quarter of an

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of the

XMAS NUMBER

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WIRELESS CONSTRUCTOR

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inch in diameter, and fairly soft. The whole length of this should not be buried, but about two inches of it should be left projecting from the ground, the rest being buried at the depth of about two feet. The end of the projecting portion, to which should be soldered the earth wire, may be beaten out with a hammer to form a small funnel, down which water may be poured from time to time. It should be stopped with wax after "filling up" to ensure a direct path for the water on the next filling. An earth connection made in this way should not deteriorate with the passage of time, and may be replenished when desired.

ADVICE FROM AMERICA.

To the British Amateurs.
 "Get Onto Youreselves. You Fellows!"
 By THE EDITOR.

MOST amateurs have heard of "Q.S.T.," the American radio journal, published chiefly in the interests of transmitters. It is a live little paper, edited by Kenneth B. Warner, and it is to be found in the home of every American radio "Ham" and "Fan."

Consequently it carries weight across the Atlantic, and may be said to be truly representative of the American radio experimenter.

A Trenchant Editorial.

In the December issue will be found an editorial which, to say the least of it, is illuminating. We would ask the leading lights of the Radio Society of Great Britain and, in particular, the members of the British Delegation who went to the Radio Conference at Washington, to study "Q.S.T.'s" editorial. In case they can't secure a copy, we reproduce a portion of the editorial here.

"While we were in Canada we had the honour of meeting the British delegation, which was assembling there with the delegates from all the British dominions before proceeding to Washington. They were present at the meeting at which Mr. Russell addressed the Canadian delegates. They became quite interested in the amateur situation and asked many questions. They asked us how many amateurs there were in the States, and were almost dumfounded to learn that there were 16,000—they had no idea of our proportions. They wanted to know what wave-lengths our Governments gave us, and did not know that United States and Canadian amateurs had been using the 20, 40 and 80-metric bands for four years. They wanted to know how we got along with our Governments. They wanted to know what the United States Government's attitude was towards us, and that gave us the opportunity to make a speech that sounded like a 'Q.S.T.' editorial. We told them that our Government valued the American amateur because of his advancement of the radio art, because he was training himself to be a skilled operator, because his stations formed a wonderful reserve communication net, and because he was doing much to advance world understanding by his contacts. The gentlemen were not at all unfriendly. On the contrary they were immensely interested. We consumed nearly an hour of their time with no sign of impatience on their part.

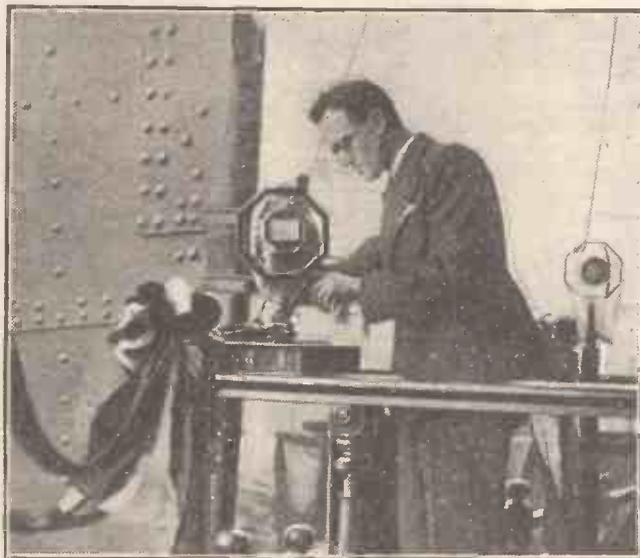
"We were particularly struck by the fact that the British representatives did not seem to know anything about amateur radio. How does it come, we wonder, that our amateurs over there have been so backward about introducing themselves to their officials? It seems that our amateurs over there are 'scared to death' of their officials and have just about never made any clean-cut representation before them. We don't know why this situation should exist. We thought them quite approachable and open-minded—they were not antagonistic, they were merely abysmally uninformed. They had no idea our Government regarded us favourably—they didn't know so! There is, we believe, a profound moral in this for the amateurs of all nations."

"No 'Hot Air' Merchant."

There is: the opinion formed by the chiefs of the American Amateur Radio game must make many a British amateur feel very annoyed with those British delegates who were "merely abysmally uninformed." Of course, we know it is a very difficult matter to teach the American Radio fan anything about Radio; but K. B. Warner, of "Q.S.T.," is no hot-air merchant; he knows what he is talking about and is regarded as an exceptionally intelligent and fair-minded man, not only by

amateurs in America, but by many in this country who have met him and who are familiar with his work.

If the "Q.S.T." editorial had been written, say, by Big Bill Thomson of Chicago we should have enjoyed a hearty laugh; but when a man like K. B. Warner admits he found the British Radio representatives did not know anything about amateur radio we must all feel (whether Mr. Warner



Fixing the microphone for the ceremony of christening the cruiser Devonshire which took place recently at Devonport.

be right or wrong) that it is a very great pity such an opinion of British Amateur Radio should be formed by responsible people in the U.S.A.

Absence of Amateur Representation.

Obviously there is a reason. Perhaps the following extract from "Q.S.T." will supply the solution.

"We asked the British delegation for their favourable consideration of the United States proposal to make the 20, 40 and 80-bands available for amateurs. Although they were non-committal on this, they indicated that they were not at all opposed to the idea of short waves for their amateurs, and they did pledge themselves to see that their amateurs were given their own conception of adequate short-wave privileges. Compare that with their reputed attitude! And when we arose to leave, instead of having an opportunity to express our thanks for being heard, they thanked us for having spent so much time in coming to them and telling them this interesting story which would help them in their work as a delegation! This delegation consists largely of the folks who run radio in England. We hope that this account of our adventures with the delegation will simply make the hair stand straight up on the heads of British amateurs. Get onto yourselves, you fellows over there!"

Mr. Warner is a little off the mark when he says "this delegation consists largely of the folks who run radio in England." As a matter of fact no one "runs radio" in England—for the amateur, at any rate.

For a long time the illusion existed that the Radio Society of Great Britain had that

privilege; it even thought so itself; and then the Radio Association and the Wireless League had vague ideas on the subject. But, as a matter of fact there is no definite leadership.

The Radio Society of Great Britain exists; but that is all that can be said for it. It lacks energy, initiative, and that sense of progressive keenness which, at any rate, inspired the chiefs of "Q.S.T." to travel to Canada and then to Washington, for the cause of Radio.

Deplorable Ignorance.

And as for the Wireless League and the Radio Association, by no possible stretch of the imagination can they be said to "lead" the amateur radio movement in this country. We have men who, given the chance and the assistance—and a free hand—could do the job: Marouse, Simmonds, and one or two other really keen and knowledgeable men.

The British delegation was, of course not in any way representative of amateurs; but the members do occupy important posts in connection with wireless in this country and one would have thought that, as a matter of common knowledge, they would have shown a little more interest about the British Amateur movement. But they didn't; and as the R.S.G.B. didn't send a responsible representative, we must put up with the fact that our delegates at least provided "Q.S.T." and other leading American amateurs with a good deal of—shall we say amusement?

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TECHNICAL NOTES

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

CONTROL DEVICES

POLE FINDERS—HOW H.F. TRAVELS, etc.

THERE are all manner of ways in which the volume given out from the loud speaker may be modified and controlled. For instance, the filament temperature gives a simple means of control, and a variable high resistance across the loud-speaker terminals, or the output terminals of the set, gives another. De-tuning the set is probably the simplest way of control, but it is apt, in any but the simplest types of set, to introduce distortion and other complications.

An addition to the numerous ways in which the output volume may be modified is a tapped high-resistance across the secondary of the first L.F. transformer (in a transformer-coupled circuit). In this arrangement a resistance of, say, 500,000 ohms is connected across the first transformer secondary, one end of the secondary being also connected to the negative grid-bias terminal and to the secondary of the second transformer. The sliding contact on this $\frac{1}{2}$ -meg. resistance, or potentiometer, is connected to the grid of the first L.F. amplifying valve. In other words, a $\frac{1}{2}$ -meg. potentiometer is connected across the transformer secondary, the slider being connected to the first L.F. amplifier grid. When the potentiometer knob is turned in one direction it brings the grid connection near to the filament end and decreases the volume. When the slider is in the middle position the volume is about half the full volume.

In the case of a resistance-coupled amplifier, the potentiometer may be substituted for the grid leak of the second valve, and the slider of the potentiometer connected to the grid of that valve.

A Curious Photo-electric Effect.

A very curious discovery in connection with a Tungar rectifying valve is communicated by a reader to one of the American Radio journals. This reader happened to be experimenting with a burnt-out valve in which there was a very tiny break in the filament, a break so short that when the valve was connected to the 120-volt lighting circuit, a glow appeared in the valve.

But if the experiment were tried in a dark room the glow did not appear and it was soon found that some kind of photo-electric influence was at work which rendered the gap between the two parts of the filament slightly conducting when the valve was exposed to light, whereas the gap was practically non-conducting in the dark.

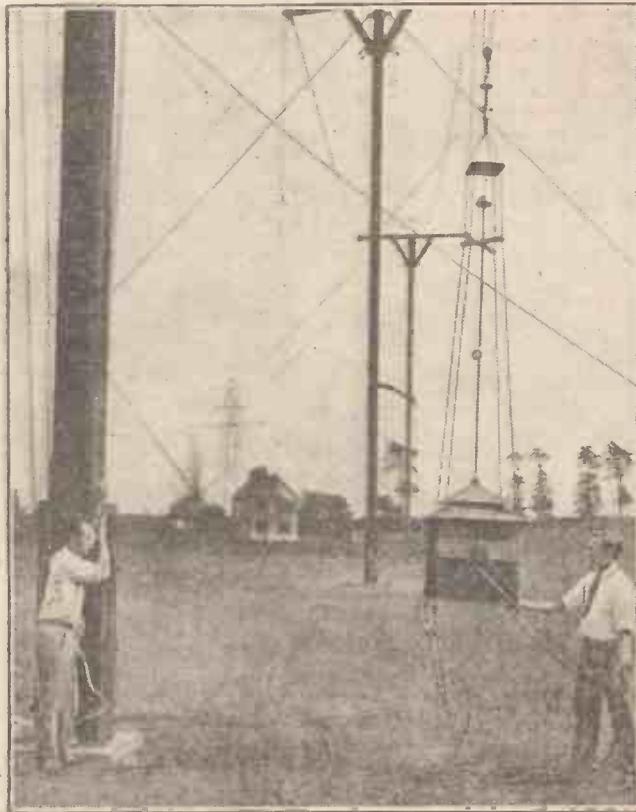
Active "Getter."

A closer examination showed that the "getter" which had been used in the exhausting of the valve, or it may have been some of the metal vaporised during the operation of the valve, had deposited over one-half of the glass bulb, whereas the other half was practically clear. Therefore, light

which entered at the clear part was reflected from the "silvered" part and was focussed more or less upon the gap in the filament.

In this way the argon gas in the Tungar valve was ionised and "triggered" the 120-volt discharge. More consistent results were obtained by connecting a tapped H.T. battery in the circuit so as to raise the applied voltage to a value just below the critical potential.

The experimenter who describes this effect demonstrated his discovery by connecting



American engineers hoisting a 5 metre transmitter up its mast, where it operates 75 feet from the ground. The meter on the instrument is read with the aid of a telescope.

the secondary of a telephone induction coil in series with one filament lead, whilst the primary was connected a 2-volt flash-lamp. On directing a beam of light upon the valve in an otherwise darkened room, enough current was passed to light the flash-lamp to full brilliancy.

This little experiment suggests very interesting possibilities, and no doubt many readers of these Notes will have in their possession discarded valves with which similar experiments could be carried out.

Pole Finders.

Often when experimenting it is necessary to find out whether a source of electric supply is alternating or direct current, and also it is very useful to have a ready means

of finding the polarity of terminals to be used for such purposes as battery-charging and so on. There are various devices by which the polarity may quickly be determined, and a new and very simple one has recently been produced by the Runbaken Company. This consists of a small glass U-tube filled with a colourless solution, each leg of the tube being fitted with a terminal and a metal electrode dipping in the liquid.

When the terminals of this little device are connected to a source of D.C., the liquid around the negative electrode turns red. The indicator should only be connected momentarily and, after disconnecting and shaking, the red colour disappears and the device is ready for further use. If it is connected to alternating leads the red colour appears at both terminals.

If the voltage of the leads which are about to be connected is unknown, it is preferable to connect one lead to the polarity indicator and to touch the other lead momentarily against the other terminal of the indicator, so as to avoid passing too great a current through it. The coloration effect is instantaneous.

This little device should prove very useful for a number of purposes in the experimenter's laboratory.

How H.F. Travels.

Everyone knows that high-frequency oscillatory current when travelling along a conductor travels in the surface layers more than in the interior of the conductor. It is for this reason that the constructor is advised to use stranded wire for his aerial and for other similar purposes, where possible.

In the October issue of QST (the Official Organ of the American Radio Relay League) is an exhaustive article by one of the consulting engineers of the American Dubilier Condenser Corporation, describing in great detail how high-frequency oscillatory

current behaves when passing along conductors of various types. Diagrams are given illustrating the passing of the current over the surface of a metal cone, and also how it flows lengthwise through a cylindrical cage having straight longitudinal wires with circular rings at regular intervals.

It is shown that there is no current inside the cage, the high-frequency current distributing itself on the outer portion of the longitudinal wires. When two wires are pressed endwise against opposite surfaces of a metal sheet it is shown that the high-frequency current does not pass straight through the sheet from the end of one wire to the beginning of the other, but flows along the surface of the metal, around the edges,

(Continued on page 531.)

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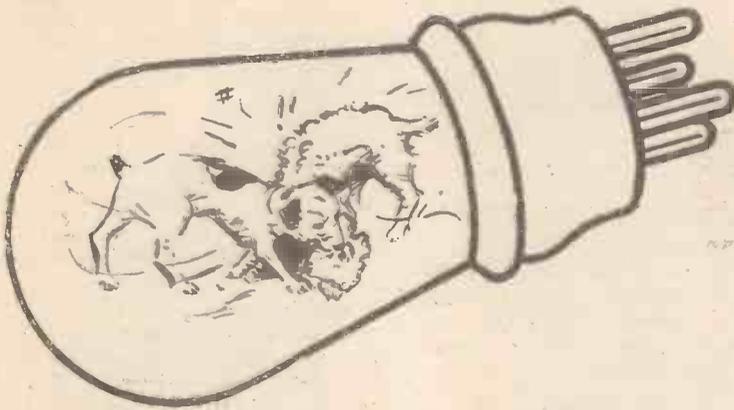
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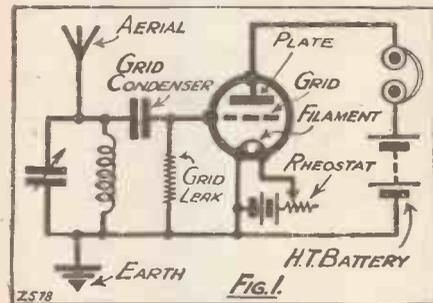
No. 6. CONSTRUCTING A SIMPLE SET.

In this article a brief explanation of reaction is offered and the practical applications of the various principles applicable to a single one-valve set are outlined.

By G. V. DOWDING, Grad.I.E.E.

(Technical Editor.)

I EXPECT that the word "reaction" will be familiar to you and you will know that this is something in a wireless set which causes that "oscillation" which from time to time forms the subject of special announcements from the various broadcasting stations. The use of a reaction in a set enables very great sensitivity to be obtained, but, if it is misused, it can also cause considerable interference



with other listener's reception. In effect, reaction can transform a wireless receiver into a transmitter and make it emit waves of its own which will mix up with the legitimate radio waves and thus upset radio reception in a whole district.

A plain detector-valve circuit, as shown in Fig. 1, is not particularly sensitive—it is about equal in this respect to a crystal set. But it is possible to feed back some of the energy developed in the plate circuit and pass it through the valve again for further amplification. This is accomplished in one way by connecting a coil in series in the plate circuit and bringing it near to the aerial tuning coil. Now, you will remember that when a current of electricity passes through a coil it produces a field of magnetic force.

An "Oscillating" Condition.

If this field of magnetic force tends to envelope another coil it will develop a current of electricity in it. The closer the two coils are to each other, the more the energy that will pass, as it were, from one, to the other—or the tighter the coupling as we say. A two-way coil is a component designed to take two plug-in coils and mechanically vary the distance between them, so that the coupling effect can be controlled. Fig. 2 shows a circuit similar to Fig. 1 with a reaction coil added. The arrow through the reaction and aerial coils indicates that the distance or coupling

between them is variable. To obtain the most from the reaction effect these two coils should be not too close together. As the coils are brought nearer and nearer together so the feed-back increases, but there comes a point when the volume of sound reaches a maximum in the telephone receivers, and past this point it tends to become seriously distorted. This is known as an "oscillating" condition, and the set is then actually transmitting. Subsequently, when the coils are very close together, a howling noise which drowns all speech and music may develop. A certain amount of disturbance can be caused long before this, however, and the considerate listener will not strengthen his reaction coupling beyond that point where distortion begins to creep in.

I am showing Fig. 2 in a pictorial form at Fig. 2a. Here the various components are drawn not as symbols, but in their natural form. I want you to take these two diagrams and closely study them, tracing the complete grid, plate and filament circuits through line by line.

Working Diagrams.

After you have done this, turn to Fig. 2b. This is Fig. 2 again, but this time re-drawn in the form of a wiring diagram. In this case not only are the various components given their normal appearance (in plan), but the lines which connect them represent actual wires. You will see that the batteries and the telephone receivers are missing, and that terminals take their places, and this also applies to the aerial and earth. Most modern sets are built up on the panel and baseboard fashion (see Fig. 2c), and Fig. 2b represents the back of an ebonite panel and the top of the baseboard flattened out as it were. In this manner the actual construction of a set can very clearly be shown and if you will take the trouble to compare Fig. 2 with this Fig. 2b you will gain an insight into the way a theoretical diagram illustrates the circuit incorporated in a set.

Fig. 2b is not drawn to any particular scale, but I want you to take a careful note of the valve holder. A valve is provided with four pins and these pins are spaced in such a way that they must fit into

their appropriate sockets in the valve holder. Two opposite pins represent the connections to the filament of the valve, while the pin, which is spaced rather widely out from the others, is connected to the plate of the valve. The remaining pin is joined to the grid.

Capacity Reaction.

I have now dealt both theoretically and practically with a simple detector circuit employing what is styled "magnetic" reaction, but there is another way in which reaction can be obtained. This is the capacity method. You will see that

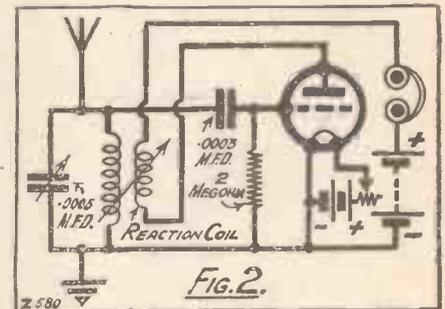
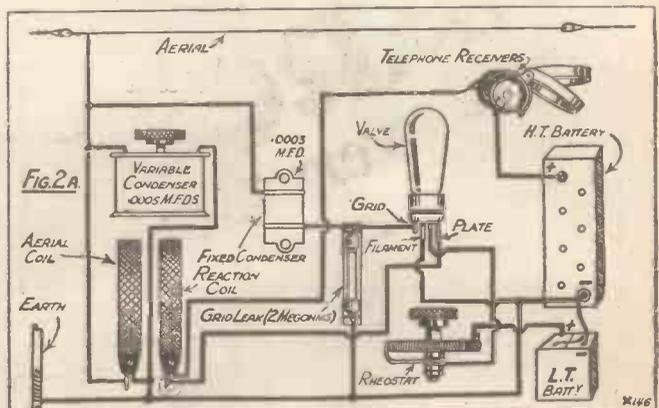


Fig. 3 is again very similar to the simple detector circuit shown in Fig. 1, but this time two things are added, viz., an H.F. choke and a reaction condenser.

An H.F. choke is, as its name implies, a component designed to prevent the passage of high-frequency currents. In effect, it is a large coil—that is, a coil consisting of a comparatively large number of turns. Generally speaking an H.F. choke is a compact component and its numerous turns consist of thin wire. It therefore possesses a greater inductance than the high-frequency current has time to overcome before it changes its direction.

The insertion of an H.F. choke in the plate circuit as shown in Fig. 3 prevents

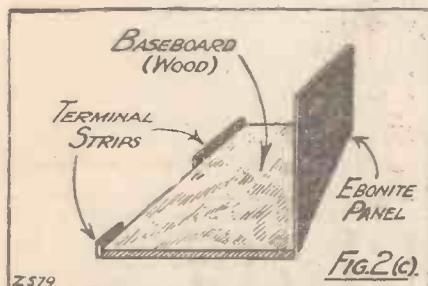
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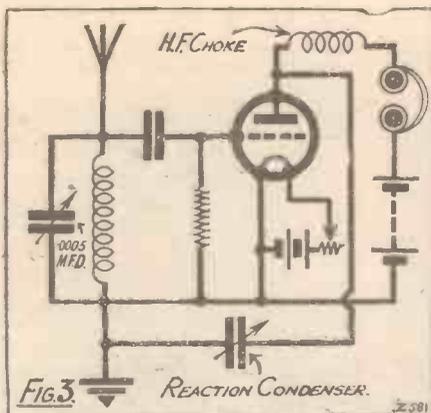
A SERIES FOR THE NEW AMATEUR.

(Continued from previous page.)

any high-frequency current passing from the plate of the valve through the 'phones-H.T. battery circuit, but there is still a path for them through a variable condenser. The smaller this condenser the less H.F. current will be able to get through and back to the grid of the valve. This then forms a reaction control. By varying this variable condenser, which should have a maximum capacity of about 0003 mfd., we can vary the feed-back from the plate of the valve through the aerial coil to the grid of the valve.



Capacity reaction is superior to the swinging coil method for several reasons, and is employed in practically all modern sets. It has several applications in addition to the simple form described above,



and what is known as the Reinartz is, perhaps, the most popular of any.

This differs but slightly from the straight-forward capacity feed-back. If you refer to Fig. 4 you will see that the only difference is that a tapped aerial coil is employed and that a portion of this is used in the reaction circuit, as it were.

Sequence of Operations.

I am going to conclude this article by repeating in brief the sequence of electrical operations which occur in the simple circuit shown in Fig. 2. If you manage to follow it fairly intelligently, then you will be able to turn to high and low-frequency amplification and successfully grapple with more complicated arrangements.

In the first place, high-frequency currents are generated in the aerial circuit by the ether waves emanating from the broad-

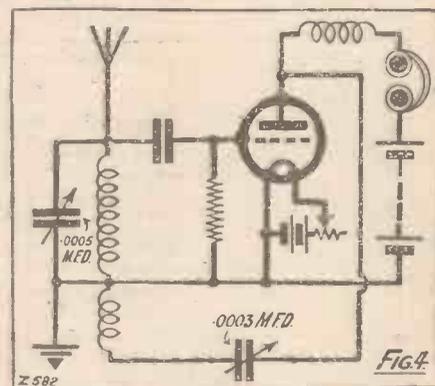
casting station. The aerial circuit, consisting of the aerial, the coil, the variable condenser and the earth, is tuned so that these currents can oscillate backwards and forwards in time with the arrival of the waves, or rather the passing of the waves, as the waves themselves are not currents of electricity.

An alternative path is offered to the high-frequency current through the grid condenser. This and the grid of the valve tend to store up the current, but it does not completely choke up the grid of the valve, as it can leak away through the grid leak. The intensity of the current varies in proportion with the modulation at a low frequency of the waves by the transmitting station.

A Varying "Bridge."

The varying charge of electricity on the grid of the valve varies the number of electrons which reach the plate from the heated filament. Thus, a varying "bridge" is offered to the current which tends to flow from the H.T. battery through the telephone receivers, the reaction coil, and across the valve between the filament and the plate.

As this plate current varies at a low frequency it is able to operate the telephone



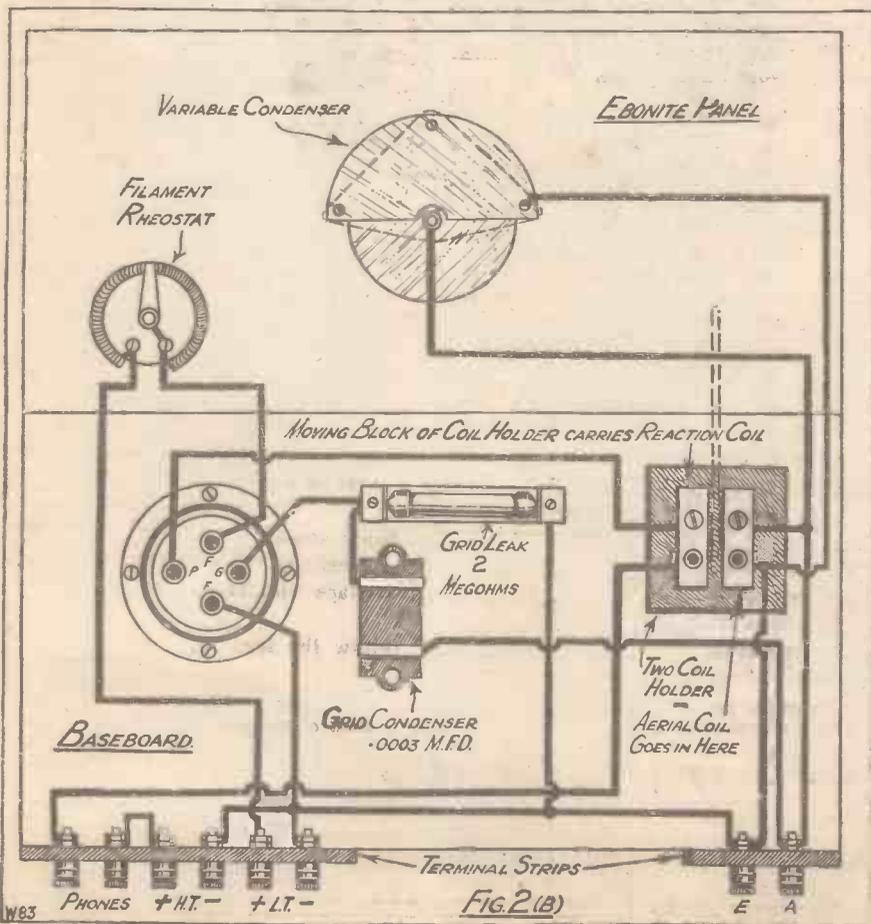
receivers, and these produce air waves and thus sounds can be heard. A certain amount of the energy in the plate circuit is fed back to the grid of the valve across the inductive linkage between the reaction coil and the aerial coil to be amplified again.

That is the operation of a simple one-valve set, and I am sure you will now be ready for the more complex arrangements. By the way, I have shown the grid leak connected to the L.T. minus in all my diagrams. It is usually taken to L.T. plus. It does not make much, if any, difference to a one-valve set, and for my present purpose it simplifies a diagram to take it to minus.

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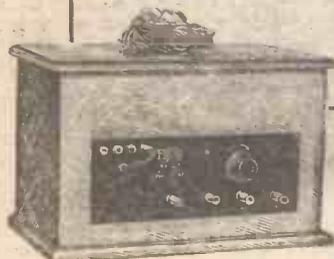


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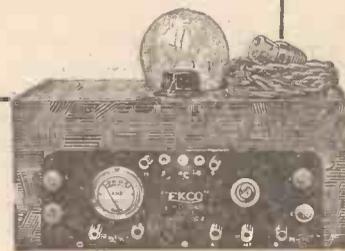
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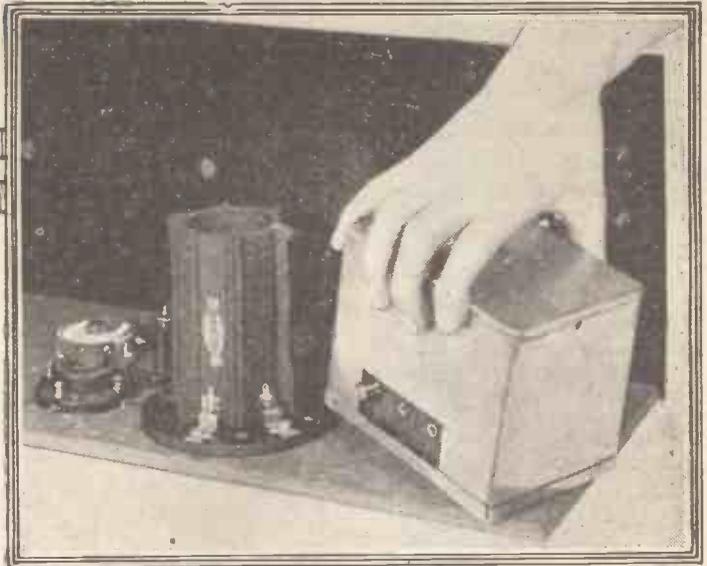
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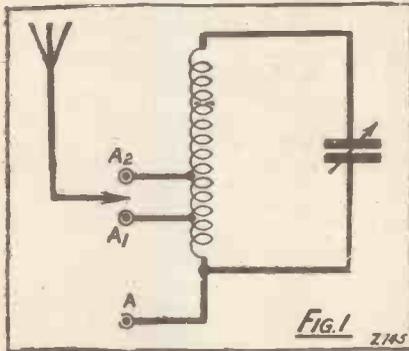


An efficient, easily-made and compact wave-trap which can be used in any type of receiver.
By G. P. KENDALL, B.Sc.

THE arrival on the air of 5 G B has caused even the local listener to take a keen interest in the problem of getting rid of a nearby station, a problem which has always beset the long-distance enthusiast. To meet this problem by means of greatly increased selectivity is not always an easy matter and moreover there are technical reasons why the selectivity of an ordinary set with only a limited number of tuned circuits should not be increased beyond a certain point, and in consequence much greater attention of late has been devoted to wave-traps of the more recent and reliable kind. The reader will remember that a

poration in a receiving set, since it must be remembered that one of the difficulties of the use of a trap always experienced is the matter of interaction between the trap circuit and the receiver. Actually this difficulty becomes very much more acute when the trap is to be included in the make-up of the set itself, instead of being placed at a safe distance from the receiver. It became obvious that special precautions must be taken to deal with this difficulty, and in addition, of course, it was necessary to choose a trap arrangement which should be as simple and straightforward as possible, giving dependable results, and having as little effect as possible upon the tuning and general behaviour of the receiving circuits proper.

lead by the method known as auto-coupling, in which a few turns of the coil itself are connected directly in the aerial circuit. This arrangement has been found to be a very dependable one, giving remarkably uniform results under different conditions, and having very little effect upon the tuning of the set itself.



A Reliable Type.

The whole question of wave-traps was under review at the time of the opening of 5 G B, and there was little hesitation in deciding upon the circuit known as Type D, which, as the reader may remember, is simply a tuned circuit consisting of a suitable coil and a variable condenser, which is connected in series in the aerial

Preventing Interaction.

Moreover, it is very effective as a trap when a suitable coil is used, and the tapping point for auto-coupling to the aerial circuit is well chosen. It may be remembered that this circuit was incorporated in the wave-trap described in POPULAR WIRELESS No. 271 under the title of "Preparing for 5 G B," a wave-trap with which a number of readers have got remarkably successful results in eliminating their local station.

The difficulty of preventing interaction between the trap and the remainder of the set will, in most cases, require to be met by the use of some simple form of screening, such as a sheet of copper placed between

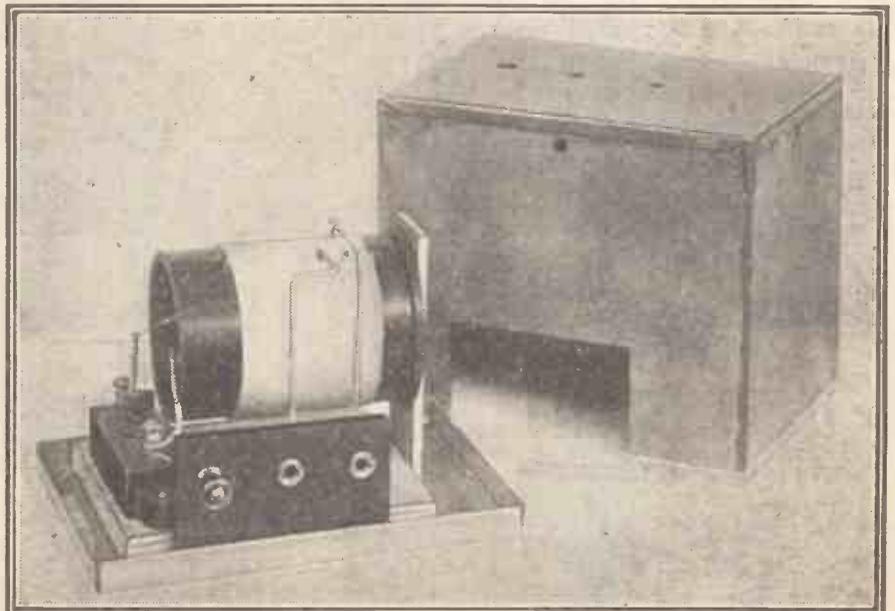
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special wave-trap was described in POPULAR WIRELESS at about the time of the opening of 5 G B to a regular service, and several sets have appeared in this journal and elsewhere, actually incorporating various special forms of traps.

An Important Problem.

The problem seems likely to attract continued attention, and accordingly the "P W" Research Department has devoted some considerable time to an investigation of ways and means. It was considered that quite a large number of future sets will require to incorporate a wave-trap and it was decided to produce a standard component which could be specified for use in a large number of sets. The advantage of such a component from the designer's point of view is obvious since it will not be necessary to produce a new special trap each time a set design is prepared while from the point of view of the constructor, it would again be a considerable convenience, since whenever he decided to build a new set he could be fairly sure that the trap he had incorporated in a previous receiver could be transferred bodily to the new one.

A number of interesting points arise in producing a trap suitable for actual incor-



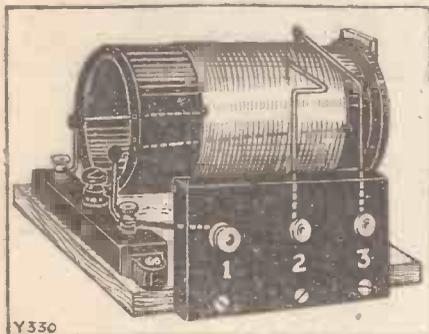
The complete wave-trap can be used with a metal screening box.

A STANDARDISED WAVETRAP.

(Continued from previous page.)

the trap and other parts of the set, and this is a detail which will require to be arranged to suit any particular receiver. The design of the standard trap, however, has been arranged to reduce difficulties as regards interaction and to make the screening easier where this may be necessary by the use of a coil of as small dimensions as will give the desired degree of efficiency. The spread of the external field of the coil is thus very considerably reduced.

As regards shielding, it may perhaps be as well to mention at this point that this will not be a difficult matter in a given set,



The wiring connections can be seen above.

and where desired the whole trap as a unit can be enclosed in a rectangular metal box, as may be seen in some of the photographs accompanying this article, these illustrating the use of the box produced by Messrs. L. McMichael Ltd., for use with their Dimic coils.

Constructional Details.

So much for general considerations. Turning now to the practical details of the construction of the standard trap, it will be seen in the photos and diagrams that it is assembled upon a small wooden baseboard, measuring $2\frac{1}{2}$ in. by $2\frac{1}{4}$ in. and about $\frac{1}{8}$ in. thick, the intention being that this baseboard shall be screwed down directly upon the wooden base of the receiver. The coil is mounted on this in a horizontal position at a height indicated in the diagrams herewith. This point of the height of the coil is mentioned because it will later be of importance in cases where the trap is screened, the position of the trap inside whatever screen is used naturally being a matter which must be standardised. The coil is wound upon a piece of ebonite, Paxolin, Pirtoid, or similar good material, 2 in. in diameter and 3 in. long, and this can be mounted in any convenient fashion which does not entail the use of large pieces of metal. In the trap illustrated the method is to fix an ebonite end disc into the tube and attach this by means of a screw to an upright strip of three-ply wood, whose lower extremity is similarly secured by means of screws to the edge of the little baseboard.

The coil consists of sixty-four turns in a single layer of either No. 28 D.C.C. wire or, alternatively, the same number of turns of $9/38$ Litz wire, the material to be used depending upon certain considerations which will be explained in a moment. As the coil is wound, tappings are made in the

sixteenth and twenty-fourth turns, these being the alternative positions for the aerial tap, the ends of the windings being secured by the simple procedure of passing them through two small holes drilled in the tube at the correct points, while the two tappings may be made in a variety of ways. For example in the case of the solid wire the whole coil can be wound without making any tappings whatever, and then the sixteenth and twenty-fourth turns can be prised up slightly with the blade of a pocket-knife, and two short pieces of match stick about half an inch long slipped under them. The wires thus lifted up can be scraped bare of cotton covering by means of a knife, and the appropriate leads soldered on to them.

Choice of Wire.

In the case of the Litz wire, however, a somewhat more elaborate method must be adopted since it must be remembered that in making connections to a Litz coil at any point it is essential that a good soldered joint should be made to every strand of the wire. In this case, then, the simplest way is to regard each tapping as a finishing point of the coil, cutting the wire and passing the end through two small holes as before. Then drill two more small holes further round the tube, and secure the end of the wire from the reel as before, and carry on winding until the next tapping point is reached, where the process should be repeated. At each tapping point, therefore, the coil will be broken and two ends will be left sticking out. The ends of the strands should then be bared at these points, and all carefully soldered together, the two ends next being soldered to each other and to the connecting wire.

This point brings us to the question of whether Litz or solid wire should be used. The answer is that Litz should by all means be used by the constructor who feels that he has had enough experience of soldering and handling fine wire to be certain of

making a really perfect joint at each point. At one time it was believed that Litz wire was not of much value on the broadcast band of wave-lengths, but more recently research has shown us that even on these waves there is a very definite advantage to be gained by the use of this stranded material.

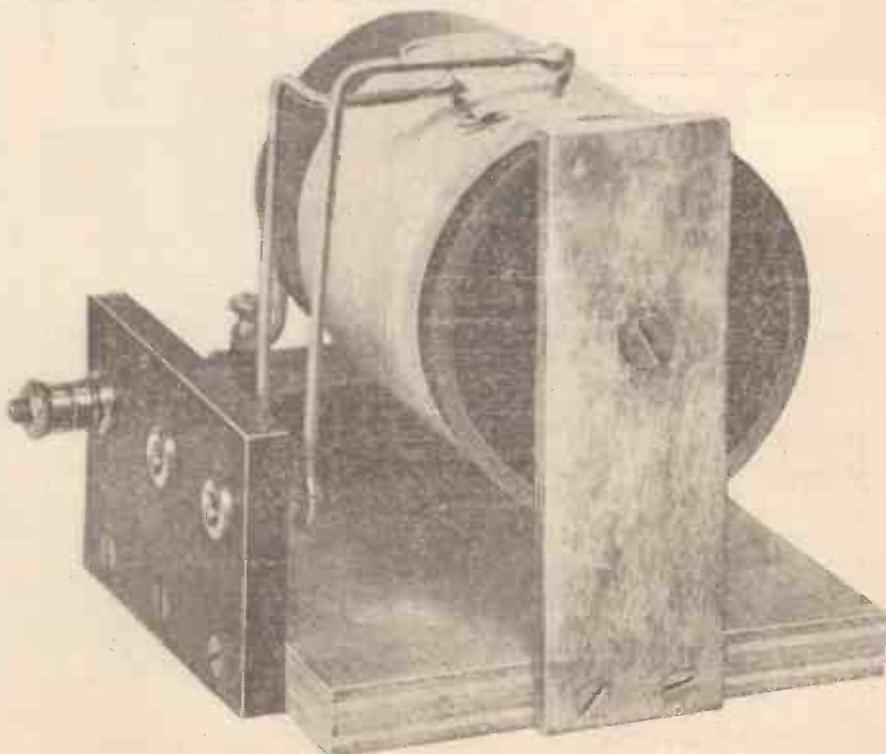
It is, therefore, desirable that it should be used in this case provided that the constructor is quite certain that he can guarantee a perfect joint. This is absolutely vital, and if you feel the least doubt about it by all means use the solid wire and be sure of a coil which is at least reasonably good, instead of running the risk of one which is definitely bad, which may easily be the result of an unskilful attempt to use Litz.

At this point it may be as well to mention that the real difficulty of using Litz is simply that of properly baring, cleaning, and soldering each strand, and this will be found a very much easier process if the type of Litz chosen is that which is silk-covered only without enamel insulation of each strand. With this type of Litz it is fairly easy to get the silk off by lightly singeing with a match and then a little careful scraping of each strand will make it quite bright and fit for soldering.

Tuning Capacity.

Mounted upon the baseboard immediately beneath the end of the coil is a small variable condenser of the compression type which is now becoming so popular for work of this sort. The one actually used in the trap illustrated was a Formodensor, a product of the Formo Company (Arthur Preen & Co., Ltd.), the capacity of this component depending upon the wave-length of the station it is desired to eliminate. If the wave of your local station is below 400 metres, a $\cdot 00025$ mfd. or $\cdot 0003$ mfd. will be required, while if it is 400 metres or over one of $\cdot 0005$ mfd. should be chosen. (The alternative capacities of $\cdot 00025$ or $\cdot 0003$ mfd.

(Continued on next page.)



The wiring of the wavetraps is exceedingly simple to carry out, as will be seen by the above.

A STANDARDISED WAVETRAP.

(Continued from previous page.)

have just been given because in some makes only a .00025 mfd. is available, whereas in others a .0003 mfd. is produced and, as a matter of fact, either will serve.)

These components have a screw-down adjustment which can be performed by means of a screwdriver and, of course, the condenser can be left permanently set to the correct capacity once this has been found.

Screwed to the edge of the baseboard of the trap is a small piece of $\frac{1}{4}$ -in. thick ebonite, 2½ in. by 1½ in., carrying a terminal and two sockets such as the Clix or Eelex types, these being for the external connections to the trap. In use, the lead from the set to the trap will be connected to the terminal, while the aerial lead will terminate in a plug which will be inserted in one or other of the sockets, according to the number of turns on the coil which it is desired to use for coupling purposes.

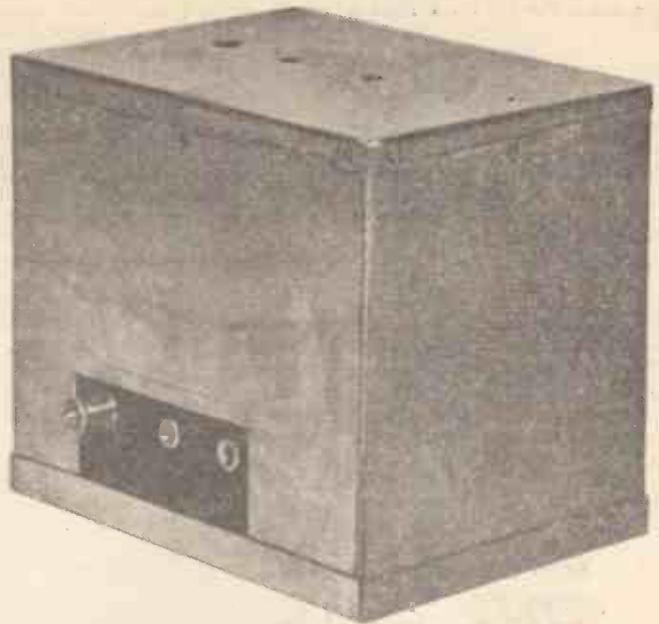
Many Uses.

Actual practical details for the use of the trap would be out of place here, as they will naturally be given on various occasions when describing receivers incorporating this component. This article is intended to provide the reader with a complete specification of the trap, and it is recommended that it should be kept at hand by constructors, so that when building future receivers they may be able to refer to it for details of this component, which may be referred to simply as a "Standard Wave-trap." It may, perhaps, be as well to point out here that this standard trap forms a very useful component for all sorts of pur-

poses, in addition to its uses of a "shutter out" of the local station. It provides in effect a complete tuner for simple purposes, with a moderately selective coupling scheme for the aerial and earth. Thus, if one wishes to rig up a stand-by set in an emergency, all that is necessary is to connect a valve or crystal and 'phones across the tuning condenser in the trap, connect earth to the terminal and aerial to one or other of the sockets, and the receiver is complete.

When a screening box is used it is to be noted that provision must be made for the adjustment of the condenser from outside, since there is of course a change of tuning when the lid is put on. If a suitable hole is drilled in the box, a long-bladed screwdriver can be inserted and the adjustment made quite easily, but just a little care is needed to get the hole in the right spot, i.e. exactly above the adjusting screw of the condenser. This hole can be seen in the lower photo on the first page of this article, rather to the left-hand end of the box.

The other holes are intended for fixing screws, leads, etc., and are not used in this particular application of the "Dimic" box.

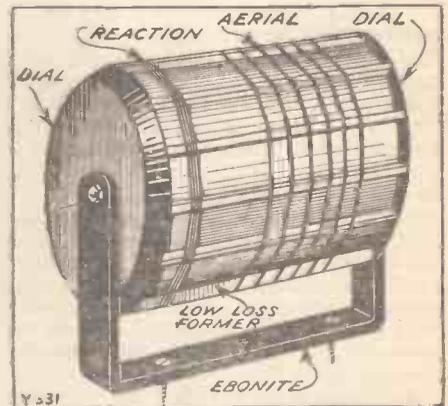


When fitted into a screening box the instrument forms a very compact and useful adjunct to any set.

NEAT COIL FORMER MOUNTING.

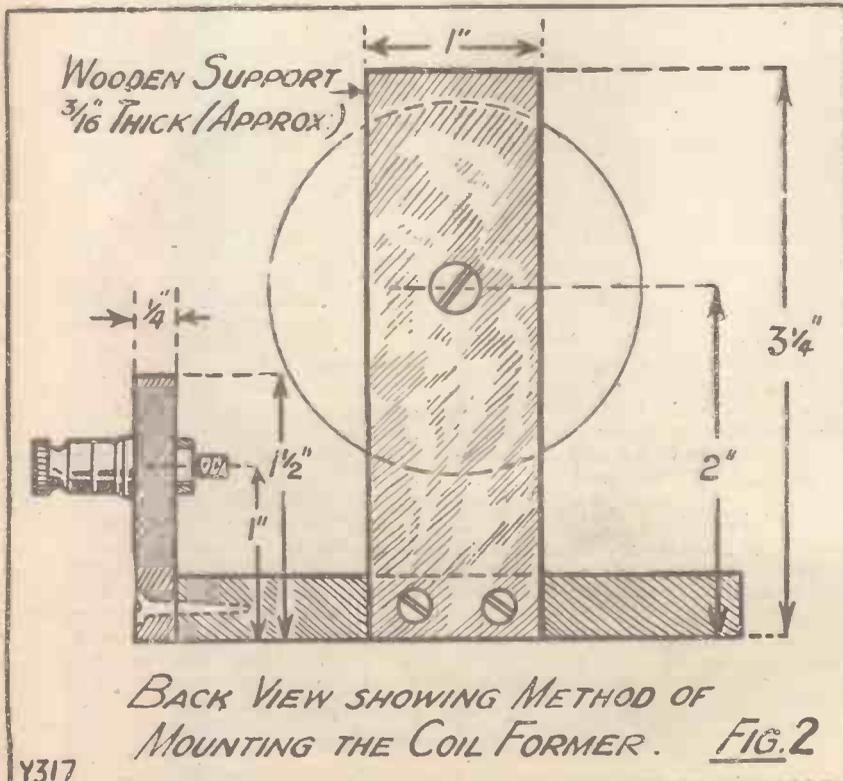
WHEN it becomes necessary to mount a low-loss coil former of the ribbed variety it needs some little consideration as to the quickest way of doing it consistent with practicability.

The accompanying sketch shows the



method adopted by the writer, which has the merit of being adaptable to different coil formers, is neat in appearance, perfectly rigid, and what is perhaps of equal importance, there is practically no constructional work.

The material required is a strip of ebonite, a length of 4 B.A. studding, four 4 B.A. nuts and two condenser dials. The only work involved is in bending the ebonite support at right angles, and this can easily be done by holding it in boiling water. The ebonite has a tendency to spring back unless it is held securely until it hardens. After bending allow cold water to run on the ebonite and it will "set" immediately, thus saving time and annoyance.



BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Knaresborough Ruins—An Important Football Broadcast—Bournemouth Problems—"Romeo and Juliet"—Manchester Novelties—Professor Tovey on Schubert—"A Post-War Cocktail" at Belfast—"Christmasy" Talks.

Knaresborough Ruins.

AMONG the many ancient monuments and ruins scattered about the County of Broad Acres, none are more interesting to Leeds listeners than those at Knaresborough, where for nearly three years excavations have been proceeding on the remains of the castle, resulting in some fascinating discoveries of bygone days and of the habits of the people of those times.

If you would hear the story of how the subterranean passages of the old castle were brought to light you must listen to Mr. Stephen Barber on Tuesday, November 22nd, when he is giving a talk from the Leeds-Bradford station. The excavations have been carried out under the supervision of Mr. Barber, and his forthcoming talk will deal with every aspect of the work during the past season and will supplement his previous talks, by which listeners have been kept informed of the progress made from time to time.

An Important Football Broadcast.

Leeds United and West Bromwich Albion, the clubs that were relegated from the First Division of the Football League last season, are now making a neck-to-neck fight for the top positions in the Second Division. Their clash on the Elland Road Ground, Leeds, on Saturday, November 26th, is, therefore of considerable importance both to themselves and their supporters. The fixture should prove admirable for a running commentary, particularly as the commentator will be Mr. Stacey Lintott, who is both an expert on Association football and a lucid and fluent speaker.

Bournemouth Problems.

When Bournemouth becomes a relay station, and depends largely on London for its wireless fare, there will be a lot of agitation unless considerably more latitude is permitted the local officials to identify their transmissions with the activities of the town, than is given to other stations of a similar status.

It will not be an easy matter for London to incorporate in its programme all the functions of the Bournemouth Station, since many of them are of interest only to South Coast listeners. There is the Bournemouth Musicians' Benevolent Fund Concert, part of which is to be relayed from the Winter Gardens on Sunday, November 20th.

Sir Dan Godfrey is the conductor, and Miss Winifred Ascott (soprano) and Mr. Tom Brown (bass baritone) the soloists. Then there are the various churches, from which services are broadcast from time to time, and a list of clergymen and other preachers whose voices are familiar to listeners and whose discourses are very popular with listeners.

The address on Sunday, November 20th, will be given by the Reverend Percival

Triggs, S.J., of the Church of the Annunciation, Bournemouth, while the service will be followed by an appeal on behalf of the Cornelia Hospital, Poole, by Councillor Miss Paterson, J.P., Chairman of the Ladies' Collecting Committee.

Bournemouth listeners will also want to hear such events as the speeches that are to be relayed from the Town Hall on Thursday, November 24th, when the Annual Dinner of the Bournemouth Chamber of Trade takes place, as well as its own specially arranged talks like that on Monday, November 21st, by Miss A. Doulton Edwards, Secretary of the Bourne-



Senator Marcoon, visits the Electrical Show in New York during his recent American tour.

mouth Council of Social Service, who has something to say on "Some Social Service 'Musts'."

Those who would reduce the status of a main station to that of a relay have chosen a stoney path, but the experience gained may be valuable for the time when it becomes necessary to reduce the number of stations from 20 to 9 under the much-advertised Regional Scheme.

"Romeo and Juliet."

The story of Romeo and Juliet will never die—it is a story that must live while human love endures. Shakespeare saw the lyrical quality of the story; to Berlioz's fiery soul the drama of it was the impulse that led him to introduce into the symphony a dramatic force hitherto unknown in this form of music. A performance of the work "Romeo and Juliet" by the Hallé Chorus and Orchestra is to be broadcast from Manchester, London, Daventry and other

stations on Thursday evening, December 1st. The solo artistes are Olga Halev (soprano), Leonard Gowings (tenor), and William Anderson (bass).

Manchester Novelties.

Mr. E. Liveing, the Manchester Station Director, has introduced many novel features into his programmes during the last few months, and yet another is to be tried in the near future. It is proposed to select a number of short stories by well-known writers, when the material shows qualities that lend themselves to broadcasting, and to present them in the form of one act plays the episodes in the story being linked by narrative. The first story to be treated in this way will be "Good Hunting, Old Chap," by "Sapper," which is being given a place in the evening programme on Monday, November 28th.

Professor Tovey on Schubert.

Professor Donald F. Tovey, Mus. Doc., of Edinburgh University has arranged a special Schubert programme for transmission from Edinburgh on Friday, December 2nd. In his construction of the concert, Professor Tovey has aimed at giving a thoroughly representative selection of Schubert's works, with the necessary consequence that the greater part of the limited time available will be occupied by songs which Joan Elwes (soprano) and Herbert Heyner (baritone) will sing.

Instrumental music will be represented by a pianoforte solo, played by Professor Tovey himself, and by a movement from one of Schubert's unfinished works which is to be played by the Edinburgh String Quartet. Professor Tovey's reputation as a critic and authority over the whole field of music is sufficient to insure a most enjoyable evening, particularly as he has promised to introduce the various items himself.

"A Post-War Cocktail" at Belfast.

Listeners in Northern Ireland have already been given glimpses into the music-hall of the middle of the nineteenth century, and into the London theatre of the days of the "Beggar's Opera" and should find much that is enjoyable in a revue entitled "A Post-War Cocktail," which is to be "shaken" by popular microphone favourites at 9.35 p.m. on Friday, December 2nd.

The revue will bring us closer to the entertainment of the present day, and its songs from "As You Were," "Pell-Mell," and "Buzz-Buzz," will recall memories of the days when men on leave came home for a well-earned rest and a round of the theatres.

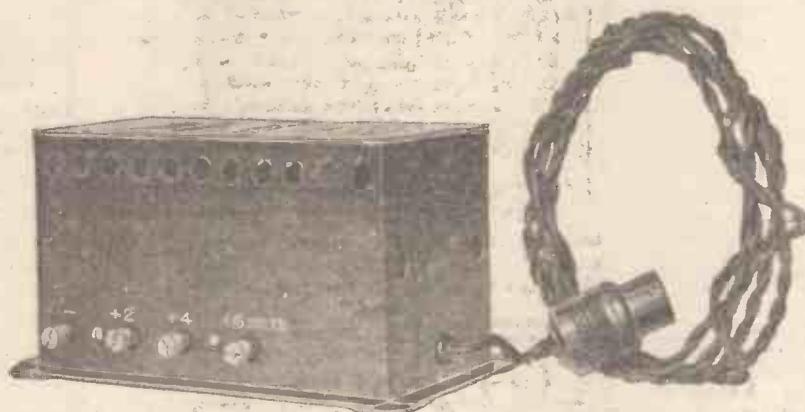
"Christmasy" Talks.

Housewives, already engaged in thinking of preparations for Christmas, will know how much more pleasant, particularly to themselves, the festive season can be made if the little dainties which they prepare are just a bit out of the ordinary in choice and cooking. They will find some useful hints in a talk on "Christmas Cakes," which Mrs. Cottingham Taylor is giving on Monday evening, November 28th. Another "Christmasy" talk is down for Saturday evening, December 3rd, at 7 p.m., when Mr. H. Haddon, Editor of "The Farmer and Stock-Breeder" will have something to say about Smithfield Market, with particular reference to the Fat Stock Show, which opens on Monday, December 5th. Both talks will be from London and other stations.

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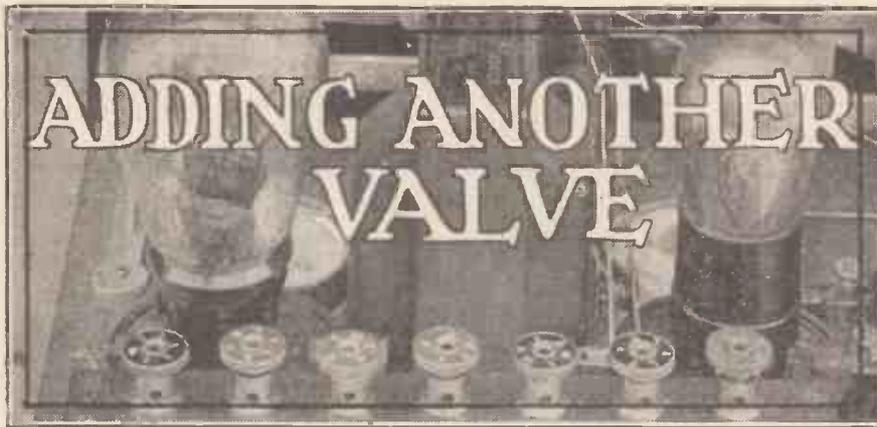
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1. Will charge your accumulator at home at negligible cost.
2. Eliminates the possibility of discharged and sulphated accumulators.
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LANCASHIRE.



By HUMPHREY PURCELL.

IT is amazing how the habit persists of asking the question "How many valves?" before expressing an opinion on the performance of a set. So many people have the impression that such-and-such results ought to be obtained with two valves, and that with three valves a skilful operator ought to be able to get the whole of the British Isles and at least half the continent. The idea of using four valves, or even three, to listen to a station within ten miles appears to these people to be the height of extravagance.

This attitude of mind is as much out of date as the bright emitter, and it is no exaggeration to say that the man whose first consideration is the number of valves he can do without is the man who puts quantity first and quality nowhere. It is true, of course, that two valves plus unlimited reaction can do marvellous things, just as it is true that music can be produced from a one-string fiddle made out of

man who is quite at home when handling his two-valver, but once the convenience of having a reserve of power in the set has

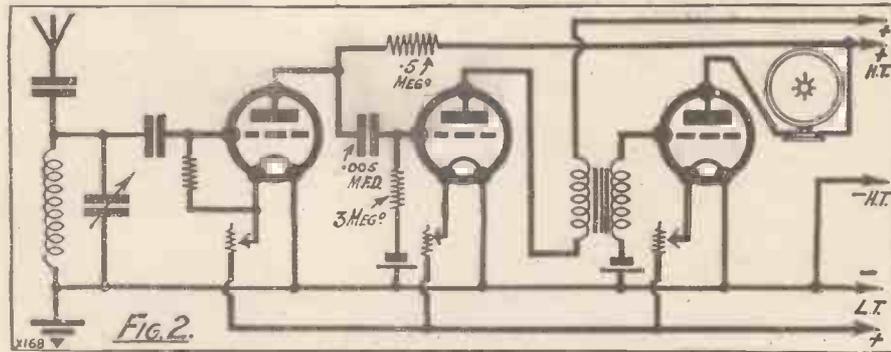


FIG. 2.

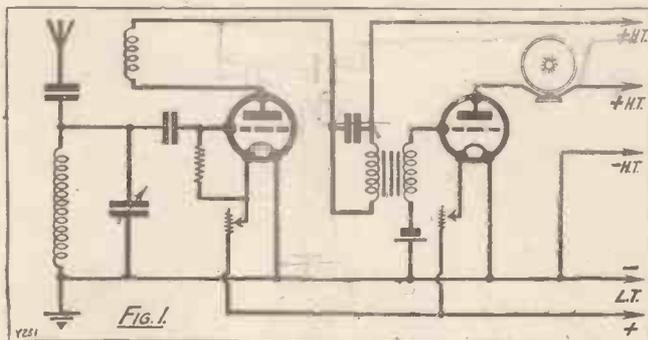


FIG. 1.

a biscuit-tin. But a two-valve set has very definite limitations, whether used with skill or not.

A Simple Matter.

The addition of a valve to a set is such a simple matter, and so comparatively inexpensive, that it is well worth while considering the advantages. Fig. 1 may be taken as typical of a two-valve set which will do marvels. Fig. 2 may be taken as typical of a three-valve set which will give similar volume on the local station as the two-valver will when pressed to its utmost. The difference in components is one fixed condenser, two grid leaks, and a valve-holder. The difference in performance is simplicity of operation, certainty of volume, and purity.

This may not look much on paper to the

been experienced, it is appreciated as an advantage not to be given up lightly. There is no fiddling for the precise "right spot." There is no continuous testing of the H.T. and L.T. supplies only to discover that it is "something else" that is holding the set down. There is no need to wonder whether the broadcasting station has dropped its power a bit, or whether the aerial has sagged. The set that has a pound or two of power in reserve does not vary as does the set that is everlastingly being pushed to the uttermost.

The absence of reaction (Fig. 2) will, of course, make the set less selective, and

this circuit is useless for distant reception. But no set that consists of a detector and L.F. amplifier only is really suitable for distant reception. Fig. 2 can be brought up to the level of Fig. 1 for occasional distance work—and a good deal above—by incorporating reaction as shown in Fig. 3. One further fixed condenser, of .00005 mfd., is required. But a set containing a stage of neutralised H.F. amplification is much more reliable and certain in its results, and is much kinder to the neighbours if something more than the local station and Daventry are wanted at all frequently.

Negligible Cost.

One word about the cost of an additional valve. The passion for running a set inexpensively arose out of the high L.T. demands of the old bright emitter. Nowadays L.T. counts for nothing, for a very small accumulator will last for two or three weeks with three valves. H.T. current is

more of a problem. But a resistance coupled valve takes so little current from the H.T. battery that the difference between a Fig. 2 set and a Fig. 1 set will hardly be noticed. The first cost, for valves and components, may for all practical purposes be counted as the last cost.

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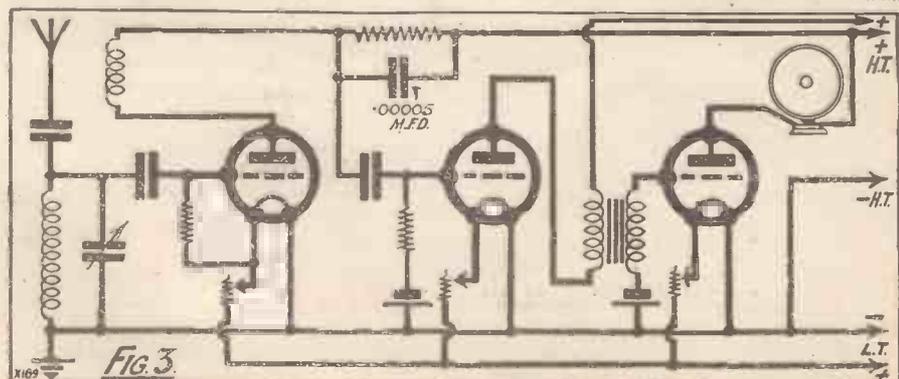
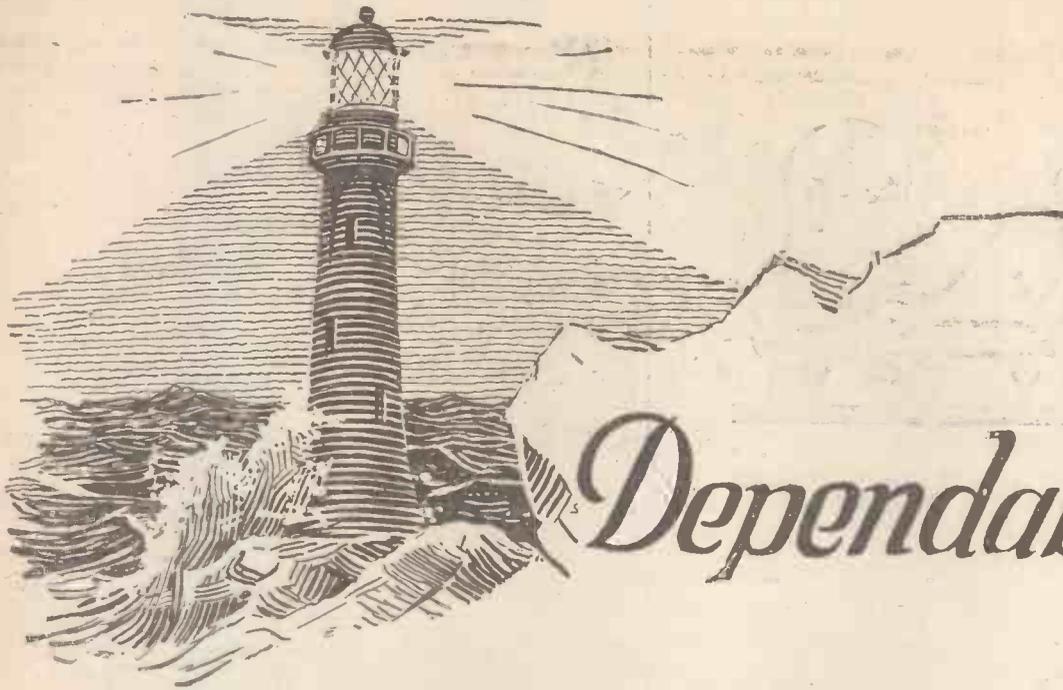


FIG. 3.



Dependability

ON BOARD SHIP! A roaring gale, the darkest night, dangerous rocks and shallow water ahead. But your fears subside; for there, clear-cut through the blackness, flashes the lighthouse's ever present warning. Your faith in the watchdog of the seas never wavers.

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- Screw " 2/3
- Large Capacity.
- Torch, 4.5v. - - 1/1
- " 3v. - - 9d.
- " 1.5v. - - 4½d.



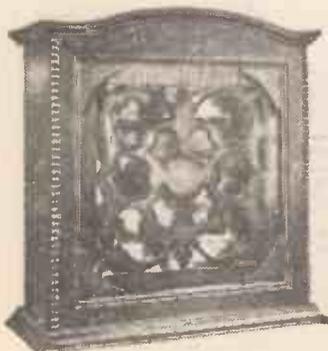
"I sing all the low notes"
 —"You wonder how he
 gets 'em."

(from their well-known duet).

*Yours very sincerely
 Holsam & Jetsam*

He gets them—but do you?
 Until you have heard an Amplion
 Cone you cannot realise the wonderful
 possibilities of radio reception. The
 Amplion Cone gives the correct value
 to all notes and brings you the low
 tones which give such colour to music.
 It is the "Natural Tone" Loud Speaker.

N.B.—For best results with an Amplion, as
 with any other kind of loud speaker, there *must*
 be ample H.T. supply and correct grid bias.



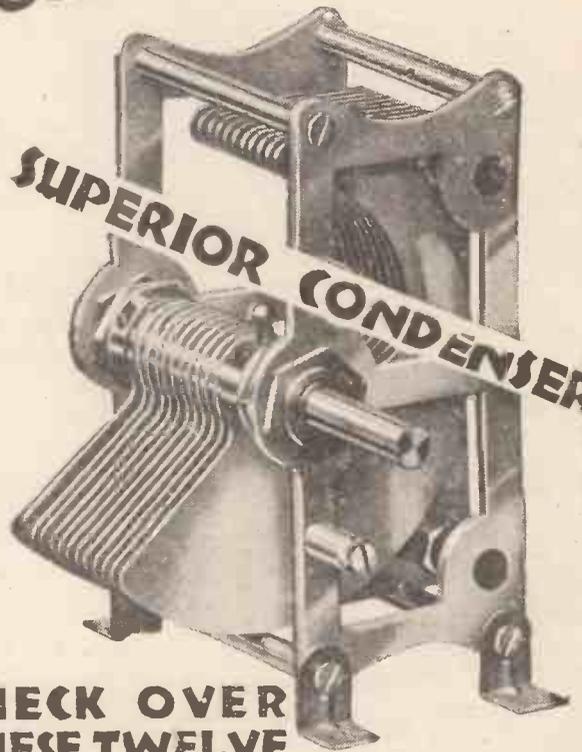
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| <p>1 Massive aluminium chassis—very strong.</p> <p>2 Eureka Loga-cyclic plates ensure even distribution of wave-lengths and prevent overcrowding.</p> <p>3 Terminals to both fixed and moving plates.</p> <p>4 Ebonite bush supplied free enables Condenser to be easily ganged.</p> <p>5 Last plate adjustable for compensation purposes when Condenser is ganged.</p> <p>6 Fibre friction washers ensure velvety smooth working.</p> | <p>7 One-hole mounting for those who prefer ease of fitting.</p> <p>8 Fixed plates insulated from chassis by means of four heavy ebonite bushes.</p> <p>9 Generous metal bushes prevent wear and ensure long life.</p> <p>10 Stout centre spindle eliminates "whip."</p> <p>11 Three-hole mounting for those who want extra rigidity.</p> <p>12 Four brackets enable Condenser to be mounted squarely on baseboard.</p> |
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RADIO ON RAILWAYS.

A demonstration of wireless reception on a train was recently given on a run to Brighton and back, and in this short article some interesting details concerning this are given.

By A SPECIAL CORRESPONDENT.

IN Canada and the U.S. and on the continent, where there are many long railway journeys, radio on railways has made great progress. I believe, for instance, that every train running on the Canadian National Railways has broadcast receiving equipment, while in Germany it is possible on some trains to call up by telephone any ordinary telephone subscriber, the link between the moving and fixed elements being, of course, a radio one.

But in this country we have comparatively few really long train routes; it takes but a matter of hours to traverse England in any direction. And again, most of the coaches used on British tracks are either divided into a number of small and completely self-contained compartments, or into small sections opening on to connecting corridors. Only on the Underground systems or in dining Pullmans do we find the one large compartment which could be served by one large loud speaker.

No Technical Difficulties.

Taking all the above facts into consideration, it is doubtful whether the railways in this country ever can be convinced that radio on their trains could be either practical or even advantageous.

Some years ago an attempt was made to introduce "luxury expresses" into Great Britain, and for a time the Great Western had trains running carrying such refinements as are to be found only on the most modern of present-day trans-continental trains of the U.S. But, although over here we have come to a general level of comfortable travelling, there is now little of the old "de luxe" about it.

Further, the new grouping system has to a great extent reduced competition, and the railways do not require to offer inducements to the travelling public. At least, there is now little competition between the railways themselves, but road traffic must

be proving itself an increasingly keen competitor to the steam tracks.

Now would the installation of broadcast receivers on trains prove *economically* worth while? This is the only angle at which our railway chiefs would view the problem.

Personally, I think it would, even although, as I have indicated, there are many arguments against it.

From a technical point of view there are no difficulties; this has been proved in other countries and also in England. Quite recently the writer was privileged to witness a radio demonstration arranged by British Brunswick, Ltd., on the Southern Railway.



Fred Murray and Eileen Perkes demonstrating the new Rhythm Step to music supplied by a Panotrope on a Brighton express.

Pullman coaches attached to one of the evening expresses running from Victoria to Brighton were fitted with the necessary gear, and the experiment proved to be quite successful.

Complete Panotropes were also brought into operation, and these, too, gave excellent results. The Panotrope is an electrical gramophone. Instead of having the usual sound-box which directly operates a diaphragm, it employs what is known as an electrical "pick-up."

This "pick-up" transforms the "waves" engraved on the waxen record into electrical pulsations, and these are passed to a valve amplifier. Subsequent to amplification the energy is carried to a moving-coil loud speaker.

Thus it will be seen that the Panotrope is a gramophone peculiarly adapted to work in conjunction with radio, and this was effectively demonstrated upon the above-mentioned occasion.

Very Successful.

The 5 X X Daventry station was picked up on a super-heterodyne receiver having a frame aerial, and the music delivered to the Panotrope amplifier for reproduction. Every now and then a gramophone record was put on and the music projected from the same speakers.

5 X X was chosen for there was little interference from the train dynamos on this wave-length. Reception faded out as the train rushed through stations and tunnels, but otherwise maintained a very excellent evenness.

The Panotrope is a fine instrument and dealt faithfully with both its mechanical and electrical inputs. And the music was most enjoyable. It formed a very pleasant "background" at dinner.

ONE by one, many of our old wireless theories have been discounted by the searching investigations of radio scientists. It is not so very long ago since we were urged to adopt silver connecting wire for the wiring-up of our receivers, and although the idea did not "catch on" to any extent in this country, it certainly had its disciples in America.

And, after all, the theory that tarnished copper or brass wire lost much of their conductivity was a very plausible one. The "tarnish" coating which forms on these metals after long exposure to the atmosphere consists of layers of the low-conductivity oxide or sulphide, and it was very reasonable to suppose that high-frequency currents, with their known tendency to travel along the "skin" of the metal, would find their progress impeded by the resistance of these oxide coatings.

Now the oxide and other corrosion

ANOTHER GHOST LAID!

By A. J. BOYINGTON.

products of silver are usually only slightly less conducting than the metal itself. Thus, silver was suggested as a superior media for making the necessary back-of-panel connections in wireless receivers, for cat's-whiskers in crystal detectors, and for various purposes where high-frequency currents were being handled.

An Accidental Discovery.

But Dr. Roberts, of the University of Kansas, has dispelled the illusion for us by a discovery made quite accidentally whilst he was pursuing another field of investigation. He had set out to test a

reported discrepancy between text-book theory and actual practice regarding the resistance of copper wires to currents in the neighbourhood of 10,000 kilocycles (30 metres). Working at frequencies of 8,600 and 15,000 kilocycles, he tested copper and silver wires of identical gauge for the exact values of electrical resistance.

When precautions had been taken to equalise the distribution of the current in all parts of the loop of wire that was being measured, the resistance values found were sufficiently close to those predicted by the theory to prove the text-books correct. The incidental discovery was that resistance curves run on bright copper wire were found to coincide with curves run on the same wire after it had acquired a heavy coating of oxide.

Since these values are identical at even such high frequencies, it appears that, after all, we have been worrying unnecessarily over our tarnished wiring.

EVERYTHING **The G.E.C. your guarantee** ELECTRICAL

THE LATEST
GECOPHONE
triumphs



CABINET SUPER CONE

Cat. No. B.C. 1694. The GECOPHONE Super Cone Loud Speaker represents the nearest approach to the ideal. It is fitted with a large cone of conoidal form operating from a delicately balanced armature. The cabinet is of solid mahogany.

PRICE
£8 : 8 : 0

CABINET CONE



Cat. No. B.C. 1690. A most desirable loud speaker embodying both quality of reproduction and fine appearance. No other instrument at the price can reproduce with such wonderful faithfulness. Solid mahogany cabinet.

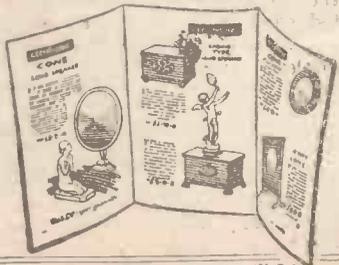
PRICE
£6 : 0 : 0

Sold by all Wireless Dealers and Stores.

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REGISTERED TRADE MARK

CABINET CONE
LOUD SPEAKERS
MADE IN ENGLAND.

Write for a copy of the illustrated GECOPHONE Loud Speaker Folder B.C. 4563, which contains full particulars of the complete range of GECOPHONE Loud Speakers. **POST FREE** on request.



Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London. W.C.2.

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The CHEAPEST VALVE
IN THE WORLD



better results—lower filament current used—longer and more satisfactory service—the lower price, all combine to make the All-British BERITON VALVE the cheapest valve obtainable.

A 12 - Dull Emitter Valve at half price. A triumph of British design. British organisation and production of a huge scale, yet each BERITON VALVE is individually made and tested. The BERITON is an entirely new invention being entirely NON-MICROPHONIC and incorporating the latest features in valve design ensuring greater clarity and better reproduction with an entire absence of "mush."

WE GUARANTEE SATISFACTION

Refunding money in full for any Valve returned to us within three days.

Buy direct and save money.

TYPE H.F. and DET. (Red Line) 2-volt, 4-volt and 6-volt **6/6**
TYPE L.F. (Green Line) 2-volt, 4-volt, and 6-volt (Post Free)
TYPE R.C., 2-volt and 4-volt...
TYPE POWER (White Line) 2-volt, 4-volt and 6-volt. **9/-** (Post Free.)

Type.	Amps.	Anode Volts.	M. Voltage Amplification Factor.	R.A.C. Anode Resistance Ohms.
H.F., 2-volt..	0.1	30-90	13	29,000
L.F., 2-volt..	0.1	30-100	7.5	15,000
Power, 2-volt..	0.25	60-100	5	7,000
H.F., 4-volt..	0.1	30-90	13	11,000
L.F., 4-volt..	0.1	30-100	7.5	6,250
Power, 4-volt..	0.15	60-100	5	5,000
H.F., 6-volt..	0.1	30-90	14	20,000
L.F., 6-volt..	0.1	60-100	8.5	10,000
Power, 6-volt..		90-100	5	5,000

Resistance Capacity :

R.C., 2-volt..	0.1	60-120	30	120,000
R.C., 4-volt..		60-120	40	80,000

R.C. 6-volt to be issued shortly.

Fill in the name of the Company on all Postal Orders and cross "G. & Co."

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Apparatus Tested

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 TRIPLE-GANG VARIABLE CONDENSER.

THAT very desirable feature of compactness has certainly been achieved by Messrs. Ripaults, of King's Road, London, N.W.1., in their new lateral action triple-gang condenser. The lateral action movement of the Ripault variable condenser seems to lend itself to ganging, indeed, it appears to be ideal for the purpose. As the name indicates, in this type of variable the moving plates move laterally in and out of the fixed plates. In this Ripault triple gang the three variables are mounted in line. The moving vanes are linked together by two ebonite bearers which slide along two common runners, a single and centrally-placed cam movement supplying the necessary action. The front plate is of metal and provides the necessary shielding, while on the back ebonite plate are three vernier movements which can be independently operated to give a complete balancing.

On the back plate are also seven terminals, two each for the condenser units and one for the front shielding metal panel. A slow motion dial is fitted and the movement is excellent, smooth and absolutely free from backlash and harshness. In general the design of this triple gang is very good. It is, as we mentioned, compact and the movement is mechanically efficient. In some sets, where ganging is desired, it is necessary to provide shielding between the various sections of the ganged condenser. The design of this Ripault ganged condenser lends itself to such shielding, and we recommend the makers to consider the advisability of incorporating such in some of their models.

AMPLION CONE LOUD SPEAKER.

Messrs. Graham Amplion Limited inform us that during the recent Radio Exhibition they received a considerable number of inquiries from interested people as to why

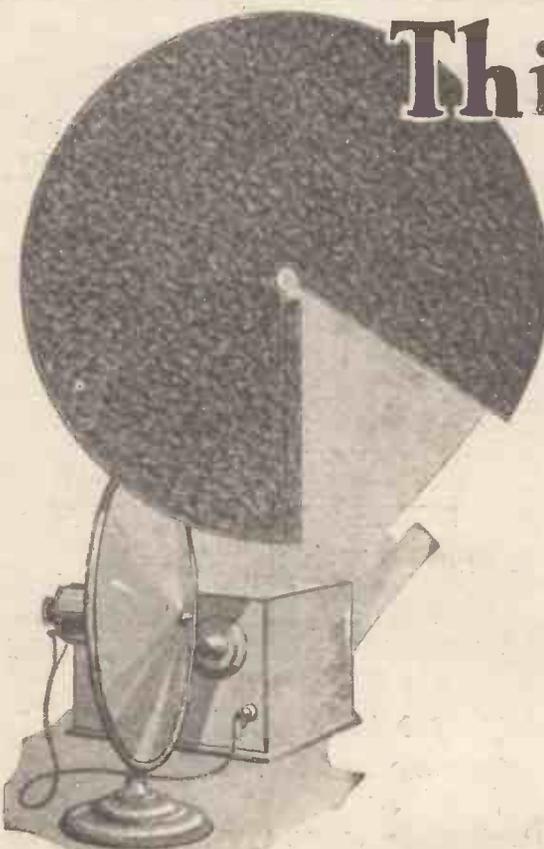
two distinct types of Amplion cones have been placed on the market, i.e. the senior type models A.C.3, A.C.5, A.C.7, and A.C.9. and the junior series A.C.1, A.C.4, and A.C.4 M. Two different types of units are also employed. Their explanation of this is as follows, and we are sure that all of our readers will find it most interesting

"When visualising the market," they state. "we, as manufacturers of loud speakers only, have to bear in mind that we have no knowledge specifically of the type of set with which our instruments will eventually be associated. Therefore, we decided to classify radio sets, from our point of view roughly into two groups. First of all, those sets giving ample volume and with probably plenty of H.T. current and with a super-power valve in the last stage. To meet this class, the senior models above enumerated were evolved, and users will find that these will take any amount of volume they care to put in them, and probably far more than is really needful.

"In other words, the special seamless fabric diaphragm used in Amplion cones and operated by the type of unit employed in our senior models will not rattle when driven by a powerful set of good design, although loaded to a degree well in excess of the requirements of the average user.

"In the other category is the man who has an expensive two- or three-valve set with probably only normal battery power available. Here, the junior cones which are very sensitive will give unqualified satisfaction and a volume sufficient to fill

(Continued on page 618.)



This Winter's most pleasant hobby

Why pay a high price for a Cone Loud Speaker when you can make one just as efficient and attractive yourself, and for a quarter the outlay? A few hours spent on the fascinating and easy task of constructing your own Cone Speaker and you have an instrument which is equal in performance to any that can be purchased. But one important point must be borne in mind. Six-Sixty Cone Speaker Paper is the only Cone material which will guarantee you that perfect reproduction which is so desirable. A very special material, the processes in its manufacture ensure tonal qualities and purity unobtainable with any other material.

The quality of Six-Sixty Cone Speaker paper may be judged from the fact that it is used in most of the well-known American Cone Speakers. America is the country which originated the Cone.

Made in two sizes, 12 in. diameter and 19 in. diameter, Six-Sixty Cone Speaker paper is obtainable from all Radio dealers, but in case of difficulty write direct to us.

Prices 2/6 and 3/6.

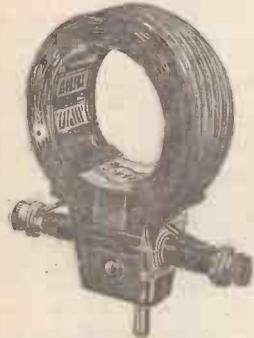
Brass Washers 3d. extra.

THE ELECTRON CO., LTD., Dept. P.W.,
122-124, Charing Cross Road, London, W.C.2.

The Ideal Plug-in Inductance



IGRANIC
Triple Wound
HONEYCOMB COIL



IGRANIC
UNITUNE APERIODIC
FIXED COUPLER

For years Igranic Coils have been the standard by which other coils have been judged. The famous triple honeycomb winding reduces the high frequency resistance and self capacity to a minimum and at the same time provides a very compact and robust coil for mounting on the standard plug.

There is now an Igranic Triple Honeycomb Coil to meet every requirement and for every circuit. If you are building a new set you will obtain the maximum efficiency by using Igranic Triple Honeycomb Coils. If you have an old set you can improve its efficiency without alteration to the wiring by using the Igranic Tapped Triple Honeycomb Coil for it is mounted on a standard plug.

Triple Honeycomb Coil.
The standard Igranic Coil which made the Triple Honeycomb winding famous. Sizes L25 to L1500. Prices 2/9 to 16/.

Tapped Triple Honeycomb Coil.
Standard mounting. Centre and aerial tapping taken to sockets at side of plug. For all circuits requiring tapped coils. Sizes 1 to 5. Prices 3/9, 4/3, 4/9, 5/6 and 6/3

Send for List
No. R67 now

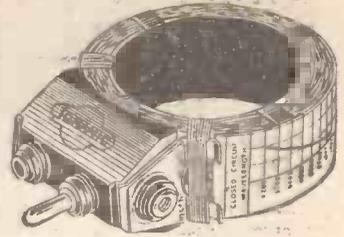
Unitune Aperiodic Fixed Coupler.
For aperiodic aerial coupling. Increases selectivity of any set without alteration to wiring. 250-500 metres. Price 4/6

Honeycomb H.F. Transformer.
For efficient H.F. coupling. Tapped primary enables neutralisation to be effected. Sizes 1 to 4. Prices 6/-, 6/9, 8/3, and 10/.

It gives full particulars.



149, Queen Victoria Street, London, E.C.4
Works: Bedford.



IGRANIC
Tapped Triple HONEYCOMB
INDUCTANCE COIL



IGRANIC
HONEYCOMB
H.F. TRANSFORMER

THE NEW **NO CRYSTAL SET USER SHOULD BE WITHOUT NON-VALVE MAGNETIC**

MICROPHONE BAR AMPLIFIER

(Patent No. 419581/25.)

which operates a loud speaker direct from any crystal set up to six miles or more (according to strength of original reception) from main Broadcasting Stations, or makes weak reception loud and clear in headphones under any conditions. A great boon to deaf persons. May be used with small valve sets.

Works perfectly on one or two dry cells; no other accessories required.

NO Valves, Accumulators or H.T. Batteries. Fragile Parts. Distortion.

PRICE **34/-** POST FREE.
(Without Battery).

Every Amplifier Guaranteed.
2 Dry Cells (lasting 3 months) 4/-

NOTHING TO GET OUT OF ORDER. A CHILD CAN ADJUST IT
Write to-day for illustrated literature, free.

May be obtained from your Dealer, or from
Sole Manufacturers and Patentees:
NEW WILSON ELECTRICAL MANUFACTURING Co., Ltd.
18, Fitzroy St., Euston Rd., London. W.1. Phone: Museum 8974.

Something NEW!

a value not for the million!



at **50/-**

complete with two coils but without valves. Marconi Royalty extra.

Brownie 2-valver! Remember the name. Amazing loud-speaker clarity within 30-35 miles main B.C. Stations or 120 miles Daventry. Brownie's greatest achievement. See and hear it at your local radio retailer's.

The BROWNIE WIRELESS 2-VALVER

BROWNIE WIRELESS COMPANY (G.B.) Ltd.,
NELSON ST. WORKS, MORNINGTON CRESCENT, LONDON, N.W.1.

APPARATUS TESTED.

(Continued from page 616.)

an ordinary-sized room without overstraining the set or the speaker.

Summing up, therefore, the Amplion range of cones provides the inexpensive good-looking and exceedingly efficient junior models for the man who has little to spend and the very handsome senior cones which will give splendid reproduction to the man with a set capable of giving considerable output.

A CORRECTION.

In an advertisement which appeared in our November 5th issue Messrs. H. Clarke & Co. (Manchester), Ltd., state that their "Pirtoid" tubing is "specified as the former for use in the Cossor 'Melody Maker.'" This should read: "'Pirtoid' is eminently suitable for use in the Cossor 'Melody Maker.'"

ORPHEAN GEM LOUD SPEAKER.

The London Radio Mfg. Co., Ltd., of Station Road, Merton Abbey, London, S.W.19, recently sent us a sample of their new Orphean Gem Loud Speaker. This is a speaker of the horn type which, the makers state, is almost full size. It is a gracefully modelled speaker, and is finished in a dark chocolate colour. Its base has four claw-type legs and these are fitted with rubber to prevent them scratching anything upon which the instrument might be placed. An adjustment device is provided beneath

the base, and on the side are two terminals, one of which is bright red to indicate that it is the positive connection.

The speaker stands nearly 19 inches in height, and the diameter of the flare is about nine inches. On test we found it to be quite sensitive and it gave pleasing results for its type when used with a fairly powerful receiver. On a straight Det.-L.F. two-valver, it gave sufficient volume to fill a moderately-sized room with, in the circumstances, not a great deal of coloration. Its price is 30s., and it is the sort of loud speaker that would give satisfaction to the average constructor when used with the average small type of receiver. It is interesting to note that its various parts can be purchased separately, the base can be obtained for 12s. 6d., the stand for 2s. 6d., and the horn for 15s. It is very well made, the base being moulded and polished bakelite. Readers who may be searching for a cheap loud speaker are well advised to hear this Orphean Gem demonstrated at their local wireless store.

A RADIO CYCLOPEDIA.

Frederick J. Drake & Co., publishers, of Chicago, recently sent us a copy of "Drake's Radio Cyclopaedia," a voluminous work very adequately

covering the subject of radio from the amateur and constructor's point of view. Although American components and valves, etc., are referred to throughout, the British reader will find a great deal that is of interest in the book. It is excellent to have it to hand for reference purposes

A PATENTED CIRCUIT.

Messrs. E. K. Cole, Ltd., of the "Ekeco" Works, London Road, Leigh-on-Sea, inform us that the circuit incorporated in the H. T. Unit, which is described and illustrated in "P.W." Blue Print No. 29, is covered by their Patent No. 262567

THE UNIDYNE VALVE COMPANY.

The address of this concern is No. 1, Charing Cross, London, W.C., and not No. 6, as given in their recent advertisement.



Capt. Plugge's "Standard" Car, "Aether III," which was fitted with an elaborate radio outfit (note the frame aerial), about to leave the Hotel Europa at Tarrazona en route for Madrid.

Don't treat your Valves like an Ass!

If your dealer cannot supply we send post free!

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.

-  RESISTOR AND BASE 2/6
- State particulars of valve for which Resistor is required when ordering.
-  MULTIPLE FIXED CONDENSER 5/6
- 15 various capacities from the one unit.
- R.C.C. UNIT 5/6
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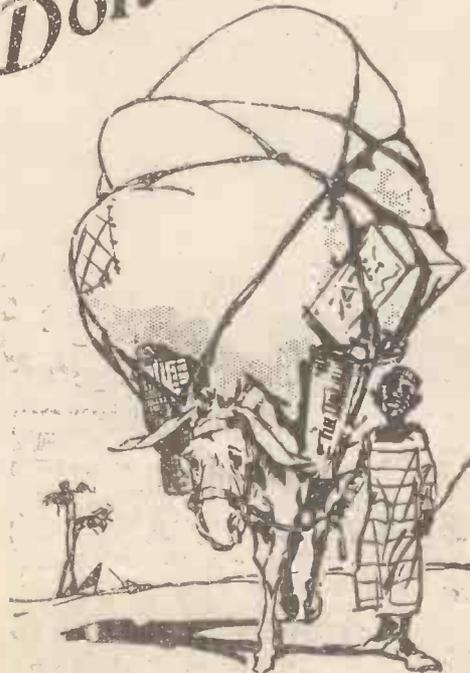
Ashley Radio

Neatest and most reliable at lowest price obtainable.

GUARANTEED COMPONENTS

Two fully descriptive leaflets will be sent on request.

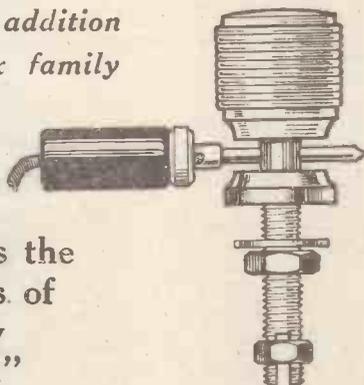
ASHLEY WIRELESS TELEPHONE Co. (1925) Ltd.
Finch Place, London Road, LIVERPOOL



CLIX

Rainbow Terminal

A new addition
to the Clix family



"Meets the
Needs of
Every
Lead."

YOU can't make any mistakes if you use Rainbow Terminals. You connect by colour with every lead wearing a neat identity ring corresponding in colour to the terminal top.

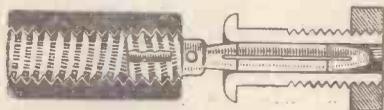
Whilst CLIX Rainbow Terminals are primarily designed for use with Pin Terminals, Spade Terminals or both they will take any standard fitment of this kind.

In nine distinctive colours for every purpose

Complete Terminal with nuts, washer and coloured identity ring for affixing to pin or spade connector.

5d.
each.

CLIX PARALLEL PLUG



Coloured Bushes and Identity Rings are also available for this extraordinarily useful fitment.

FOR H.T. BATTERIES

use CLIX Wander Plugs, but for Wet H.T. Batteries use CLIX Parallel Plugs.

World Wide Patents.

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RECUPERATING AGENT
IN THE

HELLESEN 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

A. H. HUNT, Ltd. (Dept. 12), CROYDON, SURREY.

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They Last Longer

RADIOTORIAL

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All 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.

ECONOMY AND SHORT WAVES.

"SHORT-WAVE CONVERT" (Leamington, War.).—"I heard a short-wave set working round at a friend's house the other evening,

and I was fascinated by its extraordinary distance-getting properties. It was only a two-valver, and the American stations were coming through far, far better than I have ever managed on my own four-valver. I was so fascinated by the whole thing that I have decided to have a set of my own, but, unfortunately, I am strictly limited as to expenditure. With the amount that I am prepared to spend I am unable to buy both an H.F. choke and a good variable condenser. Left over from a previous set I have a good .0003 mfd. variable condenser with vernier, which I thought would do for the reaction circuit, but either I shall need to make my own H.F. choke or else I shall have to get a very cheap variable condenser for the aerial circuit. Which is my best plan—to buy a really good variable condenser and to make my own H.F. choke, or should I be wise in putting up with a little less expensive condenser and purchasing a really first class H.F. choke with the money so saved?"

We are glad that you raised this question, because you might have spoilt the whole set through choosing wrongly. For short-wave work it is absolutely

essential to use a first-class variable condenser for tuning your grid circuit. Furthermore, it is necessary to use a choke of low self-capacity, and as this latter need have only a comparatively small inductance it is quite possible to make a good H.F. choke for a few shillings. You can wind this choke with wire of fine gauge, say, 32 or 34 D.S.C. About an ounce will be required and its former can be an ordinary glass test tube, obtainable at any chemist's for a few pence. About 100 turns of the wire should be wound on the tube, and in order that each turn shall be separated from the next turn, a thread about the same thickness of the wire should be wound on at the same time. Each turn of wire will thus be separated from the next by a thread, and when the coil is finished the thread should be removed leaving a spaced winding. The test tube may easily be mounted by means of a cork on which the tube fits screwed on to the baseboard.

HAND CAPACITY WITH NEW CONDENSERS.

V. J. B. (Newcastle-on-Tyne).—"I have just fitted my three-valve set with a new variable condenser for tuning the H.F. transformer, and although it is geared and gives very fine tuning I am in great difficulty now with hand capacity, which formerly did not trouble me. What is the best method of overcoming this?"

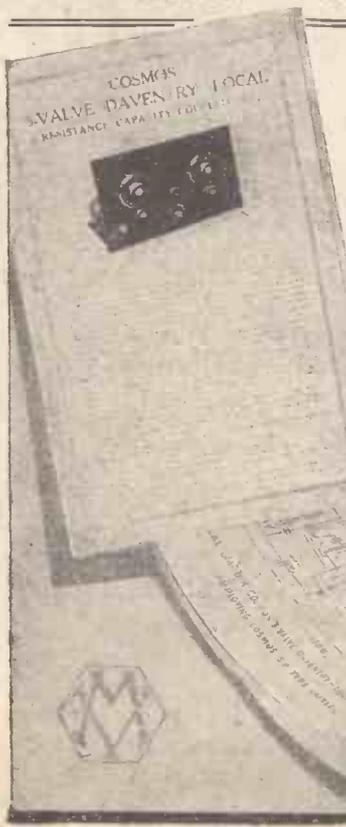
As the condenser which you had in use before did not give the trouble, we suspect that the fault lies in your method of connecting the new one. Try the effect of changing over the leads to this condenser, and this will probably remove the trouble. If it does not, examine the new wiring and see if any of these leads can be taken further away from the panel, so that when tuning the hand does not come so close to them. We should expect that you can cure the trouble in this way for evidently the circuit itself is all right, since it gave good results before you fitted the new condenser.

WIRE FOR H.F. TRANSFORMERS.

P. T. W. (Freshwater, I. of Wight).—"I should like to experiment with Litz wire for transformers, but I am told that it is almost impossible to make a good job of soldering this wire to the coil connections. Having made a

(Continued on page 622.)

Another Met-Vick Constructor Set



"Cosmos" (Met-Vick) 3-Valve Daventry-Local, Resistance Capacity Coupled Set for home construction

This is a neat, compact 3-Valve receiver, easy to build, low in cost, simple to operate, and excellent in performance.

It is fully described and illustrated in Booklet 7117/3 which contains complete instructions for building, a dimensioned drilling template, and wiring diagrams both pictorial and theoretical. The set embodies the New A.N.P. (Astatic, Non-Parasitic) Coils, "Cosmos" Detector Unit and the well-known "Cosmos" Coupling Units and Shortpath Valves.

Ask your dealer for this Booklet, or, if you prefer, Booklet 7117/2, which describes a similar set for working off the electric light mains:

METRO-VICK SUPPLIES LTD.,
155, Charing Cross Road,
LONDON, W.C.2.

£300 A YEAR FOR YOUR SPARE TIME!

Wonderful New Invention YOU can Make and Sell under My Patent!

REALLY, genuinely, you can make at home and in your spare time a sum of extra money up to £300 per year. The work is of fascinating interest. It will open up to you new ideas, new vistas of money-making; provide many of those luxuries and necessities which you have so long wished for, and give you occupation just at those hours



when time is apt to hang heavily on the hands.

Others are doing this by working my enormously successful patents. Why not you? It costs you nothing to write for full particulars, and you can then see for yourself exactly what you can do.

My patents are in very great demand in the field of wireless and electricity—so much so that

I GUARANTEE your profits, and further guarantee to protect you against any in-

fringement or interference with your market. Only one person in 50,000 of the population is allowed to manufacture under my Royal Letters Patent, in order to ensure unrestricted marketing. Let me hear from you NOW before somebody else is granted the licence and the extra income that can so easily become yours.

Simply forward the coupon below and by

return of post, I will send you every particular with which you may wish to be acquainted. It is those who seize opportunities who succeed. Take this opportunity NOW.

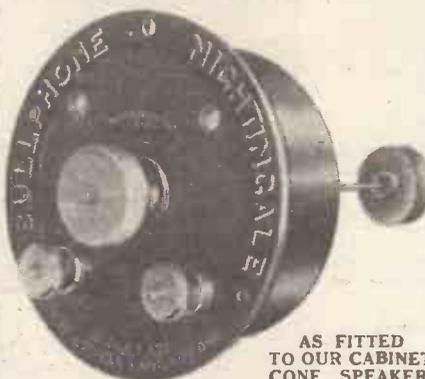
"MAKE-MONEY-AT-HOME" COUPON.

To THE ENGLAND-RICHARDS CO. 113, King's Lynn, Norfolk
 Sirs,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage.
 Print your name and address boldly in capital letters on a plain sheet of paper and pin this coupon to it.
 "Popular Wireless," Nov. 19th, 1927.

MAKE YOUR OWN CONE SPEAKER

with the New Wonder NIGHTINGALE Balanced Armature CONE UNIT

15/- EACH



AS FITTED TO OUR CABINET CONE SPEAKER.

WONDERFUL RESULTS ARE GUARANTEED. There is no Loud Speaker yet made that can equal this Unit with your home-made Cone. **YOU'LL BE SURPRISED**

From a 3 ply board, 24 square cut out a 12 1/2" circle, then cut a strip of wood 16 1/2" x 5/8" and



make a hole 2 1/2" in centre. This will carry the unit. Fix strip to board as shown.

Double paper cone, with tissue paper edge for easy fitting, as fitted to



our own loud speakers, 2/- each

BULLPHONE DOUBLE PAPER CONE

Post 2/- extra.

TRADERS are invited to use this unit for the finest of all Demonstration Speakers.

You must have a precision instrument



for sharp tuning

Modern radio circuits call for critical tuning—critical tuning demands precision condensers—precision condensers means Pyc condensers for accuracy and reliability. Pyc Precision condensers are scientific instruments made one at a time with great care. You need them to get the best from your set.

PRICES — '0001, '0002, '0003, Mid. 17/6 each. '0005 Mid. 18/6 " '00075 Mid. 22/6 "



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 "Granta Works," Montague Rd.,
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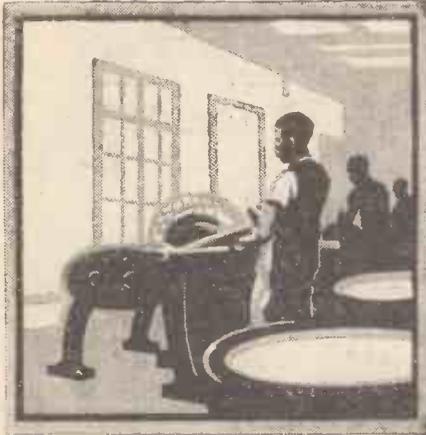
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3. From milky sap to pliable rubber.

NOW we know no more the milky fluid collected by the native in the plantation. It has set, junket-like, in the tanks. Now it is removed in slabs and put through powerful roller machines to express the impure serum.

It is only the purest of the long, thin sheets which result that are selected for the manufacture of Resiston Panels. The slightest flaw—and it will never become Resiston.

Look at a Resiston Panel. Examine it closely. Not the slightest impediment will you find, marring its beautiful surface. Nowhere a flaw to be seen prejudicing its great strength. For every Resiston Panel is as near perfect as it is possible to make it. In insulation. In colour permanence. In dielectric constant. Fit Resiston to your Set and know that your panel is right. Ask your Dealer—he knows.

Q Resiston Panels come in 13 stock sizes in black and Mahogany-grained. From 6 in. x 9 in. in black, 3/5 to 8 in. x 30 in. Mahogany-grained 19/.

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"24 hours Cut Panel Service"

Adv. American Hard Rubber Co., Ltd., 12c, Fore St. E.C.

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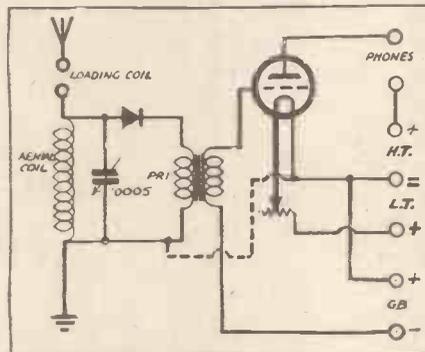
RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 620.)

dozen or more sets from 'P.W.' I have attained quite a considerable skill in soldering, so I should like to try my luck with the Litz, unless you think the satisfactory making of a coil with such wire is a hopeless job, except for the expert?"

We think that in view of your experience in the past you would be able to make quite a success of the Litz wire soldering. The reason that Litz has given such unsatisfactory results in the past is that for a long time the only kind of Litz on sale for wireless purposes was that with enamel for insulation. As the wire is very fine and the enamel has to be removed before soldering, it is very difficult to make a success of the task using this wire. But now it is possible to buy silk covered Litz, and if great care is used it is not at all difficult to strip the silk from each strand of the wire and then to tin and solder the wires in turn.

WHAT IS WRONG?



The above diagram is supposed to represent the connections of a crystal set and low-frequency amplifier, for receiving 5 X X or the local station; but it is wrong, and the set would not work properly.

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week, and the series will work up from a simple crystal set to multi-valves.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about radio circuits.

It is most important that not one strand of the wire should be broken, otherwise the efficiency of the coil will suffer considerably.

THE REACTION CONDENSER.

W. N. (Leatherhead, Surrey).—"I am getting the components together to build up the 'Standard' two-valve set described in POPULAR WIRELESS Blue Print No. 31. Would it be possible for me to use a .00025 mfd. variable condenser for reaction instead of the .0002 mfd given in the list of components?"

Yes, in the circumstances there is no reason why you should not use the .00025 mfd. Instead of the .0002 mfd. The only difference in operation will be that you will require a slightly smaller coil for reaction than would otherwise be the case."

AN ACCUMULATOR MISHAP.

B. J. (London, E.11).—"Can you tell me what is wrong with my accumulator? I can get no satisfaction from the people who charge it, and as I rather think that they have spoilt it, I shall be glad of your opinion. It is a 6-volt 30-actual capacity, of the type which is made up in three separate 2-volt units. As I sometimes use 2-volt valves, I frequently disconnect the straps between the

separate cells and use only one unit at a time, or two of them in parallel. This had been done the last time I used it, so that the last time it was taken to the shop it is quite likely that the cells were not connected together. When I collected the accumulator they told me that the connecting straps had not been brought with it, so I took it home in separate units, and started to connect it up there. It happened that I was again using 2-volt valves, so I started to connect the different cells up in parallel, but when I connected the positive of one cell to the positive of the next a heavy spark occurred, so I took the connecting bar off again. A moment's further thought convinced me that no spark should have occurred when two cells of the same polarity were connected together, so I thought I must have been mistaken, and tried to connect the negative of the first cell to the negative of the next. This time there was no doubt whatever. A large spark took place directly the two negatives were connected together. The spark is so big that I am certain it is quite unwise to connect the two together, and I am wondering whatever can be the cause of it, and what I shall do to overcome the difficulty?"

From your description we are afraid that the cell has been charged backwards. That is to say, that its polarity has been reversed by careless charging. Probably what happened was that when charging the central cell was turned round so that its negative was placed where its positive should have been. The consequence was that when the heavy charging current passed through the three cells the centre one which was connected wrongly was rapidly discharged, and then charged in the opposite direction by the current which continued to flow. Consequently, the pole of it, which should be positive and which is marked positive, is probably much more negative than the other pole. We should take it back to the charging shop, explain, and if necessary demonstrate what happens when two cells are connected in parallel, and ask the dealer if he will make good the damage?

A LONG RANGE SET FOR WEST AFRICA.

R. E. (Hford).—"I have taken up a position with a bank in West Africa, and as I shall be a long way from home I should like to take a wireless set out to hear some news of the old country occasionally. I understand that I shall have no difficulty in getting a good supply of electricity out there, but I should like to take out the simplest set possible as I am not very skilled in the use of wireless apparatus. What sort of set do you recommend?"

For use in such circumstances there is certainly nothing so good as a short-wave receiver. With a set of this kind only two valves are necessary and yet extraordinary distances are covered, and you should be able to receive America, and the Dutch concerts from P.C.J.J., as well as concerts from the old country. At the present time the B.B.C. is erecting a short-wave experimental transmitting station at Chelmsford, and probably tests from this station will be heard before the end of this year. In the meantime very good programmes are being sent out by Mr. Gerald Marcuse from his station at Caterham, Surrey, 2 N.M., and we believe he has already been picked up with great success in West Africa as well as in Australia, New Zealand, South Africa and other distant parts. Simple short-wave receiving sets are already on the market, or if you would prefer to make your own you can choose from the variety which from time to time have been described in POPULAR WIRELESS, "Modern Wireless," or "The Wireless Constructor."

A SHARP TUNING CRYSTAL SET.

F. W. (Watford).—"I am going to make a crystal set for a lady who lives at St. Albans, but she tells me that crystal sets in that neighbourhood are not generally successful, because very often the programmes from London and the programmes from Daventry can both be heard at the same time. Surely this is not an insuperable difficulty, and I should be very glad of particulars of a good set that will get either programme at will."

You will find details of a suitable and easily constructed set on the "P.W." Blue Print No. 33. This little receiver is quite easy to make, and the tuning is so sharp that the set has been called The "Knife-edge" Crystal Set. As there is quite a big difference between the wave-length of London

(Continued on page 624.)



Judged by results

THE B.T.H. Nickel Filament Valve has a longer filament and a greater emission than any other 2-volt valve

As a result, the new valve gives better performance for a longer period.

This new valve offers the line of least resistance to good reception. It detects without loss and amplifies without distortion. It is the very ace of valves.

Whatever 2-volt valves you may be using at present, you can be sure of improved results by changing over to B.T.H. Nickel Filament Valves. You need not take our word for it. Try them yourself. You will be amazed at the improvement in volume and quality.

Judged by results B.T.H. Nickel Filament Valves are superior to all other 2-volt valves.

B. 210H

R.C. and H.F.

Fil. Volts... 2
Fil. Amps 0.10
Max H.T. V. 150

10s. 6d.

B. 210L

General Purpose

Fil. Volts... 2
Fil. Amps 0.10
Max H.T. V. 120

10s. 6d.

B. 215P

Power Amplifying

Fil. Volts... 2
Fil. Amps 0.15
Max H.T. V. 120

12s. 6d.

The above prices are applicable in Gt. Britain and N. Ire. and only.



VALVES

NICKEL FILAMENT

Made at Rugby in the Mazda Lamp Works
The British Thomson Houston Co., Ltd

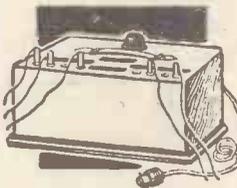
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HIGH TENSION BATTERY ELIMINATORS

The convenience of obtaining HIGH TENSION SUPPLY STRAIGHT OFF THE MAINS, where electric light is available, has created a wide demand for High Tension Battery Eliminators

The Efesca Junior (illustrated), for direct current, incorporates a feature not usually found in low-priced instruments in the provision of Grid Bias, which not only clarifies reception, but suppresses the commutator noises from the generating station usually experienced. It is guaranteed to give satisfactory results when used with sets employing up to **35/-** three valves.



MODEL NO. 1

Dimensions, 12 by 7 by 4 1/2 in. Direct Current suitable for up to five valves.

Contained in polished oak case, with three positive tapping— one variable 40 to 75 volts, for H.F. and detector valves, and

two fixed at 90 and 120 volts, for L.F. and power valves, incorporating negative grid bias tapplings at 2, 4, 6, and 8 volts.

Price £4 10s.



EFESCA
ALL WAVE
REGENERATIVE
AERIAL
TUNER
25/- EACH

EFESCA
VARIFORM L.F.
TRANSFORMER
WITH FOUR
INTERCHANGEABLE
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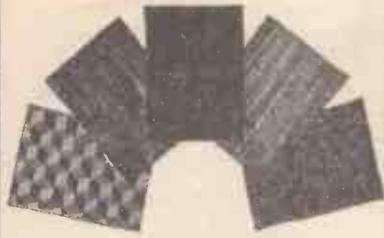
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Write for complete Catalogue of Efesca Components.

FALK, STADELMANN & CO., LTD.,
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TROLITE

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PRICES, per square inch :

	Mahogany	Cube
Polished Black	Walnut	Wavy
6 in. .. 3d.	6 in. .. 3d.	
4 in. .. 2d.	4 in. .. 1d.	

Ask your dealer to show you samples of Trolite. If you have any difficulty in obtaining, write direct to the makers and send the name of your nearest Radio Store.

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 Manchester Office: 185, Princess Street :
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RADIOTORIAL QUESTIONS AND ANSWERS

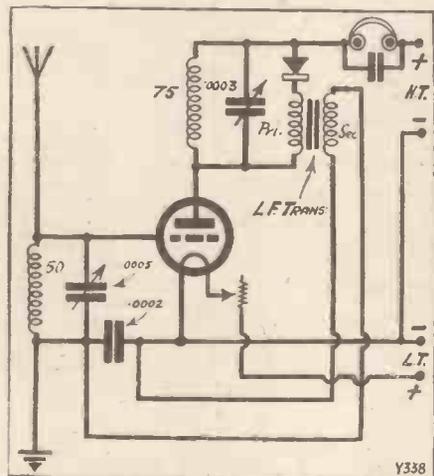
(Continued from page 622.)

and the wave-length of the Daventry station (5 G B) it will be quite easy to separate the two programmes with a sharp-tuning receiver of this description.

SPARKING IN H.T. BATTERY ELIMINATOR.

D. J. (Wimbledon, S.W.19).—"When I bought this house, some months ago, I took over with it an H.T. battery eliminator of rather unusual type, which had been used previously by the man who was living here. It consists of rectifying cells containing lead and tantalum, and it has been giving a perfect H.T. supply until recently, when I bought a large super-power valve to replace one of the ordinary power type. Since then there seems to be a tendency for sparking, and the liquid in the cells sprays about a little. (As the liquid there appears to be pure

A ONE-VALVE REFLEX SET.



The correct connections for a one-valve reflex set, with parallel aerial tuning, are given above.

In the "What is Wrong?" diagram last week the crystal detector was shown connected across the anode coil, with the low-frequency transformer primary in series with the anode condenser. Another serious fault was the connecting of the aerial tuning condenser to filament side, instead of to the earthed side, of the '0002 condenser with its leads from the low-frequency transformer secondary.

sulphuric acid this is very undesirable!) Is there any simple way of overcoming the difficulty?"

In such cases a satisfactory cure can generally be obtained by the use of refined paraffin as used for medicine. A little of this should be inserted into each cell so that it floats upon the top of the liquid in a layer about half an inch thick, and this generally stops sparking and spraying.

LOUD-SPEAKER RESONANCE.

"LOUDSPEAKER" (London).—"I have discovered a fault in my loud speaker which cannot be attributed to either its makers or to the receiver, and having seen no mention of a similar experience in POPULAR WIRELESS, I should like to bring the matter to the notice of others. My loud speaker is a horn type of well-known make. The trouble is that when a certain note is played or sung it comes through very harsh and tinny. This is particularly noticeable when the note is sung by a soprano or played by a wood-wind instrument. I have ascertained

(Continued on page 626.)

DIX-ONEMETERS

are the best Bargain ever offered to Radio users. £10 worth of precision, Multi-range Mirror scale, Jewelled knife-edge Instrument for 55/-



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ELECTRADIX RADIOS for Everything

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THE PERFECT WET H.T.

Assured with our new Insulating Liner, Jars, 1/3 doz. plain; 1/6 doz. waxed; Special Zincs, 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 Earrs, Telephones and Loud Speakers re-wound.

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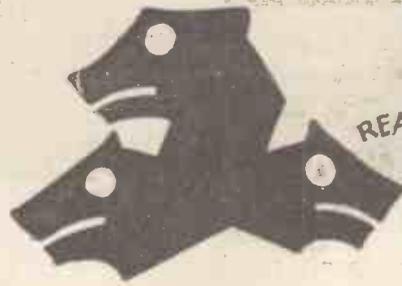
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Prices: Tested on 750 volts D.C.
equal to 500 volts A.C.

1 mfd., 3/- 2 mfd., 4/- 4 mfd., 6/9

Inquire for prices of Condensers tested at 1,000, 2,000, 3,000 and 6,000 volts D.C.

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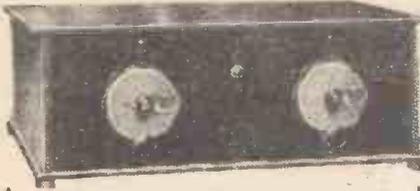
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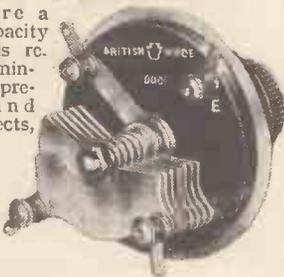
- Red Triangle Panel, Polished s. d.
- Matt back, 21 x 7 x 1/4. Drilled free 9 6
- Red Triangle Terminal Strip, 21 x 1 1/2 x 1/4, Drilled Free. - 2 3
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Everything from stock.

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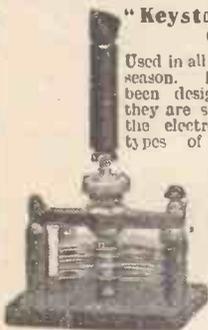
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**RADIOTORIAL
QUESTIONS AND ANSWERS**

(Continued from page 624.)

that the trouble occurs on this note only, viz. top F sharp. The horn of the loud speaker is ebonite and the flare is of metal, so that the cause appears to be that the flare conducting the note F sharp vibrates when the note is sounded by either soprano or woodwind. Other voices or instruments do not give the same effect. I have found that gripping the flare with the thumb and finger prevents the vibration, and a small spring clip permanently fixed on a rib of the flare

**"P.W." TECHNICAL
QUERY DEPARTMENT**

Is Your Set "Going Good"?

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

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

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

prevents any recurrence of the trouble. Do other loud speakers suffer from the same trouble?"

You have undoubtedly diagnosed the trouble correctly, the fault being resonance. A great deal of the tinny sound which one hears from small metal loud speakers is due, undoubtedly, to their tendency to vibrate at their own frequency. To overcome this difficulty the Rice-Kellogg and similar types of loud speakers have been developed. Such instruments have practically no "natural" resonance at all, and consequently there is no tendency for them to vibrate, and they give a perfectly faithful reproduction of the music or speech fed to them from the output of the receiver.

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D.24	2	.1	Power	9 6
D.42	4	.06	G.P.	7 6
D.44	4	.25	Power	9 6
D.45	4	.25	Super Power	11 6
D.62	6	.1	G.P.	7 6
D.64	6	.3	Power	9 6
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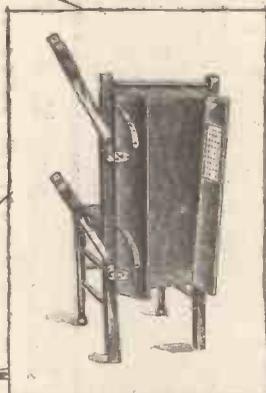
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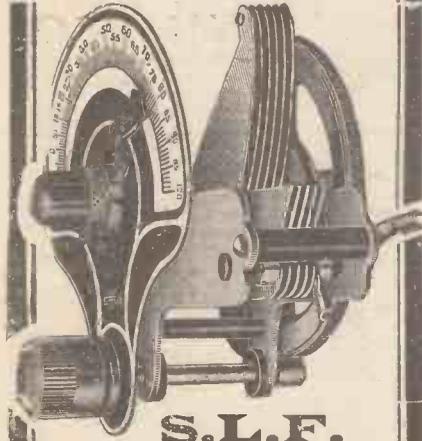
- | P.W. BLUE PRINT
Number | P.W. BLUE PRINT
Number |
|--|--|
| 1. DETECTOR VALVE WITH REACTION. | 16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (with Switch for Last Valve). |
| 2. UNIDYNE DETECTOR VALVE WITH REACTION. | 17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (with Switching). |
| 3. 1-VALVE L.F. AMPLIFIER. | 18. 1-VALVE REFLEX AND CRYSTAL DETECTOR with 1-VALVE L.F. AMPLIFIER, Controlled by Switch. |
| 4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER. | 19. H.F. DETECTOR AND L.F. (with Switch to Cut Out the Last Valve). |
| 5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION. | 21. THE 2-VALVE LODGE "N." |
| 6. H.F. AND CRYSTAL (Transformer Coupled, without Reaction). | 22. "THE GUARANTEED REFLEX." |
| 7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode). | 23. THE 1-VALVE "CHITOS." |
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| 10. H.F. AND DETECTOR (Transformer Coupled, with Reaction). | 26. A "STRAIGHT" 4-VALVER (H.F., Det., and 2 L.F. with Switching). |
| 11. DETECTOR AND L.F. (with Switch to Cut Out L.F. Valve). | 27. A "MODERN WIRELESS" 4-VALVER (2 H.F., Det., and L.F.). |
| 12. DETECTOR AND L.F. UNIDYNE (with Switch to Cut Out L.F. Valve). | 28. A "MODERN WIRELESS" 5-VALVER (H.F., Det., and 3 L.F.). |
| 13. 2-VALVE REFLEX (Employing Valve Detector). | |
| 14. 2-VALVE L.F. AMPLIFIER (Transformer Coupled, with Switch to Cut Out Last Valve). | |
| 15. 2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled, with Switch for Cutting Out Last Valve). | |

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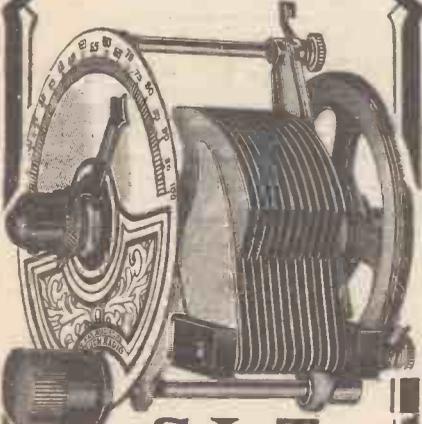
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OPERATING THE "SYDNEY" TWO.

THE first point to consider when we come to the working of the set is obviously the type of detector valve to use (the second valve can be any L.F. or small power type). What is wanted is a valve of a freely oscillating type which is also a good detector, and the modern special H.F. valves will be found to satisfy these requirements very well for the most part. Here are a few examples: P.M.5X., B.4H., D.E.L.610, Cossor 610H.F., S.S.6075H.F., etc.

H.T. Adjustment.

The H.T. voltage on the detector must be adjusted by trial, and will be found in most cases to be rather higher than one is used to on the broadcast band. This is because there are usually several patches on the tuning range of a short-wave where it is a little difficult to get enough reaction, and a fair amount of H.T. is needed to overcome the trouble. Further, of course, the H.T. and L.T. must be adjusted to give smooth reaction effects, and in this you will find the potentiometer on the base-board very useful. This is a special feature of the "Sydney" Two, and is a great help in getting rid of the annoying trouble called "threshold howl," which afflicts so many short-wave sets. It takes the form of a nasty little squawk just as the set goes into oscillation, and makes it a very difficult and ear-aching business to get the receiver adjusted to the proper point on the verge of oscillation (for telephony reception, of course).

Searching.

Once the detector valve is functioning properly there is little to do except to re-voice the tuning dial very carefully and slowly, keeping the set just oscillating with the reaction condenser, until you pick up a carrier wave. Then bring back the reaction until oscillation just dies out, very carefully and delicately re-adjusting the tuning all the while. A little practice will be needed in handling these controls, and in learning to allow for the slight hand-capacity effects which are almost inevitable on the shorter waves. By the way, if you find body-capacity really very troublesome (this may occur with some pairs of 'phones) connect up a fixed condenser of .001 mfd. across the 'phone terminals.

The only other operating point concerns the aerial tap, and this again must be adjusted by trial on each station picked up. As a general guide it may be stated that on stations coming on the upper half of the condenser dial the tap will be somewhere near the middle of the coil, while for those near the lower end of the scale it should be only about two or three turns from the right-hand end. With these adjustments and the particular type of tuning condenser and vernier dial mentioned in the list of components, K D K A should be then found between 60 and 70 degrees on the dial, and Sydney between 10 and 20 degrees, assuming an aerial of medium size. For K D K A the "grid" clip will be on the left hand end of the coil, and for Sydney on the fifth turn from the right.

DEAD SILENT!!!



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New Process

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Even if you need them to carry 10 milliampères we positively guarantee these new Anode Resistances to be absolutely silent, fieldless and

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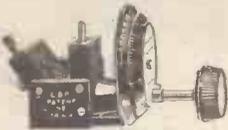
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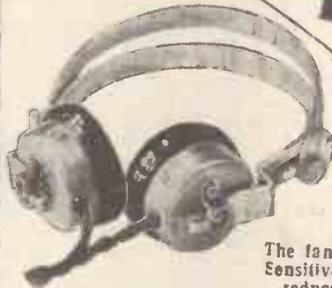


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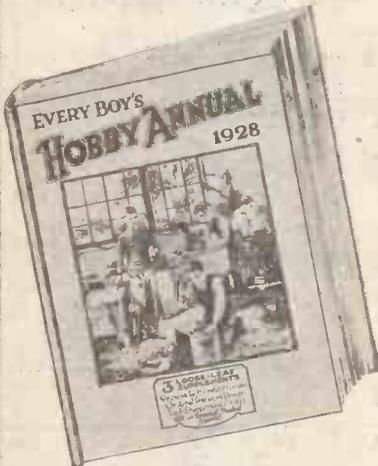
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These wonderful instruments incorporate all 1928 improvements, and are the finest sets money can buy.

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.

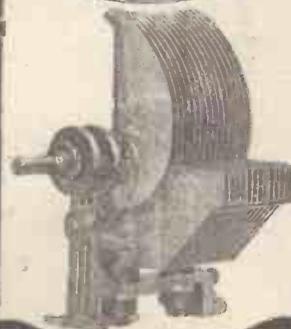
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"The best possible materials for the best possible receivers," is the motto of the experts who design the sets published in the famous P.M. publication, "Radio for the Million." Therefore, the fact that they have specified Junit Self-Soldering Wire for ALL the circuits in the Autumn Double Number, proves beyond doubt that they consider Junit the really ideal wire for internal connections.

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Junit Self-Soldering wire is sold in attractive packets, each containing five two-foot straight lengths.

Price 1/- Per Packet.

If you cannot obtain it at your dealer's write direct to us.

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**SHORT-WAVE
NOTES.**

By W. L. S.

NEW broadcasting stations seem to be arriving on the shorter wave-lengths almost daily at this time of year, and there really are an astonishingly large number of them to be heard. KDKA has started an irregular sort of transmission on about 42 metres—whether it is to be permanent or not is not yet known. This particular transmission is very strong indeed at times, although from the way in which it varies one would conclude that it is still in the experimental stage. 2FC at Sydney is now rather stronger than he was a fortnight ago, although the B.B.C. still do not seem to have much luck with their relay of this station. Several readers report hearing him on the loud speaker with two valves and at good headphone strength with one. 2XAD on 22 metres is a rather more severe test of a receiver, but he seems to have been receiving his full share of attention. The only remaining attractions are 2XAF (still the star turn of U.S.A.) and the "mystery stations" 2XG and 2XXA, who are continually giving out word tests. These two stations, curiously enough, can usually be heard on about 33 metres as early as 9 p.m., although 2XAF, who is just as strong in the usual way, is quite faint at this hour.

Eliminating the "Fade-Out."

Amateur work is still very lively indeed in Europe, although conditions for transatlantic work still do not seem to be as good as they were at this time last year. Several London stations report working with Americans on powers of the order of ten watts, but nothing is done with smaller inputs than this.

From the results achieved by some amateurs using the 45-metre wave it appears that, by intelligent planning of the aerial and its coupling inductance, adjustments may be arrived at whereby the evening "fade-out" may be eliminated altogether. The writer finds that one particular degree of coupling gives much stronger signals in Denmark than in France at any given time of day, while these results may be reversed by altering the aerial circuit. The ideal arrangement would, of course, be one which would allow the operator to put strong signals into any particular country just by altering the tuning or coupling of his aerial circuit—he would then cause no interference except in the particular country to which he was transmitting, and would, moreover, be fairly certain of receiving a reply from that country. There is a vast field open for experiment in this direction.

Underground aerials do not seem, to the writer's mind, to be receiving their full share of attention. Two or three receiving stations use them and report great freedom from atmospheric, but very little has been done with transmission. Probably a strong directional effect would prove one of the worst handicaps, but there should be some way of overcoming this. An aerial about 100 feet long and only two feet or so in height is, of course, very directional, and very useful for reception from its own particular direction.

**Let your eyes
guide your choice!**

IT is quite safe to allow your eyes to guide you to choose COLUMBIA Radio Batteries:

Because the materials employed are as good, and the internal construction is as thorough, as their external appearance is attractive.

It is when exceptionally heavy drains are made on Columbia Batteries that their exceptional efficiency is demonstrated!

Take for instance the beautifully finished Columbia 'Layerbilt.' There is no other Battery but this which will maintain its voltage for any time in the face of a couple of LS5s! And at a mere 15/20 m/a drain its life service is correspondingly remarkable.

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CENTRE-TAPPED COILS
not only give the best results, but are limited in use, as they can be employed in any circuit, centre-tapped or otherwise.
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There is a Gambrell Coil Holder specially designed for use with above coils which does away with all flexible leads.
Price 1/9 each.
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SCRAP your old crystal now and put new life, new power, and new tone into your set. Results will astonish you. From your dealer or direct, post free, from Dept. P., **RUSSELL LABS. 138, Suffolk St., Birmingham.** World Distributors.
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TECHNICAL NOTES.

(Continued from page 598.)

and along the other surface, even though the path is considerably longer.

Capacity Jumping.

If two strips of metal have each an end turned over at right angles, and these two turned-over pieces are butted together and bolted so as to form a continuous strip, the high-frequency current tries to jump the joint by capacity rather than to follow round the joint, as direct current would do.

There are many other very interesting observations in the paper referred to, and this should certainly be consulted by experimenters who are interested in the design of high-frequency apparatus. Some important conclusions are also given, bearing upon the design of coils and condensers for high-frequency work.

Television.

Television, or the transmission of "movies" by wireless, seems to be attracting more and more attention in different parts of the world, and I have heard recently of at least three new processes. One is that of the American Telephone and Telegraph Company and is the invention of Dr. H. E. Ives and Dr. F. Gray, of the Bell Telephone Laboratories.

The "scene" which is to be transmitted is split up automatically into a large number of separate units, each unit corresponding to a small section of the scene, after the fashion of the little blocks of a toy picture puzzle.

A spot of very intense light is made to travel rapidly over these sections in succession, and the amount of light which is reflected depends, of course, upon the lightness or darkness or colour of the different sections.

This reflected light is then received upon a photo-electric or light-sensitive cell, which converts the light-energy into electrical energy for operating a wireless signal.

Photo Cells.

At the receiving end the electric signal, which corresponds in strength with the brightness of the spot on the "scene" which is being illuminated, is transformed back into light by means of a discharge lamp in a manner which is already known. The brightness of the glow in the neon gas of the lamp varies in accordance with the strength of the received electric signals.

One of the most important features of this new process is the use of special large photo-electric cells, which are the invention of Dr. Ives. Three cells are employed, contained in glass cylinders about 3 in. in diameter and about 15 in. in length. Owing to the great light-collecting power of these giant photo-electric cells, the illuminated spot of the scene (the "scene" may consist of a sitter's face) may travel very quickly, thus permitting the transmission of a picture with considerable detail and still at a high speed.

45,000 Signals per Second.

The sending and receiving apparatus each include an electric motor, these two electric motors being operated in perfect synchronism. In a demonstration between Washington and New York, Mr. Hoover

(Continued on next page.)



COMPONENTS OF QUALITY

In Radio, Benjamin have the honour of setting the standard for five types of components. They represent the culmination of many years' experimental work and the attainment of the highest degree of efficiency. They are classics.

1.—The Benjamin Anti-microphonic Valve-holder

No other anti-microphonic valve-holder so efficiently disperses microphonic noises and absorbs shock so thoroughly as the Benjamin. Nearly 1,000,000 manufactured and sold to date. Price **2/-**

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5.—The Benjamin Battery Eliminator. The Majestic—for alternating current 200-240 v. 50 cycles. Delivers current for loads up to 12 valves, 180 volts for power valve. Two variable voltage controls ensure fine tone quality. A really dry eliminator unit—no acid or liquids, and no hum. Price **£7 15s.**

BENJAMIN

THE BENJAMIN ELECTRIC LTD.

Brantwood Works, Tottenham,

London, N.17.

TECHNICAL NOTES.

(Continued from previous page.)

acted as sifter, and the screen was divided into 2,500 separate units. The entire face was covered by the exploring light-spot eighteen times per second, making altogether 45,000 separate impulses which had to be sent and received each second.

The synchronism of the two motors was accurate to about 1-100,000th of a second.

It is claimed that this process is the most successful which has yet been demonstrated by anyone, owing largely to the great rapidity with which the complete picture may be repeated.

Multi-Impedance Loud Speaker.

Visitors to the recent Radio Exhibition will have noticed the new Mullard P.M. loud speaker, which has some noteworthy and very advantageous features. One of these is that it provides three different impedances, and so the usual objection that the impedance of the loud speaker renders it unsuited to the output valve of the low-frequency amplifier is overcome. The P.M. loud speaker has the further important advantage that its polarity is reversible, and the damage to the loud speaker, which so often arises from reversed polarity, cannot occur with this speaker. The "movement" of this loud speaker employs a balanced armature which drives a free edged cone.

FEED IT WITH
DAIMON

D.E.

Dull emitters thrive on Daimon Dry Batteries. They're quieter in their work, steadier and louder. Besides, there is no bother of recharging accumulators. Put your Dull Emitters on Daimon.

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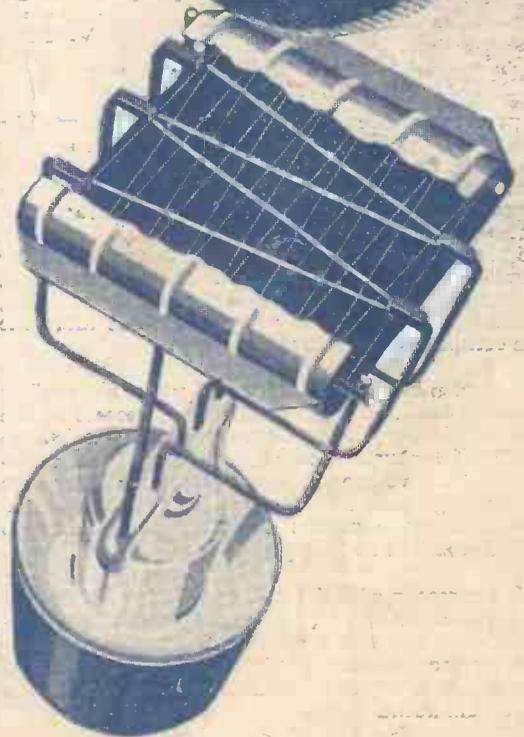
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