

BUILD THE "TRAVELLER'S" THREE (See Page 741.)

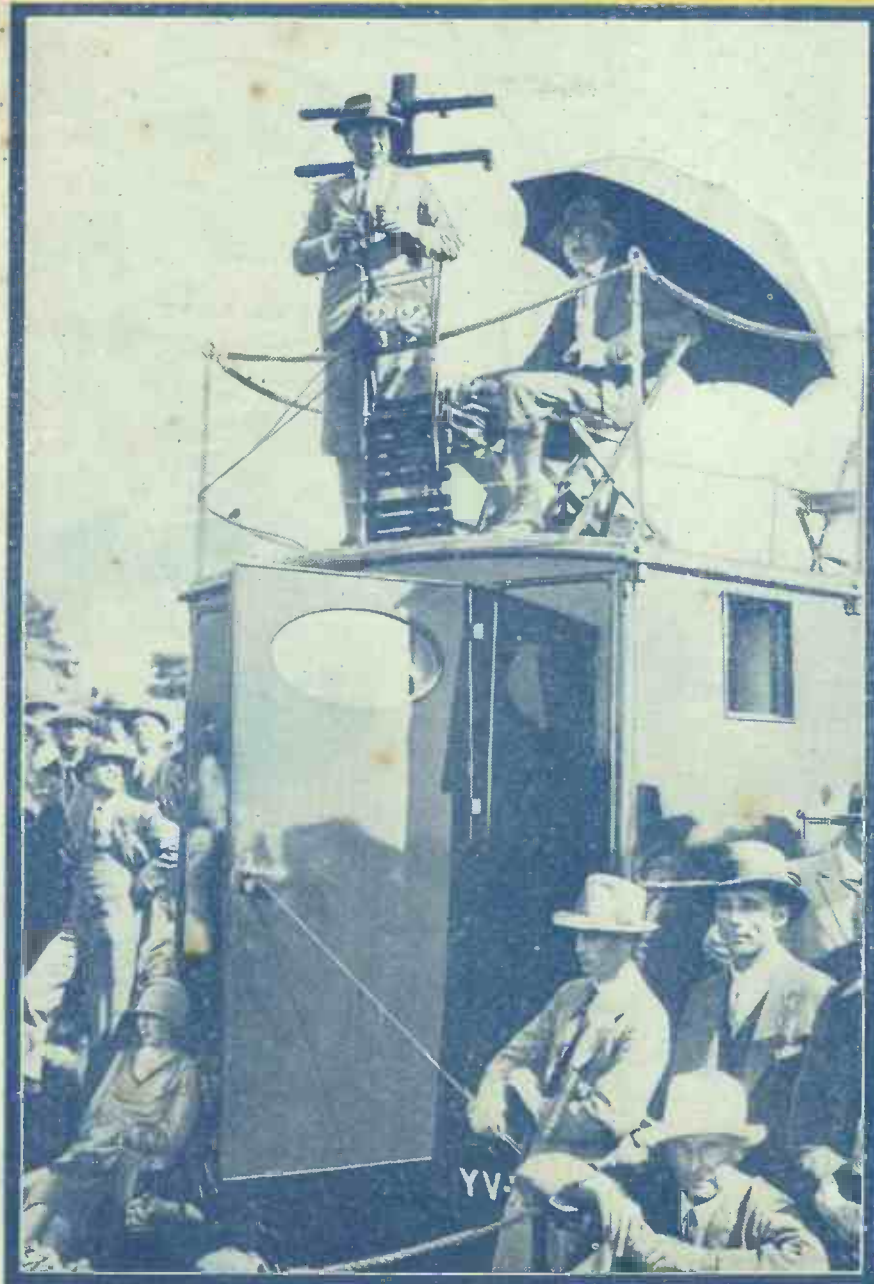
Popular Wireless

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INCORPORATING "WIRELESS"

August 4th, 1928.



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ECONOMISER

WORK AT 2 D A

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CONE

DAYLIGHT
TELEVISION

THE "SCEPTIC'S"
SPREE

THE PROGRAMME
STRAFE

BROADCAST
EDUCATION ON
TRIAL

etc., etc., etc.

Some few weeks ago "Popular Wireless" gave exclusive details concerning the B.B.C.'s "Hush-Hush" van. This is a mobile studio, the top of which forms a comfortable and safe stand giving broadcast commentators a clear view of the sporting event they are describing. Our cover photo shows this wonderful new van in action at the recent Bisley meeting.

COSSOR for DISTANCE



COSSOR Valves bring in distant stations with amazing ease and volume. They bring you melody from seven countries on the famous Cossor "Melody Maker" — strong, clear music which delights the ear. Add more stations to your log and make a big improvement to your Set. Use Cossor Valves.

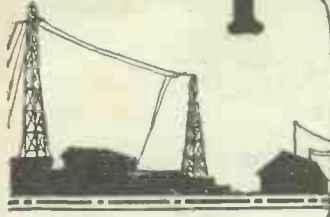


COSSOR VALVES improve any Set

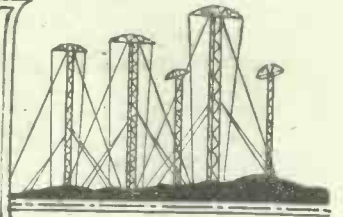
Get this Book FREE!
Please send me a copy of your 48-page Book "How to get the best from your Cossor 'Melody Maker'."

Name: _____
Address: _____
P.W. 4/10/23

Popular Wireless



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RADIO NOTES AND NEWS.

Home-made X's—Nature's Broadcast—B.B.C.'s Latest Brick—Sceptics Cured Daily—Radio and Wedlock—Safety First—New W G Y Schedule.

Radio Al Fresco.

SET-makers have been to enormous trouble to tickle the public's fancy with portables, and some of the models now available are worthy of very high appreciation. A portable set of not less than five valves, with a loop antenna, is really a handy thing. You can use it in any room—and that is fine for invalids. You can take it to a friend's; to Wigan; to the club; on the car; in the garden. No need to sing in the bath—the portable set will do it for you.

Home-Made X's.

ANYBODY else noticed this? My neighbour tells me that he has been suffering from an exaggerated type of "atmospheric," particularly noticeable during the hot, dry spell in July. The phenomenon was like a continuous discharge. But on comparing notes—for I also had been driven almost mad with the row—we found that when he turned off his lawn sprinkler the noise abated. This is probably some variant of the well-known "squall" effect; electrified rain discharging.

Nature's Broadcast.

TALKING of X's, which I am afraid will be much to the fore this month, I wonder whether readers recollect that research into the origin of these pests brought to light the fact that the most prolific source of them, so far as Great Britain is concerned, is West Africa. It seems bad management on somebody's part that a storm on the Gold Coast can spoil a programme in London, doesn't it? The B.B.C. again!

How Does the Sea Look?

NO doubt thousands of "P.W." readers are now basking in the sun by the sea. Heave a thought in the direction of the toilers of Tallis House, please! And a good time to you all. Give the kids a double ice-cornet each and ask them to suck Ariel's health, for once I also did the heavy but benevolent father in the deck-chair, and dispensed coppers to clamorous kiddies. One thing the B.B.C. overlooked in the days of its "stunt" seaside broadcasts, was the plaintive piping of puerile voices for pennies.

Statistical Note.

JUST to keep us all *au courant* with B.B.C. affairs I will record the following. Paid licences at June 30th, 2,506,300; free licences for the blind, 12,772; a total of 2,519,072, being an increase of 211,394 since June 30th last year. Healthy, what? But the 12½ per cent of the fees which is raked off by the Post Office for the cost of collection is a crying scandal. Just work it out and consider whether the collection should—or does—cost that huge sum.

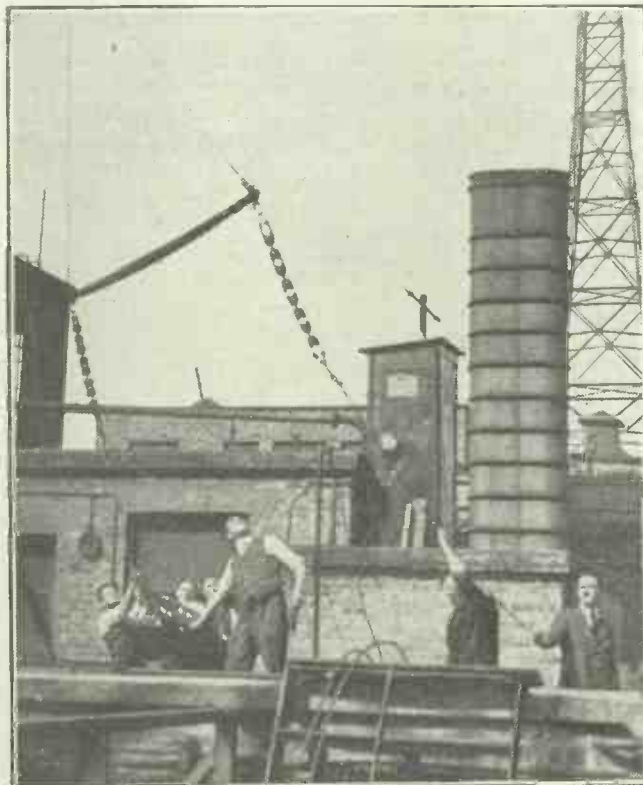
Mr. Maxton and Beer.

WHAT a terrible juxtaposition! Our interesting young contemporary, the "Irish Radio News," referring to the first controversial broadcast debate, said that it took place between Mr. Maxton and Sir Ernest Beer. Now, Sir Ernest Benn, who is a most genial individualist, would probably be immensely tickled about this, but I myself am saddened. The "I.R. News" ought to have said: "Sir Herbal Beer and Mr. Clerk Maxwell." A lost opportunity.

The B.B.C.'s Latest Brick.

IN allowing a reference to vegetarians as "maniacs" to pass the censor the B.B.C. dropped an unusually weighty brick—especially in this hot weather, when lettuces and lemons are the uncrowned kings of our dietary. A man can be a vegetarian and not be a crank, but that man cannot but be a crank who includes chamber music in a programme which is intended to divert 2,519,072 citizens of the United Kingdom. Even Ariel is a vegetarian—in theory. But he loves vegs. so much that he cannot bear to feed only upon them. It doesn't seem fair, somehow.

TRY TAKING 2 L O's TIP!



How long ago was it that you overhauled your aerial? The B.B.C. believes in frequent cleaning and renewing, and this photograph shows engineers and workmen taking down 2 L O's aerial for one of its periodic inspections. So as not to interfere with broadcasting in any way the job was undertaken early one Sunday morning. Why not get your aerial ready for the winter this week-end or next?

The Menin Gate.

THE British Legion pilgrimage to the sacred Menin Gate (through which flowed such a priceless stream of British manhood) is

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

to be broadcast from 2 L O and other stations on August 8th. The last broadcast from "The Gate" was excellent, and there is no reason to suppose that the B.B.C. engineers (who are not cranks, with temperaments) will fail us. Let us doff our hats and tune in, as skilfully as we know.

The Complete Listener.

THIS would be a good idea for the snappiest thing (in a small way) I have seen in radio "literature" for a long time.

Cossor's have issued a booklet, three by five, 48 pages plus a blank "log" for condenser readings of various stations. The idea behind this is, of course, to induce you to try their well-known "Melody-Maker" set—and you might do worse. But in the process of doing that they have managed to produce a fine little handbook for the listener.

Condensed Hints.

HERE are a few of the subjects treated in this booklet. (I have seen worse sold for a shilling or more.) Aerials, earths, and lead-in. Battery connections. Operation of the set, with a handy chart showing approximate condenser settings for many stations. Set maintenance. Care of accumulators. H.T. batteries. Grid-bias battery. Valve "Don'ts." Questions and answers (16 pages). You can get a copy by sending a card to Publicity Dept., A. C. Cossor, Ltd., Highbury Grove, London, N.5.

The Results of Radio.

SIR HAMILTON HARTY, known to all listeners in this country, says: "The increasing audiences at the Hallé concerts are due in great measure to wireless."

Exactly what one would expect! I beg Sir Oswald Stoll, the timorous, to take note of that dictum. Again, the Quaker organ, "The Friend," reports that a Welsh farmer, of strong Nationalist tendencies, is at last beginning to learn English so that he can listen to the B.B.C. talks (cuss 'em!), and gain a wider world outlook. Bless me! if I were Sir O. Stoll I should welcome radio as the cheapest and best publicity agent in the world.

Sceptics Cured Daily.

A VERY nice letter from J. B. (Stockport), who says that the Stockport Radio Society will devote an evening to testing the "Sceptic's" Three, with Mr. B. Elston as the guest of honour. But I rather fancy, in view of Mr. Elston's "peccavi" in this issue of "P.W." that he will be prepared to convert J. B., who is admittedly sceptical as to the powers of the "Sceptic's" Three.

Will Elston Convert Stockport?

THIS is a delightful turn of events. Mr. Elston does a prolonged seep. "P.W." invites any club to try out a 3-valver and to report; meanwhile "P.W." produces the "Sceptic's" Three and converts Mr. Elston. Then—up comes Mr. J. B., with grave doubts, and offers to confirm Mr. Elston's horrible scepticism. Now—Mr.

Elston, who is an artist in humour, surely cannot resist the temptation to convert the Stockport club! It's funny enough to write a story about, and I implore Mr. Elston not to neglect to push home the radio joke of the century.

A Rare Award.

IN view of Mr. Elston's adventures in radio and his safe anchorage after a stormy passage from Never-never Land to the Country of Belief, "P.W." proposes to invest him with the high and mighty Order of Companion of Honour (Radio Section). Any complaints? No! Carried! The new Companion is hereby advised that his target's address, etc., is Mr. J. Bunter, Mersey Chambers, King Street East, Portwood, Stockport, Cheshire. Sic 'em, lad! Meanwhile, our very best thanks to J. B. and his club, the only one to come forward and offer service to "P.W."

SHORT WAVES.

Harold (showing Granny his wireless set): "Of course, you know who invented wireless, don't you, Granny? It was Marconi."
Granny: "Harold—Harold, how disrespectful! You should say Mrs. Coni."
"Passing Show."

An enthusiast asks: "Why is it that the amateur station 3 B Y's musical selections come through so loudly, and yet, when the operator speaks, his voice seems much weaker?"

Well, we presume it is because he is not a loud speaker.—"Popular Radio Weekly."

As the result of the erection of three meteorological stations in Greenland, two days' notice will be given to ships of storms intending to reach the Atlantic Ocean. Remote control, evidently!

Slogan for those who wind their own coils: "Half a turn, half a turn, half a turn onward."

PRIDE GOES BEFORE A SERVICE.

Mother: "Hurry now, Pa, and get into your Sunday clothes."

Father: "What for, I ask you? We're not going out anywhere to-day."

Mother: "Don't argue, I tell you, I'm going to tune in the services up at the cathedral."
"Radio News."

THIRSTY WEATHER.

"This hot weather," we read, "is very bad for dry batteries."

And what about our poor dry throats?

Sing a song of sixpence,
And twenty-seven shillings more.
That's what built a short-wave station,
But kept the programme poor.—"Australian Paper."

Have You Heard D M B Y?

SHORT for Daily Mail Broadcasting Yacht, the "Ceto," which is bimbbling along the littoral of Great Britain, broadcasting concerts by means of a loud speaker which delivers the goods over a distance of between half a mile and a mile. Which reminds me of Paul Bunyan's dinner-horn. He was a mythical American timber-logger, created by the long-bow yarns of the loggers round the camp fire. He had a dinner-horn so large and powerful that his men used to ride home to the cook-house on the echo!

Popular (Wireless) Bart Married.

WH O can it be? I'll explain. A. G. R. (Falmouth) applies for a Valve Bartship on the strength of his having heard on L.S. a W G Y (Schenectady)

programme, using detector with Reinartz reaction and one L.F. stage. Well, A. G. R., your letter denotes you a brisk lad, with a snappy style. Your performance, though above Knight standard, hardly qualifies you for a Bartship. (Have you heard of 3 L O?) All the same, since you are good enough to consider "P.W.'s" accolade an honour, I offer you the Bartship of a man who has forsaken radio for television—and I'll throw in an O.B.E.

Radio and Wedlock.

I WAS so interested in the investiture that I forgot the marriage announcement. I mean to say, A. G. R.'s triumph with W G Y was truncated because he had to turn in at 12.30 a.m.—"being a married man." I wonder whether he put the cat out! Which inspires the latent bard within me.

*Oh, woman, in our hours of ease,
Shy, fussy, coy, and hard to please.
When Yankee signals are a "wow,"
It's "Egbert, WILL you stop that row!"*

Radio Care for the Blind.

MESSRS. BURNE-JONES & CO., LTD., who have contracted to supply 100 sets for the Derbyshire Association for the Blind, tell me that Mullard valves will be used throughout. Burne-Jones & Co. are a live firm and know "what's what." I congratulate them—and the blind folk of Derbyshire. I should like to see a combination of the radio clubs on behalf of the blind. A penny per member per meeting! All to be forwarded to the R.S.G.B. for distribution. The German Post Office has collected many thousands of pounds for the blind. Shall we do less?

Safety First!

OH my! Some people in a car fitted with a radio set turned a couple of somersaults—car and all—while trying to pass another car at Duxford early last month. They were listening to Daventry, presumably 5 G B. For real sober, safe driving I recommend 2 L O. No distraction, no excitement, but just a soothing drone! Nothing to divert the attention from the white line or the car in front. Specially recommended for beginners. Try our 2 L O-tion!

Business Note.

AN ecstatic reader of Wantage asks how we can produce "P.W." for threepence. The answer is "We can't; we sell it for threepence." In case he should continue to wonder, I will give him some valuable "inside information." It is true that we lose a farthing per copy—but we make up for it by the huge number we sell! This is about the oldest joke in the publishing community. It is handed down from editor to editor as a sacred trust, and "P.W." is now the first periodical to break away from the tradition and disclose the truth. What will Fleet Street say? A scoop!

New W G Y Schedule.

E. H. (Dewsbury) kindly informs me that 2 X A D has announced the following new schedule: Monday, 2 X A F, 2 X A D; Tuesday, 2 X A F; Wednesday, 2 X A D; Thursday, 2 X A F; Friday, 2 X A D; Saturday, 2 X A F; Sunday, 2 X A D. Much obliged! No doubt a few Barts will check this up, to keep their hands in and to verify whether what I say you said 2 X A D said is correct. **ARIEL.**

A HOME-MADE CONE



This easily made cone assembly was primarily designed for use in the "Traveller's" Three, seen in the photo to the left, but it has proved so useful that it is being described separately. It can be worked into a variety of portable receiver designs, or even be mounted in a cabinet for home use.
By THE "P.W." RESEARCH DEPT.

THERE appears to be a certain number of readers who always welcome the idea of constructing a set where everything, bar such things as L.F. transformers and batteries, can be home-made, and as a three-valve portable receiver appears in this issue, it was thought that it would provide an excellent opportunity for the description of a home-constructed

The unit originally employed was a Lissen, while another of a more elaborate and expensive type was also tried, both giving the desired results, so it may safely be assumed that any of the standard makes can be chosen.

A list of the various pieces of wood required is given with this article, and the constructor is advised to prepare them beforehand and pick up each piece as required. Construction is best commenced with the sheet of plywood 11 3/8 in. by 13 7/8 in. by 1/8 in. thick, which must have a hole cut at the centre 9 1/2 in. in diameter to take the diaphragm.

First Steps.

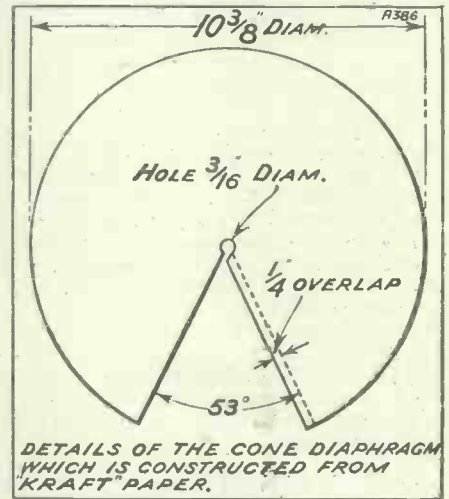
The centre of the hole can be found by drawing faint pencil lines from opposite corners and marking the point of intersection as the centre of the circle. Obtain a pencil compass and describe a circle of 4 7/8 in. radius. The next step is to drill a small hole through the surface of the wood close to the line inside the circle. This is to take a fretsaw or alternatively a keyhole saw, and it is as well to do the cutting very carefully, because an unevenly cut circle will be an eyesore.

Now take the two pieces of wood 11 3/8 in. by 1/2 in. by 3/8 in. thick and screw these to the 11 3/8 in. sides of the plywood board with 3/8 in. or 1/2 in. countersunk brass screws. The strips of wood are screwed on with their 3/8 in. sides against the plywood in the position indicated in the photographs of the completed loud speaker.

Another piece of wood 13 7/8 in. by 1 1/8 in. by 3/8 in. thick is then screwed across the 13 7/8 in. side of the plywood board, the 3/8 in. surface being flush with the front surface of the latter. This piece of wood screws on top of the side-pieces and is held in position by one screw each end, into the other strips of wood.

The remaining pieces of wood,

excluding the mouldings, consist of one piece 11 3/8 in. by 2 1/2 in. by 3/8 in., and two pieces 3 3/8 in. by 2 1/4 in. by 3/8 in., and these screw together as



shown in the photographs, 1/4 in. countersunk brass screws being employed for the purpose. Before fitting to the plywood board the loud-speaker unit must be fitted in the centre of the longest piece, as shown.
(Continued on next page.)

COMPONENTS AND PARTS REQUIRED.

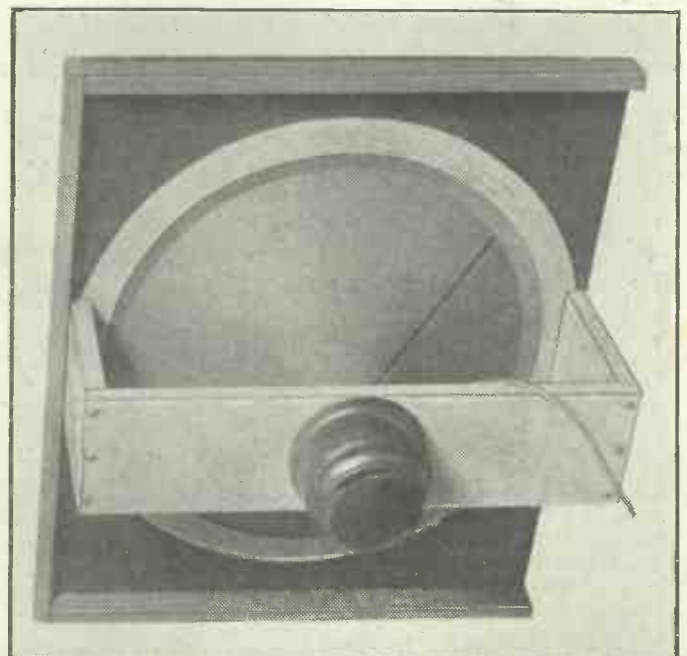
- 1 Loud-speaker unit (Lissen unit shown). (Goodman, "Bluespot," etc.)
- 1 Sheet of 3-ply wood, 13 7/8 in. x 11 3/8 in. x 1/8 in.
- 1 Piece of wood, 11 3/8 in. x 2 1/2 in. x 3/8 in.
- 2 Pieces of wood, 3 3/8 in. x 2 1/4 in. x 3/8 in.
- 2 Strips of wood, 11 3/8 in. x 1/2 in. x 3/8 in.
- 1 Strip of wood, 13 7/8 in. x 1 1/8 in. x 3/8 in.
- 1 Sheet of "Kraft" paper, medium grade (obtainable from most stationers dealing in drawing requisites or from F. Squire, 24, Leswin Rd., London, N.16).
- 1 Cardboard ring (F. Squire).
- 5 Pieces of material for suspension (F. Squire).
- 12 3/4 in. countersunk brass screws.
- 10 3/8 in. or 1/2 in. countersunk brass screws.
- 4 1 in. or 1 1/4 in. countersunk brass screws.
- 4 pieces of 1/2-in. half-round wood moulding, each piece about 14 in. long.
- Tube of Seccotine or Croid.

cone loud speaker specially suitable for this set, or for use as a separate speaker that can be connected to any set.

Naturally, the instrument costs but little, the total expenditure not exceeding 17s. 6d., while the results compare very fairly with many of those of commercial manufacture.

An Adaptable Design.

It should be clearly understood the speaker is suitable for any receiver and can easily be adapted to most portable sets. Further, by virtue of the simple support provided for the device it is possible to use practically any make of reed movement with this design.



Here you see the completed assembly from the rear. Note how the unit is mounted, also the strips of wood round three edges of the front piece. These are only needed for mounting in the "Traveller's" Three.

A HOME-MADE CONE.

(Continued from previous page.)

No dimensions are given here, as the exact holes to be drilled will depend on the particular loud-speaker unit employed.

It now remains to cut out and "form" the cone diaphragm and stick this to the cardboard ring via the special suspension material given in list of components. Dimensions for the cone are given elsewhere, so it is only necessary to cut it out, stick the overlapping portions with Seccotine or Croid glue, stick the five pieces of material for suspension on to the *inside* surface of the diaphragm about $\frac{1}{8}$ in. from the edge, and fix the cardboard ring (with Seccotine, etc.) to the remaining surface of the material, leaving a small surface of material around the diaphragm, as shown.

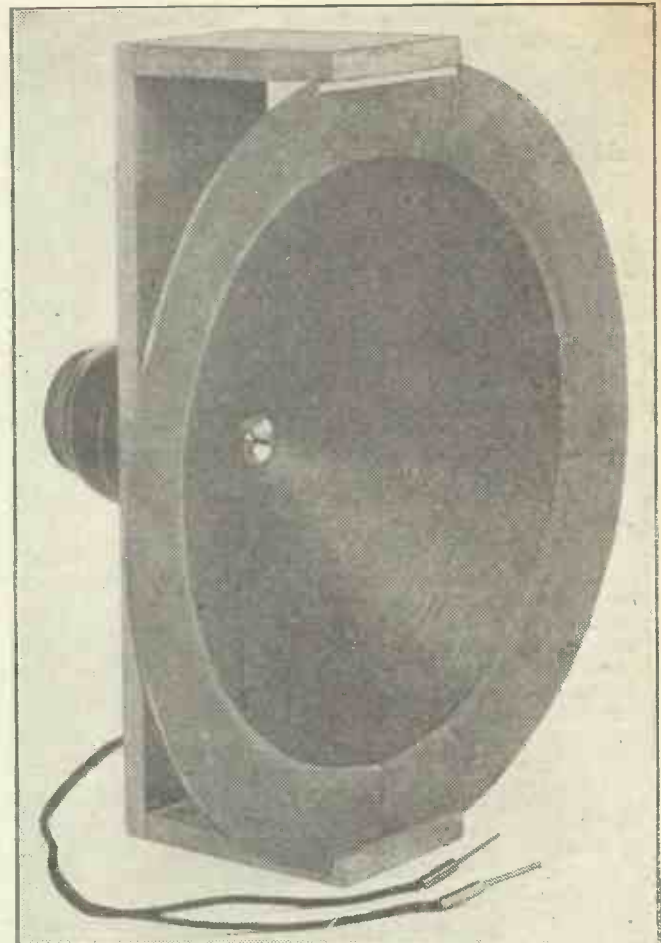
Fitting the Cone.

When the adhesive has "set" the diaphragm can be attached to the loud-speaker unit by the "coned" washers and small locking device provided with the latter. It will be necessary to cut small pieces out of the cardboard ring to prevent it fouling the wooden supporting framework. The positions of these cuts can be seen in the photograph of the back of the completed unit.

All that remains to do to complete the unit is to screw the supporting framework to the plywood board by means of counter-

sunk screws from the front of the latter, screw the cardboard ring (it can be gummed as well) to the back of the board, fix the whole unit to the set with four 1-in. screws, two on each side (see photograph of loud speaker partly attached to set), and when in position fix the moulding around the edge of the plywood board with $\frac{1}{2}$ -in. "brads." The moulding really serves the purpose of hiding the screw-holes around the board, but it also gives a neat finish to the whole assembly, as can be seen from photographs given with the article on the three-valve set.

Naturally, the mounting arrangement described above is intended to suit one particular receiver, but there is no reason why it cannot be varied for other purposes, the actual alterations being a matter for the ingenuity of the constructor.



Another view at the same stage in construction as that to the left below. This shows how the driving rod is attached to the point of the cone.



This is the cone and unit assembly before attaching to the piece of plywood which forms the front.

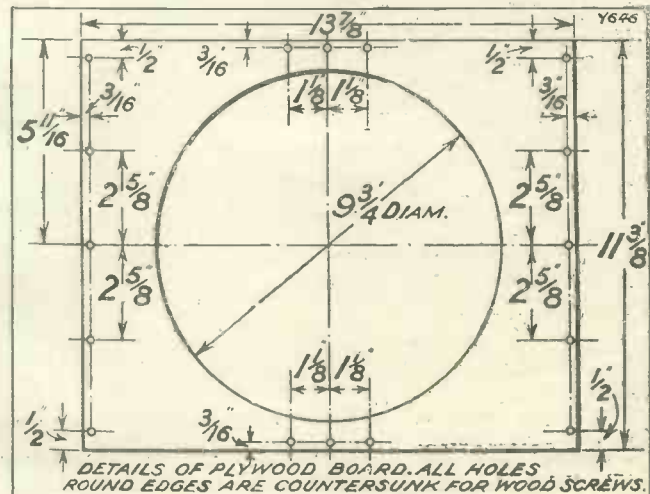
With any loud speaker of this type there are always a few points which the constructor should experiment with a little for himself, in order to suit the particular unit he has chosen, his taste in reproduction, etc.

The principal detail of this kind concerns the choice

of paper for the cone, and it is to be noted that by a mere change to a different sort of paper cone one can change completely the whole style of reproduction.

The cone first tried, for example, was made of a heavy, stiff grade of paper, and this proved very muffled and indistinct on speech. A much thinner and lighter paper was next tested, and was found to give much crisper and brighter reproduction in every way. This is a very easy thing to try, and tests are advised, although the paper specified gives very good average results in most cases.

The principal detail of this kind concerns the choice





The "TRAVELLER'S" THREE

This very neat little set is a good example of the class of portables which come between the very small and light type, which require an aerial and only give headphone signals, and the large heavy variety which work a loud speaker from a frame aerial at long distances. Using three valves it works a built-in loud speaker from a frame aerial fitted into the case at moderate distances, and an outside aerial can be added when necessary.

By THE "P.W." RESEARCH DEPT.

IN general, one can divide portable receivers into two main classes, namely, the small and really portable

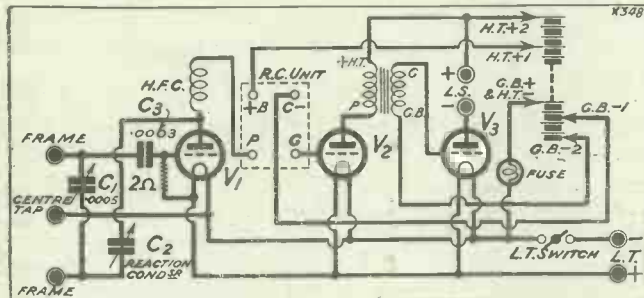
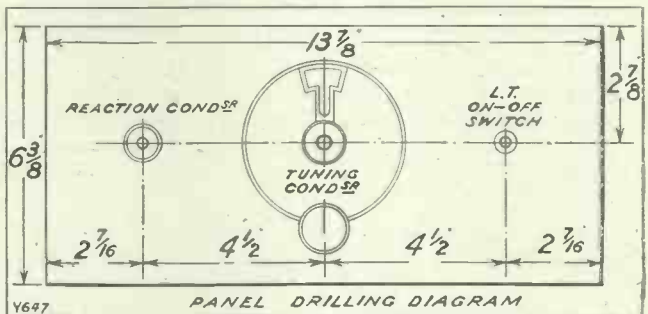
kind which only gives headphone signals and usually requires the erection of some small makeshift aerial, and the larger and more ambitious type which includes a loud speaker, perhaps a frame aerial, and employs a considerable number of valves and will give loud-speaker results up to considerable distances. This latter type is usually pretty heavy, and it is scarcely portable in the true sense of the word, since no one but an optimist would describe it as a suitable companion for a picnic unless one is going by car.

Probably a better description for such instruments would be "transportable"

receivers, and their real use is probably to take away with one for the holidays, when they can be regarded simply as part of the luggage, and for use as an all-the-year-round set with the special advantage of being capable of use in any room in the house without trailing wires, aerial leads or anything else untidy.

Now, this general classification is all very well, but there is also, it should not be forgotten, a third type of receiver which is in effect a compromise between the other two and which is also a very useful affair in its own particular way. This type employs a strictly limited number of valves, say two or three, with a built-in loud speaker and a frame aerial capable of giving loud-speaker reception at very moderate distances, and if a small improvised aerial can be attached, at greater distances.

Such a set can be made decidedly compact and of only moderate weight, since



the batteries need not be of very great size, and the components employed can be quite light, since it is assumed that there are no H.F. valves, with a corresponding simplification and lightening of the tuning arrangements. Again, it is quite easy to build so that it has quite a presentable appearance and is capable of use as an all-round receiver, to which an aerial can be attached when it is used at home. When it is used in this latter fashion, the outside aerial should be tapped on to a suitable point on the frame aerial, whose windings then become the equivalent of the ordinary tuning coil.

(Continued on next page.)

COMPONENTS REQUIRED.

- 1 Ebonite panel, 13 3/4 in. x 6 3/8 in. x 1/4 in. or 5/16 in. This can be a 14 in. x 7 in. x 1/4 in. cut down on two edges.
- 3 Sprung valve holders (Lotus in set. Any good make—Ashley, Benjamin, Bowyer-Lowe, B.T.H., Burndep, Burne-Jones, Igranic, W.B., etc.).
- 1 R.C. unit (1st-stage type) (Mullard in set. Any good make—Dubilier, Lissen; R.I.-Varley, Marconiphone, etc.).
- 1 L.F. transformer (Ferranti A.F.3. in set. Any good make of moderate size).
- 1 On-off switch (Benjamin, Igranic, L. & P., Lissen, Lotus, etc.).
- 1 Micro-condenser (about .00005 mfd.) (Igranic, or similar type).
- 1 H.T. fuse (Magnum in set).
- 1 .0003 fixed condenser (Clarke, Dubilier, Igranic, Lissen, Magnum, Mullard, T.C.C., etc.).
- 1 2-meg. grid leak and holder (Dubilier,

- Ediswan, Igranic; Lissen, Mullard; etc.).
- 1 .0005-mfd. variable condenser (Igranic in set. Any good make).
- 1 H.F. choke (Bowyer-Lowe, Climax, Colvern, Cosmos, Igranic, Lissen, Magnum, R.I.-Varley, etc.).
- 1 Vernier dial (Igranic on set. Any good pattern).
- 2 Black wander plugs.
- 2 Red " "
- 2 Spade tags (one black and one red).
- 2 Red plugs } (for frame aerial).
- 1 Black plug }
- 3 Sockets for latter, complete with nuts.
- 2 Packets of Glazite wire.
- 5 or 6 yds. of single flex, 1 1/2 mm. diameter approx.
- 2 Pieces of wood (walnut or American whitewood) 17 1/2 in. x 4 in. x 3/8 in. for sides of framework.
- 1 Piece ditto, 13 3/4 in. x 5 1/4 in. x 3/8 in. for top of framework.

- 1 Baseboard ditto, 13 1/2 in. x 5 1/4 in. x 3/8 in.
- 1 Strip of above wood, 13 1/2 x 1 in. x 3/8 in.
- 2 Strips of above wood, 3 3/8 in x 1 in. x 3/8 in.
- 2 1/2 feet approx. of 1/2 in. half-round moulding (Hobbies).
(Materials for loud speaker and its subsidiary woodwork are given elsewhere in this issue.)
- 1 Sheet of 3-ply wood, 14 in. x 17 1/2 in. x 1/8 in. thick for frame aerial.
- 1/2 lb. approx. No. 24 D.C.C. wire, or alternatively, reel of special frame aerial wire such as Lewcos, Goltone, etc.).
- 4 Pieces of ebonite 4 1/2 in. x 3/8 in. x 1/4 in. for supporting wire on frame.
- 1 Leather or hide case, approx. measurements 14 in. x 13 in. x 7 in. deep, as made by H. G. Bradley, Selsea Place, Crossway, London, N.16.

THE
"TRAVELLER'S" THREE.

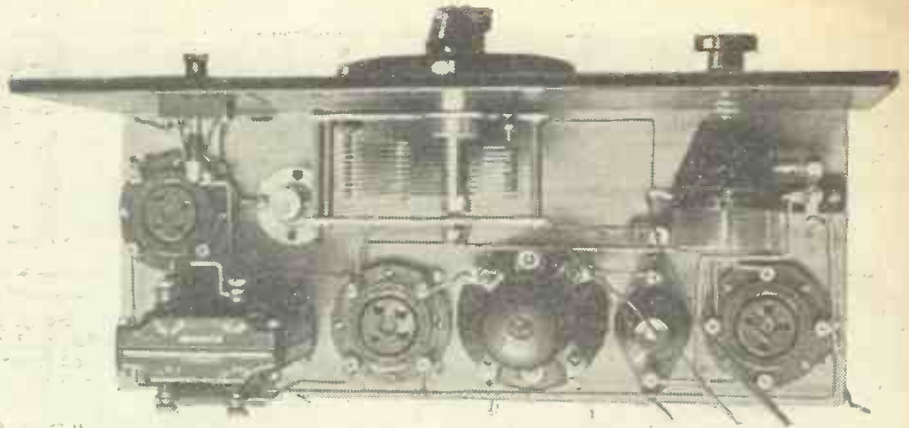
(Continued from previous page.)

By careful design, it is possible to keep down the weight to a figure of about twenty pounds or even a little less, and although this is perhaps rather more than one would care to bother oneself with on a walking tour, it is not an altogether impossible figure for special occasions and it is, of course, well within the usual limits of a large self-contained receiver of the more elaborate types.

Easy Construction.

As regards the actual bulk of such a set, it is possible to make it extremely compact, but, if this were done the design would be a difficult one for the average handyman to copy, and it is really not wise to go too far in this direction; but it is, on the other hand, quite easy to keep down the size to something decidedly smaller than the average multi-valve portable while not making the constructional work at all difficult.

Sets of this general type have a certain



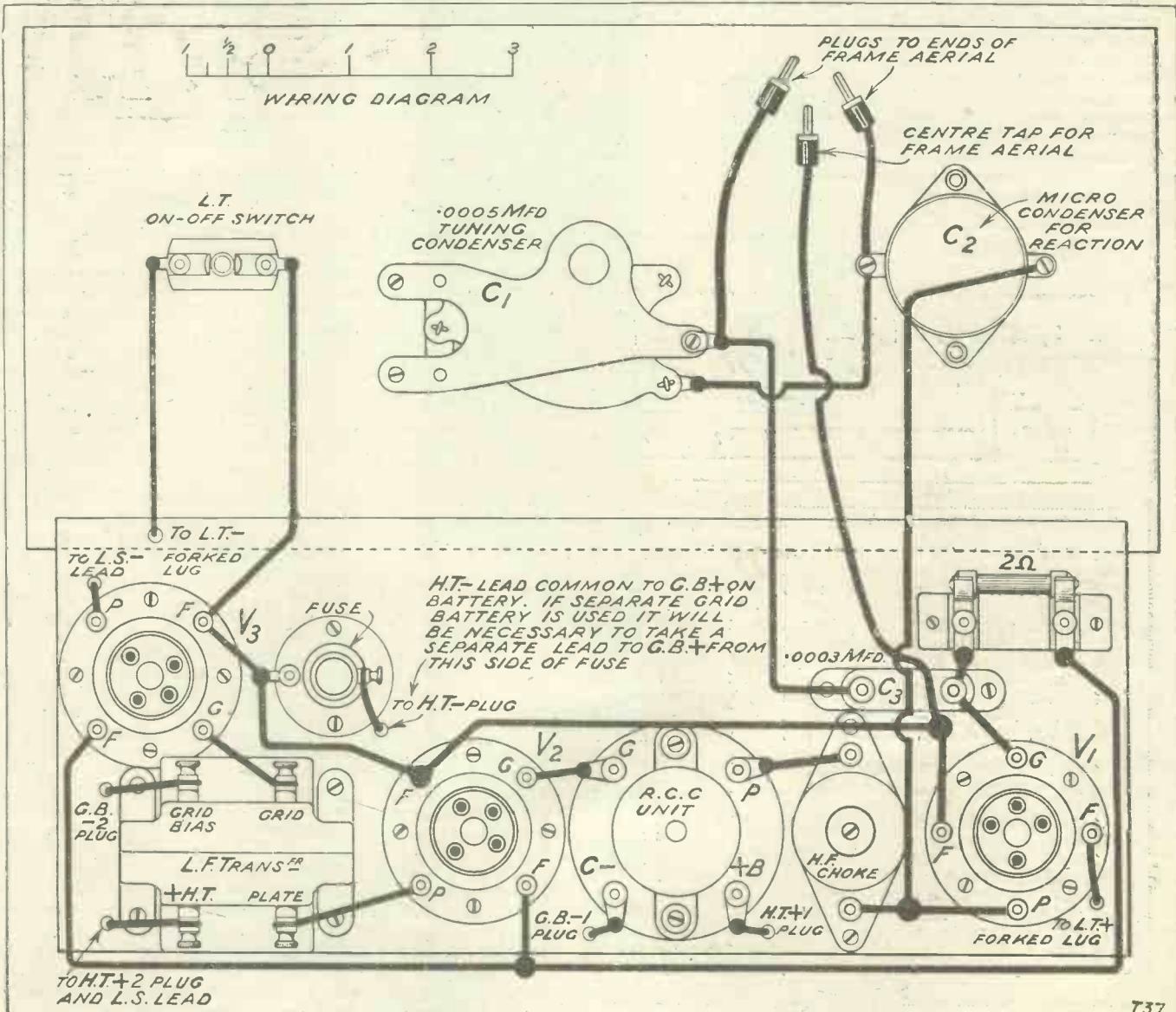
This is the set itself, complete and ready for fitting into its place in the wooden framework.

quite well-defined sphere of usefulness; it has been thought advisable to produce a good example of this variety to supplement the previous designs for receivers of the other two classes, namely the "Summer" One and the "Birthday" Four, which have appeared in recent issues of "P.W." The set which has been produced uses only three valves working on a very simple but

efficient circuit consisting of a detector valve with reaction on the Hartley principle, followed by one resistance- and one transformer-coupled stage of low-frequency amplification.

The set is built upon a very rigid but light wooden framework which slips inside a special cowhide case rather smaller than a

(Continued on next page.)



**THE
"TRAVELLER'S" THREE.**

(Continued from previous page.)

suit-case which has been specially produced to take it and which is available to readers of "P.W." at a cost of only 27s. from Messrs. H. G. Bradley (see list of parts). Although the set is provided with a built-in frame aerial, and loud speaker, with space for high- and low-tension batteries, the internal dimensions of the case are only 14 by 7 by 18 inches, so that you will see that it is not really at all an impossible outfit to carry about with you.

There is nothing particularly difficult about its construction, but it should be explained at once that it is definitely the type of design which will appeal to the man who likes to construct a good deal of the outfit for himself, rather than merely assembling a number of bought components.

A Home-made Speaker.

There is the wooden framework to make, a frame aerial to wind, and, if you wish, a home-made cone loud speaker to construct from the instructions given in another article in this same issue. If, of course, you do not wish to carry out this latter step you can quite well work into the design one of the ready-made cone units, such as the Mullard or the Amplion, with slight modifications in the wooden framework to fit it in. If you make the cone loud speaker for yourself you may rest assured that you will have quite an interesting time doing it, and you will save a good deal of money.

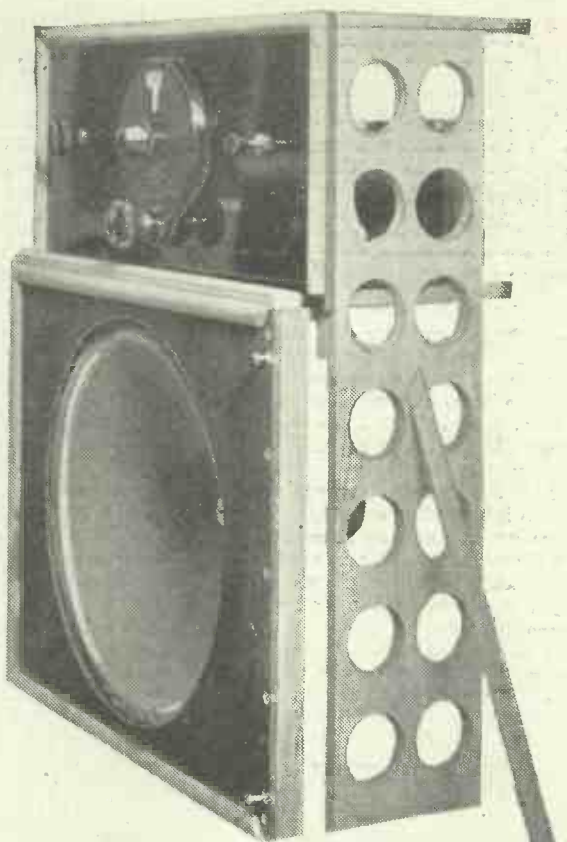
As regards the results, the first tests

were conducted in the "P.W." Research Laboratory, which is situated in a badly-screened position in the City, and here it gave adequate loud-speaker strength from 5 G B in daylight, without the use of any other aerial than the built-in frame, so that it may be assumed that the loud-speaker range without an outside aerial is quite considerable. Tested at a distance of fifteen miles from 2 L O it gave full volume loud-speaker strength used with a moderate amount of reaction, and when connected up to an average suburban aerial it brought in quite a string of distant stations in a very satisfactory manner. It can obviously be regarded as a good standard receiving equipment for all-the-year-round use if desired.

Although the design is intended chiefly to work on the 200 to 500 metre band, if desired a special frame can be wound for the reception of 5 X X, a point which will be gone into at a later point in this article. A frame for the longer waves is necessarily rather a troublesome thing to wind, and so it was decided to make one for the main wave-band the standard, with data for the larger one as an alternative for the benefit of the real enthusiast.

A general description of the outfit will probably be necessary to enable you to make a start on the constructional work, since there are sundry special features which may not be entirely clear in the photos. The set itself is quite simple, and is built on the usual panel and baseboard, the only points to note here being, first, that the dimensions should be worked to with some care to ensure a good fit in the framework and in the case, and, secondly, that no terminals are provided for the batteries or the frame aerial.

Instead, flex leads are brought out direct from suitable points on the wiring, and terminate in plugs (H.T., G.B., and frame leads) or spade tags (L.T. leads). The frame aerial is provided with three sockets (Clix or something similar) into which the appropriate plugs from the set are inserted, and it is worth noting that these connections



This view was specially taken during the process of assembly to make various points concerning the woodwork as clear as possible. Note how the loud-speaker assembly is fitted to the front edge of the framework.

should be made before the assembled outfit is placed in the carrying case. You will find that you can quite easily slip set and frame aerial in together when everything is finished.

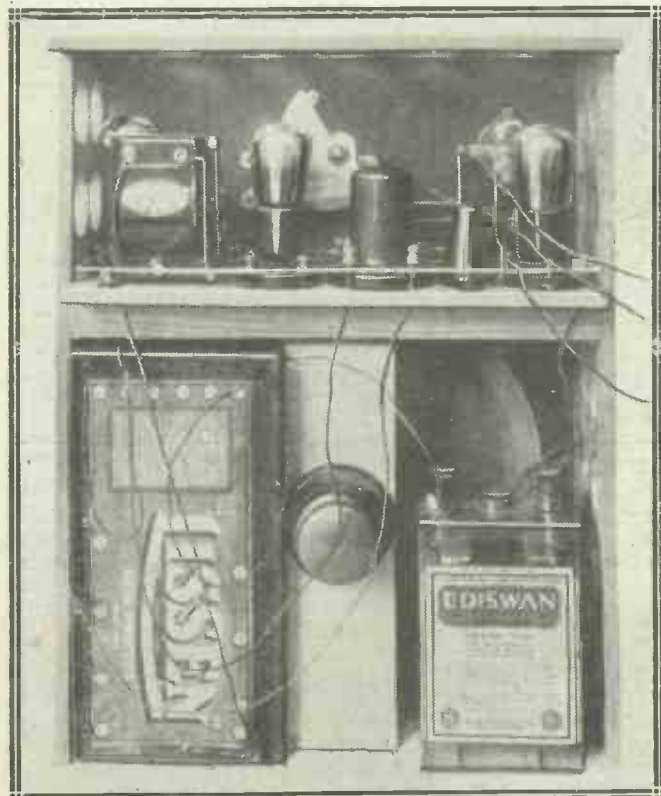
How it is Assembled.

The panel of the set, it is to be observed, covers the edges of the wooden framework across the top and upper part of the sides, whereas the baseboard fits inside and rests upon two little wooden ledges screwed to the upright pieces of the framework. Another detail calling for explanation is the finish given to the edge of the panel and the edge of the sheet of three-ply which forms the front of the loud speaker.

These could, of course, be left plain if desired, but it was thought desirable to give a somewhat more finished appearance to the original set, and this was done by screwing strips of half-round beading (a standard line at Messrs. Hobbies' shops) neatly round all these edges. By the time this has been done and the woodwork given a coat of varnish, the whole outfit assumes quite a "professional" appearance.

By the way, you should note carefully how the wooden framework is stiffened by means of a narrow wood strip running across from one side to the other under the rear edge of the baseboard of the set proper.

The remainder of the details of the general assembly of the set and loud speaker, and placing of the batteries (2-volt accumulator cell and 100-volt Lissen H.T. unit, which provides G.B. also) will be clear from the photos, and there we must leave matters for the present. Next week we shall be dealing with the frame aerial, etc.



Although the outfit is not large there is ample room for quite good-sized batteries. This view shows the whole assembly (except the frame aerial) ready for insertion in the carrying case.

THE PROGRAMME STRAFE.

In all the many arguments, criticisms and controversies concerning the B.B.C. transmissions there seems to be an agreement of opinions on at least three points. These are dealt with briefly in the following article.

By **THE EDITOR.**

THE controversy about the B.B.C. programmes which started in the Press a few days ago and which, as is usual in this hot weather, worked itself up into quite a respectable blaze, has died away again, leaving but a few smouldering ashes in the shape of odd letters in the newspapers.

Like the Phoenix, however, the argument about broadcast programmes will no doubt arise again from the ashes in due course, and columns will appear in the Press containing extracts from letters from listeners giving their views, some sensible, some nonsensical, as to what the B.B.C. should do and should not do in the way of catering for broadcast listeners.

It is curious how this question of programmes constantly crops up. For surely, by now, people should have realised that the B.B.C. chiefs have minds of their own, and although they are willing to listen to intelligent criticism and to modify their policy when a really intelligent point is made, they definitely refuse, and will no doubt always refuse, to be bullied into radical alterations because of a few grumbling letters which appear in the Press.

And this policy of theirs in ignoring the bullying tactics above referred to is undoubtedly the correct one. From the letters of correspondents which have appeared in the Press lately it would seem that there is an agreement of opinion on at least three points:

1. That the talks are too numerous.
2. That the variety in the programmes could be more emphasised, and
3. That the Sunday programmes could be made a little more cheerful.

That News Bulletin.

These three criticisms are more or less justified, and if the B.B.C. will consider them we feel sure they will not be doing anything contrary to the wishes of the majority of their listeners. The arguments about programmes have at least brought into constant use the terms low-brow, high-brow and middle-brow—terms which, before broadcasting, were comparatively rare. High-brow, perhaps, was fairly frequently used before broadcasting, but the definitions middle-brow and low-brow were seldom heard before the B.B.C. began a regular broadcasting service.

A writer in "The Nation and The Athenaeum," obviously of the superior, high-brow genus, hopes that the Broadcasting Corporation will not allow itself to be hustled by silly-season grumblers in the evening papers into vulgarising the programmes to suit a low standard of entertainment, and he expresses the opinion that the writer of one typical letter who abused the B.B.C. for circulating news which is to be found in the evening papers is stupid enough to have missed the elementary fact that the news service is chiefly

intended for people beyond the range of evening papers—the villages, and so on.

As a matter of fact, this is not correct. The B.B.C. have not specifically stated that their news service is intended chiefly for people who do not obtain evening papers; and, in any case, if they did this it would hardly be justified considering the amount of time which is spent on the news service.

The B.B.C. news service is intended to be a summary of the latest news for the majority of listeners, and if the B.B.C.'s news service is not what it should be, that matter rests almost entirely with the potentates of Fleet Street. The B.B.C. have always had considerable difficulty in arranging matters with regard to a news service because of a certain opposition to the circulation of news, which is considered to be the prerogative of Fleet Street.

The Three Camps.

However, as we have pointed out before, this argument about programmes will never be satisfactorily solved, nor will it ever be concluded. There seems to be three distinct camps: the critics who will only be satisfied when the B.B.C. cut out all educational matter and give a consistently low-brow programme; the critics who will never be satisfied until the B.B.C. give a consistently high-brow programme; and

very simple pictures, such as single human faces, which, though exceedingly coarse in structure and, therefore, very imperfect, can, with a certain amount of imagination, be recognised.

He points out that, as is well known, all methods of television are based on the same principle as is the reproduction of pictures in the Press; the picture in each case is composed of a mosaic of minute dots, so small and so closely packed together that the individual dots are not recognisable as such by the unaided human eye.

Referring to pictures which appeared in the "Times," Mr. Swinton points out that the former of these pictures is a large one, being a little over ten inches by sixteen inches in size, containing, according to measurement, rather more than a quarter of a million separate dots; while the other picture, on a rather smaller scale, is similarly built up of about 70,000 dots.

Four Millions a Second!

In his letter he then proceeded to point out that on the same principle that requires that cinematograph film pictures have to succeed each other at the rate of about sixteen a second, so as to take advantage of the persistency of vision of the human eye and give the illusion of continuous vision without flicker, for the purpose of successful television each one of these thousands of dots has got to be automatically registered in its proper place and with its proper strength no fewer than about sixteen times a second.

Thus, to transmit successfully the two pictures Mr. Swinton refers to in the "Times" would require machinery capable, in the case of the larger picture, of registering the dots at the rate of more than four million a second; or, in the case of the smaller picture, at the rate of 1,100,000 per second.

RADIO ON A SEAPLANE.



A Dornier-Napier seaplane fitted with the latest Marconi wireless transmitting and receiving apparatus. Note the aerial arranged above the fuselage.

those critics who will never be satisfied whatever the B.B.C. does!

Probably the best answer to all these critics is the steady rise in the number of licences issued.

"Times" and Television.

Mr. A. A. Campbell Swinton, F.R.S., the well-known scientist, contributed a very interesting letter on television to the "Times" the other day. Mr. Swinton pointed out in the course of his letter that at present, with the mechanically-operated devices employed by all demonstrators, both in this country and in America, all that has been found possible is to transmit

Such achievements are, as Mr. Swinton points out, obviously beyond the capacity of any mechanism with material moving parts, and it is becoming more and more clear that the final solution of the television problem will probably lie in the direction of the use of cathode rays.

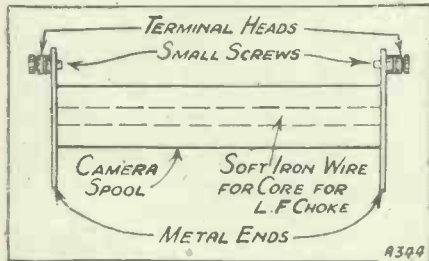
"Meanwhile," concludes Mr. Swinton, "let it be distinctly understood that television will be restricted to very simple pictures, such as single faces or figures, as can be produced, and even then only very coarsely-grained, by a few dots numbered by the thousand instead of large quantities of dots numbered by the million."



A Camera Choke.

THOSE who indulge in the pleasant hobby of photography, in addition to that of wireless, will find that old camera spools make very good formers for winding chokes. The diagram suggests how the former should be prepared.

The type shown has metal ends. A small terminal is attached to each end, which answers the dual purpose of providing a means of connecting the unit in circuit and making connection for the beginning and end of the wire winding of the choke.



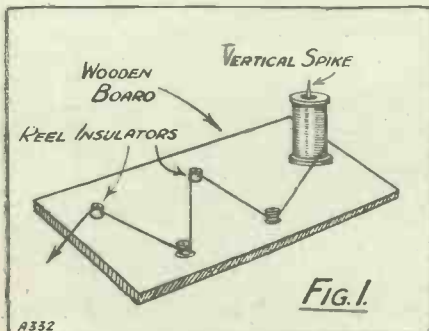
To make an iron core choke, an iron core is pushed through the centre hole of the spool and the requisite number of turns wound on in the ordinary way.

Soft iron wire, cut in suitable lengths, will answer, but the ends of the core should be insulated from the metal end-pieces of the spool.

A Coil-Winding Accessory.

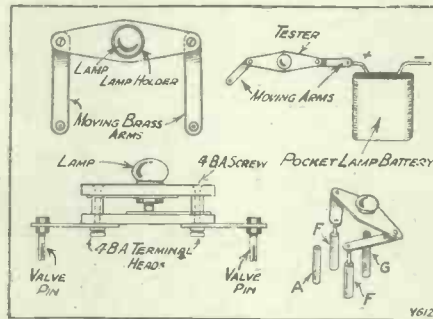
QUITE often one has occasion to wind coils of a variety of types and sizes for experimental and test purposes, and while for straightforward solenoidal coils the process is quite simple, when the shapes assume a more curious formation greater care must be exercised. Unless this is done, the wire will be found to get into kinks, which may cause the insulation or wire to break, and if the wire reel is not "anchored," it will run about, and cause the wire to get entangled. To assist in these matters, the board shown in Fig. 1 should be constructed, and it will prove very handy and convenient.

Just procure a piece of fairly thick



A selection of short articles of an eminently practical nature which covers all phases of radio receiver construction, operation and maintenance.

wooden board and arrange a vertical spike at one end so that the coil reel can slip over this, and turn round comfortably when the wire is pulled off the spool. To prevent the wire getting slack or kinks forming, four small reel insulators, such as those used in aerial erection, may be positioned on the board, and held down by screws, as indicated in the sketch. The inside diameter of these reels should be packed if necessary, so that they turn round smoothly on the screws, and the wire from the spool is then fed round the reels in the manner illustrated. The heavy baseboard prevents the apparatus from moving during the winding operations, while the provision of the small reels suffices to keep an even tension on the wire, and militates against the formation of kinks.



A Neat Tester.

A VERY neat and compact tester which can always be carried in the pocket is described in the accompanying drawing. The material necessary is a lamp holder, some brass strip, screws, terminals, nuts, etc.

Any type of holder will do equally well for the purpose if the assembly is carried out on the lines indicated. The brass strips have a hole punched in each end and are secured to the holder as shown by means of screws and terminal heads.

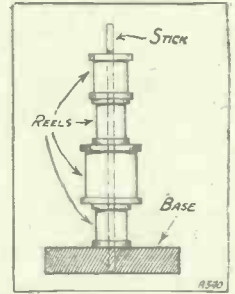
The end of each strip is equipped with a valve pin. The drawing shows how conveniently the lamp attachment may be linked on to a battery for testing purposes.

It is also simple to plug the lamp into a valve holder for the purpose of testing filament circuits before actually inserting the valves. In the case of a newly constructed set, this should be done with all batteries connected up.

There are numerous uses to which the device may be put and the gadget should be considered an essential acquisition to all constructors.

A Wire Reel Rack.

HERE is a simple idea for storing useful lengths of wire which are at times left over. The wire is wound upon cotton reels, each reel being reserved for a certain gauge of wire.



When a number of these are acquired, the reels may be neatly stacked upon a stick mounted upon a small base, as shown in the diagram. When a certain gauge or type of wire is required, it is a simple matter to remove any reel from the stick and replace the others. If desired, the reels may be labelled indicating the gauge of wire.

A Charging Tip.

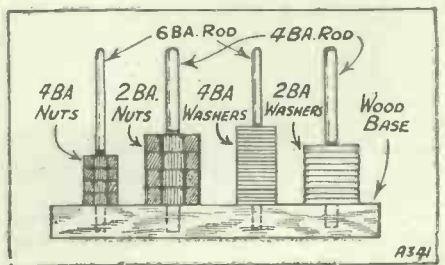
LISTENERS who do their own charging by means of a vibratory rectifier are sometimes troubled by sparking from this component. This can be overcome by placing a large fixed condenser across the contacts.

A Rack for Nuts and Washers.

A RACK for storing small nuts and washers is a very useful acquisition. A very good one may be made as shown in the drawing.

All that is necessary is a small wood base to which is attached a number of nails of varying size, or B.A. rods. If nails are used, the heads should be cut off.

If B.A. rod is used it will be found that 4 B.A. will serve to hold 2 B.A. nuts or washers, the smaller size of rod holding the next size of nut or washer in each case. Thus, it is impossible to place the wrong size of nut or washer over the wrong rod, and it is always easy, therefore, to select either one of a given desired size.



DAYLIGHT TELEVISION.

A New Baird System.
BY A SPECIAL CORRESPONDENT.

IT is an admitted drawback to ordinary systems of television that the "sitter" or person to be televised must be subjected to a flood of light from a powerful arc lamp. This is necessary in order to obtain clear-cut light-and-shade effects.

Each element of the picture must be sufficiently well defined to influence the light-sensitive cell, and to produce a current from it of different value to that produced by an adjacent element. Otherwise it would be impossible to reproduce the separate features of the sitter's face, such as the eyes, nose, and mouth.

A Significant Fact.

In the most elementary form of television, such a distinction is not attempted. The optical cell is located behind the sitter, whilst the floodlight is in front of him. In such circumstances the sensitive cell can obviously only record the difference between the full light and the shadow thrown by the sitter's face. No matter how ingenious the rest of the apparatus may be, all that can be seen at the receiving station is a simple silhouette effect or shadow of the person or object being televised.

In order to get a distinct full-face effect showing the features in detail, reflected light must be used. That is to say, both the sensitive cell and the source of light must be located on the same side of the sitter, instead of one being in front and the other behind. Now, the difference in intensity between direct light, as used in the shadow effect, and reflected light where the separate features are shown, is approximately as 1,000 to 1.

It follows, therefore, that in order to reproduce a full-face effect, either the intensity of the arc lamp must be increased a thousandfold, or else the clearness of the transmitted image must suffer in the same proportion. As even in the case of television shadow effects the definition is by no means free from blurring, it is impossible to make any further sacrifice in this direction, so that in practice the flooding light is intensified to such a degree that it becomes extremely trying to the unfortunate sitter.

A Definite Limitation.

Quite apart from the feelings or discomfort of the individual sitter, the use of ordinary reflected light imposes another definite limitation, by making it impossible to televise extended scenes in ordinary daylight—or, in fact, to televise any object or scene which cannot be flooded at close range by a powerful arc lamp or similar source of intense light. This, in effect, restricts the scope of television to the reproduction of single objects, or the features of a single individual, under what may be termed "studio conditions."

In British patent No. 238,882, issued jointly to Television Ltd., and to John L. Baird, a system of television has already been described in which the object or image to be televised is flooded by infra-red rays

instead of with ordinary light. The inventor has termed this Noctovision, or "seeing in the dark." One of its advantages is that a "sitter" subjected to rays of infra-red, or "dark" light, does not experience the same sense of discomfort as when exposed to the intense light from an arc lamp.

According to the patent specification the infra-red rays are obtained from an ordinary searchlight projector, by interposing between it and the "sitter" a "relatively thin diaphragm of ebonite, which absorbs the visible rays of the spectrum, but permits the passage of the infra-red rays."

The infra-red rays are first focused upon the "sitter" and are then reflected back from the face and features to pass through a rotary exploring disc. From this disc the rays pass in interrupted pulses (corresponding to separate picture elements) on to a bolometer or photo-electric cell sensitive to this type of invisible light.

A Light Barrier.

The resulting current variations are next amplified and are then transmitted to the receiving station, where they control the varying illumination of a glow-lamp in much the same way as in the original Baird system. The glow-lamp variations are, in turn, synthesised by a second rotating disc, fitted with spiral holes or

available to actuate the "sensitive cell," the reaction of the latter will not be sufficient to give clear-cut effects in reception.

The mere fact of interposing "a thin diaphragm of ebonite" between the arc lamp and the object (in order to separate out the infra-red rays) is sufficient to indicate that the bulk of the radiant energy must be blocked out at its source.

In a more-recent patent, No. 292,185, granted to the same inventor, the particulars of which have just been published, another scheme is disclosed for securing the ordinary results independently of the ordinary arc lamp or searchlight projector.

The New Scheme.

In this respect the method is not necessarily confined to the studio, but could be used with equal effect in the open air and under daylight conditions. It consists briefly in using short-wave wireless radiation instead of light. The actual wavelength is not definitely specified beyond the statement that it is "adjacent to the infra-red part of the spectrum, but of longer wave-length than the red rays."

The short-wave generator may consist of "two metal spheres across which an oscillating discharge passes." The resulting radiation is focused upon the object to be televised by means of "a lens formed of pitch or other material suitable for the purpose."

At the same time the object is explored by a rotating obturator disc of the familiar type, and the re-radiated short-wave energy is thrown in pulses (each pulse corresponding to a definite picture element) upon a receiving wire, stated to be "equivalent to the aerial of a wireless receiver."

The energy so picked up is then rectified by a crystal or valve, and after being amplified is transmitted as current variations to the receiving station, either along a wire connection, or as modulations on a radiated carrier wave.

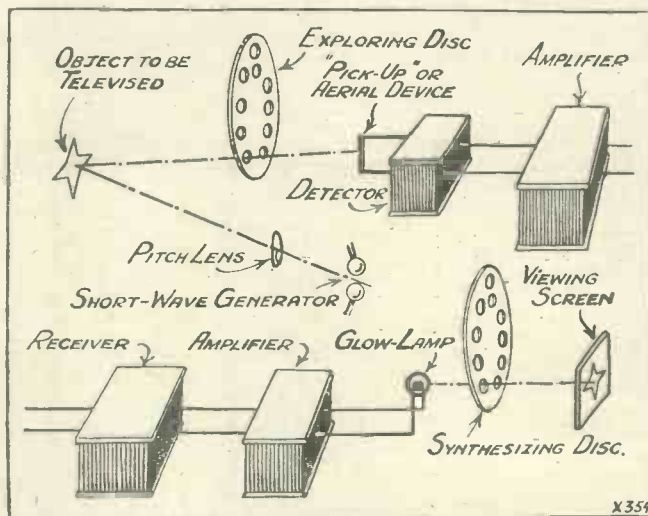
At the receiving station the incoming signals are amplified and rectified, and are then applied to control the illumination of a glow-lamp, the varying light effects from which are synthesised by a rotating disc and thrown upon a viewing-screen as before.

No detailed information is given as to the manner in which short-wave radiation approximating to infra-red frequency is generated, nor what proportion of such energy is reflected from the object to be televised.

This is a point which must give rise to considerable speculation.

Metallic conductors are admittedly good re-radiators or reflectors of electro-magnetic energy, and it is therefore possible that a metallic object might respond to a projected ray in the required manner.

It is, however, very problematical to what extent, if any, ordinary flesh and blood will react to such treatment, so that the advantages of the new scheme are difficult to estimate, so far as human "sitters" or actors are concerned,



This is the drawing which accompanies the "Daylight Television" patent specification.

lenses, and are finally thrown in proper sequence upon a viewing screen.

Although it is possible that infra-red rays can be manipulated in the manner stated, and whilst any "sitter" subjected to their actions would suffer little inconvenience, it seems obvious that the reflected rays must contain comparatively little radiant energy.

One is therefore thrown back upon the considerations set out in the opening paragraphs of the present article. Unless reflected light of considerable intensity is



BED ROOM

DRAWING ROOM

KITCHEN

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WORK AT 2 D A



Some interesting Screened-Grid Valve Experiments carried out at the "Popular Wireless" Experimental Transmitting Station. Described by the Engineer-in-Charge.

BY the majority of amateurs, high-frequency amplification on short waves has generally been left severely alone. They argue that it is not really necessary, and that it merely complicates matters. To a certain extent their argument is undoubtedly true, for some people may most decidedly regard a stage of H.F. as a complication. But to say that it is not necessary is simply an excuse for not having it—a case of "sour grapes," in fact.

Anyone who has handled a short-wave receiver must surely have longed for something that would bring up a weak signal to a decent degree of audibility without it being necessary to force reaction or resort to several stages of L.F. One stage of high frequency would do this quite well, but, unfortunately, the usual methods of H.F. amplification with three-electrode valves are not, as a rule, efficiently applicable to short waves, and it is on account of this that so few receivers incorporate such a desirable factor as H.F. amplification.

Short-Wave Amplifiers.

Short-wave super-heterodyne receivers certainly overcome the inherent difficulties of ultra-high-frequency amplification, but their method of doing so is often tricky, and, in any case, the disadvantage of the super-het (number of valves and battery consumption) are such as to make it unlikely that receivers of this type will ever become really popular with the short-wave enthusiast.

The desirability of a stage of H.F. on short waves has long been appreciated at 2 D A (the "P.W." experimental station), but it was not until the innovation of the screened-grid valve that anything like efficiency was attained in this direction. Now the screened-grid valve is particularly adaptable to this sort of work, and many suitable circuits have been devised and are known to work remarkably well. The arrangement used at 2 D A, however, is shown in the diagram, and has been found to be very suitable for the type of work it is called upon to do.

It will be seen that the circuit is quite simple, and more or less a straightforward transformer-coupled stage of screened-grid

H.F., followed by a detector. The tendency for self-oscillation (which is always present to a certain extent, even with screened-grid valves) is particularly marked on short waves, but this can be quite effectively prevented by really efficient screening, transformer coupling, and by keeping all leads short and direct.

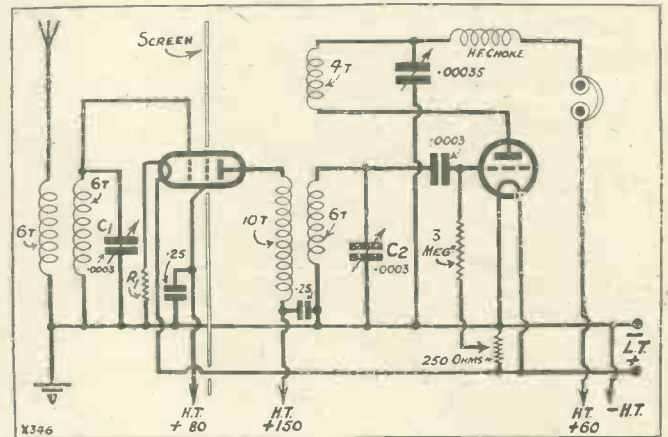
In practice the circuit is perfectly stable right down to 15 metres, and the degree of amplification very considerable, in spite of the use of transformer coupling. A useful characteristic of this circuit, moreover, is the comparatively flat tuning of C_1 . This is a great advantage when "searching" for a station, as the tuning may be carried out on C_2 alone, with C_1 left set anywhere within 20 or

30 degrees of the actual point of best adjustment; and when eventually the station being searched for is found, C_1 can be adjusted so as to bring both circuits into tune without throwing out the tuning of the detector circuit to any appreciable extent. At the point where the two circuits are brought into resonance the amplification suddenly increases by a quite astounding amount.

The H.F. Transformer.

The fixed resistance R_1 in the negative lead to the filament of the H.F. valve gives a slight grid negative. The value of this resistance depends, of course, upon the filament current of the type of valve used and the amount of grid negative desired. Both windings of the H.F. transformer, together with the reaction winding, may be wound on a low-loss former, as there is no necessity to have the coupling variable. With the number of turns indicated in the diagram the range of wavelengths covered is approximately 28 to between 60 and 70 metres; but if the grid coil of the amplifier and the secondary of the transformer are made variable by means of a clip, there is no need to change the coils over the whole band of waves from 70 right down to 15 metres.

The screen is a simple copper one running from the panel to the back of the base-board and the valve is mounted through it.

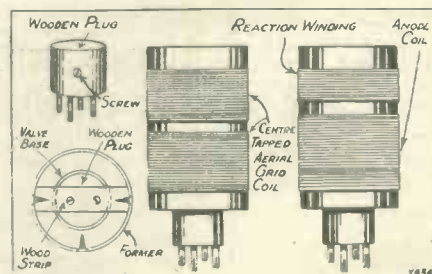


USEFUL COIL MOUNT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose a sketch showing how the bases of old valves may be utilised for mounting plug-in solenoid coils.

I have adopted this principle in a four-valve set, screened-grid H.F., Det., 2 L.F. and find it perfectly satisfactory. To secure the formers to the valve bases, I fix a wood strip across the bottom of former



and screw this to a wooden plug fixed inside the valve bases. In the case of the tuned-anode coil with reaction, the four wires are brought down inside the former and soldered to the four valve legs.

In the case of the aerial grid coil, three legs only are, of course, required, the three wires being again brought down inside the tube, but it is an advantage to retain all four legs for the sake of steadiness, especially with a long former for the 5 XX range.

Yours faithfully,
J. A. BLACKALL.

Oswestry, Salop.

ITEMS OF INTEREST.

IT is expected that the wireless beacons at the Caskets and Start Point will commence operation during September next.

The Lundy Island coast beacon will probably start transmitting during November next.

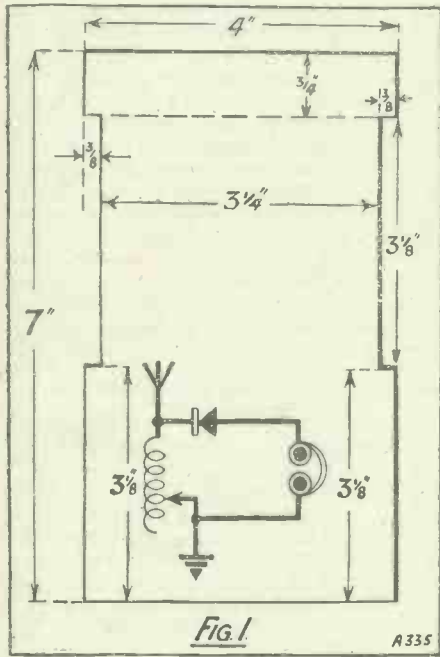
At the beginning of May the total number of wireless licences issued in Britain was 2,482,455.

The "S.B." CRYSTAL SET



THIS "Scrap Box" crystal receiver is made up from odd parts and various "stock-pot" materials. It is extremely simple, it works well, and any beginner might do well to try his hand with it before going to the expense of building something more elaborate.

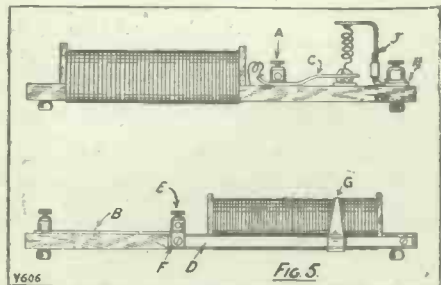
The most important points in its construction are very clearly defined in the



photographs and sketches, and thus a few brief explanatory remarks should suffice.

The Simple Framework.

The circuit diagram is shown in Fig. 1. This sketch gives the dimensions of the baseboard, a piece of dry deal about 1/2 in. in thickness. Across the recessed portion is nailed another piece of board, 3 1/2 in.



by 3 1/2 in. by 1/2 in., the edges of which are made flush with the edges of the recesses, and the four edges then rounded off. Two lengths of thin hardwood are then nailed to the ends of the smaller board so as to form flanges (see Fig. 2), and the combined baseboard and coil former is then complete, except for the usual introduction to the shellac brush.

No. 26 enamelled wire is used for winding

* * * * *

Here is a receiver capable of quite good results which can easily be made from "scrap box" materials.

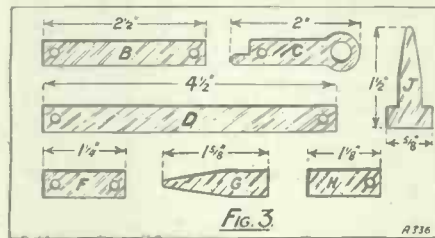
By OSWALD J. RANKIN.

* * * * *

the coil, the beginning of the winding ("open end") being anchored under one of the four wooden beads attached to the under side of the baseboard, and the end passed up through a small hole drilled through near the centre of the front flange, plugged with a match-stick, and afterwards soldered to the crystal clip.

Winding the Coil.

The only parts now required are a few pieces of scrap sheet brass, which are arranged as shown in Fig. 3, two small wood screws, and four terminals with wood-screw shanks. The parts B, F, G, and J are of thin spring brass, but C, D, and H should be cut from thicker material. The



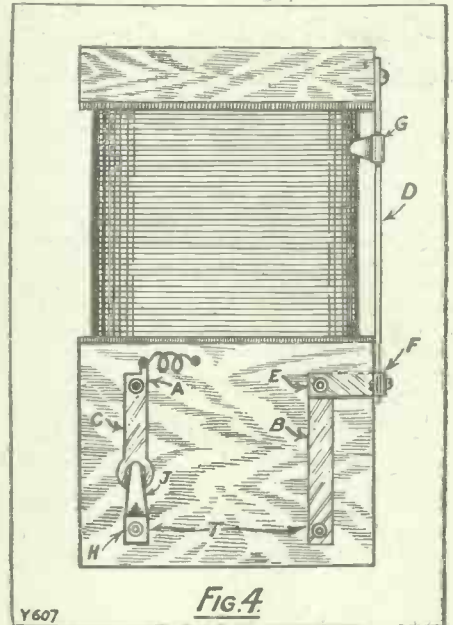
general arrangement of these parts may be clearly understood by studying the photo and Fig. 4, where each part is represented by a letter corresponding with those in Fig. 3. All parts are about 1/8 in. wide.

If the former is fully wound with No. 26 wire, and an aerial of average length is used, the set will cover the lower band of broadcast wave-lengths; i.e. the local

station should be heard, providing, of course, one is within the usual crystal range.

For the longer wave-lengths the baseboard should be cut much longer, and provided with longer recesses to accommodate more wire.

It should not be necessary to add that the cat's-whisker should be well soldered



to the sliding arm, J, and the end of the winding similarly attached to the small extension piece on C. The enamel is, of course, scraped away along the line where the slider, G, makes (a hard) rubbing contact. Finally, the four terminals are labelled "A" (aerial), "E" (earth) and "T" (telephones).

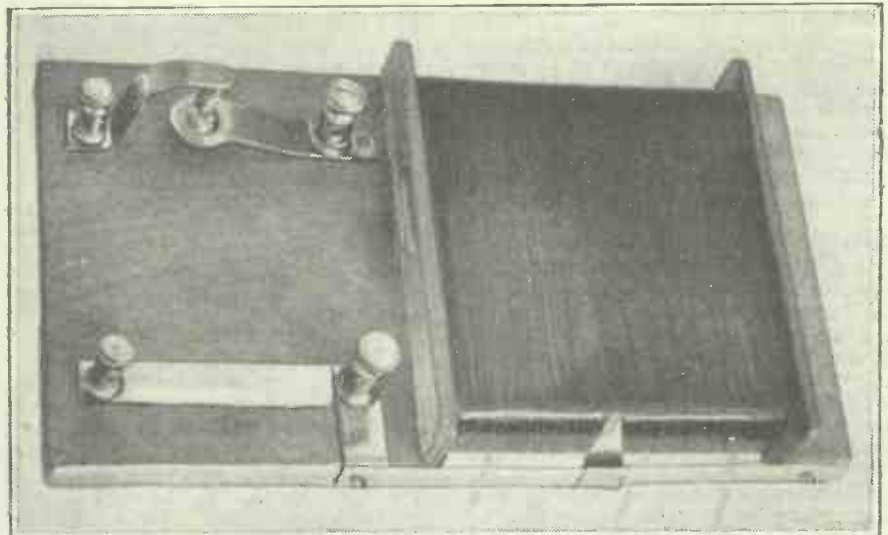


Fig. 2. The complete receiver. The baseboard and coil former form a simple wooden structure which even the most amateur carpenters among us could, with simple tools, construct with no trouble.



A humorous account, based on facts, of the building of, and the successful results obtained with, a "P.W." Set.

BY BERTRAM MUNN.

DEAR MR. EDITOR,—Until last night I was all the things that Mr. Bernard Elston has called me. An "ordinary family man" with not overmuch cash, only one pair of unskilled hands for knob manipulation, and far handier with the lawn-mower than a soldering iron and bits of tinned wire. I know nothing about either low or high-brow frequencies, and all I understand about valves is that when they won't light up they should at least glow. Furthermore, I was one of those ferocious SCEPTICS who scoff whenever they read letters by the go-getters of the ether.

When I heard that Mr. G. P. Kendall had "marshalled all his resources" in order to convert the likes of us, I at once began saving up what I could and borrowing what I couldn't. I am happy to say that as soon as "P.W." of June 16th appeared I was in a position to go round to the local cycle shop, plank down eight pounds and "P.W." and say: "Give me exactly what is herein specified, even unto the last screw and terminal." Which he did.

"Crossing the Channel."

The following Sunday morning, while my youngest son was tuning up the lawn-mower and my wife removing the dead ends of the dinner carrots, I set to work on the set.

At 10.30 p.m. it was finished, but so was 2 L.O. I also realised that all the English stations had—like the good little fellows that they always are on Sundays—now gone to bed for the night. Therefore, my only hope of a test was to get abroad.

My hands shook as I hitched up the last wire and finally turned to turn the knob.

Silence!

My wife coughed. I looked at her sternly. "Hush!" I whispered. "Dicky birds! The thing is, at any rate, alive."

With great care, I went on with the knob-work until a gentle rushing sound stole through the room.

"Waves!" I cried. "Quiet! We're crossing the Channel."

"We Stood Entranced."

And sure enough we were, for the next moment a German was talking to us just as if he were in the very room. It was wonderful! We stood entranced. Not one of us could understand a single syllable, in spite of the money I have spent on the children's education. But we hung on to every word he said, just as though it were one of those splendid, uplifting talks from our own local station.

Then the baby—who had been specially kept up for the occasion—hiccoughed.

"Away with him!" I cried. "We

mustn't miss a word of this. Listen! *Hark!* What was that?"

As the baby was being taken up to bed, I heard the soft strains of music.

"Turn the knob a bit," said the apple of my eye. "You're on the edge of another station."

With trembling hand, I turned the knob, and in it came, just as if we had suddenly been transported from a lecture-room to the Queen's Hall.

"Where can that be?" I asked feverishly.

"It sounds to me," said my daughter,

"like Viennese music. You're in Vienna!"

"The deuce I am!" cried I. "By Jove, I believe you are right! We'll just try again. What's the next town past Vienna?"

OUR SCEPTIC CURED.

Mr. Bernard Elston, the original "Sceptic," whose letter to "P.W." aroused so much interest and who was the direct inspiration of the "Sceptic's" Three, bravely admits to a change of opinion.

By BERNARD ELSTON.

SCEPTICISM usually starts amongst wireless men on a Thursday when

"P.W." arrives. There they read that a perfectly good wireless set can be made for seven pounds or so and given them three or four stations on the loud speaker. It is just what the prospective patient wants, but it sounds rather too good to be true. Anyway, they *do* make it and find it really *is* true; in fact, they may even find a spot or two of jam on it as well.

The complaint dies away—for a time.

Some three weeks or so later, and again on a Thursday, the patient reads that someone—who, unknown to him, is suffering from opulent opticism—has heard six stations on the loud speaker, and immediately the complaint returns stronger than ever.

How Scepticism Develops.

Every Thursday thereafter these six stations grow by leaps and bounds to ten, fifteen, twenty and even thirty, and ordinary scepticism rapidly develops into septic scepticism, poisoning the whole system and mind. At this critical stage the patient fluctuates between a twenty-valve superhet and the gas-oven.

I gave the knob a little turn, and a moment later a girl's beautiful voice was telling us something about Spanish lovers—or possibly onions. I am quite sure that it was Spanish, because it had about it that sort of toreador lilt which is so unmistakable.

"Stations Cascaded In."

The stations simply cascaded in. No power on earth could keep them out.

My eldest began counting:

"Thirty-one, thirty-two, thirty-three! Go on, daddy! Go on; I know that one! I heard it the other night on Joe's set. It's a Yak station. Listen! There's his call sign. Two grunts and a squeak!"

At 2 a.m. America began to come in. No mistaking that country. A man in Frisco was telling us how to eat popcorns without a knife.

But why go on? I am no longer a sceptic. I say it as with my last breath. I'll believe anything about radio in future—anything! Furthermore, if Mr. Bernard Elston cares to come to my house, unarmed, on any dark and stormy night when conditions are unfavourable, I'll guarantee to get him thirty stations on the loud speaker, and that with only one hand and no display of skill on my part. Moreover, if he likes to spend the night in my back parlour, I will comb America for him.

I enclose a pack of my visiting cards for distribution to any sceptics still left on your books, and hasten to sign myself

"CONVERTED."

Know, then, all you sufferers, that there is only one real cure, the Technical Staff of POPULAR WIRELESS and their "Sceptic's" Three.

True, I did not get nine stations on the speaker. I never thought I should, because as everyone now knows, I am just a plain darned fool; but before starting in to build it I figured that if I got about half these experienced gentlemen achieved, I should be doing very well indeed.

Judge, then, my surprise when I got six. Yes, six, and without getting my ear jammed between the speaker diaphragm and the magnets either. I am not going to even mention headphones in case someone comes back at me and says that I am suffering from opulent opticism, or, as some old-fashioned people still call it—good hearing.

Afraid of a Relapse.

Truly "P.W." may be proud of its staff. They are real public benefactors in turning out such a set for which the masses have clamoured. The price is right, dead right, the performance is equally right; even I am right, for once.

And so at last I am cured; but deep down I am afraid, yes, terribly afraid of a relapse. To such experienced men of acknowledged and proven merit as the designers I do not hesitate to concede the nine stations on the speaker, to really skilful and experienced amateurs I will allow the same number, and possibly to a few others who are exceptionally well-situated; but if the Editor publishes any letters from Little Leonard or Aunt Alice telling me they got twenty, I shall burn the blooming set and keep white mice or something.

Say eight stations for eight quid. Why, a hog could not want more.



LORD JUSTICE SANKEY,
Member of the Hadow Committee.

BROADCAST EDUCATION ON TRIAL

Is the B.B.C. handling this side of its work properly? Will it, as at present constituted, ever adequately be able to deal with radio schooling?

By THE EDITOR.

broadcast education are guilty of a grave psychological error. In their advocacy of the extension of broadcast lessons they have suggested that, with the introduction of the voices of great authorities into the schoolrooms up and down the country, there might well be a considerable reduction in teaching staff. With such suggestions about, it is understandable that many teachers look with suspicion upon the intrusion of wireless into the class-room.

Work for Whitehall.

What of the future? Experience to date, however scrappy, does prove at least one thing, and that is that if broadcasting is to rank seriously in the educational system of the country, then it must be contracted out of the B.B.C. and absorbed by the Board of Education. The B.B.C. would remain the "enabling agency," but all responsibility for programmes, lectures, artistes and lecturers would pass to Whitehall. If the Board of Education after full discussion and consultation with its subsidiary authorities, cannot undertake this responsibility, then the B.B.C. should drop all transmissions to schools. There would certainly be no justification for the B.B.C. going on spending more money on

a service which was of doubtful value even in the eyes of those whom it was designed to benefit. The licence money is not paid for this kind of thing.

Thus, if broadcasting education is to become a permanent thing, it should be administered and controlled through the recognised education authorities. A section would be set up whose purpose it would be to arrange for subjects and speakers. In order that these lectures and lessons might be of any real value, there would have to be most carefully considered pre-arrangement of detail. For one thing, each course, and each lecture of each course, should be made to fit naturally into the normal syllabus of the schools receiving it.

Two Main Purposes.

For another thing, the broadcast lectures, being administered by the educational authorities themselves, would become compulsory. Neither of these two main purposes could possibly be served if the control of school transmissions on the programme side were to remain at Savoy Hill.

Therefore, if school transmissions are to be developed the only legitimate part of the work for the B.B.C. is the technical distribution.

IN view of the "serious" bias of B.B.C. policy, it is not surprising that there has always been at Savoy Hill a great deal of fuss and talk about broadcast education. Paradoxically, the B.B.C. has been so anxious and concerned about education that it has had time to do very little. Savoy Hill has been too much engaged in organising and re-organising its education side. Still, some progress is recorded; perhaps more by luck than by anything.

Test Being Undertaken.

In several hundred schools throughout the country, broadcast receiving apparatus is installed. The afternoon programmes of Daventry and some other stations include lessons meant specially for these schools. Some of the lessons are good; but by no means all the schools that are equipped receive these programmes. The reason for the irregularity is two-fold, uneven apparatus for the reception and the hostility of the Education authorities.

It has been left to the enterprise of the Carnegie Trust to undertake a careful practical experiment in co-operation with the Kent County Education Authority. The purpose of this experiment is first of all to ascertain the practicability and desirability of using broadcasting as a permanent auxiliary to the normal machinery of State education. The main issue having been determined, an attempt will then be made to secure a decision on the apparatus of reception. An early favourable report is expected.

A Psychological Point.

The attitude of pupils in schools is almost invariably enthusiastic. But this is not because they recognise or welcome any educational value in the broadcast lessons. It is because the novelty of the thing appeals to them and it is a variation in the drudgery of the class-room. The attitude of teachers is not so enthusiastic. Those who are interested in wireless are naturally favourable. But there is a considerable proportion who look with growing disfavour on an intervention which may tend to deprive them of their means of existence. The more ardent friends of

RECEIVING RADIO PICTURES.



Dr. E. F. W. Alexanderson (right) and Mr. D. McFarlan-Moore with one of the special valves used in their new and simple outfit for the reception of broadcast radio pictures. This is not "television," it should be noted, which is as different as is the developed cinematograph from the simplest pocket camera.

TECHNICAL NOTES.

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

ELIMINATOR DANGERS

NEW REGULATIONS—LIVE WIRES—USE OF HEADPHONES—MAINS TRANSFORMERS—HIGH-TENSION BATTERY, ETC., ETC.

Eliminator Dangers.

IN view of the increasing use of eliminators, or "mains supply units," for high-tension electric supply to the radio receiver, attention has been called to the dangers which are almost inevitable with devices of this kind connected directly to the electric-light mains.

There have been a number of instances where the users of such devices have received severe electric shocks, and on that account the whole matter of the design of such instruments came up for consideration by the Institution of Electrical Engineers.

It is clear, if you consider for a moment the usual circuit of a high-tension eliminator, that one of the terminals is in direct connection with the mains and is therefore "live." If the user accidentally connects this to earth, either through his body or through some metallic connection, the danger is evident.

New Regulations.

It is for reasons such as these that the General Regulations which apply to the Electrical Equipment of Buildings have been modified and extended so as to cover the use of electric supply devices for radio purposes. The particular Regulations, which are affected are Regulations Nos. 126 to 136, and the alterations were approved by the Council of the Institution on May 17th.

Manufacturers of apparatus of this kind have, of course, been notified of the alterations, and experimenters and constructors will find it useful also to have a copy of the Alterations, which can be obtained from the Secretary of the Institution.

One of the most obvious and important of the Recommendations is that all parts which are live, or are intended to become alive, from the supply mains shall be so guarded as to prevent accidental contact by the user with such parts under normal conditions of use.

Live Wires.

The Recommendation referring to the isolation from the supply mains states: "There shall be no connection, except through a condenser, between any conductor directly connected to the supply mains and the earthing lead of the radio apparatus which is connected to the earth plate, waterpipe or other earthing system. The condenser referred to should preferably be incorporated in the radio apparatus, or should be placed as close as possible to it.

"Where radio apparatus is connected to D.C. supply mains, the aerial shall only be connected to the apparatus through a double-wound high-frequency coupling transformer adequately insulated for a test pressure of 600 volts, or through a condenser inserted in series with the aerial circuit and immediately adjacent to the aerial terminal.

"Where radio apparatus is connected to alternating current supply mains without the use of a double-wound mains transformer, the aerial shall be connected as described above; but the condenser referred to shall have a capacity not greater than 0.001 microfarad."

Use of Headphones.

The Recommendation with regard to head telephones and loud speakers states: "These shall be connected to the radio apparatus either through a double-wound transformer or, alternatively, through a circuit which includes a condenser in series with each of the outgoing conductors.

"The field circuit of a moving-coil loud speaker having a separately excited field system may be independently connected to the supply mains in accordance with the Regulations which are applicable."

CORRODED CONTACTS CAUSE CRACKLES.

Crackles, scratching noises, and poor reception generally are all liable to be caused by a dirty aerial-earth switch.

Keep Contacts Clean.

**Mains Transformers.**

A Regulation with regard to mains transformers states: "Every 'mains' transformer shall have its core earthed and shall be of the double-wound type in which the winding that is in direct connection with the supply mains is effectively separated from all other windings either by an earthed metallic screen, or by adequate insulation capable of withstanding a test pressure of 1,000 volts (alternating current). The insulation resistance between the above winding and all other windings, when measured after the above pressure test, shall be not less than 20 megohms when tested with a pressure of 500 volts (direct current) or twice the supply pressure, whichever be the greater."

High-Tension Battery.

Incidentally, it is interesting to note that the new Regulations do not apply to a high-tension accumulator battery which is being charged whilst disconnected from the radio set.

Another important paragraph which should be noted is as follows:

"Radio apparatus, which is not connected to the supply mains, does not form part of the electrical equipment of a building and is therefore outside the scope of these Regulations, but it should be noted that when in these conditions such apparatus (including a crystal set) is used in a room in which there is an electrical installation, care should be taken while using headphones, or while handling any of the radio apparatus having an earth-connection, not to touch any metal switch, portable metal lamp standard, electric heating or cooking appliance, or any other metallic part of the electrical installation, as in the event of a fault in the electrical installation such metal may accidentally have become alive."

Sealed Coils.

The placing of coils within an evacuated container has many times been suggested, (Continued on page 758.)

NEWS FROM SAVOY HILL.**FROM OUR OWN CORRESPONDENTS.****BANK HOLIDAY ARRANGEMENTS**

DRAMATIC PRODUCTION AT CARDIFF.

Bank Holiday Arrangements.

PROVIDED the Air Ministry discover no depressions round our shores, the broadcast programmes on August Bank Holiday will not excite a great deal of interest. But the B.B.C. is taking no chances, and whatever may be the climatic conditions, the holiday fare will be good and appropriate to the occasion.

There is dance music in the afternoon for London and other stations by a new combination under Alphonse du Clos from the Hotel Cecil, and later an eye-witness account by Mr. John Scott Hughes of the events of the day at Cowes Regatta. The first part of the evening programme will be a concert by the Band o' London, under the conductorship of Percy Gayer, who is responsible for the organisation of the band.

Mabel Constanduros has written a new sketch about another visit of the Buggins family to the Zoo, just the sort of thing

which is likely to be appreciated on Bank Holiday. This will be followed by a relay of excerpts from the musical play, "So This is Love," from the Winter Garden Theatre, after which there will be dance music by the B.B.C. Dance Orchestra under Jack Payne, and by the New Princes Orchestra, until midnight.

The task of deciding what form its Bank Holiday programmes shall take has been virtually decided for the Manchester Station by the old-time rivalry, now fought out on the cricket-field, between Yorkshire and Lancashire. Both counties are in the running for the county championship, thus adding considerably to the importance of the game which takes place on the Old Trafford Ground.

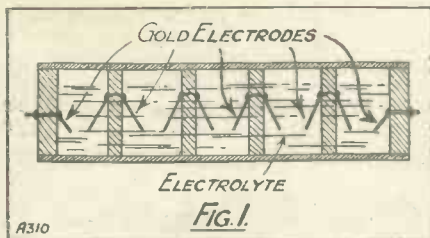
Bank Holiday will doubtless find the encounter in its most interesting stage, and ideally suited for the running commentary

(Continued on page 764.)

THE latest radio gadget in France is "l'autopolariseur," a neat little component about the size of a Dumetohm grid leak which replaces, with considerable advantage, the ordinary grid-bias battery in a low-frequency amplifier. As will be seen from the photograph and sketch, the device consists mainly of a glass tube divided into five compartments, each of which is filled with a special electrolyte. Fine gold wire electrodes are sealed into the partitions and end-caps, these being arranged as shown in the sectional sketch, Fig. 1.

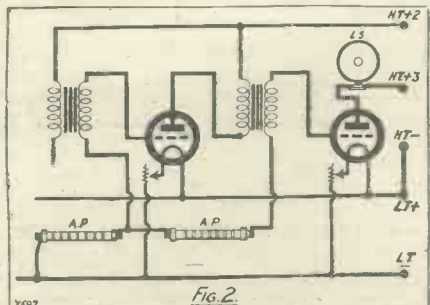
Automatic Adjustment.

When the device is wired up in place of the G.B. battery (the question of polarity is ignored), grid bias is automatically applied to the L.F. valve in correct proportion to the applied plate voltage, any adjustment to the latter resulting in a



correctly proportional increase or decrease of G.B. voltage. Thus, if the H.T. positive wander plug is moved from, say, 120 to 90 volts, the G.B. voltage drops automatically to the appropriate value. Similarly, if the plate voltage is increased, the G.B. voltage rises proportionately.

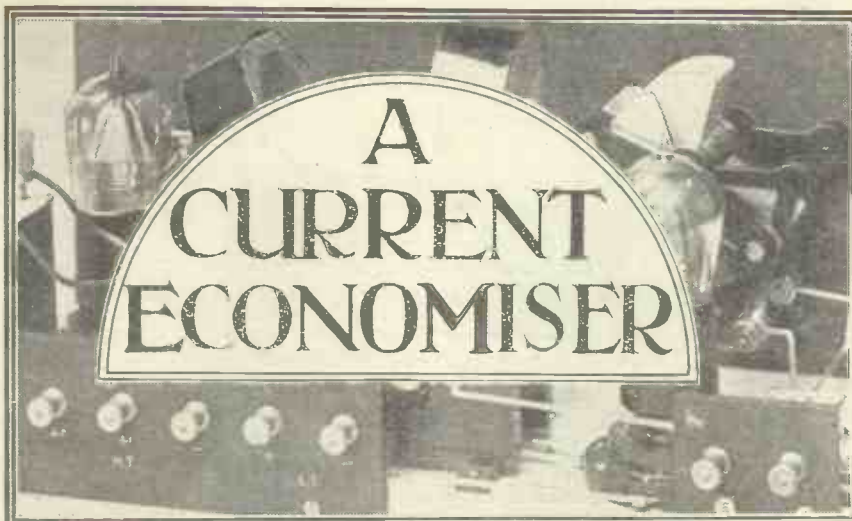
On test, the Automatic Bias afforded some very interesting experiments. With the milliammeter and voltmeter hooked up, it proved to be in every way equal to the orthodox G.B. battery as regards economy in plate current, and signals were



slightly stronger and certainly more pure than when using the G.B. battery.

Voltage Fractions.

The maximum "load" for a single Auto-Bias is 6 volts. In cases where the second L.F. valve requires a higher G.B. voltage,



 Some details of a novel automatic grid-bias adjuster.
 By O. J. RANKIN.

two Auto-Bias units are wired in series and arranged as shown in Fig. 2.

One often finds that 1 volt, or a fraction of a volt, would be very desirable with certain types of L.F. valves, and with an ordinary G.B. battery it is not possible to tap off intermediate values between the usual fixed stages of 1½ volts. With the Auto-Bias, however, fractions of volts are easily obtained, and this, of course, means much finer adjustments, and, incidentally, better results. It is to be hoped that this interesting little device will soon be available for British amateurs.



The component takes the form of a small grid leak.

 THOSE G.B. LEADS.
 By H. J. B.

IT really is surprising how small errors can so easily upset the anticipated performance of a wireless receiver and, as the following little incident shows, even sets made up to a complete specification by wireless firms themselves are by no means immune from mistakes. The receiver in question was of straightforward design, being a three-valver comprising the popular arrangement of detector valve, followed by two low-frequency stages, R.C. and transformer coupling, the bare details of which are given in Fig. 1. As I had had an opportunity of testing out a similar set pretty thoroughly only a few days previously I was surprised when a friend of mine said that he was disappointed in the receiver from the standpoint of reproduction.

In this instance no blame could be attached to the loud speaker, which was a high-priced model, and a thorough overhaul of the set had been made. It did not take long to run over the connections, since the wiring of the set was so simple and a quick comparison could be made with the wiring diagram. Everything appeared to be quite in order, however, and when the batteries and valves were tested separately they proved to be above suspicion.

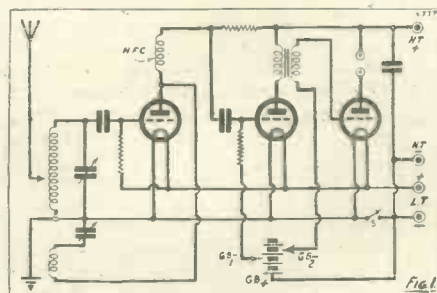
The set was accordingly again connected up, a full 120 volts H.T. plugged in for the single H.T. tapping, and the grid bias on the last valve adjusted to 12 volts so as to reduce the possibility of distortion in that direction, while G.B. - 1 for the preceding valve was made 3 volts. When switched on the set still gave the same trouble, and while experimenting the G.B. - 1 plug was altered in position. Increasing the value from 3 to 4½ volts made matters worse, but adjustments in the other direction improved the reproduction, the best results being secured with G.B. - 1 and G.B. + in the same socket.

Flex-lead Fault.

This, of course, appeared contrary to expectations, so I examined carefully the G.B. + and G.B. - 1 leads. In the actual set these two connections happened to be made fairly near to one another, and the two flexible leads had been twisted together once or twice. The examination revealed that the usual red and black terminating plugs had been fixed to the wrong leads, and since in arranging the grid bias notice had only been taken of the red and black colours, by glancing at Fig. 1 it is easy to see what had happened.

L.T. - is the datum point from which the grid-bias voltages are reckoned, and as G.B. + had really been plugged into the - 3 socket of the battery, and G.B. - 1 into the positive socket, the resistance-capacity coupling stage was working a 3-volt positive bias, while the negative bias on the last valve had been reduced by 3 volts.

No wonder distortion took place. It was only a moment's work to rectify matters and correct the voltages, the plug colours being changed so that future errors could not occur, and the set then gave the results that had been anticipated.



FROM THE TECHNICAL EDITORS' NOTE BOOK



A SMOOTHING CHOKE.

THE main requirements for a smoothing choke used in an H.T. eliminator are that it should have ample inductance, a reasonably low ohmic resistance, and be able to carry a fair current. Inductance, however, cannot be regarded as a fixed quality, like the capacity of a condenser. The inductance of a smoothing choke will vary with the current which flows through it.

Thus one may have a choke with the useful inductance of 50 henries when only 1 milliampere of current is flowing, but the inductance may drop to a mere henry or two when the current is increased to, say, 20 milliamps. A choke of this nature would be quite useless in the average H.T. mains unit, where currents of the order of 20 milliamps and more are quite commonly met with, and a choke having an inductance in these conditions of anything less than about 14 or

The R.I.-Varley Smoothing Choke.

15 henries would not provide efficient smoothing.

It is because until recently we have not been able to obtain easily, and at moderate prices, chokes capable of carrying heavy currents that completely silent H.T. D.C. mains units have been difficult to construct. But now that we have, among others—but not too many others, by the way—the new R.I.-Varley choke, silent units are practical propositions. When handling the total current of even the largest H.T. mains unit this choke has the minimum inductance of 20 henries. But even when it is asked to carry as much as 1 of an amp., its inductance is still of the useful order of 14 henries.

GENEROUS CONSTRUCTION.

It is a heavy article, for characteristics such as the above are, in the usual way, only achieved by the use of plenty of iron. It is completely shrouded in a stout metal casing, and the two terminals are situated towards the bottom, although they are quite accessible. I think Messrs. R.I.-Varley are wise to place the terminals in this position. It enables us to keep the wiring well down on the baseboard, a procedure

which is distinctly advisable in the construction of a mains unit.

A "DOUBLE DRUM" CONTROL.

Practically every receiver produced these days in America has what are known as "drum-drive" variable condensers instead of the knobs and dials familiar to British constructors. A "drum-drive" is a device which is arranged to operate the variable similarly to an ordinary dial (generally it is geared down to provide slow motion), but it is fitted behind the panel.

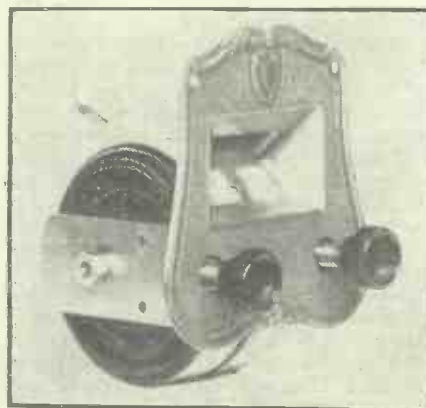
The edge of the drum carrying the indicating figures shows through an aperture in the panel, and a small knob is fitted for control purposes. Sometimes the edge of the drum is knurled in order that it can be controlled direct by the fingers. An ornamental plate is fitted to the panel, which hides the cut edges of the panel aperture and the screw-heads.

Drum-drives are rather difficult to fit, at least they cannot compare from an ease-of-fitment point of view with the well-known dial type, but they are certainly most effective in operation and very pleasing in appearance. Personally, I consider them well worth the trouble they necessitate in mounting.

SMOOTH MECHANISM.

A very excellent drum-drive recently came to my notice—one that is obtainable from Rothermel Corporation Ltd., of Maddox St., London, W.1. It is an American production, and is known as the New Pilot No. 1283 Double-Drum Control. It is listed complete with condenser at 22s. 6d.

I particularly like the movement of this unit. The gearing takes place between a pair of small metal discs and a ridge in the hard Bakelite structure of the drum itself. A most satisfactory velvety action results, and one seldom if ever to be found in mechanism in which metal-to-metal gearing



This Pilot "Double Drum" Control operates two variables aligned to left and right of it.

exists. And the whole article is soundly made and provided with a fine finish. Every necessary nut and screw is supplied, together with clear instructions for assembling the device on a panel.

EDISWAN L.F. TRANSFORMER.

The Ediswan people are so well known for their valves that one is apt to overlook the fact that they produce several other excellent radio components and accessories. For instance, there is an Ediswan loud speaker, and a very good instrument it is too; it is known as the "One-der," and it is rather a wonder considering the results it gives. Although it is of the horn type it reproduces a respectable bass, together with a good upper register. Further, it really has that sensitivity popularly attributed to horn-type speakers.

However, the Ediswan product I want to deal with more or less in detail on this

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

particular occasion is the Ediswan L.F. transformer. This is a quality component which must take its place with the best of its kind. I recently received a sample and have incorporated it in a test circuit. It



This is the Ediswan L.F. Transformer.

has a ratio of 3.5 to 1, an eminently suitable sort of ratio for the kind of work such a component has to do in an ordinary receiving circuit.

"LEADING QUALITY."

It is a "smooth," nicely turned out article, and has quite a thoroughbred appearance with its shiny black casing. In operation it is similarly attractive. It has ample primary impedance and can pass adequate current for normal purposes without saturation troubles occurring. Used as a last intervalve coupling in a four-valve arrangement in which was also an R.C.C. stage, results were satisfactory in both point of amplification and purity.

The price of this Ediswan L.F. transformer is 22s. 6d., and as it is of leading quality it is a very reasonable one.



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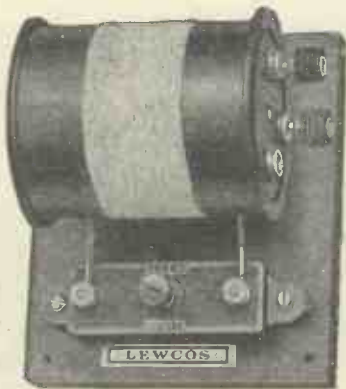
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RECEIVER MISTAKES

Before building your next set it will be worth your while to read this interesting article.

By L. H. THOMAS.

CONSIDERING how well most constructors seem to know their own minds with regard to their own requirements, it seems remarkable to the writer that a huge proportion of the various sets with which he has met have been hopelessly unsuitable for the owner's requirements. One bright youth, for instance, who used to love to play with reflex circuits of a more or less ferocious character, actually inflicted one of them on his grandmother, who asked him to fix up a nice simple set for her, and as a result the peace of at least one home has been shattered, and probably the immediate neighbours' homes are also far from peaceful, judging from the unbelievable variety of noises produced from the set by the old lady.

This sort of thing may not seem a very heinous crime when described in print, but considering how easily it may be avoided, it is surely up to the home constructor to bestow a little thought on the designs which he proposes to inflict on others. It is not too much to ask that he should be as considerate with them as he is with himself when he is building his latest effort. Classifying the better-known types of set under a fairly small number of headings, we can easily decide, very broadly speaking, on one which is more or less certain to give satisfaction to any particular person that we know.

Catering for a Choirmaster.

To take an example, the writer was recently asked to advise a gentleman who is an organist and choirmaster as to the type of circuit that would be most suitable for a set for the use of his family. Needless to say, the chief consideration here would be first-class quality, and probably such considerations as selectivity and sensitivity to weak signals would hardly enter into it at all. As a matter of fact, the set that was ultimately built comprised an anode-bend rectifier without reaction, two resistance-coupled stages of L.F. and a large "Kone" loud speaker. 2 L O is nearly always the programme-provider for that family, but 5 G B is available by the turn of a single knob if he is desired.

How unsuitable a set like this would be, however, for one of those people we all know who are never happy unless they have a "gadget" to fiddle with! There are large numbers of this type, and nothing pleases them better than an imposing row of dials and knobs. Probably the best set

of knobs, and if separate filament rheostats are fitted a really pretty panel will result, fit to delight the heart of any "gadget-lover."

Then we have the person that makes a fetish of tidiness. Some of the people the writer has in mind would probably present this class of person with one of the ancient "sloping-panel" receivers, with dozens of terminals on the front panel, and equal numbers of wires trailing in all directions. Could there be a more glaring receiver mistake.

A Simple Set Wanted.

What is wanted is a set with a small cupboard underneath to take the batteries, all the connections being taken from a terminal strip at the rear of the set, none of them needing to be visible at all. The

for this type of patient is one that is a fairly good "distance-getter," comprising, say, two H.F. stages and one L.F. stage, with tuned-anode coupling, neutralised, of course, and with reaction on the detector. This combination offers opportunities for the inclusion of an uncommonly large number

them, and it is extremely dangerous to the health of the set and valves to entrust them with anything more complicated than this. Very often the stupidity is only a pose, but it is as well to assume that it is not, and to minister to their requirements. A very suitable set for this class is a detector with fixed reaction—sufficient to keep the set somewhere near the oscillation point over the whole band covered by one coil—and one or two note magnifiers. Generally speaking, they will not want to receive distant stations at all, so that the design of the set is very simple indeed.

Valve Sets for Villagers.

Probably the most glaring class of "misfit" occurs, however, with regard to current consumption. A friend of the writer's recently brought to his notice a set that had been made for a lady living in a very lonely village which had no accumulator-charging facilities and no electric light or gas. What had been installed here but a complete set of *bright emitters!*

One might be excused for thinking that the constructor of the set had a grudge against the lady, but it was not so. He had apparently committed this ghastly blunder in all innocence, and in this case the symptoms displayed by the patient were a tendency to carry a heavy weight two miles about once a week, and a very low opinion of the programmes! If ever there was a case for the "06" type of valve, here it was. But he had probably made a set of this type for some one living next door to a charging station or possessing mains in his own house.

One more point that should always be considered is that of aerials. It should be obvious that, in cases in which there is little or no room for an outside aerial, the set should be reasonably sensitive and should incorporate one or two H.F. stages. Where a large outdoor aerial is available one can often dispense with them unless the prospective owner is likely to turn into a "DX-fiend."

One might also mention that, out of consideration for the long-suffering battalion of neighbours, one should, wherever possible, make sets of a non-radiating character, particularly in cases where the owner is likely to be the sort of person to mishandle them.

Although in the foregoing few words it

has been assumed that the set is being made for someone else, it may be said in conclusion that the greatest receiver mistakes sometimes occur in cases in which the set is made for one's own use. Look well through the descriptive article before deciding to make any particular set; look at the claims for the set and note the ease of construction before deciding to make it. A little time spent in this way may save many regrets in the future.



Messrs. McMichael, of London, recently carried out experiments in radio reception on an express train between Hatfield and London. The station tuned in was Melbourne, Australia—not one of our lusty locals!

panel lay-out in this case, too, should be as simple as possible. Two dials and a switch, symmetrically arranged, generally provide a pleasing appearance, and if each filament is to have its separate rheostat let them be placed on the baseboard and concealed from the public view.

Another class is, of course, that which requires a "foolproof" set. Anything more complicated than a panel with one dial and one switch completely flabbergasts

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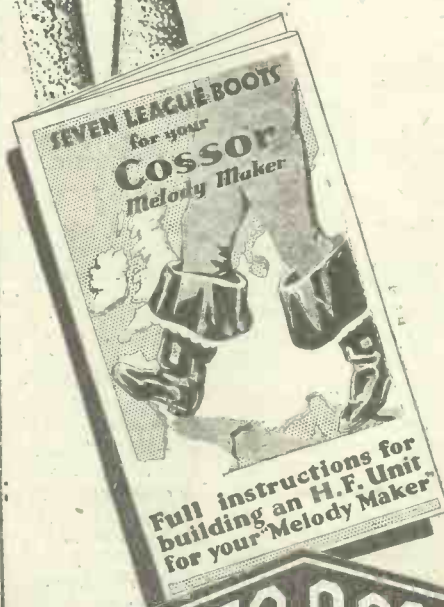
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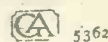
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TECHNICAL NOTES.

(Continued from page 752.)

the particular advantage being to protect the coil from dirt and moisture and also from the effects of handling, all of which may interfere with its characteristics.

For short-wave work, the constancy of the characteristics of the coil is especially important, and I notice, in this connection, that an American manufacturer is now placing on the market short-wave plug-in coils which are sealed up in a glass vessel precisely similar to the bulb of a valve. The coil is wound upon a bakelite tube and is mounted upon four metal leads sealed into the pinch in exactly the same way as in a valve. These coils are made in several sizes which cover the amateur and broadcast short-wave bands. The glass bulb is set into an ordinary valve base provided with the usual four pins and adapted to be inserted into a regular valve socket.

Efficiency.

In spite of the distributed capacity of the leads and the socket, and the losses which are due to the bakelite tube, it is found in practice that the short-wave coils made up in this way are very efficient, and excellent results are obtained owing to the concentrated field of the coil. The very compact way in which the coils are enclosed in the valve bulb means that the coils can be easily connected up into the circuit and a very neat layout is possible.

It is found that the coils retain their characteristics indefinitely, which is a most important advantage. Any wave-band may be covered by simply plugging in the appropriate coil.

Sealed Condenser.

Another component, which follows somewhat similar lines, is the vacuum condenser, which is a fixed condenser of efficient and compact design, made with mica and copper strips tightly bound together, and placed within a small glass tube rather larger than the tubes which are used for certain types of grid leak. The leads from the condenser are brought out to metal caps at opposite ends of the tube in the usual way, and the interior of the glass tube is evacuated so as to ensure the complete absence of any interfering agent which might upset the characteristics of the condenser.

I understand that up to the present these condensers have only been made in comparatively small capacities, but there is nothing to prevent quite large capacity condensers being built up in evacuated glass tubes in the same way. Incidentally, the condenser made up in this fashion is very conveniently mounted between spring clips after the fashion of a grid leak.

Screened Valves.

Although shields for coils and for definite parts of a circuit are now so popular, the separate type of small shield for the individual valve has not "taken on" in this country to the same extent as in America. In U.S. the individual valve shields are now freely advertised, and from what I learn from readers over there they are gaining in popularity.

The shielded valve is very similar in principle to a screened coil, and one of the latest types of screen is $5\frac{1}{2}$ ins. in height and $2\frac{1}{2}$ ins. in diameter. This screen, which is of sheet copper, completely covers the valve

and is attached to the sub-panel by means of a bakelite base made in the form of a ring, over which the screen is slipped.

The top of the screen is in the form of a removable cap, and when this is removed connection can easily be made to the terminal at the upper extremity of the tube (in the case of valves of that type). Where connection is made in this way a screened flexible lead is provided, not unlike the flexible incompressible tube of a Bowden brake.

Cone Angles.

What effect has the angle of the cone of a loud speaker upon the reproduction? At first you might think that, inasmuch as the cone formation gives the sound radiator a considerable degree of rigidity, the actual angle of the cone was more or less unimportant. But you must bear in mind that although the cone is comparatively stiff it is not wholly rigid, and it is a fact that a small-angle cone is more rigid than a wide-angle cone; in other words, the nearer the cone approaches to the plane the less rigidity it derives from its cone formation.

It has been stated by some writers that there are definite angles which must be employed to ensure reproducing the bass notes and the higher notes. For example, it

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has been estimated, that for cones about 18 ins. in diameter the best all-round angle varies between 90 degrees and 130 degrees.

Free-Edge Cone.

The free-edge cone, as its name implies, is supported only at the centre by the driving pin from the "movement" of the loud speaker, and the edges of the cone are quite free. Theoretically such a cone is intended to move as a rigid body, and if it were absolutely rigid the edges would move in exact accordance with the centre. As a matter of fact, however, inasmuch as the material of the cone has a certain amount of elasticity, the cone does not move as a rigid whole, but acts partly as a rigid diaphragm and partly as a diaphragm with the edges fixed. Although in some cases considerable loudness can be obtained from a cone of this type, there is a tendency to "blast."

"Floating" Diaphragm.

In order to overcome the tendency to blast, the edge of the cone may be fixed either wholly or partially. If the edge is mounted upon a resilient support, such as soft rubber, the diaphragm or radiator is sometimes referred to as "floating."

If, on the other hand, the edge of the cone or radiator is mounted on a rigid support, then the sound is produced by the cone

acting as an ordinary diaphragm but of high natural pitch.

In order to increase the rigidity sometimes two cones are secured together at their edge, making a "double cone."

It is interesting to notice that attempts have been made to cover effectively the whole acoustic range by mounting three separate cones co-axially, all driven by the same pin from the loud speaker "movement." The three cones are of different sizes, large, medium and small, the idea being that the large cone properly reproduces the lower register, the medium cone the middle register, and the small cone the upper register. How this works out in practice I am not able to say, as I have not tried it, but possibly some of my readers may have tried such an arrangement or may be interested to do so.

Graduated Thickness.

Another rather interesting thing to try in connection with home-made cones is the graduating of the thickness of the cone from the centre towards the edge. It has often been suggested to make the cone thinner at the edge than at the centre. A cone can easily be graduated, at any rate roughly, by graduating the thickness of the sheet from which the cone is to be made. For example, suppose you wish to make a cone thicker at the centre than at the edge. You take a full-size circle of the paper you intend to use and then you cut a somewhat smaller circle of paper and stick it concentrically upon the first sheet. Another circle of paper still smaller is taken, and this is stuck in the same way on top of the second sheet, and so on, with gradually decreasing diameters of circle. In this way a sheet is made up which thins off from the centre to the edge.

This sheet is then cut out in the usual way and mounted up in the cone form. If it is desired to make a cone which is thicker at the edge than at the centre, you must take your first circle of paper, and then a second circle of the same size but with a smaller circle cut out at the centre. A third sheet of the same size is taken and a larger circle is cut out of the centre, and this is stuck on top of the second sheet, and so on, gradually increasing the size of the hole cut from the centre.

Comparing Capacities.

A very simple way of testing the capacity of a condenser (of the ordinary type, not the electrolytic) is to use a neon lamp with a high resistance. If the condenser is connected to a source of high voltage, say 200 volts or more, through a series resistance, and a neon lamp is bridged across the condenser, the lamp will light up when the voltage applied to the lamp reaches the critical value. The resistance used may have a value about 1 megohm, or more.

After the neon lamp has "lit up" at a voltage somewhere about 170 or 180 volts it will remain illuminated until the voltage drops to about 140 volts, when it will "go out." The result of this is that the lamp will flash intermittently at a frequency which is determined by the voltage applied to the system, the capacity of the condenser, and the value of the resistance through which current trickles into the condenser. Thus, if you have one condenser of known value, you can determine the capacity of the other (approximately) by counting the rate of the flashing, which is very nearly inversely proportional to the capacity.

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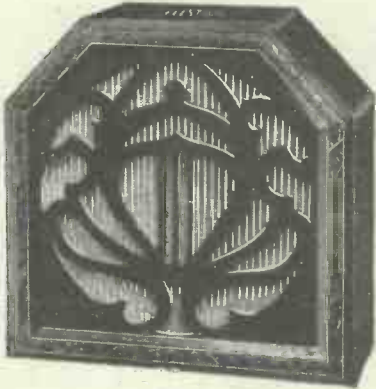
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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns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

TAPPING NOISES AND A SPARK.

E. J. (Cheshire).—"I was very interested to read in 'Radiatorial' some time ago about the troubles due to atmospheric electricity, and the experiences of other readers who have written to the 'Correspondence' columns of 'P.W.' have encouraged me to write you a few words about a curious experience I had a week or two ago.

"The set is a two-valve, Det. and L.F., and generally it is connected up to a rather

"There was a sort of roaring noise when it rained fast, and as it seemed to be getting very loud I went to switch off the aerial by means of the earthing switch, which is placed near to the lead-in. When I caught hold of the switch I felt a distinct shock in my arm, and although it did not hurt me, I must say I was considerably surprised.

"There had been no thunder about at all, so far as I heard, and I had been out in the garden some time. How do you account for this?"

Although you had not been hearing any thunder or seeing any lightning, there is very little doubt that the rain which was falling was electrically charged. Quite large charges of electricity are sometimes carried by clouds, and when rain falls from these each drop may carry a small charge of electricity of its own.

If there is a condenser in series with the aerial lead the aerial will become charged. Evidently this was what happened in your case, and when you went to switch over your arm and body conveyed the charge to earth. We recommend switching off in such cases, and the use of an earthing device so that charges are carried to earth when the set is not in use.

COILS FOR 5 X X.

R. N. D. (Gillingham, Kent).—"How many turns of what-size wire should I use to wind an aerial coil for Daventry on the standard six-pin former? I understand that the end connections are made across the pins one and two, and that tapings are taken at about a quarter and a third of the way down, to the pins 3 and 4."

For the Daventry coil you will require 300 turns of No. 40 S.S.C. wire. This is connected across pins 1 and 2, as you state. The tapings, however, are not taken at a quarter and third of the way down, but at the 30th and 50th turns. These are connected to pins 3 and 4 respectively.

READERS' DIAGRAMS CHECKED.

L. M. W. (Cambridge).—"If I send you the diagram, can you check it up for me and tell me what is wrong? If so, what do you charge?"

Under the rules of the Queries Department readers may submit their own diagrams, etc., for checking or for criticism. These diagrams should be as large and as clear as possible, so that details can be clearly seen and suggestions or alterations indicated. The charge per diagram is 2s. 6d.

THE USE OF A PILOT LAMP.

P. F. (Grantham).—"In a sketch of the set it shows a sort of dotted line across the filament connections, and a little circle with a letter 'P' in it. Underneath it says that 'P' may be a pilot lamp of suitable low consumption.' What is a 'pilot lamp'?"

A pilot lamp is simply a small bulb of the flash-lamp variety. It is generally arranged on the panel in some conspicuous position so that whenever it glows it can be seen at a glance.

If it is wired so that it lights up every time the valves are alight, it will be almost impossible to leave

(Continued on page 762.)

long aerial which runs straight from the house to a tall elm-tree situated at the bottom of the garden.

"I suppose the total length must be very near that 'one hundred feet' allowed by the P.M.G., and the other night I fixed up a long lead, and was listening-in in the garden. Presently it started to rain, a few big drops, and what I noticed that was so curious was that as soon as raindrops began to fall I could hear a corresponding sort of clicking noise in the 'phones.

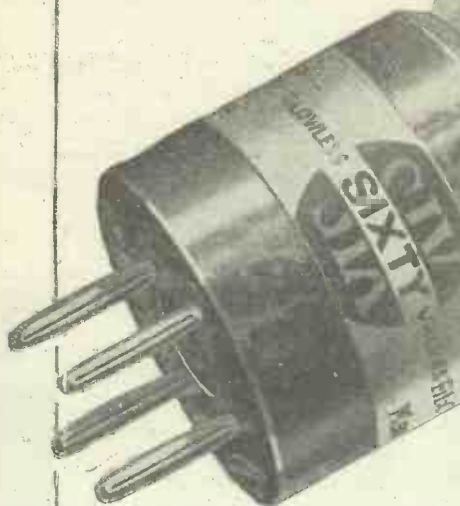
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 760.)

the set on all night inadvertently and so run the accumulator down. A low-consumption lamp (i.e. a lamp which takes very little current) is advised, because otherwise the drain on the battery would be defeating the object of the pilot lamp, which is to make sure that current is not being used by the valves unnecessarily.

CENTRE-TAPPED COIL AS H.F. OSCILLATOR.

P. G. (Kirkby-Lonsdale).—"What are the connections for using a centre-tapped coil as an H.F. oscillator?"

The centre-tapped coil can be used as the common grid and plate coil for a high-frequency oscillator in a variety of ways. The following two methods are commonly employed.

In the first arrangement, the plate of the valve is connected to H.T. positive. H.T. negative is connected to one end of the centre-tapped coil.

The other end of the centre-tapped coil is connected to the grid. The centre tapping on the coil is connected to filament and to L.T. negative.

The remaining filament tapping is connected to rheostat, the other side of which is connected to L.T. positive. The circuit is then tuned by connecting a variable condenser of suitable capacity across the ends of the centre-tapped coil.

Another common arrangement differs only in regard to the variable condenser's connections. In this second instance the variable condenser is not connected across the grid and the plate coil, but, instead, one side of the tuning condenser is connected to that filament terminal which is connected to the centre tapping on the coil.

Then the remaining variable condenser connection is taken either to grid or to H.T. negative, in which position it can tune either the grid or the plate coil, respectively.

CONNECTIONS FOR A BY-PASS CONDENSER.

E. G. C. (Bedford).—"With the object of getting perfectly smooth control of reaction I have been told that it is necessary to connect a high-resistance potentiometer connected across the filament battery, the slider of the potentiometer being joined to the wire from the tuned grid-circuit of the detector valve (filament return lead).

"This I did, but it did not seem completely satisfactory, and now I understand that such a potentiometer should have a by-pass in order to get the smooth reaction-control effects.

"How should this be fitted, and will a .01 mfd. fixed condenser do?"

The fitting of a suitable by-pass condenser to the potentiometer should certainly increase the smoothness of reaction, and is a very simple job.

All that is necessary is to connect one side of the by-pass condenser to the slider of the potentiometer; the remaining side of the by-pass condenser then goes to one of the sockets of the filament of the detector valve.

Although .01 is a suitable capacity to use for this purpose, it should not be implied that any .01 condenser will do, though it is a fact that any kind of .01 fixed condenser might effect an improvement. To get the best results, however, this condenser should be made of mica dielectric.

ON TOUR WITH A "BABY"!

F. R. E. (Near Southampton, Hants).—"At the end of August we are going on a motor tour to Scotland for a fortnight, and I am thinking of taking a very small wireless set with me.

"I say 'very small' because I only want a one-valve set, and it is essential that it should be all self-contained in one little case.

"The car is only a 'baby,' and there is not too much room to spare.

"Have you ever given a description in 'P.W.' of a really small one-valve set of this kind, preferably one which could be used as an ordinary little one-valve receiver during the winter.

"I should not expect a set as small as this to work as good as an ordinary one, but I thought perhaps we should be able to pick up, not only the various local stations as we approach the different B.B.C. areas, but also, perhaps, the Davenport station before we started, noting how the strength got better and better as we approached Northampton.

Do you think I am expecting too much from such a small set, and if not, can you tell me where I can get the description?"

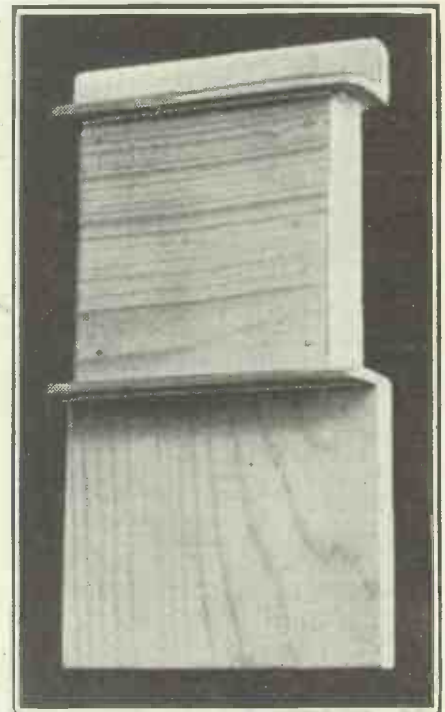
We recommend you to get a copy of "P.W." No. 312, May 26th issue, in which appeared a full description of the "Summer" One. This little set, using an ordinary type of valve and small unspillable accumulator, is absolutely self contained, and measures about 8 in. by 13½ in. (4½ in. to 5 in. deep).

The cost of construction is low and need not exceed, say, twenty-five shillings. The range of the set is uncommonly good for such a small affair, and, as a matter of fact, the original "Summer" One has been tried out in the New Forest, where it picked up 5 G B at quite good strength.

As it was designed with this sort of trip in mind, it should be the very set for your purpose. If possible you should also refer to "P.W." No. 315, June 16th issue, where there is a short article entitled "The 'Summer' One on Tour," in which some further details of aerial, etc., and of the results obtained are included.

THE "S.B." CRYSTAL SET.

"SCHOOLBOY" (Thame, Oxon).—"I like reading about the valve sets in POPULAR WIRELESS, but I cannot afford one yet, so I want to make a crystal set. But I want to make all of it—the coil as well, so as to keep it cheap. Never before have I tried it, but I think the only difficult part that I might fail in is the coil. So can you tell me where I can get a



This view shows the coil former of the "S.B." Crystal Set, which is described in detail on another page of this number of "P.W."

description of a crystal set, using a home-made coil?"

You will find a full description of a suitable set in this issue of "P.W."; under the title of "The 'S.B.' Crystal Set." The cost is very low, and we think you will find the description of the construction quite easy to follow.

The additional photograph of the former on which the coil is wound, which is reproduced on this page, will help you in this part of the constructional work.

CARE WITH WET H.T. BATTERY.

H. T. B. (Rotherhithe, London, S.E.16).—"Is it a fact that the zinc for wet H.T. batteries should not be amalgamated at home because it is a dangerous operation?"

We should not think that this is exactly "a dangerous operation" if ordinary care is used. It is a fact, however, that when using the solution of mercury perchloride with which such zincs are amalgamated, the solution should not be allowed to come into contact with any wounds, broken skin, cut fingers, etc., as the mercury perchloride is very poisonous.

(Continued on page 764.)

MODERN WIRELESS

Now on Sale

August Issue

Price 1/-

Are you going to try for AUSTRALIA ON THE SHORT WAVES?

Afraid it costs too much? Think it's too difficult?—Then you'll be glad to read about the "2.35 FOR AUSTRALIA." Two Valves. Thirty-five shillings! And it picks up Melbourne direct! Read the full constructional details in the *August Issue* of MODERN WIRELESS which is *Now on Sale*.

Apart from this "M.W." is packed with good things, including:—

The "Twin-Wave" Four || The "M.W." De Luxe H.F. Unit
A London-Daventry Crystal Set || Those Startling Short Waves

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—SUNDAY GRAPHIC—

ADVERTISEMENTS

As far as possible all advertisements appearing in "P.W." are subjected to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," 4, Ludgate Circus, London, E.C.4.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 762.)

THE "SYDNEY ADAPTOR."

"SHORT WAVE" (Edgbaston, Birmingham).—"Where can I get how-to-make details of the famous 'P.W.' 'Sydney Adaptor.' Before the winter comes I am going to get ready, because I have made a bet with a friend that I will get Australia direct before Christmas?"

We are going to surprise you very much. "Short Wave," by telling you that you will not get Australia on the "Sydney Adaptor." "Why not?" "Why just because there is no such set. So you cannot very well pick up Australia or anywhere else on that, can you?"

Apparently you have got yourself very thoroughly mixed up between two famous "P.W." sets, either of which is capable of bringing in Australia direct. One of these was the "Sydney" Two, which was originally described in "P.W." No. 284, circuit details of which are now available in blue-print form, (No. 39), and the other set which you have heard of is called the "Antipodes Adaptor." This is a little one-valve gadget which is intended to be used to convert any ordinary receiving set into a short-wave set.

With the "Antipodes Adaptor" there is a plug and a flexible lead, and this plug goes into the detector valve on your ordinary set, the valve itself being taken out and put into the valve socket in the "Antipodes Adaptor." The tuning is then done on the dials on the "Antipodes Adaptor," and the short-wave results come out on your loud speaker.

The "Antipodes Adaptor" was described in "P.W." Numbers 303 and 312.

WHICH LEAD IS EARTHED?

A. J. (Barkingside).—"I am thinking of putting in a switch so that I can charge my accumulator at home. How can I find out which of the two mains is earthed?"

Procure an ordinary electric socket, and join a wire from one side of this to some earthed conductor, such as a water-pipe. Place an electric lamp of the ordinary household voltage in the lamp socket, after connecting a flexible lead to the other side of it.

Fasten this flexible lead to a piece of wood or other insulator, and then carefully touch the bared end of it on the two leads from the mains, in turn. The lamp will glow brightly when you touch one lead, but it will not glow when you touch the other.

The lead that does not show a bright glow in the lamp is the one that is earthed.

ALL WAVE-LENGTHS ON A THREE-VALVER.

S. R. E. (Runcorn, Ches).—"I cannot afford to go to more than three valves, but the set I want must be capable of receiving all wave-lengths. I mean, not only the long waves, 5 XX (Davenport), and so on, and the ordinary waves such as 5 GB (Davenport), Manchester, etc., but the short waves as well.

"I shall not be satisfied with it unless I can get the American programmes regularly with it during the winter. Do you think it is possible to do this with three valves?"

"If so, will you please tell me what parts are required, and where I can get details of such a set?"

You will find that the "All-Purpose" Three, which was described in POPULAR WIRELESS, May 19th, 1923 (No. 311), is just the receiver for your purpose. This receiver has already attained a considerable measure of popularity as an ordinary household set, and is making quite a name for itself upon the short waves.

The following are the components required:

- 1 Panel, 14 in. x 7 in.
 - 1 Baseboard for same, 12 in. deep.
 - 2 0005-mfd. variable condensers, with slow-motion dials.
 - 3 Non-microphonic valve holders.
 - 1 L.F. transformer.
 - 1 H.F. choke.
 - 1 Rheostat.
 - 1 Single-circuit filament jack.
 - 1 0002 and one 015 fixed condensers.
 - 1 4-megohm leak with clips.
 - 1 1-megohm leak with base.
 - 1 250,000-ohm wire-wound resistance.
 - 1 "adjustable-fixed" condenser, .0001 to .00015 mfd.
 - 1 Baseboard-mounting neutralising condenser.
 - 1 On-off switch.
 - 1 Seven-terminal strip, and one two-terminal strip.
- Material for short-wave coil mounts, screws, wire, etc. Full details of the particular components recommended are given in this constructional article.

NEWS FROM SAVOY HILL.

(Continued from page 752.)

which Mr. A. E. Lawton will give at intervals in a military band programme throughout the afternoon. Mr. Lawton is a great authority on cricket, having captained Derbyshire for several seasons besides playing for Lancashire before the War.

Then, when the play of the day is over, the respective captains of the clubs, Major W. A. Worsley and Lieut.-Col. Leonard Green, will continue to fight the Battle of the Roses in the studio, each having planned a programme to which listeners will look forward as much as to the earlier part of the day's proceedings. Appearing in the White Rose Concert will be John Henry, who, though not quite such a frequent broadcaster as he once was, is still the great artiste he always was, and a great favourite in the North.

His opposite in the Red Rose concert will be Thornley Dodge, whose views on things Yorkshire should be decidedly entertaining. Selections will also be played by a Yorkshire and Lancashire military band, while Walter Widdop and Percy Bilsbury will contribute vocal items. Further interest in the friendly rivalry between the counties will be sustained by the broadcasting of an eye-witness account of the last day's play of the cricket match at 6.45 p.m. on Tuesday, August 7th, also by Mr. A. E. Lawton.

The Birmingham Station, in so far as it is responsible for the arrangements of the programmes from 5 GB on Bank Holiday, proposes to compress into an hour the spirit of a visit to the seaside for those who will have to stay at home. There will be items by the band of the 1st Battalion of the Suffolk Regiment, and an entertainment by the Imperial Scots Concert Party.

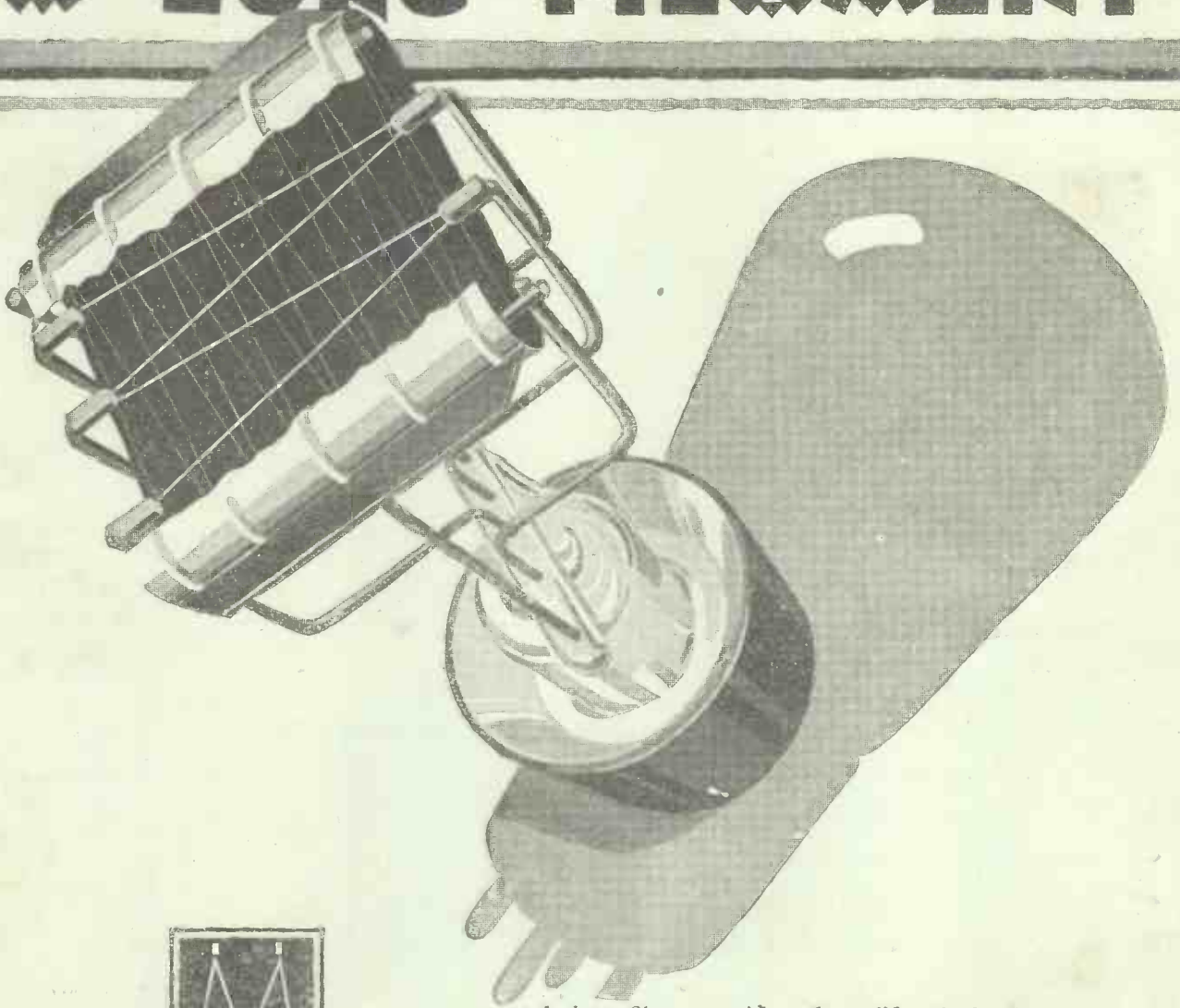
In addition some "bracing atmosphere" will be provided by Molly Hall and Stuart Vinden, together with Emma, Enry, and Young Albert, who can be depended upon to put up a lively show. Then, at 9 o'clock there is to be a symphony concert by the Birmingham Studio Symphony Orchestra, whose programme will include such items as the ever-popular overture to Paganini, and some songs by Charles Knowles (baritone), finally, a wind up with the dance music, without which no holiday programme is complete.

Dramatic Production at Cardiff.

Cardiff Station is hoping to broadcast several events from the Summer School of Dramatic Production which is to be held during the first fortnight of August at Citizen House, Bath. The school assembles every year, and the splendidly equipped studios, workrooms, scenery and costume galleries at Citizen House are ideal adjuncts to providing a thoroughly practical training in dramatic production, which is the whole object of the highly concentrated period of tuition.

Miss Edith Craig will act as producer this year, while Professor Horrox, of University College, Exeter, will also be responsible for staging a Greek play and several other one-act pieces. Among the distinguished visitors who have promised to attend are Lady Margaret Sackville and Mr. Laurence Housman, who will read some of their own poems and plays.

A LONG FILAMENT



The great length of this filament gives it a gigantic emission surface, ensuring powerful yet pure reproduction.

A long filament with a long life—that's the Mullard P.M.

This wonderful Mullard filament is found only in Mullard P.M. Valves.

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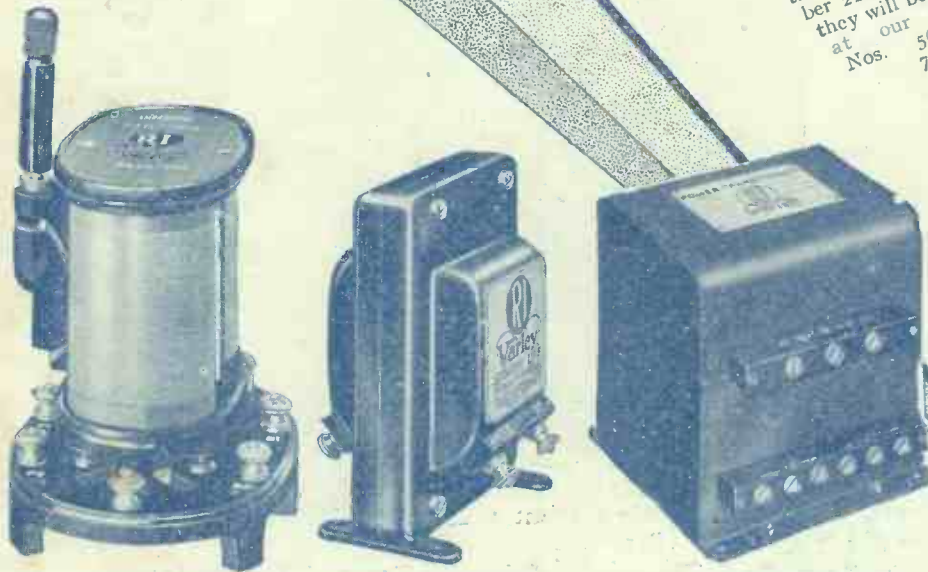
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The number of new lines for 1928-1929 will be even greater than last year, and a remarkable degree of success has been achieved in gramophone reproduction apparatus (watch for our advertisements giving particulars of gramophone pick-up and gramophone amplifier).

A few of these new lines are already available to the public and the remainder will be marketed before the National Radio Exhibition, Olympia, September 22nd-29th, where they will be on view at our **Stands** Nos. 56 and 73.



H.F. Intervalve Transformer, Long Wave, 1,000-2,000 metres..... 24'
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New Power Transformer £3 10s.
 Input 200-220-240 volts. Output 375-0-375 volts, 110 m/a, centre-tapped; Output 7.5 volts, 3.5 amps., centre-tapped. Output 5.5 volts, 3 amps., centre-tapped.

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WHAT ABOUT THE "TUNE-EASY" TWO? (See Page 767.)

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INCORPORATING "WIRELESS"

August 11th, 1928.



CONTENTS

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Tracking Crackling

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Picking a Pick-Up

Our cover photograph shows a corner of "P.W.'s" research department and Mr. G. P. Kendall, B.Sc. (left) choosing the components for some of "P.W.'s" forthcoming sets.

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RADIO NOTES AND NEWS.

One Man's Meat—Roasted by a Symphony—Radio and Animated Nature—Condensers at Play—The Clock Struck 24!—Radio Robinson Crusoe—5 SW and Week-ends.

One Man's Meat.

I OVERHEARD something last week in a "department store" which tickled me so much that I bought a concertina without knowing I did so. Two men were testing gramophones, and one said: "Oh no! We can't have that thing! Why, it sounds like wireless from a loud speaker!" That's turning the tables, if you like, eh?

America Gives B.B.C. "Once Over."

QUITE a fair number of radio men from the U.S.A. have been over here this year, giving our B.B.C. and its establishments the "once over," and, so far as I can gather, the verdict seems to be that technically, including studio design, the States have nothing to show us except superficial things and the gift of opulence. But—a big but—the programmes appear to be mass-produced. A queer criticism from America, who, if they did not initiate mass production, developed it. Still, I think that they have the right idea; the programmes are dreadfully stereotyped nowadays.

Roasted by a Symphony.

I READ in an American monthly that an experimenter has succeeded in producing sound so intense that it can disrupt living tissue, by which, I suppose, is meant that it is able to kill. No details were given, but the thing does not seem fantastic, because we are children of the Ray Age. Yet the development of the idea into imagining the case of a man being put to death by a symphony is distinctly Poe-like.

Prophetic Writers.

THIS reminds me that Kipling shares with Wells the prophetic touch, for in his story, "As Easy as ABC," first published in 1912, he writes of an Aerial Board of Control which rules the planet and which, in order to correct a recalcitrant district in America, sent "two hundred keels aloft" and these airships produced tremendous effects upon the populace by means of sound. The commander of the fleet boasted that the fleet's lower C could lift street paving. After sound, light was used, to the general undoing of the mob. All this looks like coming true.

Literary Note.

I DO not wish to turn my notes in this issue into a book prospectus, but I am really putting you on to a good thing in asking you to get Kipling's "A Diversity of Creatures" from your local library, and to read that story. It is full of other imaginative touches, "flying loops"—electro-magnetic, I take them to be—and "ground currents," which anchor people's legs. And in "Many Inventions," I think, there is Kipling's "Wireless," written in the days when radio was an affair of Leyden jars and Rhumkorff coils. A radio classic!

A Correspondent Answered.

ONE of those valuable readers whose souls are eaten up with curiosity about the anonymous and impersonal Ariel, rather than (alas!) about what he writes, favours me with two questions. (1) What is my ideal of a running commentary on a boxing match? Answer: I can but repeat the old jingle, originally applied to bus conductors, "Punch, brothers! Punch with care. Punch in the presence of the passengere." (2) If I were Sir John Reith, what would I do? Answer:

Resign by telegram, and contest Aberdeen at the next election. Hoping this finds you as it leaves me, bewildered with wealth, yores trooly.

Radio and Animated Nature.

ONE way and another the smaller fry seem to have "got it in" for radio. Mice, rats and lizards have heroically immolated themselves, vainly, in an attempt to stop radio's counter-attraction to the study of zoology. The Great Anode knows how I have suffered from plagues of fat tropical moths that formed themselves into compact masses behind switchboards and successfully upset engineering. But the only time I fairly took to my heels and ran—for a weapon—was when a tarantula (body one inch in diameter, legs about forty thousand) ran across the transmitting room. You don't argue with them critters.

There's Nothing Like Brass.

HERE'S another jewel from my post-bag, this time emanating from South America. "Dear Sirs or Madame,—Here we huge affectionate the without
 (Continued on next page.)

FAMOUS FLIGHT FROM 'FRISCO.



This view shows the receiving room at La Perouse, near Sydney, N.S.W., where messages from the gallant airmen who made the recent successful Pacific flight were picked up and re-broadcast. These bulletins gave Australia the biggest thrill she had experienced since the Anzacs went home.

NOTES AND NEWS.

(Continued from previous page.)

wires, but notwithstanding nevertheless, not to hearken at English station, which God forbid. Have the amiableness telling those Britannical broadcasteurs please to emit by the 'beam' for fear that us not overhear its emanations. America (of the United States) sounds precious here, but we desire to listen of the English much, for love of its culture and literature." What a tonic for 5 S W ! What a tribute to Britain !

The Court-Treatt Expedition.

MAJOR COURT-TREATT and party have now reached the scene of their adventures in the Western Sudan and by now, if there is no hitch, should be broadcasting, according to plan. If you want to get this unique broadcast listen-in on about 30 metres on Sunday evening between 6 p.m. and 8.30 p.m. G.M.T. Call-signal F X C T There's an exciting hunt for you, lads ! But it's Morse, not telephony, don't forget.

Condensers at Play.

NO, not a fairy story ! I refer to Dubiliers, who devote their lives—like Mr. Nestlé—mainly to condensing. They recently had their annual "outing." We used to call them "beanfeasts" in my younger days, though I never saw any beans except what "beans" we gave to any boy who broke a full bottle. There were eight elephantine charabancs full of "Dubiliers," who chuff-chuffed to Ye Olde Rye House, Hoddesdon, Herts, where they cricketed and danced. This is the sort of stuff to keep Bolshevism out—and our condensers up to the mark !

Sunday Secrets.

"REYNOLDS NEWS" says that an unsuspected cause of fading is sometimes due to leaves of a vine being blown across the aerial. Yes, but the fruit of the vine causes much stronger fading and is suspected. "The News of the World" says that much heartburning over accidents to valves and batteries may be saved by connecting the leads to the batteries themselves (*sic*) after the other ends have been made fast to their respective terminals. Yes, but much safer to connect the leads to a chair ! And quite as safe to have an "off" point on the rheostats !

The Clock Struck Twenty-Four.

SEE the letter from Mr. Hollis in "P.W." No. 320, July 21st. I thank him for his alliterative allusion to my appreciative annotations and for his horological homily : The confounded clicks of clocks constitute a conclusive condemnation of the cussedness of Kalendborg and the critical comparisons of curious commentators. Cuss Copenhagen ! Whenever I put over a good joke it is squashed by a fervid scientific observer ! Still, W. H. has the right idea. Even Charles the Second couldn't make two clocks keep unison. And he was a king !

Radio Robinson Crusoe.

H. G. B. (Weymouth) is by no means a castaway, but like Crusoe he is very successful in making useful articles out of old nails, goatskins, hoop-iron and other rubbish. His letter describes a series

of triumphs, and is very funny. Beginning on our "Progressives," he made the "One." He had to cut a condenser into halves and wind the coil with a lot of short ends. The condenser vanes were bent so it could not be "dialed," but had to be used all out.

Out of the Dust.

STILL clinging to his patent invariable "variable" condenser with the artistic vanes, our hero proceeded to conquer the "Progressive Two," the "One" having given good reception. A very mixed team

SHORT WAVES.

Small Boy (seeing crying baby brother for the first time) : "I like the radio better, I think."—Life.

A Croydon correspondent writes to tell us of a new crystal circuit he has discovered. He calls it the Trio Set—because he says he gets three stations at once.

Jones : "What's all the crowd for ? And who is that fellow they're cheering so ?"

Smith : "Haven't you heard ? That's the man who has just invented a radio set that will always work when you have company in to hear it."—Radio News.

Remember, when a classical programme is broadcast, even if you don't like it, there are hundreds of others who do—and thousands of others who don't !—Popular Radio Weekly.

Mother : "Little children should be seen and not heard, you know, Mary."

Mary : "But, mother, I want to be a radio artist."

As a last request, a negro convicted of murder was allowed to listen to an entire programme broadcast from New York. After that, the unfortunate fellow was probably very glad to die.—Judge.

R.I.P.

Handy man
Ardent fan—
Electric wires
Pair pliers—
Blue sparks
Angels' harps.

Radio Fan : "I got Hamburg and Java on the radio last night."

His Aunt : "Now, now—you can't make me believe they can deliver groceries with that contraption !"—Science and Invention.

Not one day passes by but there's
Some new device in radio wares ;
The latest tube or hook-up rare ;
Or battery beyond compare.
The latest gadget for your set ;
Or else, the newest cabinet.
But, gentle reader, here we show
THE LATEST thing in radio—
"Good-night, everybody, good-night !"

was somehow got together and there was a certain amount of agony over wire-scraping. On to the "Three" ! Here the disreputable collection of misfits was joined by a transformer—positively direct from the dust-bin. For such enthusiasm I am half inclined to give H. G. B. a Bartship—*honoris causa*.

5 S W and Week-ends.

IT is worth a few lines to call the attention of the B.B.C. to certain geographical facts, which it might bear in mind when arranging 5 S W's transmissions. The first is that clock-time varies with longitude. The Educational B.B.C. fellows know all about that, of course, but have the 5 S W section taken it into account ? The second is that in Argentina they have, according to Mr. R. G. Roberts, to sacrifice sacred cocktails and all kinds of social duties in order to get home early enough to hear a bit from the "old country." In Argentina they want 5 S W on Saturdays and Sundays. Please, B.B.C. !

An Object Lesson.

TURN to your newspaper and look at 2 L O's programmes for the day—a week-day. Now consider the following. Three L O (Melbourne) starts broadcasting at 7.15 a.m. and continues till 11.40 p.m., during which time it broadcasts on an average no less than eighty-nine items, of which almost half are musical (orchestras, singers, instrumental soloists, etc.), and by items I do not mean individual pieces, but "turns." Nevertheless they have room for weather, time signals, news, and many other features.

Wireless Weed.

ALAS ! my recent brilliant suggestion for the marketing of a wireless fan's baccy has had a great deal of its originality taken out of it. A kindly, anonymous reader has sent me a packet of "Churchman's Wireless Shag," a product of the Imperial Tobacco Company. So bang goes my four ounces a week for the moment ! Nevertheless, the smoking of shag is an esoteric art. It demands a cultivated palate and a specially designed interior. Mere common radio fans do not pretend to reach to such heights of *connaissance*, so there is yet room for some firm to come out with a radio "cut" or "mixture."

Five Ess Doubleyou.

A "REGULAR READER" in the Canary Islands offers further proof of my assertion that 5 S W is appreciated abroad. He says that in the Canaries, Cape Verde Islands and Morocco, which he characterises as "almost blind spots for long-distance reception," 5 S W comes in on three valves with unsurpassed quality, beating even P C J J. He thinks that certain detractors of 5 S W may have trouble in reception below 28 metres. This tribute to an English station is welcome—and again I beg the B.B.C. to drop its notions about "service" and to recognise the fact that it has hit the nail on the head sufficiently to warrant a more extended use of that transmitter.

Radio the Benefactor.

SOMETIMES I feel convinced that after anaesthetics, radio—all joking apart—is the most beneficent invention ever evolved by the brain of man. A missionary from Groote Island, in the Gulf of Carpentaria, Northern Australia, where the white population numbers exactly five, describes their emotion on hearing the bells of St. Paul's and the cathedral service, on a little set sent to them in a Christmas parcel. He says, "Speech was impossible, we were so moved." Let the B.B.C. cogitate, and may the Board take appropriate action. There's a commercial duty to us, but a moral and imperial duty to "those others."

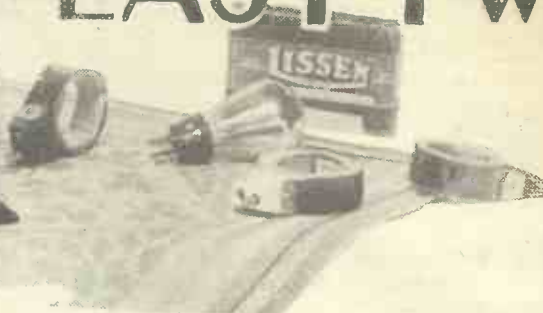
Great German Victory.

IT is reported that the exports of radio apparatus from Germany for 1927 were valued at £2,099,000 as against £1,580,000 for 1926. The 1927 figure is a world-beater and eclipses even the U.S.A. Somehow or other they do it, Versailles or no Versailles, and we've got to go "all out" to keep up with energy like that. But where on earth did all the stuff go to ? Plenty to the British Empire, as like as not.

ARIEL.



The "TUNE-EASY" TWO



A STRAIGHTFORWARD reaction-detector followed by a transformer-coupled L.F. stage is probably the best type of two-valve set for general work.

If plug-in coils are employed it is possible not only to receive a number of stations on the normal broadcast bands at good strength, but also to listen to such stations as 3 LO (Melbourne) and others on the ultra-short wave-lengths.

This little set is suitable for reception on all wave-lengths, and in addition it can be switched over to 5 X X without the bother of changing any coils. Hence for normal work apart from reception on the very short waves one can use a single set of coils and simply go straight over from the local station to 5 X X by pulling out or pushing in a switch.

Not Complicated.

This wave-change switching does not complicate the tuning in any way. There is only one tuning condenser and a small knob for reaction control. The only readjustments necessary on 5 X X are a slight rotation of the tuning dial and reaction control knob.

As regards range the set is capable of working a horn-type or small cone loud speaker up to distances of 12 miles from a main station, and 80-100 miles from Daventry at quite good

Long and ordinary wave-lengths without coil-changing, and short-wave reception, are possible with this highly efficient but inexpensive and easy-to-build set. Ordinary plug-in coils are used. Several stations can be tuned-in on the loud speaker.

Designed and Described by the "P.W." Research and Construction Department.

strength. This, of course, is on the assumption that a good outdoor aerial will be used.

For the normal broadcast wave-band the circuit consists of three plug-in coils, marked in the diagram L₁, L₂, and L₃. L₁ is the aerial coil, L₂ the secondary or grid coil, and L₃ the reaction coil.

Then when we wish to go over to 5 X X we switch in the coil L₄, which is one of the "P.W." standardised loading coils.

Wave-change Switch.

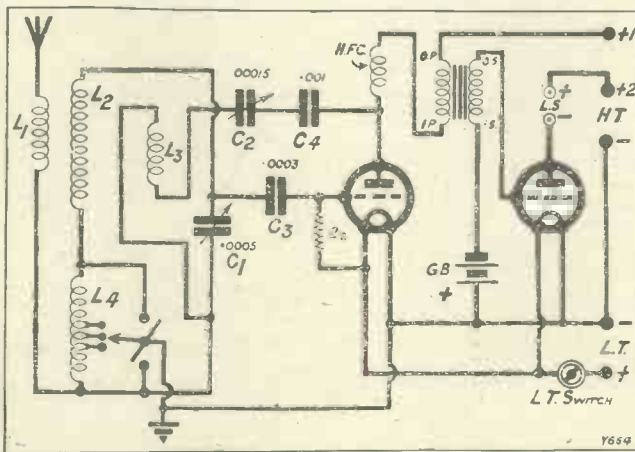
Full details of how to wind these coils were given in the article on the "Sceptic's" Three, published in the June 16th issue of POPULAR WIRELESS. An adjustable tapping is provided on this coil L₁ to the centre point on the wave-change switch and

in the operating hints this will be called the filament tap. By varying the position of the filament tap different degrees of selectivity can be obtained, but at the same time these adjustments also affect reaction, hence the best tapping position can only be determined by trial.

Now for a few words concerning the type of wave-change switch that is necessary for this particular circuit arrangement.

What is wanted is a switch in which one contact is joined to two others in the "on" position, while in the "off" it is separated from them. Further, in the "off" position these latter two contacts

(Continued on next page.)



COMPONENTS REQUIRED.

- 1 Panel, 14 x 8 or 14 x 7 x 1/4 or 3/8 in. (Any good branded material.) (Note : the panel lay-out of this set has been arranged so that either of these two sizes can be chosen, according to the stock of your dealer.)
- 1 Cabinet to fit, with baseboard 8 in. or 9 in. deep (8 in. will serve, but 9 in. is a more commonly available depth).
- 1 .0005 mfd. variable condenser, square law or S.L.F., preferably with slow-motion mechanism or vernier dial (Ripault in original. Any good make can be used, since there is ample room).
- 1 .0001 or .00015 mfd. miniature-type condenser for reaction. (Bowyer-Lowe, Cyldon, Peto-Scott, etc.)

- 1 On-off switch (Lotus, Benjamin, Lissen, Igranic, etc.).
- 1 On-off type push-pull switch (this must be of the particular type used for wave-change purposes, in which it is possible to attach a third wire to the moving plunger, so that it is brought into contact with the two side springs in the "on" position. Examples are the Lissen and Lotus. Note : This third wire is best attached by direct soldering, and should be of flex).
- 1 Standard loading coil (Paroussi, Burne-Jones, Wearite, etc.).
- 3 Single coil sockets (Lotus, Peto-Scott, Burne-Jones, etc.).
- 2 Sprung valve holders (Igranic, W. B., Burne-Jones, Lotus, Marconiphone.

- Burndept, B.T.H., Benjamin, Bowyer-Lowe, etc.).
- 1 .001 mfd. fixed condenser (Burne-Jones, T.C.C., Lissen, Dubilier, Mullard, Clarke, Goltone, Igranic, etc.).
- 1 .0003 mfd. fixed condenser (see above).
- 1 2-meg. grid leak with holder (Mullard, Igranic, Lissen, Dubilier, Ediswan, etc.).
- 1 H.F. choke (Igranic, R.I.-Varley, Burne-Jones, Lissen, Cosmos, Bowyer-Lowe, Climax, Colvern, etc.).
- 1 L.F. transformer of fairly low ratio (Igranic in set. Any good make, according to the constructor's preference).
- 1 Terminal strip, 12 x 2 x 1/4 or 3/8 in., and 9 terminals.

THE "TUNE-EASY" TWO.

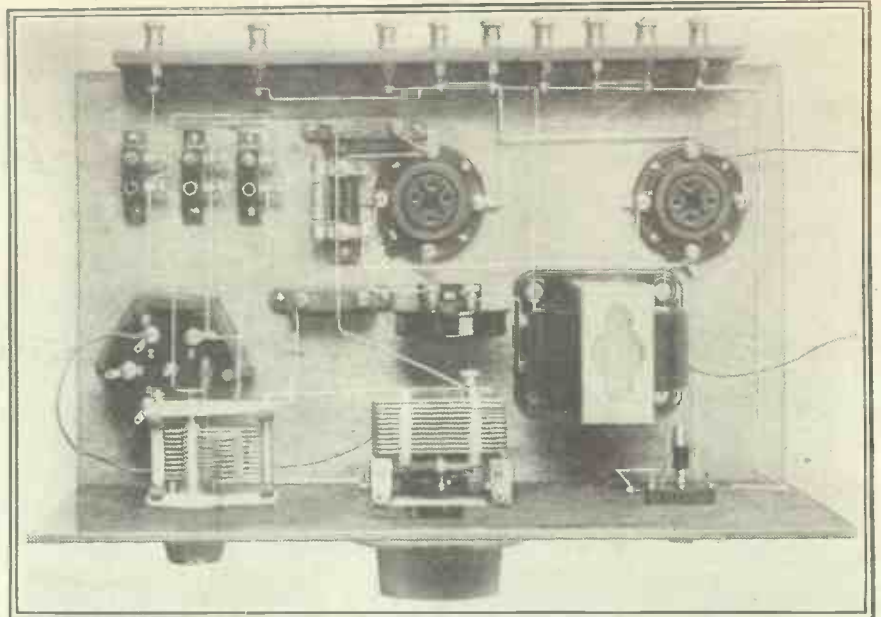
(Continued from previous page.)

must be separated from each other, so that in effect the moving contact in the "on" position bridges together two other points, which are normally insulated from each other. Thus, if we call the moving contact "A," and the other two "B" and "C," then in the "off" position "A" will not touch either "B" or "C," and further, "B" and "C" will be insulated from each other.

The L.F. Side.

With regard to the low-frequency side of the set, there is practically nothing to say. The only point is the L.F. transformer. This component should have a ratio not exceeding 4-1. For maximum quality a good ratio is between 2.5-3.5-1.

Let us now say a few words about the construction of the set. There are four components on the panel itself, the "on-off" switch, the wave-change switch, the tuning condenser and the reaction control. All these can be chosen to have single-hole fixings, and in any case it is highly probable that whatever makes are used the



Considering what the set will do, readers must surely agree that the design is as straightforward as could be, and the assembly a matter of very great simplicity. Note the "P.W." standard loading coil to the left beneath the condenser.

tuning condenser is the only component which may have a two- or three-point fixing. This is largely a matter of indi-

vidual taste. Commence by marking out the panel on the back to the dimensions shown in the drilling diagram.

Then, having made a small mark at the drilling positions with the aid of a sharp-pointed nail or centre-punch, drill the necessary holes. If the components are all of the single-hole fixing type a $\frac{3}{8}$ -in. drill and carpenter's brace will suffice. It is a good plan to run a small $\frac{1}{16}$ -in. pilot hole through first, since this helps to keep the larger drill from wandering.

Then attach the panel to the baseboard by drilling three or four holes along the bottom edge, and commence to mount the various components on the baseboard.

Completing Construction.

Follow the layout very carefully and leave room for a 9-volt grid-bias battery, as is shown in one of the photographs.

A terminal strip to take 9 terminals will be required for the aerial, earth, and battery connections. This may be a strip of ebonite 2 in. in width and two inches shorter than the baseboard at each end.

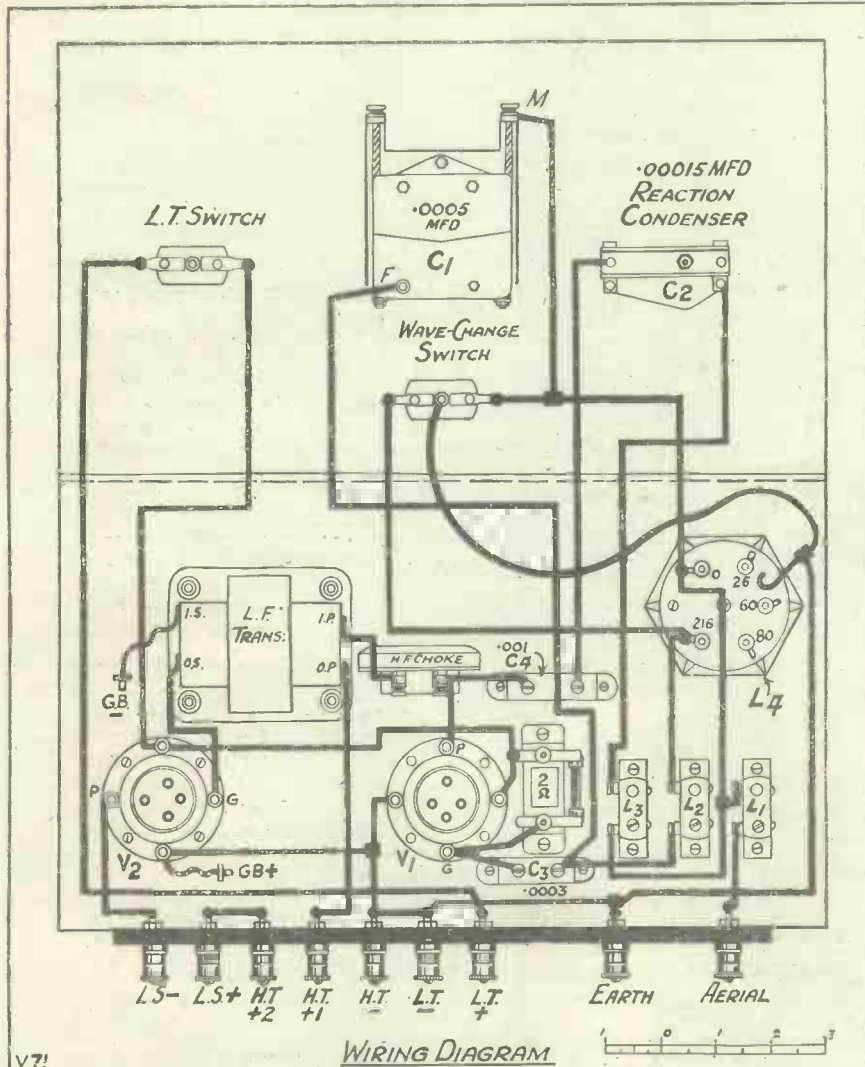
Next, commence to wire up the set. Carry out the wiring nearest to the panel first and work backwards towards the terminal strip. Use bare wire if you have had previous experience in set construction, but if this is your first attempt it will be much safer to employ one of the insulated types such as Glazite or alternatively Systoflex covering.

Do your soldering with a clean iron and a non-corrosive soldering paste.

Do not use killed spirits, since if you do you will find that the soldered joints will tend to corrode after a few months and you will probably suffer from trouble caused by faulty connections. In many cases soldered joints will not be necessary, because terminals are provided with most modern components, and it is thus possible to dispense with soldering altogether.

Keep all leads well separated and take special care with the wires to the wave-change switch, particularly that to the centre contact.

(Continued on next page.)



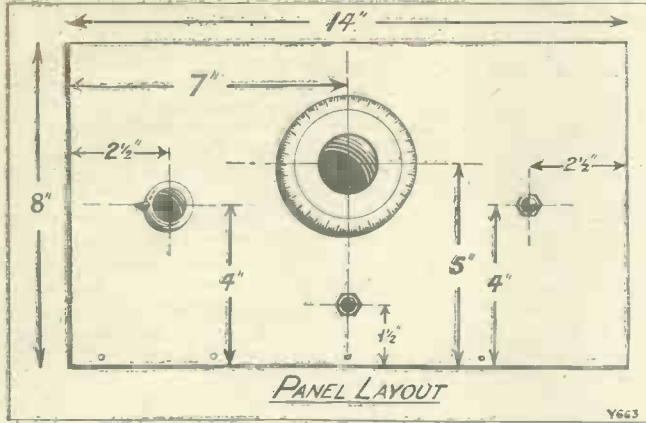
WIRING DIAGRAM

V7!

THE "TUNE-EASY" TWO.

(Continued from previous page.)

In the case of the actual switch used in the set the method of soldering the lead to the centre contact is as follows: Unscrew the switch knob and withdraw the "push-pull" device. Bare the end of a length of flexible wire and solder to the end of the switch contact as shown in the photographs. Then replace the switch and screw on the knob.



This is much easier than attempting to carry out the soldering operation with the switch movement in position on the panel. Do not forget to place the three coil sockets in positions so that the coils practically touch each other when they are inserted.

Operating the Set.

Having completed the wiring you will now wish to try out the set.

Insert an "H.F." type valve in the detector socket. Such valves are those which have an impedance of 20,000 ohms, and an amplification factor of approximately 20.

Place a small power or L.F. valve in the second valve-holder. (Such valves are those with an impedance of 6-8,000 ohms.)

Insert a No. 35 coil in the aerial socket L_1 , a No. 60 in the secondary socket L_2 , and a No. 25 or 35 in the reaction coil-holder L_3 .

The correct reaction-coil incidentally should be found by experiment, but a No. 25 or 35 is usually about right for the 250-500 metre broadcast wave-band.

Connect up the L.T. and H.T. batteries—placing the H.T. + 1 plug in the 72-volt tapping and the H.T. + 2 plug in the 100 or 120 tapping.

These voltages are only approximate, and while you will need the full voltage of the H.T. battery for the last valve, you should try various voltage adjustments for the detector.

Connect up the aerial and earth leads and adjust the grid bias in accordance with the valve-maker's instructions for the particular H.T. + 2 voltage used.

Switch on the set, placing the wave-change switch in the correct position for receiving on the normal broadcast band. Then tune in your local station by rotating

the dial of the tuning condenser (the large dial).

After this adjust the reaction knob until you receive the signals at their best strength, and give the tuning dial a final "touch up."

Now switch over to 5 X X by pulling out or pushing in the wave-change switch according to the type used, and retune the receiver until you hear the Daventry long-wave station. Then adjust the position of the filament tap by changing over the flexible lead to another terminal on the L_3 coil until you obtain the degree of selectivity you require.

On the broadcast band you can also adjust selectivity by increasing or decreasing the size of the coil L_1 . For instance, a No. 25 coil will give better selectivity than a No. 35, but probably less volume. If you wish to receive signals on the ultra-short waves you will need a set of special short-wave coils, such as the Igranic, Atlas, etc.

For reception on 32 metres (3 L.O., 2 XAF, PCJJ, etc.) try a coil consisting of one or two turns in the aerial socket, a five-turn coil in the secondary socket, and a four- or five-turn coil for reaction. For this work however, it is advisable to reduce the capacity of the tuning condenser by inserting a .0005 fixed condenser in series between the moving vanes of this condenser and the lead to the wave-change switch.

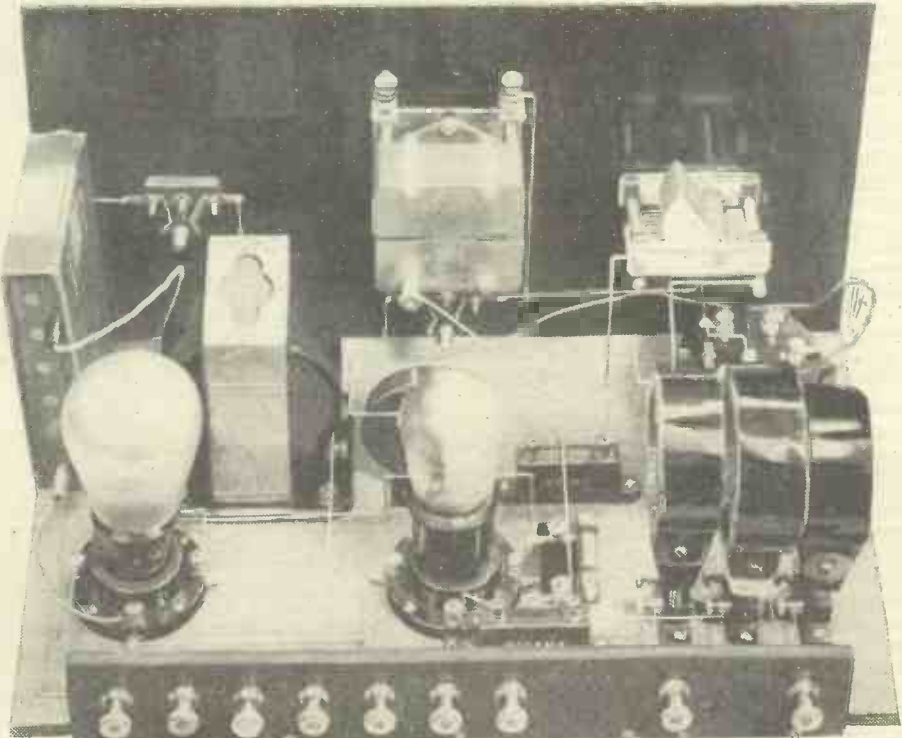
A LEAD-IN WARNING.

By C. A. J. MEADOWS.

IT is only natural that one should take the line of least resistance, particularly in anything having an alternative which involves considerably more trouble and possibly more expense. The aerial lead-in is a case in point, as there is usually to be found some convenient spot in which a hole is already drilled, of sufficient diameter to take the rubber-covered flex used for this purpose, while to use the conventional type of lead-in tube would necessitate the drilling of a hole having a much greater diameter than that so conveniently at hand. Again, some people have not a drill of sufficient size to go right through a window frame or sash, and that in itself is more than enough to cause the immediate adoption of the easy method which, as a rule, appears so obvious.

"Don't Do It."

Do not in any circumstances, however, take advantage of the fact that a metal grille is fitted over the door, having holes of exactly the size to allow the passage of the lead-in wire. This grille makes a most splendid screen, and will absorb a goodly proportion of the aerial energy, to the detriment of the results given by the set. Further, the lead-in wire will, in time, give way to the friction caused by the swaying of the aerial and lead-in, the rubber covering will gradually split, and allow the bare wire to come into contact with the grille, thereby earthing the aerial to a certain extent. So, although it means a lot more trouble, it certainly pays to drill the window sash and run a lead-in tube through in the usual way.



Here is the finished set all ready for work. You will see that the grid-bias battery is placed on its side on the baseboard. The switch just by it is the on-off switch, the other just beneath the centred variable condenser is the wave-change switch, which enables you to change over from the ordinary to the 5 X X band of wave-lengths instantaneously, and without coil changing.



M. DÉNES VON MIHÁLY.

A NEW TELEVISION DEVELOPMENT

Exclusive details regarding Dénes von Mihály's latest apparatus. The German press is very optimistic concerning its future and says the invention "has made fame and fortune."

By WILLIAM S. BRITAIN,
Our Special Television Commissioner.

ONE of the Berlin evening papers recently announced, with a headline right across the front page, that television is now here. Then followed a long story by a "Dr." Somebody and an interview with my friend Dénes von Mihály.

I had already seen von Mihály and his new apparatus. He was just back from showing his apparatus in Budapest, his native city (though he works in Berlin), and he has now gone on to show it in Stockholm. By July 17 he promised—though I believe he had to decide otherwise—to give London a demonstration.

I have advised him to work further before he comes to London or tempts New York. His apparatus is simply the Plotnow or Lipkow—or call it the Selfridge, if you like—disc system. Discs perforated with tiny holes in the form of the first ring of a spiral are fixed to the ends of a long axis which is revolved by an electric motor. A light is concentrated by a lens on the holes of one disc, and beyond is a photo-electric cell. A letter drawn on glass is brought between the light and the disc, and as it is "scanned" flashes of light pass through to the photo-electric cell.

Special Cell.

Behind the receiving disc is not a neon lamp, as in the "simple televisor," but a special type of Wolfram arc lamp. It gives a red glow like neon, however, and when you look through the opening in the casing surrounding the disc and lamp you see flickering in red and black the A or B or whatever letter is being inserted at the transmitting end.

Von Mihály took his apparatus to pieces before my eyes, and asked me to perform

every operation necessary to make a demonstration, so that I could believe that everything was what it seemed. He realises as well as I do, however, that there is nothing new in the system. What is new, he says, is the photo-electric cell, which he made himself, and the special type of Wolfram arc lamp.

Improved Lamp.

For his photo-electric cell, which has a sodium deposit, he claims special sensitivity. And ordinary neon lamps, he says, will not respond sufficiently rapidly for use in television receiving. (Here he was not taking into account the lamps made specially for

television by Mr. McFarlan Moore, in America.)

Instead, he has had a Wolfram arc lamp made by the Osram people here with rigid electrodes. In the standard type the electrodes are drawn apart by the contraction of tiny springs, but this movement makes the lamp unsuitable for television. Helped by his assistant, Nikolaus Langer, Von Mihály has made long experiments at Berlin University to determine the best gas and pressure for the lamps.

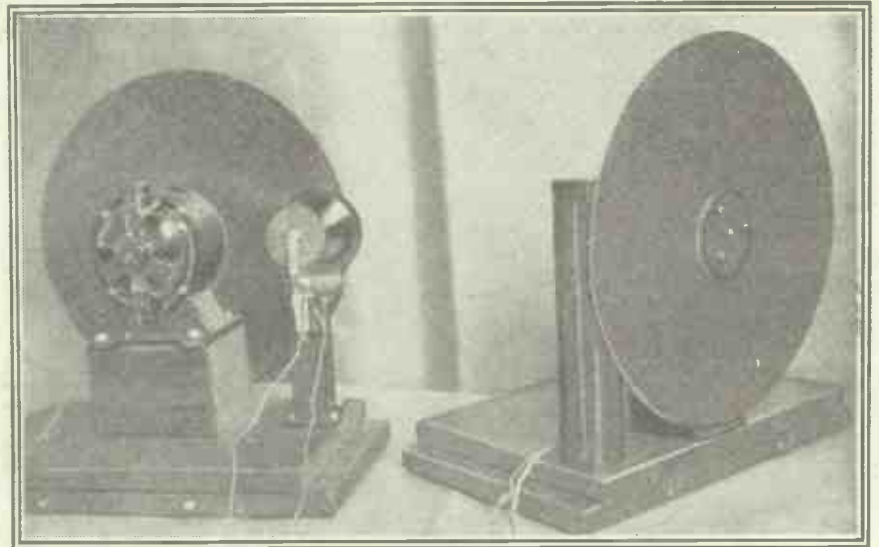
Building New Apparatus.

Last year Von Mihály explained to me his oscillating mirror apparatus. This year he has repeated to me his claim that with his old apparatus he obtained light-and-shade images of a face.

"Now," he told me, "I am having made in Budapest a much simpler type of my mirror apparatus. These discs are just to show that I have the essential 'organs' of television—the photo-electric cell and the receiving lamp. I shall fit them to my new apparatus, and then I shall have real television."

With his discs Von Mihály showed me names and designs drawn on glass as well as letters. I tried a simple photographic negative, but at the receiving end the detail was hardly perceptible.

The newspapers say he has made fame and fortune. He will have to wait for fortune at least until he has tried his new apparatus.



This is Mihály's latest television apparatus. On the left is the transmitting disc, showing the lens and the photo-electric cell. The receiving disc is on the right. The black pillar is a tube surrounding a special type of Wolfram arc lamp.

THE other evening I switched on the wireless set with a view to enjoying a particularly good programme which was being broadcast. The set had been working splendidly on the night previous, so imagine my surprise when I found the volume on 5 G B (the set having been left tuned to this transmission), little more than a whisper. It was known that all the voltage supplies were quite up to standard, and apart from the possibility of a valve having suddenly lost its emission, there should have been no cause for the peculiar occurrence. A rapid survey and test of the set itself showed that there was nothing wrong in this direction, the oscillation

WATCH THAT SWITCH.

By H. J. B. C.

control was working as well as before, and yet any of the stations that could be tuned in were only just audible.

When examining the back of the set to see if any leads had worked loose, the wire from the aerial lead-in switch was knocked and immediately there was a burst of volume from the loud speaker. It was

found that the flexible lead on to the plug which is inserted into the aerial safety switch had been nearly wrenched off, a matter that was soon rectified and normal working established. Enquiries elicited the information that cleaning operations had been in progress in that particular room during the day, and by accident this lead must have had a bad tug. Take warning readers, therefore, if the usual periodical clean is taking place, to look round your set and connections thoroughly before switching it on again. Faults can develop very easily unless special care is taken, and these may lead to far more disastrous effects than the instance just quoted.

WITH the large number of gramophone pick-ups now on the market it is becoming increasingly difficult for the average man to choose the one he will use with his set. Unlike loud speakers, they cannot be chosen from the point of view of looks—all pick-ups look much of a muchness—and the harassed purchaser cannot bring the question of appearance to bear on the subject at all.

What does bear rather heavily on the subject is the weight of the pick-up. One should choose an instrument which has about the same weight as the sound-box of the gramophone one is already using. If, however, a new gramophone is to be used or a turntable and motor and just a tone arm, and no sound-box has been purchased, the weight of the pick-up should not exceed five ounces by any noticeable amount.

Hear It Working.

It is a mistake to get too light a pick-up just as much as it is a mistake to buy one which is too heavy. The one which is too heavy will dive into the record groove too deeply and will tend to chip off the corners of the deeper transverse waves; while the light one will tend to chatter and buzz about on the record, causing all sorts of irregular damage which will quickly reduce the life of the record.

Unfortunately, price is also nothing to go by in choosing a pick-up, because there are some excellent cheap ones on the market just as well as there are some rather inferior expensive ones.

The best way, of course, is to treat a pick-up as one would treat a loud speaker, and insist upon a demonstration of its powers and virtues before one decides to purchase. Any really reliable radio dealer should be prepared to demonstrate a pick-up to a prospective customer just as willingly as he is prepared to demonstrate a loud speaker.

And here let me add one word of advice, and that is when one is hearing a pick-up demonstrated it is advisable not only to hear several pick-ups so that one can choose, but also to hear either a standard pick-up which one *knows* on a loud speaker of which one approves, or else to hear broadcasting on that loud speaker so that pick-up reproduction can be compared.

Results Can Be Misleading.

It is all very well to hear a record, a pick-up, and a loud speaker together. If the result is pleasing one may say, "Oh, well, I'll have that pick-up." If the result is not pleasing one may say, "Well, that pick-up is no good; I'll have to buy another." But the pleasing or otherwise effect may not be due solely to the pick-up. It may be due to the record, to the loud speaker, or a combination of the three.

You really want to *know* the loud speaker and what the set is capable of doing on broadcast reception, and then you are in a position to qualify the results given by the



A few hints as to the best way to go about choosing a gramophone pick-up.

By K. D. ROGERS.

pick-up. After all, broadcast reception is standard, gramophone records are not, pick-ups are not, and loud speakers are not.

It stands to reason if you hear what you consider is really good reproduction of broadcasting, then you have a reliable standard upon which to judge your pick-up and the record.

The next thing to do when choosing a pick-up is to choose a record which has fairly even tones—such as a fairly quiet organ record, and to find the pick-up which you consider gives the best results on that. Then put on a record which is fairly loud, such as a lively dance record or one in which the pick-up is most likely to blast, and try the pick-up again on that.

Proper Damping Is Necessary.

If it has insufficient damping or is too light it will blast and rattle horribly on the louder passages, and you may find that your opinion will alter. If it comes through all the tests, then it is a really reliable

should be able to know what variation of damping you can give your pick-up in order that you may treat it properly when you have it installed.

Adaptor May Be Needed.

Furthermore, see that your pick-up will take loud and soft needles, and also buy one which, if possible, will fit the gramophone tone arm you already have.

It is impossible with the large number of gramophones now on the market to make pick-ups that will fit all gramophones, but if you should find that it will not fit yours you can easily get an adaptor which will enable you to use it; or if the tone arm is too large you can cut a piece of wood or cork and fit into the pick-up and into tone arm, and thus make it fit your gramophone.

But if you improvise an adaptor of this nature make sure that it does not throw the pick-up out of its correct position relative to the gramophone record.

"MIKE'S" MOTOR.



One of the E.E.C. vans used in the broadcasting of outdoor ceremonies, such as the Cenotaph Services, and public meetings.

instrument and can be chosen as being sure to give good results on your own set.

Most of the pick-ups nowadays are sufficiently damped by the makers and need no adjustment. But several have variable adjustments for damping on them, and these should be tried by the dealer in your presence to see what difference they make and whether they work properly.

I am not insinuating that there are any on the market which do not work, but you

LONDON'S NEW STATION

At last the new 2 L O, at Brookman's Park, Potter's Bar, is to be placed under construction, and the first of the long-promised regionals will commence to materialise.

By THE EDITOR.

THERE is now no doubt about the new 2 L O. Work on the B.B.C. Regional Twin-Wave Station for London is to begin immediately, and we understand that a contract for the buildings, etc., has already been placed and that several other large contracting firms have already sent in their estimates for the necessary gear, etc.

The new 2 L O buildings will be at Brookman's Park. If you take the North Road which leads through New Barnet and Hatfield, you will pass Brookman's Park. It is a pleasant spot and one which should undoubtedly prove an ideal site for the new dual station.

Twin Aerials.

The buildings which will constitute the station at the new 2 L O will consist of a generating-room, rooms for the two transmitters, a checking-room, a control-room and a studio for use in connection with experimental and emergency work. This studio, however, is not likely to be used consistently, for most of the programmes will be relayed from the main office at Savoy Hill.

Offices and staff-rooms will also be provided. The site of the new station will cover about 34 acres, and two aerials, each 200 feet in height and about 500 feet in length, will be erected in parallel.

It is estimated that the power in the aerials will be about 30 kilowatts, which is, of course, about five kilowatts stronger than Daventry's long-wave station.

Naturally, listeners are asking when this new Regional Station will be ready. April next is the date suggested, and even then it is probable that the station will only operate on one wave-length to begin with, the alternative wave-length being kept in reserve until the new 2 L O has been thoroughly established and its technical powers fully tested.

Other Stations.

Details of the above nature were given by Sir William Mitchell-Thomson, the Postmaster-General, recently in the House of Commons. He made it clear that the B.B.C. had applied for power to proceed to take the necessary steps to erect twin-wave high-power stations at Manchester, Glasgow and Cardiff, and a single-wave high-power station at Belfast. Sir William pointed out that this plan for a series of high-power stations was really based on the very great success of the experiments carried out at Daventry, but although Sir William has licensed the B.B.C. to proceed with the new London Station, there is as yet nothing definite decided with regard to the erection of the other high-power stations.

We hope this matter will be cleared up soon, because if there is a considerable delay between the erection of the London Station and the next high-power station, it will mean that the fully completed Regional Scheme will not be appreciated

for some years to come. If the Postmaster-General is going to wait until the new Potter's Bar Station has proved itself successful, then it will be another delay of a year before the new high-power station is ready. Let us hope that all these new stations will be licensed for erection before the end of the present Parliamentary Session.

"Paradoxical."

Sir William pointed out that in matters of detail the Governors of the B.B.C. were absolutely masters in their own house, and he wanted to make it clear that he would not interfere, nor would he take any responsibility for the nature of the broadcasting programmes.

In a recent editorial we pointed out this apparently paradoxical state of affairs. Inasmuch as the B.B.C. is a Government monopoly and therefore a branch of the Home Civil Service, it seems strange that the head of that particular department, viz., the Postmaster-General, should disclaim all responsibility for the policy adopted by what, after all, are his assistants.

There are two interesting items which should be welcomed by all those who appreciate good programmes. It has been announced that Sir Thomas Beecham (who hitherto has not been exactly friendly towards broadcasting) has a new scheme which will be of immense importance to the progress of good British music in this country.

Sir Thomas has interested himself in providing for London an absolutely first-class orchestra, and this undertaking looks like being a very great success, thanks to the fact that the B.B.C. is offering considerable help. The new orchestra, it is hoped, will come into being next year. Sir Thomas has obtained the support of many friends who will form a substantial guarantee for the orchestra, while the B.B.C., with whom an agreement has been reached on principles, have also come to his assistance. The third source of help is one of the leading gramophone companies. This orchestra will be a permanent body of the finest musicians in the country, and will give Symphony Concerts at the Queen's Hall at least once a week. The B.B.C. will also be able to relay some of these concerts, and the principal orchestral items will be recorded by one of the leading gramophone companies.

Certainly the B.B.C. needs a really permanent orchestra, and not just a collection of players who come and go according to their engagements. This new orchestra will be able to concentrate on providing London, and incidentally the whole country, with music which will be thoroughly well rehearsed before public performance. At the moment this country has not a really permanent National Orchestra, but Sir Thomas' scheme, thanks to the help of the B.B.C. and one of the leading gramophone companies, has at last made this possible.

Promenade Broadcasts.

Some of the Promenade Concerts will again be broadcast this year, and Sir Henry Wood will conduct. They will start on August 11th, and will run for eight weeks, a fortnight longer than last year. About 50 per cent of the Promenade Concerts will be broadcast and from London and Daventry Experimental Station three will be broadcast each week, two from one station and one from the other. It is expected that Daventry will broadcast the majority. Other main stations will also give one concert definitely each week, with a possibility of more at the discretion of the various station directors concerned.

Therefore, it is quite likely that many listeners with powerful and selective receivers will be able, if they so wish, to hear a Promenade Concert every night of the week.

The last Promenade Concert will be given on October 6th and, on October 12th, the B.B.C. will start a series of Symphony Concerts at the Queen's Hall, conducted by Sir Henry Wood and other well-known musicians.



M. Lacoste, the father of the famous lawn tennis "star," listens-in to the broadcast account of one of his son's matches.

DID YOU GET

your copy of the August

MODERN WIRELESS?

Exceptional value for money.

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TRACKING "CRACKLING"

A THREE-VALVE SET consisting of a detector with two low-frequency stages had come into my hands, which, when placed on test, seemed reasonably up to standard as far as signal reception and purity was concerned, but it had a nasty habit of exhibiting unpleasant crackling noises when adjusting either the reaction or tuning condensers. In addition, at times, these "imitation atmospherics" would evidence themselves even when the set was not handled, and, of course, this marred what otherwise would have been a first-rate receiver.

In view of the fact that the crackles occurred when either of the two condensers were operated, I felt justified in assuming that they were at fault, so they were removed for examination. Apparently they had been installed in the set for some considerable period, and I was not surprised to find that an accumulation of dust and dirt had got between the fixed and moving plates. It did not take long to remove the offending particles with the aid of a feather and pipe cleaner, and, in connection with the last named, let me issue a word of warning.

A Point to Watch.

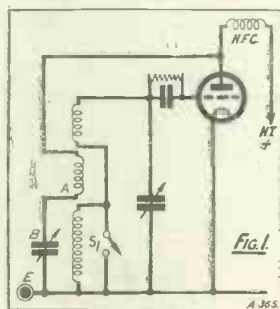
If the dust is being removed from the condenser plates while the condensers are still mounted in the set, be sure that the high tension is switched off, as if by chance an ordinary pipe cleaner is being used it is quite likely that the metal wires which hold the cleaning material in a spiral twist may be bare of covering in parts (see accompanying photograph).

If this is so, the wire may bridge the fixed and moving plates and, in the case of a

How a fault which might have happened to anyone's set was systematically searched for and run to earth.

By H. J. BARTON-CHAPPLE.

reaction condenser without a fixed condenser in series as a precautionary measure, this will mean a complete metallic path between the H.T. + tapping and H.T. — This sudden make and break of D.C.



current in a circuit which should only carry high-frequency currents has occasionally caused a break in the reaction coil winding, or burned out valves. Always make the receiver quite dead,

therefore, before attempting to perform any internal operations.

To return to the fault in question, however, the two condensers were replaced in position inside the set and everything connected up again. On switching on and turning the dials again the crackles still made their presence felt.

Finally, by taking as my cue the fact that the crackles appeared worse when the condensers were handled, the fault was

eventually brought to light and a reference to Fig. 1 will assist in the explanation.

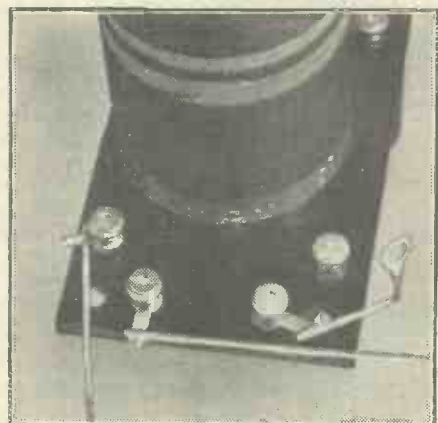
The coil in the aerial circuit consisted of a winding on a solenoidal tube, a portion of which was shorted out by the switch S, when working on the ordinary broadcast bands. The reaction coil was wound on the same tube, and it will be noticed that the moving plates of both the reaction and tuning condensers, one side of the switch S, and the lower end of the coil were all connected to earth. As far as the coil itself was concerned, it was mounted vertically on a horizontal base, appropriate terminals and soldering tags being provided for, making the external connections.

Peculiar Fault.

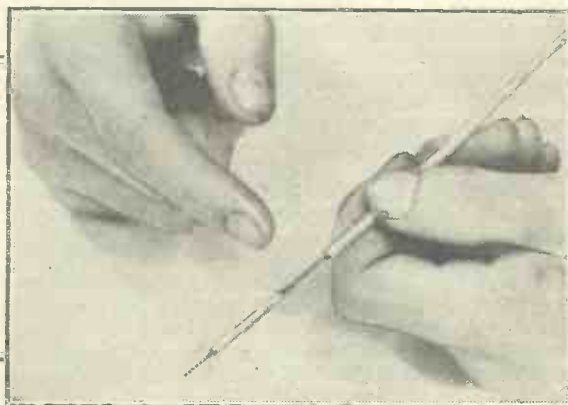
This, of course, was quite a normal procedure, but the earth terminal on the base and the terminal joined to the condenser side of the reaction coil were very close to two of the base holes used for passing screws through to the baseboard to hold the whole coil in place.

Fairly large brass screws had been employed for this purpose, and their round heads projected a sufficient distance above the ebonite base surface to allow them to touch the soldering tags of the earth connection, and also the connection A of the lead AB.

Since the panel was not very securely held to the baseboard every time the variable condensers were handled the panel moved slightly, this movement being sufficient to make and break contact between the earth wire and the lead AB and the holding screws.



When cleaning the interior of a radio set with a pipe-cleaner, (right) see that the metal parts of this do not cause short circuits. A leakage can be caused by a lead coming in contact with a mounting screw (left) and result in the sort of trouble our contributor encountered.



TECHNICAL NOTES.

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

PHOTO-ELECTRIC CELLS

DARK RESISTANCE—SELENIUM CELLS—SECURING WIRES—EXPERIMENTAL
ELIMINATOR—UNIVERSAL CHARGER—SMOOTHING UNITS, ETC., ETC.

THOSE of my readers who are interested in experimenting with light-sensitive cells may find it useful to know the name of a firm of manufacturers who are now specialising in the production of all types of photo-electric devices. I have received some most useful particulars from The London & Provincial Corporation, Limited, Cannon Street House, 110, Cannon Street, E.C.4., from which the following brief particulars are taken:

A new type of selenium cell is being made which has the advantages that it can be used with any voltage up to 300 volts, and retains its sensitivity even when immersed in water. This type of cell is such a great improvement on past types of selenium cell that it is being used for speaking-film projection.

Dark-Resistance.

Reliance selenium cells of any required surface-area of "dark-resistance" can be supplied, and these are constant at all times, and also when exposed to alkaline liquids. The ratio (i.e. the light-resistance at 240 foot candles divided by the dark-resistance) for the standard type of cell is 25 to 1, but any ratio up to 150 to 1 can be supplied at little extra cost. If required, a cell can be made for use on any particular part of the spectrum or in a liquid of any colour.

Each cell is calibrated with several light-resistance values, and this curve is given in each case in order that the so-called lag or inertia may be obviated by using on the steepest portion of the curve.

Selenium Cells.

Selenium cells control much larger currents, and consequently require less amplification, than most other existing types of light-sensitive cell. Moreover, they have the advantage of reliability and durability, and are easily and cheaply repaired should any accident happen to them.

The above-mentioned company's "Type 1" cell has an initial resistance of about one megohm, and is fitted with two terminals and enclosed in a waterproof case. The attractive surface-area of this standard type is one square inch, and the price is 20s. complete. Other types of cell can be supplied including the hair-line type, the over-all dimensions of which are 80 millimetres by 20 millimetres.

Full particulars can be obtained from the above-mentioned company at the address given.

Securing Wires.

I have a letter from a reader in Droylsden, Manchester, giving a very simple little hint which may be useful to experimenters. It has reference to the attachment of wires to a plastered wall, and the hint consists in using the small brass picture hangers which are provided with a sharp steel brass-headed needle which is driven into the wall at an angle of about 45 degrees to the vertical.

When the hook is in position the wires are laid in the lower pin of the hook, and the latter is then pressed over so as to grip the wires firmly. By turning the hook into a horizontal direction it can be adapted for securing wires which run in a vertical direction. By this simple little dodge wires may be very neatly fixed to a wall, and there is

no danger of damaging the wall as is the case with most other methods of securing wires.

Experimental Eliminator.

Another matter which crops up in correspondence relates to rectifiers for supplying the anode current—in other words, a home-made eliminator. My correspondent, who writes from Oldham, Lancashire, states that he has trouble owing to the voltage dropping frequently. The rectifier which he uses is of an electrolytic type, and it is clear from his description that the rectifier is working perfectly, but I believe his trouble is due to the fact that the bridge formation of rectifier, as used by him, is not properly balanced, or possibly he may have some of

(Continued on page 793.)

STOP—LOOK—LISTEN !



Shall we soon be able to have illustrated news bulletins by means of quite simple apparatus? The machine shown here seems to suggest that this may easily be the case.

The interesting machine shown here (with its inventor) can, in a few minutes, pick up a picture that is being wirelessly to it from a distance. Though this is not television it is an extremely interesting development of radio.

NEWS FROM SAVOY HILL.

FROM OUR OWN CORRESPONDENTS.

NEXT YEAR'S "PROMS."

ENTER FOOTBALL—SIR THOMAS CHANGES HIS TUNE—ALL ABOUT
MADAME TUSSAUD'S—THE BRAEMAR GATHERING, ETC., ETC.

Enter Football.

THE first of the 1928-29 football season talks will be heard through all stations on Saturday evening, August 18th. It will be given in a Newcastle studio by Mr. George F. Allison, who can depend on a warm welcome after his brief absence from the "Mike."

Next Year's "Proms."

It is now certain that if the Promenade Concerts are repeated in 1929 they will be on quite different lines from the current season, which may be regarded as the last of the traditional regime of Sir Henry Wood. The B.B.C. had intended to make extensive

changes in the orchestra this year; but Sir Henry Wood's opposition was successful, and the approved arrangements are substantially the same as before. But next year unity of conducting will not be observed. Sir Henry Wood will probably be offered some of the season. The rest will be taken by guest conductors, including Sir Thomas Beecham, Sir Hamilton Harty, Sir Landon Ronald, and others of that standing.

Sir Thomas Changes His Tune.

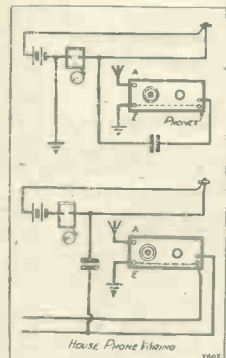
The early negotiations concerning the rapprochement between Sir Thomas

(Continued on page 792.)



Radio and the Door Bell.

MANY will have found that when their set is running, using either headphones or loud speaker, the front-door bell is almost inaudible above the concert. By connecting a small condenser between the bell circuit and one side of the loud-speaker circuit as shown, at the same time "earthing" another point shown in the bell circuit, a note will be obtained above the concert which will easily be recognised as that of the spark in the bell.



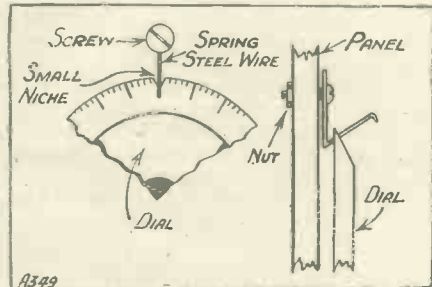
Care must be taken to connect the lead from the condenser to the side of the 'phones or speaker which is not connected to earth. This can easily be found by tracing out, or by connecting a piece of wire from the earth terminal to one of the 'phone terminals. On connecting from earth to the earthed side of the 'phones no

effect will be noticed; while on connecting to the other, or live side, the concert will disappear. This, then, is the side to be connected to the condenser.

A Station Setter.

SOME of those who have a set for the reception of the local and alternative programmes only, may, to operate the tuning dial every time, change over from one station to the other, the reaction remaining much the same in each case. A simple device which this continual tuning process on one dial makes very easy is described in the diagram.

All that is necessary is a piece of fine steel wire. This is bent and assembled as shown. The condenser dial is then carefully marked at the points where the stations are received and a small niche cut with a sharp blade.



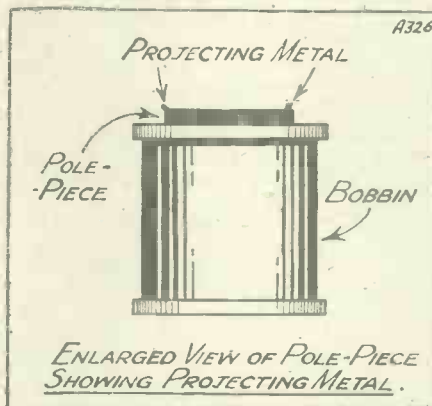
This process must be very carefully and accurately carried out. The gadget is simple to use.

A selection of short articles of an eminently practical nature which covers all phases of radio receiver construction, operation and maintenance.

Once the dial is correctly set after marking, lift up the spring with the thumb, rotate the dial, and release the spring into the first niche. To change over, lift the spring as before out of the niche. It will be seen that the spring, after being bent as shown, is secured to the panel by means of a small screw and nut. The idea may be adopted for setting several stations, providing great accuracy in marking is observed and tuning is constant and not microscopically critical.

A Loud-Speaker Tip.

I RECENTLY built up a cone loud speaker from a well-known loud-speaker unit. It worked excellently on medium power signals, but it would not take really strong



signals without causing a very bad rattle. The cone and unit were examined, and the fault was found to be due to the magnet pole pieces. The head of one of the pole pieces was not quite true, and had a small piece of metal projecting as in the diagram. The reed was vibrating against this, and so causing the bad rattle. The metal was carefully removed so as to make the pole pieces quite true, and the trouble at once ceased.

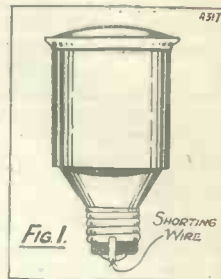
Shorting a Fixed Resistor.

WHEN using a filament resistance of the fixed-resistor type, which consists of a metal case enclosing a resistance coil of stated value and shaped at one end like the screwed portion of a flashlamp bulb, it may often happen that it is desired to eliminate the fixed resistance. This may be occasioned as the result of changing over to valves whose rated filament voltages are exactly 2, 4 or 6 volts,

as the case may be, and not, say, 1.8, 3.8 or 5.5 volts.

Special metal short-circuiting inserts can be purchased to replace the resistance and fit into the holder screwed to the base-board, but when these are not available it is quite a simple matter to short out the resistance and yet not actually damage the cartridge holder

so that it cannot again be used at its normal resistance value. Referring to Fig. 1, we see that it is necessary only to file a small sloping channel in the insulating washer between the bottom "pip" and the screwed metal shank.



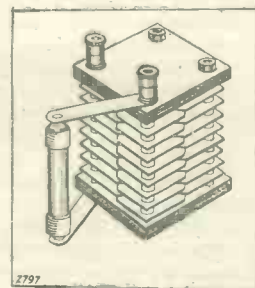
The channel, of course, should be made to just cut into the pip and shank, and then place a short piece of square wire in this channel, carefully solder it at each end and thus metallically bridge the two contacts and in consequence short circuit the resistance bobbin inside the holder.

Now carefully file away any superfluous solder or projecting wire, leaving the pip and screw formation exactly as before, and the cartridge can then be screwed back into the holder. When it is desired to remove the short and restore the resistance to its previous value, with the edge of a file just nick the ends of the small piece of shorting wire so that it can be broken away. Apart from the channel in the insulating washer, the resistor is not damaged, and in any case this will have no adverse effect on the normal working of the arrangement

A Low-Loss Grid Condenser.

THE special low-loss, air dielectric grid condenser illustrated herewith is particularly suitable for short-wave

reception. It can easily be built up of aluminium plates of 1/4 square inch overlap area, and is held together between ebonite end pieces; alternate plates being clamped at diagonally opposite corners, and spaced by washers of suitable thickness. The condenser should be provided with terminals and grid-leak clips as shown, and it can be made for any suitable capacity by varying the number of plates built in.



(Continued on next page.)

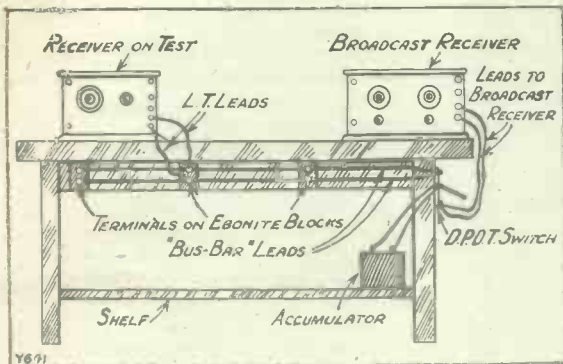
FOR THE SET BUILDER.

(Continued from previous page.)

Convenient L.T. System.

THE accumulator has to be put somewhere where acid will not do any damage, and this usually means under the table or on a low shelf out of the way. After sustaining many bruises through reaching under the table to connect the leads when testing receivers, I came to the conclusion that this was not good enough. So an L.T. "bus-bar" system was fitted up, and this has proved so useful in practice that some experimenters may like to install something of the same sort on their own benches.

The accumulator rests on a shelf under the bench, which is 6 ft. long. A pair of rubber-covered flex leads connect to the middle contacts of a D.P.D.T. switch at the end of the bench. Leads from one outer pair of contacts go to the set which is



reserved for local broadcast reception. From the other pair of contacts two rigid leads run along the front of the bench, stapled under the overhanging edge. At intervals of 2 ft. pairs of terminals are connected to these leads, mounted on ebonite blocks, also under the edge of the bench.

When a receiver is on test on the bench, its L.T. terminals are connected with short leads to the nearest pair of terminals, and the switch is put over when everything is ready. There is no need to touch the accumulator at all when connecting up, and grovelling under the bench is entirely avoided.

Ready-Made Leads.

FLEXIBLE leads for the batteries, aerial, and earth are needed whenever you want to use any of the receivers in your "stud." Odd lengths of thin flex soon become entangled and worn out, till your temper probably gets worn out, too! For L.T. and H.T. battery leads avoid the thin flex which is used for domestic lighting, and obtain a few yards of single rubber-covered cable. The size of cable ordinarily provided for the aerial lead-in is admirable.

To make leads which will always be handy and ready for use with any receiver, cut off six to eight lengths of the cable, each about 2 ft. in length. Fit both ends of one pair of leads with spade tags, coloured red and black respectively, if you like. These connect the set to the L.T. accumulator.

Three or four other leads will be equipped each with a spade tag at one end and a

suitably coloured wander plug at the other end, for the tappings on the H.T. battery. The remaining leads you can fit up as required for your own arrangement of accessories. You may want, for example, a pair of longer lengths with spade tags for the aerial and earth connections.

Make a neat and secure job of the tags and plugs, binding over the ends of the insulation with silk or adhesive tape if necessary. Then you will have a set of leads which will give you long and invaluable service.

Friction-Drive Dials.

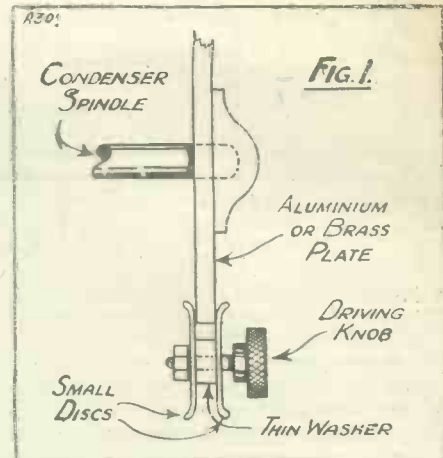
THE inclusion of a vernier dial or dials in a receiving set is undoubtedly a distinct advantage to the operator. It allows him to perform tuning operations with greater exactitude, especially when the stations being received are not particularly strong. On the other hand, if these dials go wrong or show signs of wear they are guaranteed to fray the edges of the sweetest of tempers, and in consequence it is inadvisable to be penny wise and pound foolish when making purchases of this particular component.

There are many arrangements adopted in order to impart the necessary vernier motion, and one form includes what is termed a friction drive. The bare essentials are shown in Fig. 1, and consist of a thin circular aluminium or brass plate secured to the condenser spindle. The "drive" for this plate embodies two thin discs separated by a small washer whose thickness is slightly less than that part of the large plate. When the two discs are held together by a nut on a spindle, they grip the edge of the large plate quite firmly, and, owing to the friction between the surfaces, any revolutions imparted to the discs through an outside knob drive the plate round, only at a much reduced speed.

Unless compensation is provided through the medium of a spring washer to take up wear, the edge of the plate wears somewhat thinner after a time, and in consequence slip takes place between the friction surfaces. The result of this is to nullify the previous smooth drive and make the condenser motion jerky. When this happens there are two methods open to adoption in order to cure the evil, and I have tried both separately and combined and found matters rectified once more.

One merely consists in loosening and removing the holding nut and filing down the separating washer to compensate for wear. If preferred, the two discs can be taken off and their inside faces roughened or slightly serrated by file cuts, using a three-cornered file.

On reassembling the drive it will be found that the slip has vanished and a long new lease of life is imparted to the vernier dial.



A Useful Baseboard Attachment.

A SIMPLE idea useful for baseboard mounting is described herein. It is intended for use as a grid leak and condenser unit.

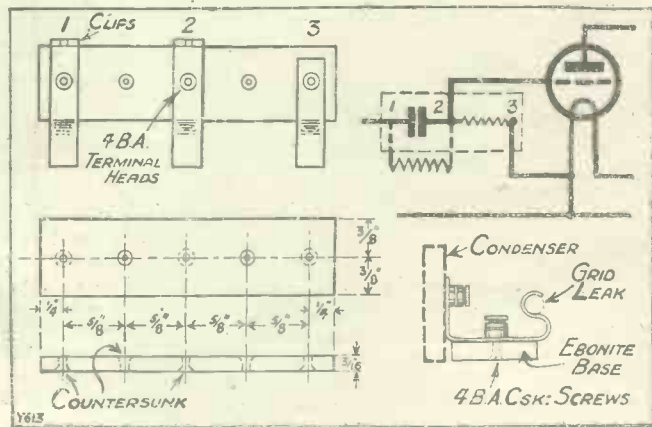
For construction, which is simple, first cut an ebonite base piece and drill in accordance with the detail shown in the drawing. Mount upon the base piece by means of three countersunk 4 B.A. screws, and 4 B.A. nuts and terminal heads, and three clips, as shown. These may be made from brass strip or clips of the Lissen type will do.

When finished, secure to the baseboard of the receiver by countersunk wood screws, in the desired position. The whole idea of the device is to be able to alter the position of the grid leak at will, without touching the existing wiring of the receiver, while at the same time the leak or condenser may, of course, be changed by clipping in others of different value.

The method of use is shown in the circuit diagram with grid leak and condenser in parallel, clips 1 and 2 being used. To use the grid leak between the grid and the filament, this component is inserted in clips 2 and 3, the condenser remaining as before.

A Short-Wave Wrinkle.

WHEN constructing a short-wave set in which a separate aerial coil is used, it is a good plan to make the coupling between this and the grid coil variable. If trouble is then experienced in making the set oscillate, it can often be cured by increasing the distance between these two coils.



A CHEAP AND EFFICIENT REMOTE CONTROL

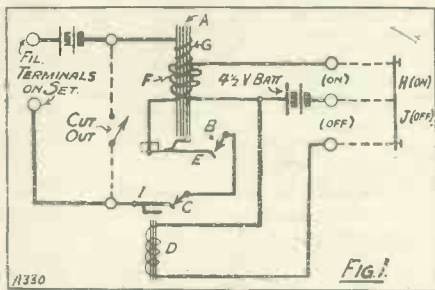


MANY readers no doubt have extensions from their sets into the garden or other rooms, and find it very inconvenient to keep on going to where the set is installed to switch it on or off. In such cases it is almost a necessity to have a reliable remote-control device.

The one about to be described was evolved by the writer after considerable experiment, and has been in use for several months. It is both simple and efficient, having the additional advantage that it is extremely cheap.

How It Works.

Referring to Fig. 1, it will be seen that when Key H is momentarily closed, A becomes a magnet by reason of the winding F. Armature E is attracted and makes contact with the screw B. That closes the filament circuit through C, B, and winding G. Hence A remains a magnet energised by the filament current through coil G, so that the set remains on until the circuit is



broken. To break the circuit we arrange a second magnet D (controlled by Key J) to act on armature I. Now for constructional details!

The containing case used by the writer was an old cigar box measuring 9 x 5 x 2 1/2 in. But any box will do so long as it is not under the dimensions given.

For the magnets procure from your dealer about 1/2 lb. soft iron wires. Cut them into two bundles, one 4 1/2 in. long x 1/4 in. diameter, and the other 2 1/2 in. long x 1/4 in. diameter, and put these into the hottest part of the fire overnight so as to thoroughly anneal them (note thoroughly—this is very important). Next bend them as shown in Fig. 2a, and file the ends square. The long sections of each core can now be given a layer of insulating tape.

The Magnet Coils.

Winding G consists of two 18 ft. lengths of 26 D.C.C. wire wound on together on the larger core.

Winding F consists of about 15 yds. of the same wire wound over coil G.

Winding D consists of about 10 yds. of 26 D.C.C. wire wound on the smaller core.

The armatures are made from thin strip brass (about 1/2 in. wide, 24 gauge) and have small L-shaped pieces of ordinary tin

* * * * *

You can switch your set on and off from any part of the house with this simple and easy-to-make device. It costs practically nothing, but has a definite, reliable action which will not let you down.

By C. LAKE.

* * * * *

twisted round them and nipped with a pair of pliers (Fig. 2b will make this clear, I think).

To assemble, the end of the core of each magnet is frayed and a batten of wood screwed over as shown in the photo.

The armature I is secured by the nut of one of the filament terminals and so bent that a gap of about 1/8 in. is left between the tin and the end of the core (note the way the ends of the armatures are bent, see Fig. 2c.)

Armature E is mounted on a small block of wood secured to the base by one screw only. This is to enable an easy adjustment of the air gap to be made.

Next the two adjusting screws (contact studs will do) are mounted in the side of the box so as to engage the ends of the armatures. (Note, these screws must fit fairly tightly.)

Fixing The Battery.

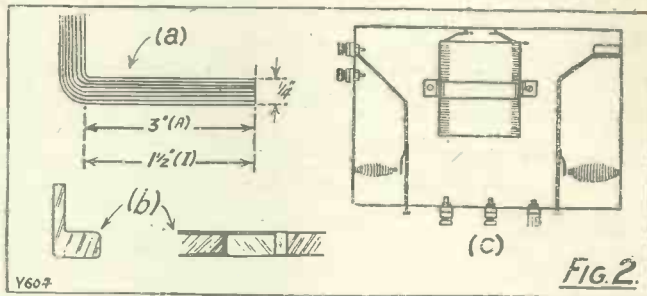
The flash-lamp battery is fixed by a strip of brass held in position by two nuts and bolts countersunk through the bottom of the box. Contact to the battery is made by means of two screws mounted on the side of the box, the brass strips on the battery being bent so as to make a good spring contact.



Could anything be simpler than the remote control shown here? It can be made in an evening without the slightest trouble and at hardly any cost.

The connections are as follow: One side of coil G to free fil. terminal. Other side of G to armature E (under fixing screw). Connect both adjusting screws together by slipping the ends of a piece of wire into the holes and replacing the screws. One end of windings D and F to one side of battery via contact screw. Other side of battery to middle terminal of the three on the other side of the box. Other ends of windings D and F to other free terminals.

Adjust tin tongue on armature E so that it covers about 1/3 core A. Close "on"



switch (H) and adjust screw until it just makes contact with armature E (there should be a gap of about 1/16 in. between the core and the tin). Adjust the other screw so that it makes good contact with armature I. This unit can only be connected one way round in the filament lead. Ascertain which is the correct way. Contact screw B will probably need some readjusting.

The control keys can take practically any form that the amateur fancies. It must be remembered though that they are essentially keys, not switches. It is only necessary to momentarily close the circuit. A "cut out" switch can, if necessary, be mounted on top of the box and connected across the filament terminals as shown in Fig. 1 in dotted lines.

* * * * *

STATION INFORMATION.

* * * * *

THE recently inaugurated tuning note sent out from 2 L O comprises the chord of C major. * * *

Eight electrically-driven tuning-forks are employed for the production of the new tuning note. * * *

Do not be alarmed if the wave-length of 5 SW appears to shift during the summer months, as during this period it is hoped to carry out tests on different short wave-lengths.

"SYDNEY" TWO IN INDIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have made up the "Sydney" Two. I hope you are not tired of hearing about it, but, after last night's performance with it, I feel I must write and thank you for the Blue Print given away with "P.W." in January. I've had it going about a week and have been able to pick up Morse all over the dial almost any time of the day. Last night I decided to go without sleep and try for some musical programmes. I started at 11 p.m. I.S.T., and immediately picked up P.C.J.J. at great 'phone strength. I was afraid to lay a finger on the dials, and simply sat in amazement and listened to a grand programme for two and a half hours, till the station closed, 1.30 a.m. I.S.T. Every word was clear and distinct and one would have thought the singers and orchestra were in my room. It's marvellous!

I was very sleepy, but thought I would twist the knobs a bit backward to see if anything was doing, when, to my astonishment, a powerful chorus of singing greeted me. I waited patiently to find out where it came from with strained ears, but straining was unnecessary. A voice shouted "This is 5 S W, Chelmsford, etc., 24 metres." The music was perfect. Well, I could write all day about it, but must not take up too much of your time, I suppose you get thousands of these.

I get your paper regularly.

Once again thanking you,

Yours faithfully,

Punjab, India.

G. B. LEAHY.

"P.W." SET IN S.A.

The Editor, POPULAR WIRELESS.

Dear Sir,—As usual I received my copy of POPULAR WIRELESS to-day, and note that it is the "Pop's" sixth anniversary, and herewith send my best wishes to the paper which has so greatly helped along wireless since its origin.

I took up wireless in England in the early part of 1923 and have revelled in it ever since, and on coming out to South Africa in 1926 I brought my set with me, viz. Det. and L.F. My greatest regret in leaving the old country was that I had to leave behind me the ether which had meant so much to me.

Port Elizabeth is somewhere about 500 miles from any broadcasting station, and in a semi-tropical country you can imagine what kind of reception one would get even with the latest low-loss coils, condensers, etc., which my own set does not contain.

However, in a recent issue of the "Pop" I saw a diagram of a 2-valve short-wave set which was also suitable for the broadcast wave-length. No special claim was made for this set, which was Det. and L.F. I have just recently constructed this set, and once again have taken a newly found interest in a two-valver.

On nights when statics are reasonably kind my results are nothing short of wonderful, and speak well of the great advance made since I left the old country, and also in wireless circuits.

I have not obtained any short-wave results at present, but hope to in the near future. One of my friends here tells me he receives Daventry short-wave quite well on suitable nights, which speaks volumes

CORRESPONDENCE.

"SYDNEY" TWO IN INDIA.

"P.W." SET IN S.A.—RECEPTION OF 5 S W.

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

for short-wave transmission, and this is on two valves only.

If I ever come back to the old country I am expecting to bag all the stations within a 1,000 miles limit, and long to switch on, the loud speaker or don the 'phones and not hear bacon frying.

Wishing the "Pop" continued success,

Yours sincerely,

H. CRAMP

(Late Leicestershire).

Port Elizabeth, South Africa.

"Re SHIELDED GRID LEAK."

To the Editor, POPULAR WIRELESS.

Dear Sir,—Mr. Pangborn's suggestion that the probable cause of the whistling trouble in my receiver is the series condenser in the aerial lead is, I think, scarcely applicable in my case, though I do not doubt the efficacy of the remedy he used in a similar case. I do not use the series condenser on the long waves (Radio Paris, 5 X X, etc.), yet the trouble is there when the third valve is switched on, unless the grid leak is shielded. My idea was (and, of course, I may be quite mistaken) that there was some sort of interaction between the anode coil and the leak, especially as the former is directly over or above the latter, and thus comes within its magnetic field. But that this is not altogether the cause is proved by the fact that I tried connecting the leak to the positive filament lead, which took it out of the range of the anode coil, but the whistle persisted, though not, I fancy, to quite the same extent. As the valve I use, however, works better with the leak across the condenser, I replaced it in that position.

Of course, it is not every arrangement of components in the aerial circuit which will permit of conveniently shielding the grid condenser and leak in the manner I described, but where it can be done it is worth trying in case of need.

although strangely enough the Australian amateurs have been almost up to their usual standard.

Personally, I think some much more complicated theory than that of the "Heaviside Layer" is necessary before any satisfactory explanation of these vagaries of the shorter wave-lengths can be explained. The skip distance phenomenon is explained very well by the present theory, but there seems no rhyme or reason in the way in which a signal from 2,000 miles may be twice as strong as one from 5,000 miles at one time of day, and much weaker at some other time, when in a few days' time the conditions will have changed completely round.

Of course, it is rather useless to take observations on amateur-operated stations, since they use so many different types of aerials that one cannot be sure that the prominence of one particular station at a particular time of day is due to the angle of radiation given by the particular aerial in use.

A Difficult Job.

When one considers that temperature, barometric height and phase of the moon all have some indubitable effect upon conditions, it will be seen that a fairly difficult job is in front of us before we can come down to hard facts!

The object of my first letter was merely to suggest a possible method of getting rid of an annoyance so common to some sets, and which had proved so successful in my own case. One cannot have too many "correctives" at hand to try out in case of need, for what may succeed in one set of circumstances may be a total failure in another set, though apparently similar in nature.

Yours faithfully,

Manchester.

A. J. WOOD.

CHOOSING COUPLING RESISTANCES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to my article appearing in POPULAR WIRELESS of July 28th, and entitled "Choosing Coupling Resistances," I should like to correct an error that appeared in the working of the voltage drop equations. The resistance of the valve stated as 8,000 ohms should of course have been more than that—dependent on the grid bias employed—and should obviously have been the D.C. resistance of the valve, which of one particular specimen at about the correct working grid bias works out at somewhere round 28,000 ohms.

This, then, gives for the equation, including the 500,000 ohm external resistance, a value of about 6 volts; and for the other, where 100,000 ohms external resistance is employed, about 20 volts across the valve.

I should like to make it clear to readers that it is necessary first to calculate the D.C. resistance of the valve before the equation is made up, and not to use the A.C. resistance, which was erroneously quoted in the article.

Yours truly, K. D. ROGERS.

RECEPTION OF 5 S W.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I add another to the many letters which have appeared in your columns in appreciation of the successful reception of 5 S W in all parts of the world.

At the same time may I also register a mild protest against the apparent bias of some of your contributors. "Ariel," for example, complains of the "Silence of 5 S W." As a matter of fact 5 S W does announce, very clearly, when he gets a chance; but I do not understand how, as an experimental station, he is to superimpose his announcements on 2 L O's programme. Personally, I can always recognise him. Possibly "Ariel" confuses him with some other station, as he refers to him as experimenting on 32 metres. And as regards W. L. S.'s remark in your issue for June 30, please let him know that 5 S W is not altogether "a disgrace to us." On the contrary, to us here it is the best by far of the S W stations. 5 S W is a great boon to Britishers in these latitudes, where (as "Ariel" knows) good reception is made impossible on the broadcasting range by static interference in the summer months.

May we therefore ask you, sir, to use your great influence in favour of the continuance of 5 S W, and also the extension of the transmissions to the news bulletins and to Saturdays and Sundays.

Aguilas,
(Murcia), Spain.

Yours truly,

GEORGE L. BOAG.

SHORT-WAVE NOTES.

By W. L. S.

SHORTLY after I wrote a note, a few weeks ago, concerning the number of expeditions of various kinds which were equipped with short-wave radio apparatus, I had the good fortune to hear three of the vessels that were concerned in the Polar expedition and ultimate search for General Nobile. The "Italia" itself, the "Citta di Milano," and the "Krassin" all carried low-power transmitters, and the latter in particular came across very well indeed on 90 metres or thereabouts.

An Insufficient Theory.

W S B S, the non-magnetic yacht "Carnegie," is again in evidence on 45 metres, with a crystal-controlled transmission, and the Norwegian boat "Thalatta" (A W R is her call) also comes through very well most evenings.

I think that by the time this set of notes appears in print the short-wave conditions for really long-distance work should be quite good once more. The American broadcast stations have all been rather poor lately,

Frequency Standards.

A friend from the States presented me a few days ago with a 40-metre crystal calibrated by the Bureau of Standards, and I took an early opportunity of checking it up against my own wave-meter (32-90 metres), which is N.P.L.-calibrated. I was rather surprised to find that I could detect no difference whatever between the two standards. I have been led to expect quite a noticeable difference between our own wave-length and frequency standards and those of the Americans, but I was quite relieved to find it so small that with the apparatus at hand I could not measure it!

ITEMS OF INTEREST.

THERE are now no less than nine studios in constant use at 2 L O. Five full-time announcers are required daily at Savoy Hill.

The Siberian expedition of the American Museum of Natural History, now working in polar waters, is keeping in touch with civilisation through the Vancouver broadcast station, C N R V.

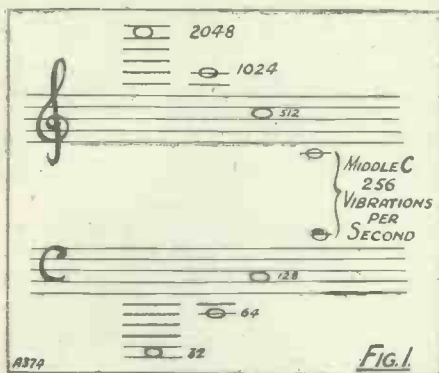
RADIO SPEECH & MUSIC.



THE perfect loud speaker has not yet been and never will be produced, and in spite of the popularity of new and improved types, old models of horn-type speaker still have many adherents. In fact, there are a great number of listeners, possibly a majority, who prefer the horn speaker to the latest type employing a moving-coil unit and baffle board, while some inferior types of cone speaker are much more popular than models known to

* Would a theoretically perfect loud speaker be more pleasant to listen to than one which distorts? That is the astounding question raised by the author, and a convincing answer is given. *
By C. E. FIELD B.Sc.

at frequencies of 512,768, 1,024, and so on. When the same note is sung by the vocalist, although the most important vibration is that of 256 per second, the harmonics are very pronounced, and many other entirely different vibrations are intro-



be capable of even reproduction over a wide range.

Consequently, the amateur is apt to wonder whether the theoretically perfect speaker would, in practice, be the most pleasant to listen to. A study of what really constitutes speech and music, based on the results of practical experiments, will probably help us to reconcile some of our conflicting ideas concerning loud-speaker reproduction, and to understand, for instance, why many new types of speaker, which give realistic reproduction of music, invest speech with an unnatural quality.

"Impure" Notes.

All sounds consist of vibrations or waves in the air, recurring with a frequency or rapidity which depends upon the pitch of the sound. Thus, for example, when the note Middle C is struck on the piano, or sung by a vocalist, vibrations at the rate of 256 per second are received by the ear. Each octave higher or lower is produced by vibrations occurring at twice or half this

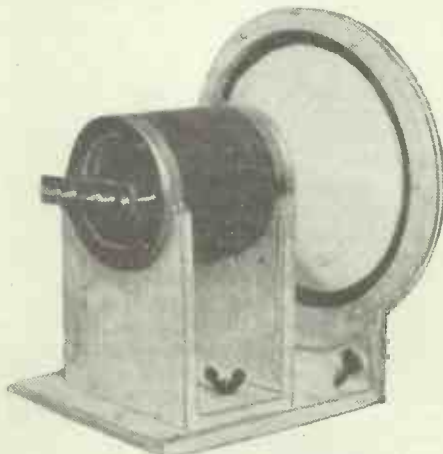
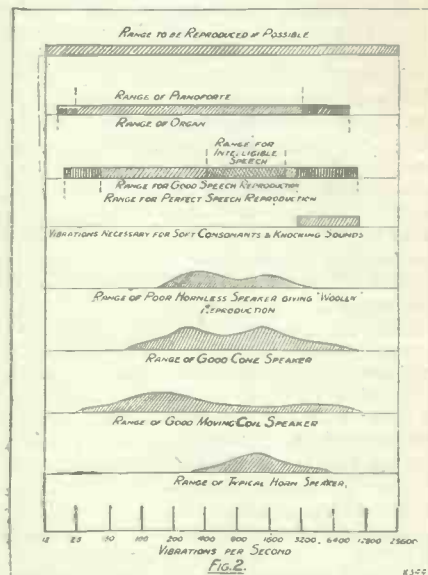
frequency, the frequencies of the C's on the piano being as shown in Fig. 1.

Now, although the singer's note and the note on the piano are of the same pitch, they have little else in common, so that there must be some other factor which determines the sound.

This factor is the "impurities" in the note.

Complicated Sounds.

When Middle C is struck on the piano, in addition to vibrations at a rate of 256 per second, subsidiary vibrations known as harmonics are also produced, these consisting of smaller vibrations at frequencies which are multiples of the original or fundamental note. Thus, Middle C would consist of a main vibration of 256 cycles per second and very much smaller vibrations



The unit of a moving-coil loud speaker, a type which probably gives the closest approach to realism.

duced, giving a roughness to the tone, and giving the difference between the various vowel sounds. The words "Popular Wireless" for instance, might be sung monotonously at a certain pitch, but the five different vowel sounds involved mean that five other sets of vibrations of different pitches and values are intermingled. Still greater complications are introduced by the consonant sounds.

Speech Frequencies.

Turning now to ordinary speech, as distinct from singing, we find that the pitch of the speech is of secondary importance, and that, although the main frequency is responsible largely for the difference between the male and female voices, conversations can be carried out in whispers in which the main frequency is entirely absent.

(Continued on next page.)

RADIO SPEECH & MUSIC.

(Continued from previous page.)

Experiments have been made, however, with the aid of specially constructed electrical filters, which have shown the part played in speech sounds by vibrations of different frequencies.

It has been found from these that while the human voice contains vibrations varying between 30 and 10,000 per second, most of the sensation of loudness is produced by the lower frequencies, while the higher frequencies make the voice intelligible. Thus, if one spoke through a telephone line which carried only low frequencies, very little sound would be lost, but the listener would not easily comprehend what was being said. Conversely, a line which conveyed only the higher frequencies would make the voice sound weak and lack body, but would still allow of conversation.

Different Requirements.

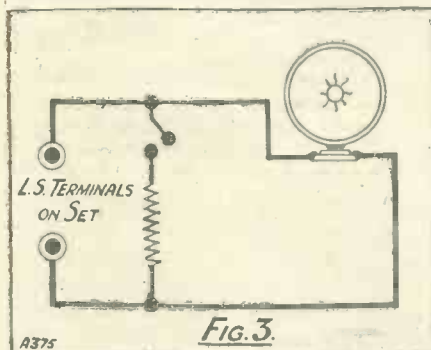
Perfectly good conversational speech can be obtained if only frequencies between 200 and 3,000 vibrations per second are transmitted, and, in fact, this is the case on many commercial telephone lines.

The most important frequencies for speech reproduction are those between 1,000 and 2,000 vibrations per second, frequencies of less than 500 per second being almost unwanted.

High frequencies above 5,000 per second are required for the reproduction of certain consonant sounds, such as s, z, j, th, sh, etc., although, in practice, these are so seldom reproduced properly that the ear does not need them. Any fizzing or blowing noise will usually be interpreted by a listener as s, z, th, etc., according to which is required.

In Fig. 2 is shown diagrammatically the way in which speech and music are built up, and how they are catered for by various types of speakers.

From the foregoing we can see that the requirements of a receiving set and speaker which will give intelligible speech are different from those of an outfit which is required to reproduce music faithfully.



The perfect receiving set is one which will reproduce all frequencies at the same relative intensity as that at which they were received from the aerial, and designers of up-to-date receivers and speakers are striving for this ideal. Such perfection has not yet been obtained, however, and what is apt to be puzzling to those who listen to some of the latest types of speaker

is the unpleasant quality of the speech reproduction.

In fact, it sometimes appears as if speech becomes worse as music is reproduced more faithfully. We have most of us heard an excellent orchestral item coming from a moving coil or cone type of speaker, and been delighted with the fullness of the pianoforte bass, the richness of the drums, and the deep vibrations of the bass violin, and then been disappointed with the booming, unnatural voice of the announcer, particularly if the volume is great.

Over-Amplification.

The reason for this is partly that the high quality of the music is obtained because of slight *over-amplification* of the lower notes, from Middle C downwards, and this brings out components of the voice vibrations which are normally scarcely heard, and, as we saw above, these low notes are largely responsible for the sensation of loudness.

The rather thin, but very clear speech obtained from many types of horn speaker



The frequencies which are necessary for speech are adequately catered for by the horn type of speaker.

is produced by great over-amplification of the frequencies which are most essential for speech — those between 1,000 and 2,000 cycles per second. This will be clear by reference to Fig. 2, which shows that the frequencies which are necessary for speech are adequately catered for by the horn type of speaker, whereas unimportant speech

frequencies are over-amplified by the other types.

The boominess of the moving coil or cone speaker on loud volumes is also due to another effect for which the speaker cannot be held responsible.

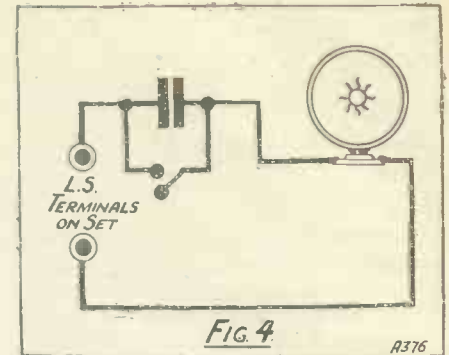
To see this quite clearly, the reader should try the following experiment for himself. He should stand by the speaker and address another person in the room, speaking in quiet, conversational tones, and then reduce the volume from the speaker until his voice and the announcer's voice sound equally loud to the listener. He will find, then, that the volume from the speaker is probably so small that all boominess has disappeared.

Interesting Experiment.

He should then go as far from the speaker as possible, say to a distance of fifty feet, and again address the listener. This time he will have to shout, and will, in so doing, unconsciously raise the pitch of his voice. He should then try to *speak* from that distance, *without shouting*. He will find that he has to adopt a deep, stentorian tone, in fact, he will "boom."

In short, a great deal of the boominess of a good speaker on loud volume is due to the fact that conversational tones are raised to the shouting level of loudness, and expected to sound natural without a raising of the pitch.

There is also a certain psychological effect to be considered. While listening to music, the listener may have in his mind's eye a picture of an orchestra at the end of a large hall, and the volume he obtains is what he expects. Then, instead of hearing an announcement from the same plat-



form, made in the tone that would be used by one addressing a large audience, he suddenly hears loud speech at a volume which suggests that the speaker is a few inches away from his ear.

There are two remedies for this boominess.

A Simple Adjustment.

One is to reduce the volume, and the other is to raise the pitch, and it is quite worth while to have a device at hand so that this can be carried out by simply throwing a key or pressing a button when an announcement or talk of any length is imminent.

In order to reduce the volume of the speech, a resistance should be joined, in series, with a switch, across the speaker terminals, as shown in Fig. 3. A suitable value of resistance for a trial would be about half the value of the impedance of the last valve.

The pitch of the speech can be raised



A good cone-type speaker will cover a good band of frequencies, as Fig. 2 shows.

by inserting a condenser in one loud-speaker lead, but keeping it short-circuited by means of a key except when speech is being received. The value of condenser required would depend upon the extent of the boominess and the type of speaker, but a value of .02 mfd. could be employed for a trial, the connections being as shown in Fig. 4.

FROM THE TECHNICAL EDITOR'S NOTE BOOK



BURNDEPT "ELECTRIC SOUND-BOX."

I HAVE often wondered who originated the term "gramophone pick-up." It is not a particularly happy term, although it appears to be accepted these days as standard. However, Burndept Wireless, Ltd., enterprisingly refuse to come into line, and they call their new production an "Electric Sound-Box," and this is, after all, the exact description of the article.

A very attractive feature is that the tone-arm adaptor is arranged for H.M.V.,



This is the Burndept "Electric Sound-Box."

Columbia and Continental tone arms. It seems to me to be a soundly designed device, and it is certainly very neat in appearance. It is contained in a cleanly moulded casing and the terminals are conveniently placed. I gave it a series of thorough tests on records ranging from quiet Pathés to the brightest and loudest Parlophones that I have. The first thing that I noticed was that it rode firmly and with a minimum of chatter, and appeared to be light on records.

A DIRECT CHECK.

I also found it extremely sensitive, more sensitive, I think, than any other "electric sound-box" I have yet tested, and the damping is just right. I should mention in passing that I always test a new gramophone "pick-up" on direct telephone reception as well as in the usual way. That is to say, I connect a pair of telephone receivers to the pick-up direct and note in that way the strength and quality of the L.F. impulses generated by the instrument.

The Burndept Electric Sound-Box has a fine reproduction curve, and it brings out both the bass and the high notes roundly and brightly. It appears to me to be a distinctly attractive proposition at £1.

Another new production due to the Burndept Wireless Co. is an H.F. Choke. This has an inductance of 50,000 microhenries and the comparatively low D.C. resistance of 480 ohms. It is a distinctly compact component and occupies very little baseboard space, for its construction is edgewise. Nevertheless, it has a remarkably low self-capacity. This, together with the very high inductance, makes it suitable for use on the shortest wave-length as well as the highest. As a matter of fact the makers claim that it can be used in intermediate frequency amplifiers in superheterodyne receivers.

The price is 3s. 6d., a very competitive figure and one which will appeal to constructors. But it should be noted that it is provided with soldering tags only and rather small ones at that. I am of the opinion that many amateurs would readily pay a trifle more and have terminals.

TWO INTERESTING RECEIVERS.

The Dubilier Condenser Co. recently published a folder describing the construction of their Toreador III Receiver, an excellent Det. and 2 L.F. R.C. coupled set. The folder can be obtained free on request.

Clarke's "Atlas" A.B.C. Receiving Set is a complete outfit of a self-contained nature, the L.T., H.T. and G.B. all being obtained from A.C. mains through a simple plug connection. A descriptive chart is available to "P. W." readers free of charge from H. Clarke & Co.

A NEW R.I.-VARLEY TRANSFORMER.

I can always remember with gratitude the original R.I. L.F. transformer, for in the early days of the home construction of radio outfits it was one of the very, very few good transformers. The majority on sale at that time were nothing but relics of Morse reception days, and not at all suited to the task of handling radio-telephony.

The subsequent years saw a gradual development all round, but the R.I. had no difficulty in holding its leading position. Then came the famous R.I.-Varley fusion, a welding together of two fine firms with brains and consciences behind them, and this resulted in, among other things, the evolution of the R.I.-Varley "Straight-Line" L.F. Transformer.

This really is a first-class modern L.F. component, and is as superior to some that are on the market as these might be to five-year-old editions of their own ilk. I use a "Straight-Line" in a favourite four-valver of mine, and I must say I obtain as much bass and as clear an upper register as the keenest ear could demand. This, I should mention, on the best moving-

coil loud speaker I have been able to install.

The "Straight-Line" has six terminals, enabling just the right primary impedance and ratio for particular purposes to be obtained, but the six terminals, no doubt, constitute a complication in the minds of some constructors. It is good news, therefore, that an R.I.-Varley "Straight-Line" L.F. Transformer has been produced having only the conventional four terminals. This four-terminal version has all the fine characteristics of its multi-terminal brother, and is, in fact, equal to it in every respect.

AN AURAL TEST.

Additionally to these advantages it is to sell at 22s. 6d., which is, I think, a very reasonable price in view of its high qualities. It did not take me long to place this new transformer, instead of the six-terminal variety, in the above-mentioned four-valver,

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

and having done so I could trace no difference whatever in the results.

It was admittedly an aural test, and we have often been told that the ear is an imperfect instrument, but it should be remembered that I was using a moving-coil loud speaker, an instrument which has little or no coloration to smother minor



The new R.I.-Varley "Straight-Line" Transformer has its terminals accessibly placed towards the base of the component.

blemishes, and which can reproduce a very moderate bass. As a matter of fact, this was a very good, practical test for the component, and the results convinced me that the new R.I.-Varley "Straight-Line" L.F. Transformer is every bit as good as the original version, and that means it is some component!

TESTING THE "TRAVELLER'S" THREE.

A short article giving final hints on making and operating the portable receiver described last week.

By G. P. KENDALL, B.Sc.

LAST week's description of the "Traveller's" Three was necessarily somewhat brief, and before we deal with operating matters we must first go in to the details of the frame aerial. This is wound in a spiral form on the piece of plywood quoted in the list of components, and one of the photos gives a fairly clear idea of the details.

The winding is supported on four strips of ebonite, each about $4\frac{1}{2}$ in. long and $\frac{3}{8}$ in. wide by $\frac{1}{4}$ in. thick, these being screwed to the plywood diagonally at the corners of the winding. In each a series of saw-cuts is made, spaced $\frac{1}{4}$ in. apart, one cut for each of the 16 turns of which the winding is composed. You will find it quite easy to slip the wire into these cuts turn by turn as the winding proceeds.

Using An Outside Aerial.

The ends of the winding are taken to sockets passed through the plywood, and this will be found to give ample insulation as long as the wood is reasonably dry. Another socket is also to be fitted, and to this the centre tap on the frame winding should be connected. The material for the winding may be either No. 22 D.C.C. wire, or preferably one of the special materials sold for the purpose, such as the Lewcos type.

If you intend to use the set with an outside aerial, you should also make a tapping at a point three turns away from the centre tap (either way) and connect the aerial to this. The earth will then be joined to the negative terminal of the L.T. battery, as is usual in such cases.

For 5 X X you will require a frame with 50 turns, which involves a fairly fine wire, say, No. 26 D.C.C., and winding several turns in each saw-cut. For example, you might use 10 cuts, spaced as before, and put 5 turns in each.

Easy To Work.

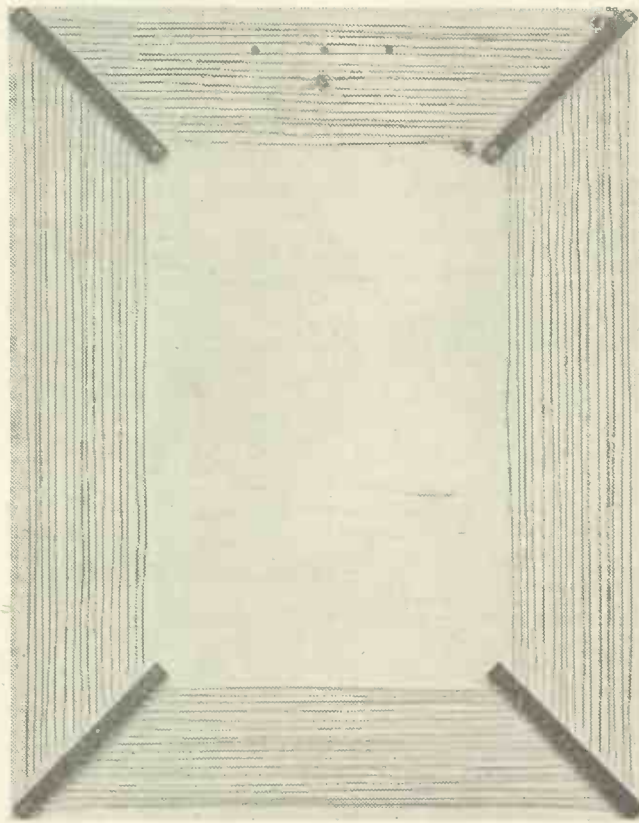
Operating the finished set you will find rather easier than usual with a portable, since the reaction control is particularly smooth and gradual. With all sets of this type, of course, the reaction setting for a given station is fairly critical, since there is no H.F. amplification, and one must work well up to the most sensitive point just below oscillation, except when fairly close to the local station, when quality can be improved by slacking the reaction back a little.

With the "Traveller's" Three you will find the correct setting very easily and quickly for any given station, since the adjustment is very smooth indeed when you have found the right voltage for the detector valve. This will usually be fairly low, perhaps between 50 and 60 volts, but a few minutes' testing will soon settle the point for any particular valve.

Tuning-in is too simple to require full instructions: all that is needed is to keep

the set just below the oscillation-point, and turn the knob of the single tuning dial very slowly and carefully until you find your station. Once found, you can proceed to give finishing touches to the reaction control, of course taking great care not to oscillate if you are using an outdoor aerial.

Finally, about valves. You will presumably use 2-volters to reduce the accumulator weight, and the types you will require are these: for the first two sockets (detector and first L.F.) you will need valves of the H.F. type, and for the last stage



The frame aerial is wound in the form of a flat spiral on a plain sheet of plywood, which fits into the carrying case behind the set. Note the four strips of ebonite which support the winding in a series of saw-cuts.

one of the smaller "power" varieties. A super-power valve is hardly advisable, because of the heavy drain on the H.T. battery.

A monument has just been erected on the church spire near Potsdam which bore the first German aerial, erected by Slaby in 1897.

Wireless beacon stations are now being installed round the coast of Great Britain as an aid to mariners.

During a recent cable breakdown the Isle of Man was kept in touch with the mainland by means of wireless.

An unusual application of "wireless" is reported from America, where a tuned circuit and meters, as used for radio, are employed to check the output of chewing-gum machines.

Continental Broadcasts.

The Munich Station relays a complete opera at least once every week throughout the nine-and-a-half months during which the opera season lasts.

The Lille Station, France, is now experimenting in Continental and U.S.A. relays.

The new No. 9 studio at 2, Savoy Hill, is 22 ft. long by $19\frac{1}{2}$ ft. wide. The solid brick walls are covered with four layers of cloth, in front of which is a special acoustic boarding.

Experience has proved that certain studios are particularly adapted to certain forms of broadcast, and for this reason announcements are never made from the new No. 9 studio at 2, Savoy Hill, but this is reserved for instrumental broadcast of all kinds—from soloists to an octet.

New Sets.

Screened-grid valves are being employed in the latest type of receiver installed by the Royal Navy.

Cromer and Dungeness are among the points at which it is proposed to erect wireless coast beacons.

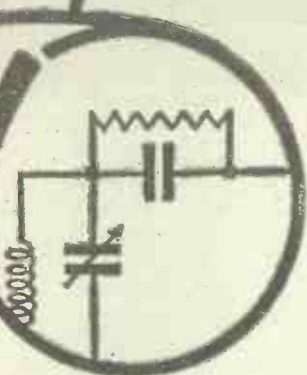
When the Cork Station Director was called recently to Dublin in an emergency the usual station announcements were made by his wife, and the innovation has been loudly acclaimed by the local listeners.

One of the best and most convenient earths for a portable set is a length of flexible wire soldered to an ordinary metal stair-rod, which, if tapered, can easily be driven down into damp soil.

FROM FAR AND NEAR

TWO Danish radio papers recently inaugurated a joint regular picture transmission from the short-wave station, 7 R L. Wireless pictures will be transmitted from there twice weekly on a wave-length of 42-12 metres.

The Right Components in the Right Place!



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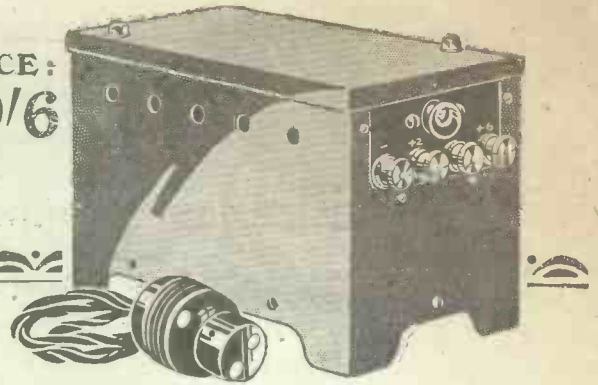


Dubilier Built is better built

Advt. of Dubilier Condenser Co. (1925) Ltd., North Acton, W.3. © 154



PRICE:
49/6



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AUTOMATIC CONTROL: An optional device which disconnects the Charger and connects the H.T. eliminator (if any) and vice versa when the set is switched on or off, is supplied at 25/- extra.

MOVING COIL LOUD SPEAKERS: This Charger may be used to excite the fields of 6-volt 5 ampere Magnavox, and B.T.H. Rice-Kellogg moving coil loud speakers without additional smoothing. The results are excellent.

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RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

RADIO ABBREVIATIONS.

Q. R. S. O. S. (Trowbridge, Wilts).—"Could you please let me have as near a complete list as you can muster of the abbreviations (Q.S.L., Q.R.N., Q.R.K., etc.—with meaning) used by amateur transmitters in this country. Every time I listen to a fresh amateur he crops up with a new one which I don't understand. So if you can give me as many abbreviations and meanings as possible I shall be everlastingly grateful to you. I am very keen on amateur transmissions, hence need for list."

The following list gives practically all the authorised abbreviations in common use:

OLD "Q" SIGNALS FOR RADIO.

- | Abbrev. | Question. |
|---------|-----------------------------------------------------|
| Q R A | What ship or coast station is that? |
| Q R B | What is your distance? |
| Q R C | What is your true bearing? |
| Q R D | Where are you bound for? |
| Q R F | Where are you bound from? |
| Q R G | What line do you belong to? |
| Q R H | What is your wave-length? |
| Q R J | How many words have you to send? |
| Q R K | How do you receive me? |
| Q R L | Are you receiving badly? Shall I send [20 v's?] |
| Q R M | Are you being interfered with? |
| Q R N | Are the atmospherics strong? |
| Q R O | Shall I increase power? |
| Q R P | Shall I decrease power? |
| Q R Q | Shall I send faster? |
| Q R S | Shall I send slower? |
| Q R T | Shall I stop sending? |
| Q R U | Have you anything for me? |
| Q R V | Are you ready? |
| Q R W | Are you busy? |
| Q R X | Shall I stand by? |
| Q R Y | When will be my turn? |
| Q R Z | Are my signals weak? |
| Q S A | Are my signals strong? |
| Q S B | How is my note? |
| Q S C | Is my spacing bad? |
| Q S D | What is your time? |
| Q S F | Is transmission to be in alternate or series order? |
| Q S G | Series of five messages. |
| Q S H | Series of ten messages. |
| Q S J | What rate shall I collect for? |
| Q S K | Is that last radiogram cancelled? |
| Q S L | Did you get my receipt? |
| Q S M | What is your true course? |
| Q S N | Are you in communication with land? |
| Q S O | Are you in communication with any station? |
| Q S P | Shall I inform you are calling him. |
| Q S Q | Is calling me? |
| Q S R | Will you forward the radiogram? |
| Q S T | Have you received the general call? |
| Q S U | Please call me when you have finished. |
| Q S V | Is public correspondence being handled? |
| Q S W | Shall I increase my spark frequency? |
| Q S X | Shall I decrease my spark frequency? |
| Q S Y | Shall I send on a wave-length of |
| Q S Z | Shall I send each word twice? [metres?] |
| Q T A | Shall I repeat the last radiogram? |
| Q T E | What is my true bearing? |
| Q T F | What is my position? |
| T R | Position report? |

NEW AMATEUR "Q" SIGNALS.

- | Abbrev. | Question. |
|----------|------------------------------------------------------------------------------------|
| Q R A R? | Is your call-book address correct? |
| Q R D D? | What direction are your messages going? |
| Q R F F? | From what station did you receive message No.? |
| Q S L L | Please acknowledge my signals by card. I will do same. |
| Q S R M? | Will you forward message No. by mail if you cannot relay by radio at once? |
| Q S S S? | Are my signals swinging? |
| Q S U F | Please call me by wire telephone at once. |
| Q S Y I | I shall shift my transmitting wave to metres? |
| Q S Y U | Please shift your transmitting wave to metres. |

THE RUGBY TIME SIGNAL.

"NAVIGATOR" (Gravesend).—"What time are the time signals sent out from the Rugby wireless station and what wave-length is used for these?"

The Greenwich time signals sent out from the Rugby station are transmitted at 6 p.m. and 10 a.m. daily, and the wave-length used is 18,740 metres.

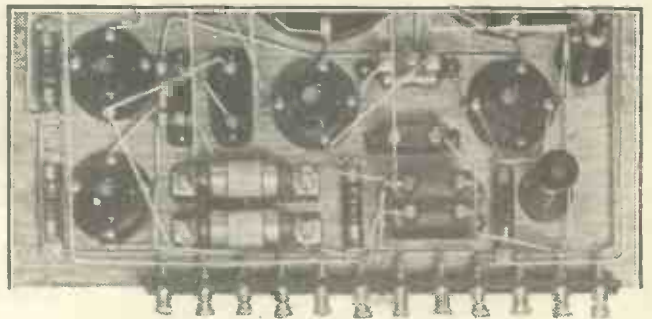
THE "GRID-TAP" ONE.

R. C. (Frinton-on-Sea).—"What was the diameter of the former on which the coil for the 'Grid-Tapped' One was wound, how many turns, what wire, and where were the tappings taken?"

The coil was wound on a three-inch diameter former, and consisted of 55 turns of No. 24 D.S.C. wire. Tappings for the grid connections were taken at the 50th, 45th, and 40th turns. Tappings for the aerial connection were taken at the 10th, 15th, and 22nd turns. The reaction coil was wound on the same former and consisted of 30 turns of No. 32 D.S.C. wire, spaced 1/2 in. away.

COMPACT COUPLING.

One of the great advantages of E.C. coupling is compactness. Resistances can be "parked" side by side, as shown, without fear of interaction such as would arise with transformers.



TESTING A TRANSFORMER.

D. W. L. (Twickenham).—"It is only a little, old-fashioned, two-valve set, but it gave very good results until about a month ago, when it suddenly went out of action. I think it must be the L.F. transformer that has gone west, and I wondered if you could tell me a way of testing this without undoing much of the wiring."

BACK NUMBERS OF "P.W."

R. K. (Jersey).—"Where can I get back numbers of 'P.W.'?"

Back numbers of "P.W." which are still in print are obtainable from the Amalgamated Press, Ltd., Back Number Department, Bear Alley, Farringdon Street, London, E.C.4, at a price of 4d. per copy, post free.

(Continued on page 786.)

T.C.C. ELIMINATOR CONDENSERS

*Reduced
in price*

BRITAIN'S finest Eliminator Condensers are reduced in price. There's no excuse for using untried condensers now that T.C.C. 800v. D.C. Test Condensers cost less.

T.C.C. Eliminator Condensers are unquestionably safe. Every one is rigorously tested and guaranteed in capacity and insulation.

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You can't go wrong if you use them in your Eliminator.

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Capacity Mfd.	Price s. d.
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1	4 3
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3	9 0
4	10 6
5	12 6
6	15 0
8	20 0
10	25 0



22nd, Telegraph Condenser Co., Ltd., Wales-Farm Rd., N. Acton, London, W. 3.

5412



J. Bennett

IT IS QUITE TRUE

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply.

**THE MOST SUCCESSFUL AND MOST PROGRESSIVE
CORRESPONDENCE COLLEGE IN THE WORLD.**

Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free: simply tell me your age, your employment and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the world, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address: The Bennett College, Dept. 106, Sheffield.

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Popular Shrouded Model

1-3 8/6 1-5

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 784.)

CUTTING OUT DIRECT PICK-UP.

E. P. F. (London, W.1).—"The set is a three-valver, and although it is capable of reaching out for distant stations, I am not able generally to do this when London is working, even with the most careful tuning.

"I am informed that the best way of overcoming this is to shield the aerial coil in one of the metal screening-boxes now obtainable, but I believe that in "P.W." some time ago I saw a warning against using this box, as it might result in 'shorting,' or burning the valve.

"Can you tell me if it is likely to be successful as an aid to more selective tuning, and if so, what other points I must watch when connecting up?"

You do not give sufficient details of your set to enable us to judge whether the extra degree of selectivity given by a screening-box will prove advantageous in your case. We should not expect the ordinary screening-box to make a really great difference, even at the distance at which you are situated, although it will certainly tend to prevent the direct pick-up from the adjacent transmitting station.

If, however, you are going to try a screening-box, the most important point to watch is to see that your coil is placed centrally in the box, and is at the correct distance from the sides, top, and bottom. Unless this is done carefully the presence of the metal will interfere with the magnetic field around the coil and spoil the tuning.

You must also remember that the box is normally connected to L.T. negative and to earth. A little consideration will show that if the H.T. positive lead touches it at any point, either permanently or while alterations are being made in the set, you will be in danger of shorting the batteries, or burning out valves.

Another point is that if you place one hand on the box while making adjustments inside the set, you are likely to get a nasty shock if you touch any of the H.T. positive leads, or any component which is connected in the anode circuit of the valves. It will be obvious, too, that care must be taken in adjusting the lid of the box. Make sure, when placing it in position, that it does not touch anything else in the set, and that it slips into place properly, or you might get a "shocking" surprise!

PUSH-PULL AMPLIFICATION.

E. P. T. (Worcester).—"Is it a fact that two special transformers are required for push-pull amplification? I was under the impression that a transformer with a centre-tapped secondary was used to connect to the grids of the last two valves, the centre tapping being taken to grid bias negative, but now I understand that a second centre-tapped transformer is necessary for push-pull amplification. How is this used?"

The transformer with the centre-tapped secondary is used as you describe, but it deals with only the input to the last two valves. It is usual to use another special transformer in the plates of these valves to deal with the output current. Such a transformer has a centre-tapped primary, the centre tap going to H.T. positive, and the ends of the primary going to the respective plates of the valves. The secondary of this transformer takes the output to loud speaker in the ordinary way.

WHAT SIZE AERIAL COIL?

R. J. A. (Reading).—"Instead of the aerial being connected to the grid coil of the first valve, the aerial terminal is connected to a separate fixed coil socket, placed close alongside the grid coil holder. This latter, being tuned by the variable condenser, will have a 60-turn coil, but I am told that the aerial coil should be smaller than this. What is the correct number of turns to use?"

In cases where the aerial is magnetically coupled to the grid circuit by means of a separate coil, the comparative size of this coil will depend upon the degree of selectivity which is required. Generally, the smaller this coil the sharper is the tuning, and the less the interference. But if the coil is too small the effect is to transfer insufficient energy from the aerial circuit to the grid circuit and, consequently, the gain in selectivity is offset by the loss in signal strength.

The best plan is either to try several coils, or else to wind a special coil to give the required degree of

selectivity. Using a 60-turn grid coil, a very good degree of selectivity would be obtainable with a 20-turn aerial coil, but sometimes it is necessary to use even as low as 5 or 6 turns for the aerial, to give the required selectivity. When there is no very nearby station to be eliminated, usual values of aerial coil are from half, three-quarters, or even up to the same number of turns as the grid coil.

SWITCHING IN A LOADING COIL FOR LONG WAVES.

M. S. M. (Chorley Wood, Lancs).—"I have mounted a socket on the crystal set for a loading coil, and it works very well, the only trouble being that the cabinet is small and the loading coil is rather inaccessible.

"Consequently, it is a bit of a bother to change over every time, and I am wondering if I could arrange to short out the loading coil by means of a switch. What sort of a switch should I want, and what are the connections for this?"

Any ordinary "make and break," such as a filament switch, will do nicely for your purpose. The connections are simplicity itself. All that is necessary is to connect one side of the switch to one side of the loading coil, and the other side of the switch to the remaining side of the loading coil. When the switch is off, all the currents flowing in the circuit have to flow through the loading coil, so that in this position you will be listening to the long waves.

"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.

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

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

When, however, the switch is "on" or in action, it will be affording a short circuit right across the loading coil, and consequently this will be out of circuit, enabling you to tune only to the lower broadcasting wave-lengths.

SIZE OF H.T. BATTERY.

H. L. E. (Aylesbury, Bucks).—"The set is a four-valver—H.F., Det., and two L.F.—and it seems to be very rough on high-tension batteries. Up to now I have been using the ordinary type 108 volts, but the dealer wants me to buy a big type, as he says my anode current is too high for these. Do you think it would be cheaper to buy the big batteries?"

Undoubtedly you would do well to buy a bigger battery for a set of your description. The smaller H.T. battery, using ordinary dry cells, works excellently for one or two valves where the anode current demand is in the neighbourhood of about five milliamps. But three or four valves, especially when the last is a power valve working a loud speaker, will take a current of more than double this, and it is imperative that the capacity of the battery should be raised accordingly.

You will find it real economy to purchase the larger size, and thus to give the battery a fair chance to supply the current demanded of it.

A GOOD FOUR-VALVE PORTABLE SET.

M. R. W. (Exeter).—"Where can I get details for building a good four-valve portable

set? Completely self-contained in a case, aerial and all, so that I can take it about on a car?"

A good set of this description which will meet your requirements was described in the July issue of "Modern Wireless," under the title of "The Suit Case Four."

LOUD-SPEAKER CONNECTIONS.

S. R. V. (Choltenham, Glos).—"Using an L.F. choke across the loud-speaker terminals of the set, I had the 2-mfd. condenser connected to the plate of the last valve. The other side of this condenser goes to the loud speaker itself, and the other side of that to an earth terminal.

"The idea was given to me by a friend, and it certainly works wonderfully well, but I cannot make out how it is that the loud speaker can possibly work when there is a big condenser in series with it. How does the current reach the loud speaker?"

You forget that the currents which operate the loud speaker are not ordinary direct currents such as flow from a battery, but are continually fluctuating and varying. Although a condenser is a complete insulator to direct or steady currents, it allows alternating or varying currents to "pass through" it. Consequently, it prevents the direct battery current from passing (and thus "shorting" the battery), but it allows the "speech" currents, which are constantly fluctuating, to work the loud speaker.

A SOLDERING DIFFICULTY.

E. B. (Wallington).—"Not having gas, I always heat the soldering iron on a fire, but I find it gets very dirty when it is placed in the flames, and even in a clear fire a certain amount of sooty mess gets on the iron. Can this be overcome?"

It is a good plan when a soldering iron has to be heated in a fire to place an empty tin upon the fire. If this is surrounded by hot coals and the end of the soldering iron is inserted in the tin it becomes heated without coming into actual contact with the smoke and flames.

BATTERIES IN PARALLEL.

M. P. G. (Stratford-on-Avon).—"It is only a little set built for a sort of stunt on the river, but the description in the book is not quite clear, and I wonder if you could tell me what is meant by this: 'For the L.T. four flash-lamp batteries will do, and these should be connected in parallel.' What is in parallel?"

You will notice that each cell has one long strip and one short strip on it for contact, the long strip being the negative and the short strip the positive terminal. When joining up the four flash-lamp batteries together there are two alternatives available. (If you were connecting the batteries "in series" you would join the positive strip on one cell to the negative of the next cell and so on until at one end of the complete battery you have a negative strip vacant, and at the other end a positive strip vacant, the rest being joined together strip to strip. This would be connecting in series.) But it is connected in parallel that you want. To effect this stand the cells side by side with all the long negative strips the same way. Then join these four negative strips together, do the same for the positive strips, and your L.T. Battery is ready.

THIS YEAR'S "CHITOS."

S. L. E. (Newcastle-on-Tyne).—"The 'Chitos' has always been a great favourite of mine, and I have made up every version of this set that you have published except the last one. I would have made this up too, but being out of work, funds are short, and it has taken me a long time to get the parts together.

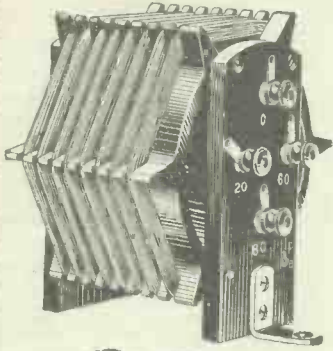
"I have not yet bought the low-frequency transformer which is necessary for 'This Year's 'Chitos' Two,' but I have enough parts to make the one-valve up, and I am wondering if you could tell me how to hook this up as a sort of 'This Year's 'Chitos' One.' Would it work all right as a one-valver, and if so, what are the connections, please?"

Yes, the revised version of the "Chitos" set works very well as a one-valver, and there is no reason why you should not use this as a one-valve set until funds allow the second stage to be added. The connections are as follow:

Aerial to one side of the fixed coil holder. Other side of the fixed coil holder to the .0005 variable condenser and to the .0003 fixed condenser.

(Continued on page 783.)

WEARITE COMPONENTS



STANDARD LOADING COIL

AS SPECIFIED IN
POPULAR WIRELESS &
WIRELESS MAGAZINE
CIRCUITS

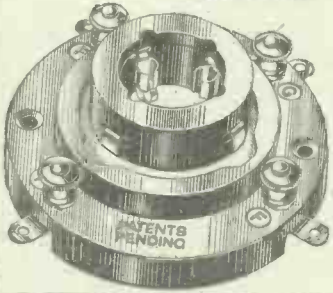
Price 7/6 each

ANTI-MICROPHONIC VALVE HOLDER

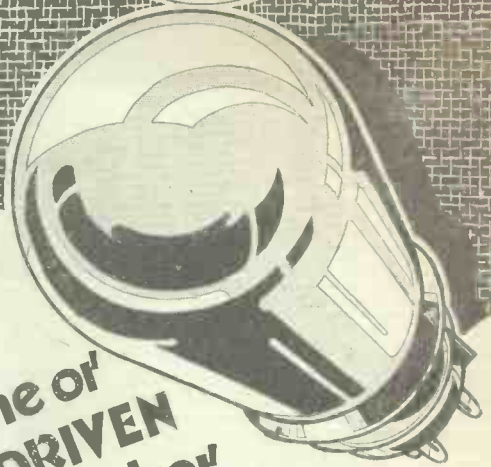
Special points of this valve holder are its exceedingly low inter-terminal capacity and the fact that it is impossible to insert a valve in the wrong way. For all types of receivers and particularly for short-wave receivers it is the ideal valve holder.

Price 2/6 each.
WRITE FOR LISTS.

WRIGHT & WEARE Ltd.,
740, High Road, Tottenham, N.17.
Phone: Tottenham 3132.



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



A Cone or
COIL DRIVEN
Loud Speaker
must have the
D.E.P. 240
SUPER POWER VALVE

FOR FULL
STRENGTH

from a

2-VOLT ACCUMULATOR

The tone of a sensitive Cone or Coil-Driven Loud Speaker is "murdered" if you obtain the required power by overloading the last valve in your Set.

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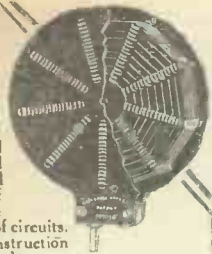
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1928
1929
1930

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 786.)

Remaining side of the .0003 fixed condenser to grid leak and grid. Remaining side of grid leak to one filament leg of the valve holder and to the rheostat. Other side of the rheostat to L.T. positive.

The L.T. negative is joined to H.T. negative, and to the remaining filament terminal. Earth is joined to the remaining side of the .0005 variable condenser, to one side of the telephones, to one side of the variable resistance, and to one side of the moving coil holder.

The remaining side of the telephones goes to H.T. positive, and the remaining side of the moving-coil holder is taken to the other side of the variable resistance and to the plate of the valve. This completes the wiring.

THE "ANTIPODES ADAPTOR."

"A LASS" (Cardiff).—"Although I have tried short waves several times I never had much success worth mentioning until I tried the 'Antipodes Adaptor.' And then the stations simply romped in.

"But I should like to try and use it as a one-valve set on its own and not as connected to another receiving set. Is it possible to do this?"

Alas! A Lass, evidently you have not been taking your "P.W." regularly! For a description of how to set about this very thing appeared in the issue dated April 21st, 1928 ("P.W." No. 307).

Full details were given, the idea being simply to connect up a small baseboard containing a valve

Theoretically the ideal plan is to use a short aerial quite loosely coupled to the set, and placed in that position relative to the roadway which experiment proves to be the least liable to the interference. The set itself with the coils will probably have to be almost completely screened in a metal box which could be earthed.

Undoubtedly it will be difficult to find a satisfactory solution to the problem, but it will provide a most interesting field for experiment.

Screening will certainly be effective in reducing the interference, but the difficulty, we expect, will be to get the screens large enough to allow the set to function satisfactorily inside them.

If we were in your place we should be inclined to try any large and likely-looking metal case, such as a discarded bath or tin trunk, supplementing this with trays or other large metal surfaces until experiment has proved just how far round the set shielding must be and whether complete or only partial screening is necessary.

USING AN INDOOR AERIAL.

E. G. F. (Barking).—"There really is not room in these gardens to put up a pole, unless I get permission from my neighbour, and I do not want to do this. What I should like is an indoor or frame aerial. How do you make them?"

A frame aerial would be of little use to you as these are intended for use with sensitive valve receivers, and yours is only a crystal set, which needs as much energy handed to it by the aerial as possible. You will probably find, however, that an ordinary indoor aerial will give good results.

To construct this you must first of all find a suitable site inside the house. Generally the best place for such an aerial is the rafters if you are near the top of the house and can get through a trapdoor or into the loft some other way. Failing this a long hallway

Are you going to try for

AUSTRALIA ON THE SHORT WAVES ?

If you think it's difficult or costs too much you ought to read about "THE 2.35 FOR AUSTRALIA"—a 2-valve set, costing only 35/- and described in the August issue of

MODERN WIRELESS

Many other valuable features of great interest to every listener and constructor are contained in this issue, which is a **Special Loud-Speaker Number.**

Now on Sale **MODERN WIRELESS** Price 1/-

holder and a terminal strip with five terminals on it. These terminals were labelled:

- (1) L.T. positive, (2) L.T. & H.T. negative, (3) H.T. positive, (4) positive 'phones, (5) negative 'phones.

They are connected to the valve holder as follows:

No. 1 to the filament lead, No. 2 to the other filament lead, Nos. 3 and 4 are connected together, No. 5 to the plate of the valve.

When batteries and 'phones are connected to the terminals as marked, and the plug on the "Antipodes Adaptor" is plugged into the valve socket on the new baseboard, the set will function as an ordinary short-wave one-valver.

INTERFERENCE FROM MOTOR MAGNETOS.

"SHORT-WAVE SAMBO" (London, E.).—"My house is situated right near the new arterial road to Southend, and well I know it! Formerly we lived in a quiet country place where there was hardly any motor traffic; and frankly, though I had heard about such symptoms, I was sceptical about the interference on twenty metres or so being due to motor-car engines.

"But now that we are living practically on the Southend Road, I find that during the week-end (when I have most of my free time) half the country seems to be going along by car to Southend, and causing no end of a disturbance in my short-wave set! I do not notice this trouble on wave-lengths over thirty metres or so, but as soon as I get down to the twenty-metre band there is a constant disturbance from this annoying interference. Is it impossible to cure it?"

We should not like to say it is impossible to cure it, but it is certainly very difficult.

or passage will be O.K., and as a last resort the wire can be stretched across the room (the objection to doing this in all cases is that by utilising a roof or passage a longer spread is generally available).

If you can get to the space underneath the roof, run three long wires across this side by side, at a distance of, say, two feet from each other. At the far end, each of these wires should be affixed to an insulator suspended from a wall or rafter.

At the other end the three wires are joined together and taken down to the set, in as direct a line as possible. It is important to keep the aerial wires themselves, and the down-lead, as far away from walls, beams, etc., as possible.

When they have to pass, for instance, through a wall, they should pass straight through it. Do not run an aerial close to a wall or ceiling for a greater distance than is absolutely necessary.

If the roof, passage, or hall is not available to fix up the aerial, and it must therefore be placed in a smallish room, it may be advisable to alter the shape. In such an instance, perhaps, the pick-up from a broadcasting station will be greater if the aerial is wound round and round the picture rail, or in zig-zag pattern backwards and forwards from one end of the ceiling to the other.

Much depends upon the exact situation of the house and that of surrounding buildings, etc., so that the only way to determine which is the satisfactory way of arranging the aerial is to experiment with different forms until the best position is found.

A CORRECTION.

On page 694 of "P.W." No. 320 (July 21st issue), it was stated that the Lissen Variable Condenser "sells at the very reasonable figure of 7s. (.0005 mfd)."

This was inaccurate; the price of the .0005-mfd. model being 6s. 6d. only, not 7s.

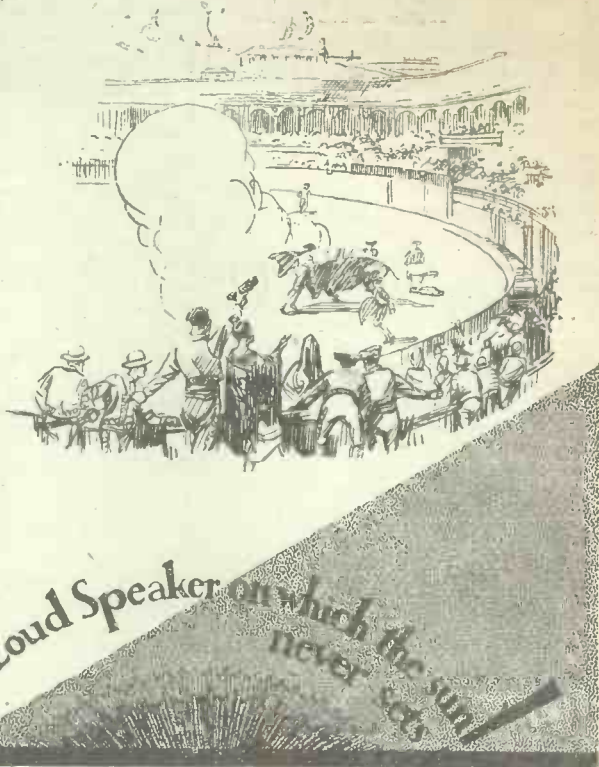


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2. OUT OF PRINT.
3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
6. H.F. & CRYSTAL (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. & DETECTOR (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
12. OUT OF PRINT.
13. 2-VALVE REFLEX (Employing Valve Detector).
14. OUT OF PRINT.
15. OUT OF PRINT.
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
19. OUT OF PRINT.
20. OUT OF PRINT.
21. THE 2-VALVE LODGE "N."
22. "THE GUARANTEED REFLEX."

P.W. BLUE PRINT Number

23. THE 1-VALVE "CHITOS."
24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1 L.F. Valve.
25. OUT OF PRINT.
26. A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F.
27. OUT OF PRINT. [with Switching].
28. A "MODERN WIRELESS" 5-VALVER (H.F., Det. and 3 L.F.).
29. AN H.T. UNIT FOR DIRECT-CURRENT MAINS.
30. A REINARTZ ONE-VALVER.
31. A STANDARD TWO-VALVER (Detector and L.F.).
32. THE "CUBE SCREEN" THREE (H.F., Det. and L.F.).
33. A "KNIFE EDGE" CRYSTAL SET.
34. AN H.F. AND DETECTOR TWO-VALVER.
35. THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled).
36. THE "SPANSACE FOUR" (H.F., Det. and 2 L.F.).
37. THE "LONG SHORT" CRYSTAL SET.
38. A TWO-VALVE L.F. AMPLIFIER.
39. THE "SYDNEY" TWO.
40. THE "SUPER SCREEN" THREE.
41. THIS YEAR'S "CHITOS" ONE-VALVER.
42. THE "Q AND A" THREE. A simple set (Det. and 2 L.F.).
43. THE "INEXPENSIVE FOUR."
44. THE "ECONOMY FIVE." For long range loudspeaker work.

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LONDON, W.C.1.

8/6
POST FREE
8/9

TECHNICAL NOTES.

(Continued from page 774.)

his rectifiers reversed. Another trouble with a high-tension eliminator, if the capacity used with the system is not sufficient, is a low-frequency oscillation known as "motor-boating."

Too High Resistance.

I am inclined to think the resistance in the circuit is too high and that the eliminator is incapable of giving a sufficient output in milliamps, with the result that as soon as an appreciable load is imposed upon it the output voltage drops to a comparatively low value.

Universal Charger.

I have had quite a large number of letters during the past few weeks from readers in connection with the stepping-down of D.C. current by the system described by me in some articles a few months ago entitled "A Universal Charger." You will probably recollect that the method employed is in principle a very simple one (although there were certain features which required some

It is obvious that the combination of the trickle-charger with the smoothing unit constitutes a low-tension eliminator, but as there are very large numbers of low-tension chargers and trickle-chargers in use, the selling of the smoothing unit as a separate component means that the owner of a low-tension charger can provide himself with a low-tension eliminator without the necessity for buying the "charger" part of the outfit over again.

Selling Well in U.S.A.

I am informed by readers in the States that these smoothing units are selling very well and that an increasing number of radio "fans" are using their chargers for operating the set direct by means of these smoothing units. The price of the smoothing unit is around six dollars, or about 25s., but this size is more adapted for energising the field-winding of a coil-drive loud speaker. For supplying the filament currents it is preferable to use at least a 2-amp. charger and a correspondingly larger smoothing unit.

Picture Reception.

I have a letter from a company in America, which is specialising in the Cooley-Rayfoto apparatus, in which they tell me that the Rayfoto broadcasting is extending rapidly and several stations have taken up the broadcasting of pictures on this system during the past few weeks. Stations in New York, Detroit, St. Louis, Milwaukee, Wilmington and Peekskill are already "on schedule" and eight additional stations will be on the air within the next month or so. As you probably know, Gerald Marcuse (2NM) is sending Rayfoto pictures on short wave for the benefit of experimenters in Europe.

Not Television.

The Cooley Rayfoto system has, of course, nothing to do with television. It is really an improvement on the old system of picture transmission using synchronised rotating cylinders. It has the merit, however, of simplicity and is well adapted for use by the amateur and experimenter. I just forget how long it takes to send a single picture, but I believe it is about three or four minutes.

Experimental Microphones.

Transmitting experimenters, and those who require microphones of the broadcast type for experimental purposes generally, may find it useful to know that these can be obtained from The Universal Microphone Company, Chamber of Commerce Building, Inglewood, California.

The 2-button broadcast type costs 15 dollars, and can be used with or without amplification; it operates on 5 to 15 milliamps per button. Other types of microphone can be obtained at higher prices, including special condenser microphones up to 200 dollars. Full particulars may be obtained by writing to the firm mentioned at the above address.

Uses for Condensers.

Although condensers are used for such a great variety of purposes in radio apparatus, you may be surprised to know what an increasing number of uses are being found for condensers for all kinds of industrial purposes. One of the most important

(Continued on page 792.)

There is still time to secure your copy of the AUGUST issue of the

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This fine number contains the full and exclusive details of

THE HARRIS "STEDIPOWER" L.T. UNIT

which cuts out all battery bother and gives trouble-free L.T. Many other special features which you can't afford to miss.

THE WIRELESS CONSTRUCTOR

August Issue Now on Sale Price 6d.

experimenting with before they were got into satisfactory shape).

The essential principle is the interruption of the D.C. high-tension input to an ordinary step-down transformer. The interruption of the D.C. input causes an A.C. current to be produced in the low-tension secondary winding, and this is then rectified in the usual way. In this way the invention provides a method of stepping down the voltage of direct current just as the voltage of alternating current is ordinarily stepped down. The obvious advantage of the system is the avoidance of a great wastage of power.

I gather from the volume of correspondence which I have had on this matter that quite a large number of experimenters and constructors have made up for themselves devices working on this principle.

Smoothing Units.

Talking about low-tension supply, I see that in the States some of the condenser manufacturers are now turning out a complete "smoothing unit" consisting of suitable chokes and large-capacity condensers (up to 4,000 microfarads), this unit being adapted to be connected to "any ordinary low-tension charger" or even a trickle-charger.

A Supreme Transformer

The *massiveness* of the Igranic Type "G" Transformer suggests something out of the ordinary in performance, but only a trial can show how really natural reproduction with this supreme instrument can be, for no other is designed to give such absolutely even amplification *under working conditions.*

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Made in two ratios:—3·6:1 and 7·2:1.

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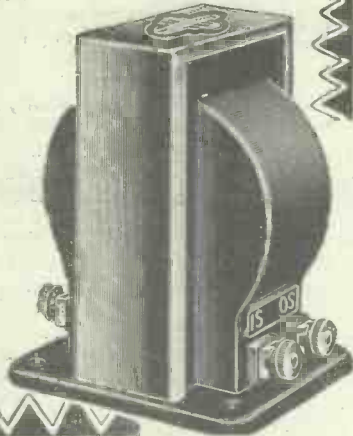


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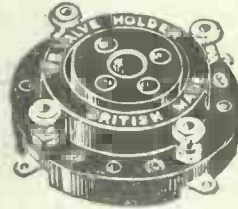
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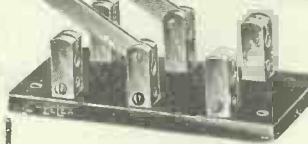
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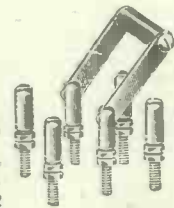
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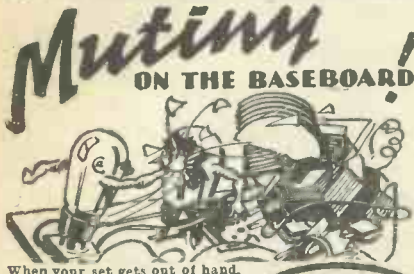
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When your set gets out of hand, take the one step that ensures the perfect balance necessary to secure harmonious, distortionless reception—fit a Sifam Meter and tune with your eyes on the dial.
FREE leaflet "Distortion" from (Dept. P), SIFAM, Bush House, Aldwych, W.C.2.

OAK CABINETS, Melody Maker, 15/-; Master 3, 15/-; Everyman Four, 18/6; Baseboards included. Portables from 30/-; Hand-made and French Polished. Rubber feet. Crated and carriage paid. Any type supplied. GILBERT, NEWPORT STREET, SWINDON.

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TECHNICAL NOTES.

(Continued from page 790.)

applications of condensers is in the protection of motor generators and instruments near to radio apparatus and high-frequency and high-tension systems generally.

Surges and resonant effects in power plants and lines may be dangerous, and proper provision should be made to prevent the potentials from rising above definite limits. The "proper provision" generally takes the form of special condensers which take care of surges and resonances by lightning, induced potentials from lightning, proximity of radio or high-frequency systems, operations of circuit breakers, switches, fuses, and harmonic alternator E.M.F.'s in resonance and low-proportioned capacity of alternators.

Power Factor.

Increasing use is also being found in industry for condensers for what is known as "power-factor" correction. Without going into the technicalities of power-factor, I should say in a general way that the peculiarities of certain alternating-current motors and power equipment are such that excessive generating and installation wiring are often required for a given amount of electric-power consumption, owing to a low power-factor.

This excessive generating and distributing cost is charged to the consumer in most cases, since it is the nature of the load that causes a low power-factor. With the proper application of condensers, however, it becomes possible to correct the low power-factor and eliminate the waste referred to. The power-factor correction, which is made by relatively inexpensive condensers, is best effected at the motor, or whatever the device may be that is causing the trouble.

Electrolytic Condensers.

In this connection I notice that an American concern announce new dry electrolytic condensers for smoothing purposes in low-tension supply circuits for radio. These polarised condensers are designed for use in all circuits employing uni-directional or direct currents up to 15 volts—where high capacities are required: they are rated at 2,000 microfarads.

Ballistic Method.

As regards the capacity rating, probably most of my readers know that the determination of the capacity of an electrolytic condenser is a matter involving some rather peculiar difficulties, and the rating just mentioned is obtained by the ballistic galvanometer method of measurement, in which the "kick" given to the needle of the galvanometer by the sudden discharge of a condenser is compared with the "kick" given by the discharge of a condenser of known capacity; by comparing the "kicks" in the two cases the ratio of the capacities of the condensers can be determined by means of a suitable formula.

Polarising Current.

The leakage or polarising current in the case of these dry electrolytic condensers is of the order of 1 milliampere, and the condensers are available in three sizes rated at 2,000, 4,000 and 6,000 microfarads capacity; they will be on the British market very soon.

NEWS FROM SAVOY HILL.

(Continued from page 774.)

Beecham and the B.B.C. were exclusively announced in POPULAR WIRELESS. These appear now to be reaching a head on the lines forecast. The Imperial Opera League, which hoped to ignore the B.B.C., has had to fall back on its support. Sir Thomas has a good chance of finding himself conducting the new permanent B.B.C. Orchestra, which the Imperial Opera League will help to produce.

"All About Madame Tussaud's."

It was inevitable that Mr. Herbert Norris should have an interesting story to tell in connection with his work of dressing the numerous wax figures now on view at the new Madame Tussaud's Exhibition in London. Some of his experiences were quite humorous, as listeners will hear in a talk which Mr. Norris is giving on Wednesday evening, August 22nd. Mr. Norris is responsible for the whole of the costumes, some of which, as may well be imagined, were very expensive, and required a great deal of thought and consideration to ensure that every detail should be perfect. It was a task calling for expert knowledge, such as Mr. Norris possesses in his position of special lecturer on historical costumes to students seeking to gain the University of London's diploma in dramatic art. Mr. Norris is now arranging the dresses in the film "Triumph of the Pimpernel" and in a stage play called "The Song of the Sea," which is to be produced at His Majesty's Theatre this autumn.

The Braemar Gathering on the Air.

Every year when the King and Queen and members of the Royal Family are living at Balmoral there takes place at Braemar the greatest of all Highland gatherings to which the clansmen of Scotland come to compete in athletic rivalry, just as they have been doing in some form or another through the centuries back to remote times. The usually quiet and almost deserted roads through the valleys and over the hills are chock-a-block with motor-cars, bringing people from all parts to watch the dancing, jumping and running, as well as to see the famous march of the clansmen and to hear the strains of the pipes. How the Braemar Gathering has become the greatest social event of the Highland season, and something of its history, will be told to all Scottish listeners in a talk which Mr. G. B. Lowe, a member of the Braemar Royal Highland Society, is giving on Saturday, August 25th.

Talks on Londoners' Country.

The wonderful country on the hills between Dorking and Camberley, and the charming, picturesque districts around Windsor Great Park, Virginia Water, Camberley, and Esher, will be described in the next of his series of talks entitled "Londoners' Country," which Mr. A. B. B. Valentine is giving for 2 L.O. listeners on Tuesday, August 21st. The purpose of this series is to assist people with limited funds and leisure to plan easy and cheap excursions to the beauty spots within easy access of the Metropolis. A companion series of talks is also being broadcast from 5 X X by Mr. Donald Maxwell, in which he will tell provincial visitors how to derive the greatest enjoyment during their visits to Town.

MODERN WIRELESS

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August Issue

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AUSTRALIA ON THE SHORT WAVES?

Afraid it costs too much? Think it's too difficult?—Then you'll be glad to read about the "2.35 FOR AUSTRALIA." Two Valves. Thirty-five shillings! And it picks up Melbourne direct! Read the full constructional details in the *August Issue* of MODERN WIRELESS which is *Now on Sale*.

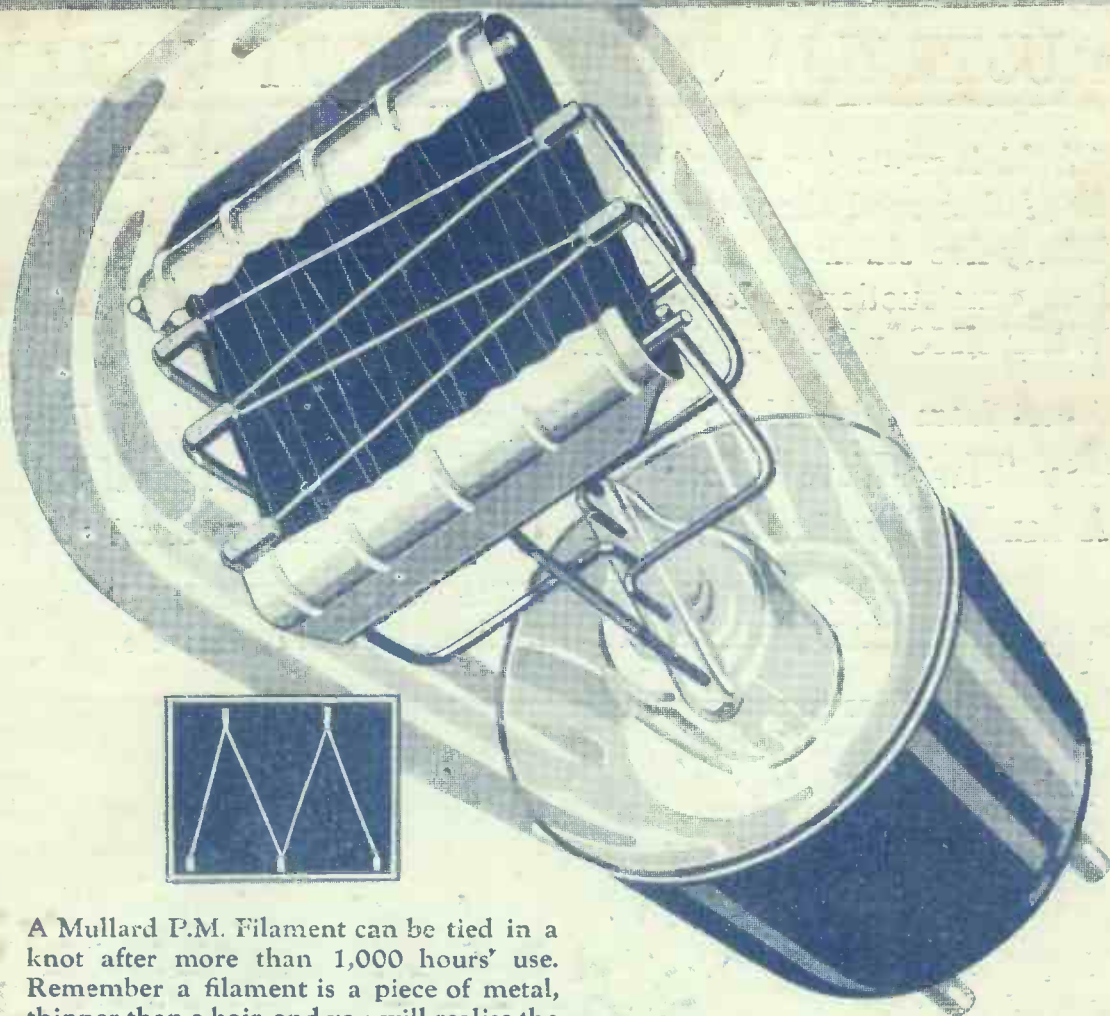
Apart from this "M.W." is packed with good things, including:—

The "Twin-Wave" Four		The "M.W." De Luxe H.F. Unit
A London-Daventry Crystal Set		Those Startling Short Waves

SPECIAL RADIO GRAMOPHONE SUPPLEMENT
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A Mullard P.M. Filament can be tied in a knot after more than 1,000 hours' use. Remember a filament is a piece of metal, thinner than a hair, and you will realise the enormous strength necessary to withstand such a strain.

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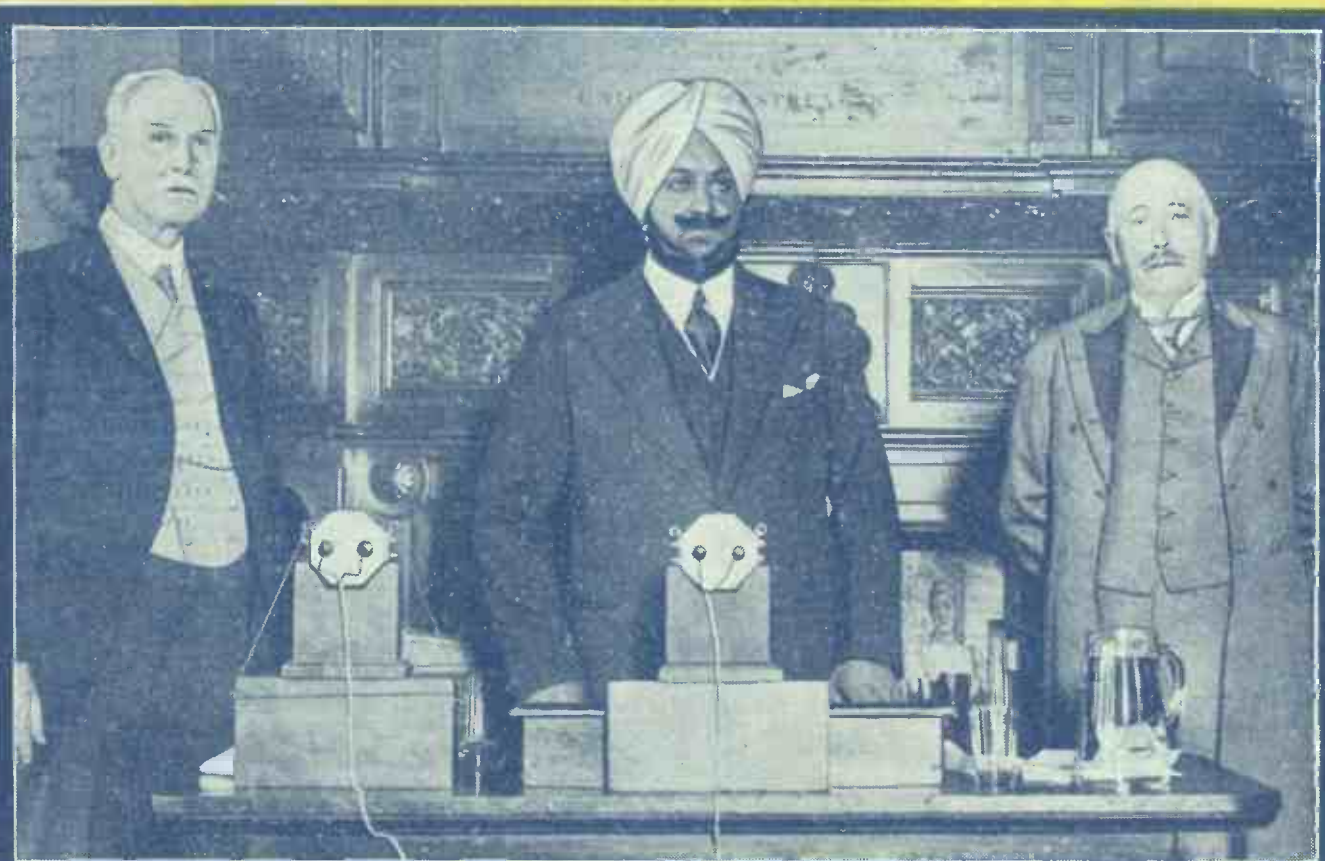
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No. 324. Vol. XIII.

INCORPORATING "WIRELESS"

August 18th, 1928.



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The World's First Broadcasting

Indoor Aerials The Last Stage For The Set Builder

and

THE "P.W." FOUR

Broadcasting is rapidly conquering the world, as is shown by this photograph of the Maharaja of Patiala, the Chancellor of the Indian Chamber of Princes, who recently broadcast a lecture on the various views and opinions of the Indian Princes.

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RADIO NOTES AND NEWS.

Shirt-cuff Notes—Television Plans—Everlasting Valves—The Wheelbarrow Set—Regional Scheme—More Scepticism—The King and Wireless.

Shirt-cuff Notes.

ON August 18th, Belfast will broadcast a running commentary on the R.A.C. Tourist Trophy Race. Sixty cars are entered, and the distance to be covered is about 410 miles. The first broadcast of a cinder-track race meeting will take place on August 18th, when 2 L O and 5 X X will relay a descriptive narrative of events at Stamford Bridge, under the auspices of the Motor Track Racing Association. At 9.50 p.m.

Business and Humour.

WHILST reading some notes on Australian affairs I hit upon a piece of unconscious humour perpetrated by 3 L O. The first note said that the proprietors of 3 L O had obtained a controlling interest in 5 C L (Adelaide). The second note was headed "The Advantage of Co-ordination," and began, "Within four days of 3 L O's representative assuming control of 5 C L's studio, a fire occurred, which completely destroyed the studio and office, which were attached." That representative ought to come over and set the Thames on fire—near Savoy Hill!

Television Plans.

WE quote below a paragraph that will be of interest to our readers. It appeared last week in the "Daily Mail."

"The secretary of the Baird Television Company, Ltd., yesterday informed a 'Daily Mail' reporter that the company is in correspondence with the Post Office regarding the proposed broadcasting of pictures.

"He stated that the company has experimental licences for broadcasting and television, but is relying on expert legal advice, which states that no licence for the transmission of a television service is required. Television was not contemplated when the Acts governing broadcasting were framed, and, in their opinion, accordingly there were no provisions affecting it."

Thrills Guaranteed.

ON August 21st, 2 L O will present a dramatic piece entitled "The Locked Chest," by John Masefield. This writer, who, by the way, composed the words of "Sea Fever," is known chiefly on

account of his poetry, which is great stuff. One of the most extraordinary curiosities of taste I have ever struck is the persistence of the public in ignoring his book, "Captain Margaret." Please get the thing out of the local library and tell me if it isn't one of the "thrillingest" buccaneering yarns ever written.

Evils of Radio.

STILL "holding the line" to Australia, I hear that although 3 L O's egg-laying competition is creating much human interest, the hens' chief emotion is indignation. They are being "sweated" by every sinister device known to science, and the least mention of radio makes the feathers fly. I wonder if I may squeeze in the following jape *à propos* of egg-laying.

Those Programmes.

THE Editor's analysis of the situation, as he sets it out in "P.W.," August 4th, is so photographically accurate

that one can add nothing but the obvious point that the B.B.C. must compromise. This, I believe, they try to do. But when we come to details there can be no doubt that, considered from almost every angle, the Sunday performance is weak. It used to be much better. I have heard Sunday concerts at seaside resorts which would knock broadcasting into a cocked hat.

Have You Done It?

I HAVE discovered to my cost that these battery eliminators may on occasion be traps for the thoughtless or the worried. I run my H.T. from the mains, but not my L.T. T'other night, the speaker being in full blast, some small domestic crisis arose. Someone said, "For goodness sake stop that din!" Snap went the switch and the desired silence ensued. But this morning I found that the valves had been on duty all night and that my accumulator hadn't the kick of a fly left in it!

(Continued on next page.)

POLICE PUBLICITY PAYS.



Way out in Los Angeles the traffic casualties mounted so high that pedestrians had to be educated in road sense by the police. But how to make listeners heed a lecturer? The problem was solved by a police quartette, which, singing before the microphone, was followed by hints from a cop on how to hop!

NOTES AND NEWS.

(Continued from previous page.)

Everlasting Valves.

ALTHOUGH an everlasting valve must mean bad business for a firm that makes it, we continue to receive chortles from valve manufacturers about the "lives" of their products. Naturally, the users favour valves which are immortal and thus never conk out, but endure for ever. Naturally, the maker wants to sell a few replacements. Still, a good valve has a good "life." Osram's give the instance of Mr. H. H. Warren, who has still in use a D.E.5 which has worked for some 6,500 hours. Obviously, Mr. Warren does not leave his darlings red-hot all night!

Increase of Tramps.

IT is reported that there is a large increase of tramps in Somerset, which delectable county was "down" by £6,687 on their account during 1927. My theory is that many of the extras are not really tramps at all, but men engaged to test portables for wireless firms. The poor beggars have to run up Dunkery Beacon or Porlock Hill "at the double" and on reaching the summit have to show a log of ten stations, a normal pulse and a dry forehead.

The Wheelbarrow Set.

AND this reminds me that there is creeping into the market what is called the "transportable set." This means that you can't carry it, but that with modern machinery it can be moved. I do not know whether small cranes are provided. I saw a picture of one the other day, and it struck me as being of just comfortable wheelbarrow size. Personally, I believe the best thing to do is to fit it with wheels and a small outboard engine, alla samee motor lawn mower!

The Regional Scheme.

ONE becomes a little weary of reading about this scheme. It's like paradise—perfectly splendid, but a long way off! However, it is exciting to know that the B.B.C., after having selected Potter's Bar for the first regional station, and rested from its labours, next actually fixed on the exact site, and sat down to recuperate. And that, some time later, it roused up and signed a contract for the erection of the building. This time next year you may perhaps hear the station. But let there be no indecent haste, brethren!

The Story of Morse.

LOVERS of Morse—and most of 'em live on the coast—may be amused to know that my daughter, rising fourteen, recently joined the Guides. She flew in after the first rally, or jamboree, or hullabaloo, and announced that she knew all about the Morse code. "Speak on, wench!" I said, "for father is slightly acquainted with the subject and would imbibe wisdom." (Me! That punched a key and coaxed a coherer before she thought of being thought of!) "Well," she said, "it's short lines and long lines, and some letters are all short and some are all long, but most are short and long mixed, but I'm not sure which, and are there any peaches left over from dinner?"

The B.B.C. Language.

EVERY time the B.B.C. departs from what the licence-holders conceive to be its legitimate functions it makes itself a laughing-stock or a source of annoyance. No doubt Mr. Stobart shudders if any two given announcers pronounce the word "fragile" in two different ways. But that seems to me no valid reason why public funds should be applied to settling the question as to which of the two is the more desirable way. We, who pay the announcers' salaries, do not much care how they pronounce. We want clarity and common usage only. Besides, it is not the B.B.C. educational cranks or "authorities" who settle these things; it is we, the English people.

More Scepticism.

OR is it just hard luck? G. T. U. (Accrington) puts his case frankly. He has built every popular set not exceeding three valves which he has noted for the past two years, and "I cannot guarantee to give a friend anything besides Manchester and 5 X X, using a straight three with loud speaker." Perhaps by now he has tried the "Sceptic's Three"; if so, will he let me know what happened? I welcome his letter because I believe he is representative of a large class; has

SHORT WAVES.

"Make your own radio programme," we read in a provincial daily paper.
If only we could!

A.: "Doesn't Jones' radio raise the devil?"

B.: "No wonder! He's working on an underground aerial."

"Broadcasts never die! Eternal wave mystery," runs a headline in the "Sunday Chronicle."

Ours only fades away.

A radio journal relates how a loud speaker was reproducing the song of a well-known soprano, and when a very high note was reached, a plate-glass window split from top to bottom.

It must have been painful.

Mother (reprovingly): "Oh, fie, Minnie! Do you know what becomes of little girls who tell stories?"

Romantic Minnie: "Yes, mamma—they grow up and get to be lady story-tellers over the radio."—"Radio News."

Television discovery in "Popular Radio" for May: "In this sort of scanning device, the holes are arranged on a belt which passes over two wheels, one of which supplies the DRINKING force."

This affords possibilities of making new discoveries in the coming radio art; but the problem of avoiding the well-known double image effect may become serious.—"Radio News."

AS EASY'S OCHT I

Just twa-three bits o' wire an' screws—
Nae need tae pucker up y'r broos

In puzzling thoct;

A wean can mak' a wireless set,

An' perts are no' see hard tae get—

They're easy ocht I

And sae that's that I

Then tae my ears I put the 'phones,
Tae hear sweet music's soothin' tones

Or hamely ocht;

And a' at ance I heard a wail:

Jean shouts: "Y'r stannin' on the tail

O' pussy cat!"

Wis I tae tail?

Fu' weel I hen the household pet

Provides the whisker for the set,

But no' the tail;

Yet, things like this mak' tempers rise

And Jean thocht I should advertise

My set for sale!

—"Glasgow Weekly Herald."

genuinely tried, but is aiming rather high and, missing his shot, doubts the results of others.

What is a Station?

G. T. U. raises the very point which I raised in the early Elston period. "What do you mean that you have done when you say that you have received a certain station?" This is the rock upon which the DX or experimental men and the "listeners" split. The DX man logs a station if it is identified. Quite legitimate! It proves a lot, which I need not explain here. The "listener" says, as G. T. U. says, "I accept a station if I can get a programme from it when I want it, and not when it decides to let me." No need for scepticism; it is purely an instance of two noble hounds barking up different trees.

Hints to the Active-Minded.

AREADER who professes himself to be bored with the everlasting reception of jazz, etc., from distant stations, asks me to suggest "fresh woods and pastures new." Very well! I suggest that he study the theory and practice of radio and then explore and try the methods of measuring signal strengths; and the direction and characteristics of X's. Frame-aerial work is fascinating, but needs a little scientific knowledge. And then there is a world of space for experiment in the observation of short-wave transmission. Let him learn Morse and then plunge into the vortex of stations all over the globe.

Wireless in Kentish Schools.

DURING 1927 the Kent Education Committee undertook an investigation to estimate the value of broadcasting to schools. Good for Kent—always to the fore! Apparently the Committee's report has sent the B.B.C. into the seventh heaven, for it has issued a sort of song of triumph. Meantime, I wish the K.E.C. would mark my boy's home-work properly; I wish they would teach him to write and not to print; and I wish they would teach him the geography of his own country before that of Central Africa. ("Education" has gone mad, I think.)

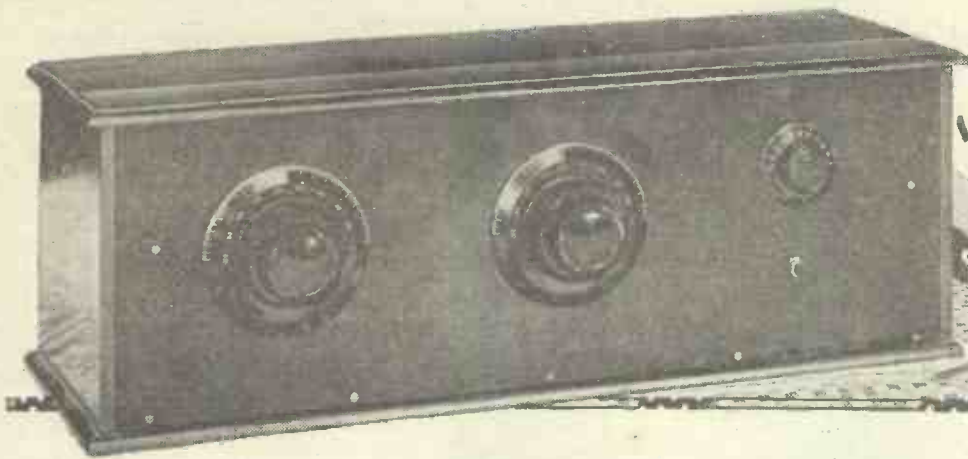
Proof of the Pudding.

AS you know, the greater part of American broadcast fare is put "on the air" by advertisers, a terrible state of affairs which we had the good sense to prevent here. Now the great firm of Wanamaker, Philadelphia, have had the courage to admit that its station, W O O, Pa, has not produced results and is accordingly closed. If this causes other firms to investigate there looms the possibility of the States having to constitute an A.B.C. That will mean licence fees! And so they will arrive at the first point from which effects Europe began! We shall see.

The King and Wireless.

THEY say that for the King's visit to Balmoral this year a new valve set has been installed in the Castle there. I'd like to have half an hour with it, for you can be sure that it is a hummer. I wonder what kind of programme His Majesty favours! My belief is that the King likes to explore the ether and does not bother much about "items." If so, it brings him nearer to our noble selves, doesn't it?

ARIEL.



The "P.W." FOUR

MOST home constructors now seem to be aware that a little screening is a definite improvement in a set using one or more stages of H.F. amplification, unless other special precautions are adopted, such as a very widely spaced lay-out, "fieldless" coils, and so on. There is, however, a strange reluctance actually to build such sets, which perhaps comes from a lurking suspicion on the reader's part that they are specially difficult to make.

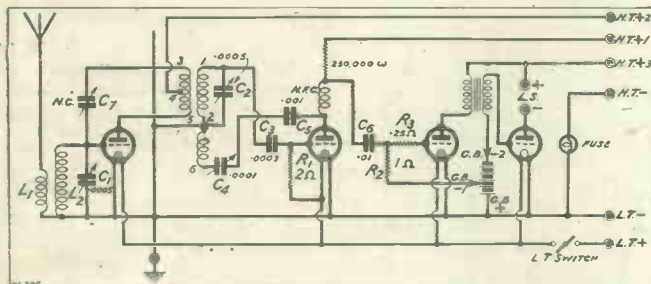
As a matter of fact, they are often at least as easy as the simplest type of unscreened set, because the screening can be arranged to simplify the assembly or wiring to a

Are you looking for a good 4-valve set? Then look here! Simple to make, "straight" in circuit, straightforward to build, and backed by P.W.'s constructional experts, this is a "sure-to-satisfy" set, "just right" for modern conditions.

Designed and Described by The "P.W." Research Dept.

applies to the drilling of the various other holes needed in the sheet of metal.

These holes are mostly for the passage of wires from the one side to the other, and should be of a fair size, say 1/8-in., since the wire used will be of the covered kind. Two of the holes, however, are for the insertion of small brass screws and nuts, to which wires will later be soldered for the purpose of making contact to the screen itself.



This diagram shows the circuit connections and the method of screening the H.F. from the aerial-stage.

wood. Some larger brass screws are then driven down through the strip into the baseboard of the set, and the job is done. A glance at one of the photos will make it all quite clear.

To one side of the screen a rectangular piece of 3/8- or 1/2-in. thick wood is secured with small brass screws in the same way as the wooden strip was fixed, and this is to provide a means of mounting up a 6-pin coil socket, as you will

quite considerable extent. It is really more a matter of the look of the thing than any real difficulty, and the design to be described in this article has been worked out very carefully to make it look easy as well as actually to be easy to make, in hopes that some readers who have previously held back may be encouraged to try it and so find out for themselves the advantages conferred by this type of receiver.

see in the photos. This part of the work, of course, is best done before the screen is fixed into place in the set, and the same

The Main Features.

There, that is a complete description of all the work involved in the use of the screen, and it has purposely been given right at the beginning of the article, before all the usual preliminary descriptive matter, so that you may see just how easy this part of the construction of the set really is, and can then go on with an easy mind to read the rest! Do not think that we do not fully sympathise with you in the difficulties of limited time and tools under which you do your constructional work, for that is far from the truth; we all remember our own amateur days too clearly for that! It is merely that we feel strongly what a pity it is for anyone to hold back from screened sets under the mistaken idea that they are too difficult for the average man.

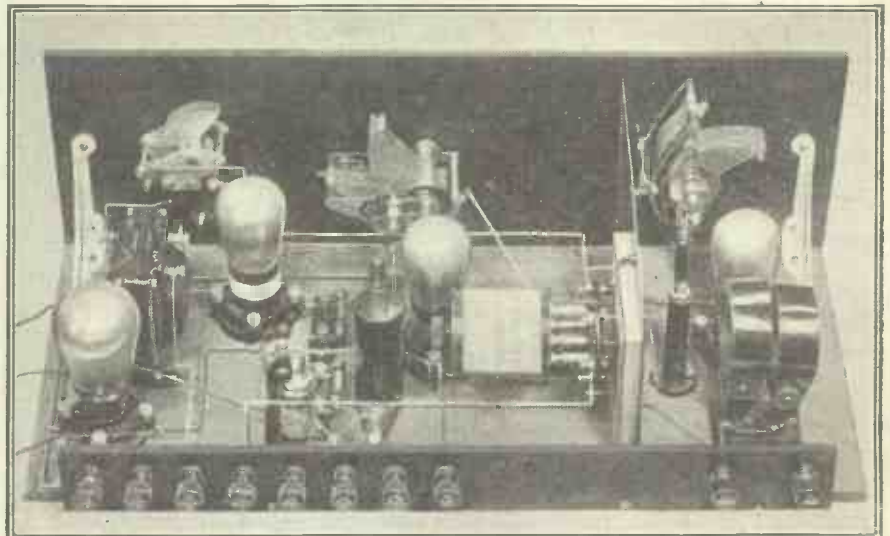
Now for a general run over the main features of the set. The circuit chosen is

(Continued on next page.)

Extremely Easy.

All that you will have to do is to get a piece of thin sheet copper or aluminium of the size given elsewhere (copper can be bought cut to size from several firms, including Messrs. Burne-Jones and Paroussi), and the only extra work is to drill some holes in this. Now, soft sheet copper is just about as easy to drill as an ebonite panel, and the tools and the methods are exactly the same, except that a rather heavier pressure is needed when drilling, so you see it is not really going to be difficult, is it?

To mount the screen in position is also quite simple, as you will see. The method is to screw a strip of wood about half an inch square along the lower edge of the copper sheet with three or four small brass screws passing through holes in the metal into the



One of the special features of this splendid set is the method of screening and coil mounting, which renders constructional work extremely easy.

THE "P.W." FOUR.

(Continued from previous page.)

one of the straightest and most satisfactory known, and no attempt has been made to incorporate wave-change switching, since it was felt that to do so in this set would be to defeat our main object and make the set complicated and difficult again. The first valve is a high-frequency amplifier, and has the usual tuned-grid circuit inductively coupled to an aerial circuit of the so-called semi-aperiodic type.

No Coil-Winding.

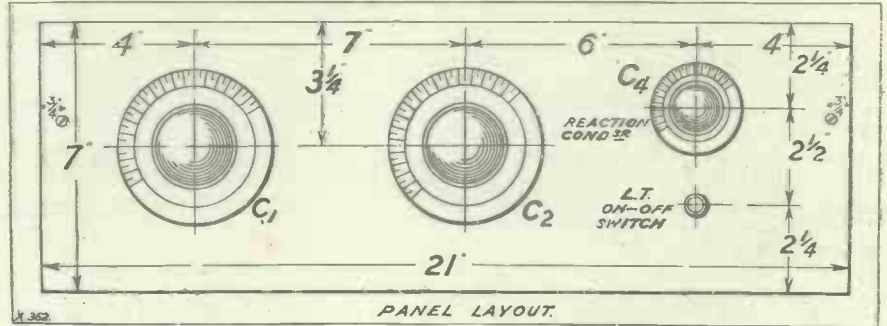
Coupling the H.F. valve to the detector is an H.F. transformer of the 6-pin type, which enables the first valve to be neutro-dyned (or neutralised, as it is more correctly called) on the simple but highly effective "split-primary" system. One of the features of the set, you will see, is that it uses standard coils throughout, most of which you will probably have on hand, and there is no coil winding to be done.

The screening is arranged on a special system first devised for use in the 3-valve Solodync receivers described a few months ago in "Modern Wireless," in which it proved highly efficient. Only a very limited

amount of screening is used (between the H.F. and detector stages, of course), but by a special arrangement of the coils it is made extremely effective, and produces a remarkably efficient set.

The rest of the circuit is very straightforward, the other two valves being L.F. amplifiers, coupled by means of one resist-ance-capacity and one transformer stage, a

normal (Reinartz, or capacity controlled) and would call for no mention, except that the presence of the fixed condenser C_5 perhaps calls for a little explanation. This condenser, then, is simply a safety device, its function being to prevent a short circuit of the H.T. battery if the fixed and moving plates of the reaction condenser, C_4 , should chance to touch each other.

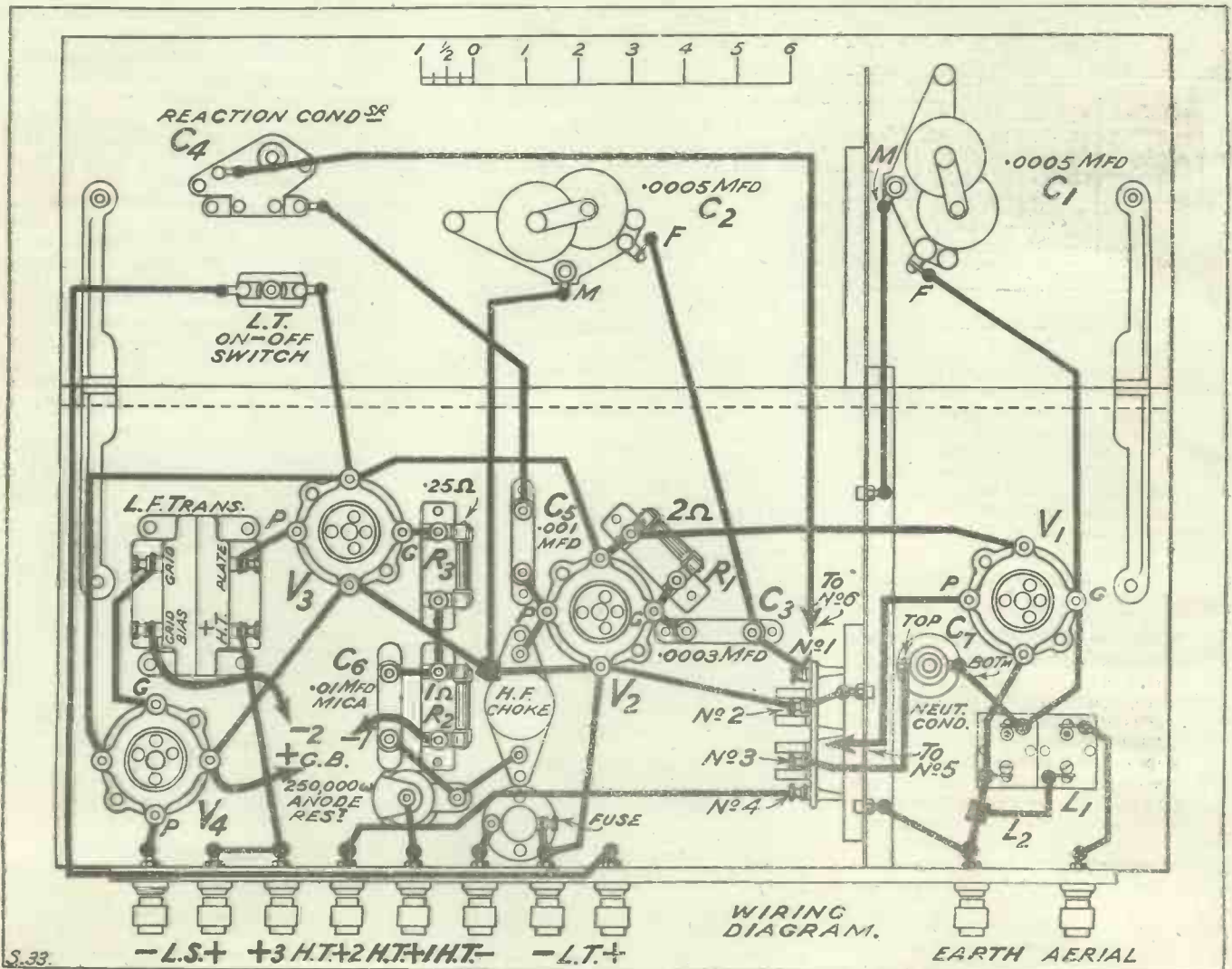


combination which has become extremely popular by virtue of the good quality and high amplification which it gives. To get good results, of course, it is necessary to use the right valves for the resistances and condenser in the R.C. stage, and a good L.F. transformer, but these are points with which the reader is no doubt familiar.

The reaction arrangements are quite

The general constructional work is very straightforward, and calls for no special instructions, since a description has already been given of the work involved in the only special feature, namely, the screen. There are, however, one or two points arising from the wiring diagram which must be dealt with. First of all, look at the

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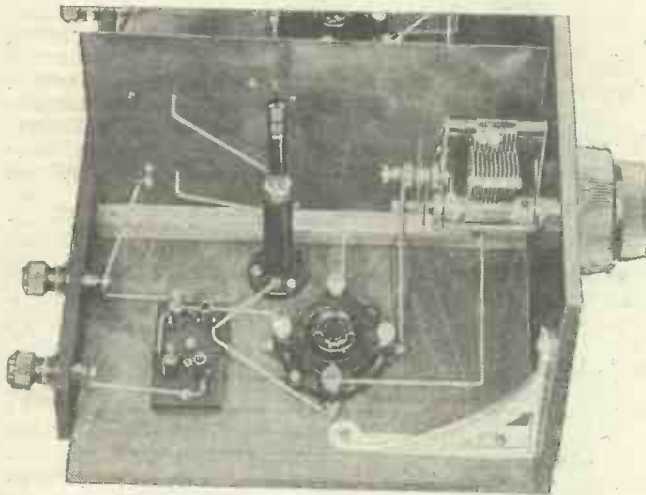
THE "P.W." FOUR.

(Continued from previous page.)

condenser C_6 on the baseboard; you will see that this is marked "mica," and it should be explained that this is to prevent you from making the mistake of using one of the Mansbridge type, which is not considered safe in this position.

A Simple Guide.

Next, you will see that the socket for the 6-pin H.F. transformer is mounted on the side of the screen in such a way that the various connections are not clearly visible, and accordingly the wires have been numbered. These numbers correspond to those which you will find marked on the socket, and indicate to which terminal or tag each wire should be taken.



The screen is very simply attached to the baseboard by means of the strip of wood seen at its base.

Lastly, you will see that the 250,000-ohm anode resistance is seen mounted in a vertical position, and this is because it is of the R.I.-Varley type, which is supplied with a holder of this kind. Another make which is also mounted in an upright position is the Lissen, but if a different make again is used you will require to place it horizontally, for which there is ample room.

Turning now to practical matters concerning the finished set, the first point to claim our attention is that of coil sizes.

For the aerial socket (L_1) you will require a No. 25, 35, or 40 on the 250-550 metre wave-band, the actual size for best results depending upon the size of your aerial (large aerial, small coil), and the amount of selectivity you need. For example, if you are very close to your local station, you will need to use a small coil to get enough selectivity to cut it out, even though in so doing you will be sacrificing a little signal strength. For 5 X X and the other long-wave stations a No. 75 or 100 will be right.

In the secondary circuit, the correct coil will be a No. 60 (75 will do at a pinch) for the lower wave-band, while for long-wave reception a No. 250 will be called for. The H.F. transformer will be of the standard 6-pin split-primary type, and you will need one for the lower waves (250-550 metres) and another for long waves.

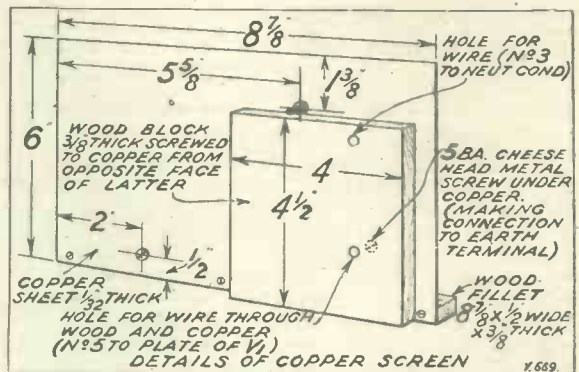
Valves for this set are a simple matter, since only two types are needed. The first three should be of the H.F. type, examples being these: Cossor 610 H.F., P.M.5 X., D.E.L.610, E.S.5 H.F., 6075 H.F., etc., in the 6-volt range. Two-volt equivalents can, of course, be chosen, if you desire extreme economy rather than super results, regardless of cost of running. For the last stage a power or even super-power valve is practically essential on any set as powerful as this one. Six-volt examples:

D.E.5, Stentor Six, B.4, P.M.6, D.E.5 A., P.V.5D.E. P.M.256, etc., 2-volters of similar type being available in all the well-known makes (B.T.H., Cosmos, Cossor, Ediswan, Marconi or Osram, Mullard, Six-Sixty, etc.)

Easily Done.

Neutralising is the first adjustment to be performed, and this is done as follows: Turn the set on, place neutralising condenser and reaction condenser at minimum,

revolve the tuning dials, and note whether the set oscillates anywhere. It will probably do so when the two circuits come into



tune with each other, but if not, bring up the reaction condenser very carefully until it just does so. Now slightly increase the setting of the "neut" and you will find the set stops oscillating again, even when returned to make sure the circuits are in step.

Almost Non-Radiating.

Proceed in this way, increasing first the reaction condenser and then the "neut," finding at last a position at which a further increase in the latter makes the set oscillate more violently instead of stopping it. This means that you have overshot the true neutralising point and must go back a trifle. What you are aiming at, remember, is to find the setting of the "neut" at which the set is most stable, and requires the greatest amount of applied reaction to make it oscillate. Once this is found accurately, the set is practically non-radiating, but during the preliminary adjustments it is as well to disconnect the aerial.

Exceptional Results.

A final word as to results: on test this set was found to be of really exceptional promise, both as regards sensitivity and selectivity, and we do not propose to quote the outdoor aerial report, simply because the list of stations would be so lengthy that the average reader would almost certainly feel that they were the result of specially skilled handling and the use of a good wave-meter! Instead, we will merely mention the fact that when tested on an indoor aerial in the loft of a two-storey house no less than twelve distant stations were heard on the loud speaker!

COMPONENTS.

- 1 Panel, 21 in. \times 7 in. \times $\frac{1}{4}$ in. (Any good-branded material).
- 1 Cabinet to fit, with baseboard 9 in. deep and pair of panel brackets (Raymond, Pickett, Artercraft, Maker-import, Cameo, Caxton, Bond, etc.).
- 2 .0005-mfd. variable condensers, with slow-motion drive or vernier dials (Any good make. J.B. in original).
- 1 .0001 or .00015 mfd. miniature-type variable condenser (Cyldon, Peto-Scott, Bowyer-Lowe, etc.).
- 1 On-off switch (Lissen, Lotus, Benjamin, Igranic, etc.).
- 4 Sprung valve sockets (Igranic, Lotus, Benjamin, Marconiphone, B.T.H.,

- W.B., Bowyer-Lowe, Burne-Jones, Burndept, etc.).
- 1 Neutralising condenser (Gambrell, J.B., Igranic, Bowyer-Lowe, Peto-Scott, Burne-Jones, etc.).
 - 2 Single-coil sockets (Lotus, Burne-Jones, Peto-Scott, etc.).
 - 1 6-pin coil socket (Burne-Jones, Lewcos, Colvern, Bowyer-Lowe, etc.). (Note: This is of the unscreened type.)
 - 1 H.F. choke (Lissen, Colvern, R.I.-Varley, Cosmos, Bowyer-Lowe, Igranic, Climax, Burne-Jones, Peto-Scott, etc.).
 - 1 H.T. fuse and holder (Burne-Jones or similar type).

- 1 .0003-mfd., 1 .001-mfd. and 1 .01-mfd. fixed condensers (T.C.C., Lissen, Dubilier, Mullard, Igranic, Clarke, etc.).
 - 1 2-meg., 1 1-meg. and 1 .25-meg. grid leaks and holders (Lissen, Igranic, Mullard, Dubilier, etc.).
 - 1 250,000-ohm anode resistance and holder (R.I.-Varley in set. See text on this. Any good make can be used—Mullard, Dubilier, Lissen, Igranic, etc.).
 - 1 L.F. transformer (Ferranti A.F.3 in set. Any good make).
 - 1 Terminal strip, 19 in. \times 2 in. \times $\frac{1}{4}$ in. or $\frac{3}{8}$ in. and 10 engraved terminals (Igranic, Belling & Lee, Etelex, etc.).
- Materials for screen (see diagram and text), wire, etc.

NEWS FROM BERLIN.

Details of a startling German claim to have solved Television problems, and news of other technical developments.

By THE EDITOR.

INTERESTING statements appeared in the "Daily Telegraph" the other day concerning Professor Karolus, the well-known physicist of Leipzig University. It was stated in this report from Berlin that the professor has actually solved the problem of television.

We hope to be able to publish next week an article dealing with Professor Karolus's system, but in the meantime it is interesting to note that the well-known Berlin paper "Vossische Zeitung" expresses the opinion that within a foreseeable time we shall have in the house alongside the radio receiver the tele-photographic apparatus, so that it will be possible to transmit and receive simultaneously the scene and the music of, say, an opera.

The Best Yet?

The paper goes on to state that an expert in tele-photography who was present at the demonstration of Professor Karolus's system, when it was operating on small power and only transmitting per second eight pictures of eight thousand light-points each, reported that he received absolutely the illusion of movement, although somewhat angular and jerky, as in the case of a slowly running cinematograph film. But it was stated that the pictures were clear and recognisable, the face of each separate actor being easy to identify.

If this is a correct report and unbiased by optimism it would seem that Professor Karolus has designed a television system very much in advance of any made public at the moment.

Full details are not available, but our correspondents in Berlin have informed us that they have sent us particulars and we hope, publishing arrangements permitting, to include these in next week's issue.

September's Surprise.

The only other television news of any interest for the week is the published statement, in the "Daily Mail" and elsewhere, that Mr. J. L. Baird's company announce that they will begin television broadcasting in the autumn. Televisors, it is stated, will be on sale at the end of September at the cost of £25. The instrument will be like an ordinary suit-case, 24 in. by 18 in. deep, and the pictures will be seen on a little glass screen about 8 in. in diameter.

The televisors will contain a wireless set to receive ordinary broadcast programmes and a televisor on which will be visualised the features of the living face. Television broadcasting, it is stated, when it begins in the autumn from the Baird Television Company's premises in Long Acre, London, W.C., will consist of the head and shoulder views of various actors and speakers.

The above has not only appeared in the news columns of the newspapers but is also the gist of advertisements which have been published by the Baird Company.

Programme Exchanges.

We understand that further tests for the interchange of wireless programmes between Great Britain and America will be undertaken during the next few weeks by the British Broadcasting Corporation and the National Broadcasting Company of America, and further that, should they prove reasonably successful, it is likely a considerable effort will be made this autumn and winter to facilitate an interchange of broadcast programmes between the two countries.

Experimental work in connection with Anglo-American programme-swapping has been carried out during the summer in London and in New York, with the object of endeavouring to find out whether a maximum guarantee of programme service could be given by the adoption of several wave-lengths to be utilised simultaneously.

Mr. Campbell Swinton and Dr. Robinson.

Mr. A. A. Campbell Swinton's letter in "The Times," on "Television," which we quoted in a recent issue, was replied to by Dr. J. Robinson, and his criticism of Mr. Swinton's letter was quickly answered—and very conclusively! We give below extracts from Mr. Swinton's reply:

"Sir.—Dr. J. Robinson, in his letter in your issue of July 24th, has, I am sure quite unintentionally, entirely reversed the meaning of what I wrote to you in your issue for July 20th. Instead of saying, as quoted by Dr. Robinson, that 'we may anticipate reasonable broadcast of television in a very short time,' I said the exact opposite—namely, that 'both scientific theory and skilled experience join in the opinion that satisfactory television that can be broadcast on any reasonable scale still remains to be accomplished, and that this may take a long time.' Then, again, I do not in the least agree that we are at the present moment seeing the birth of a new service to mankind. That, some day in the future, we may see, I hope and think; but it cannot, in my view, ever possibly come about along the mechanical lines at present being followed."

Mr. Swinton continues:

"According to my information Dr. Robinson is entirely in error in suggesting that in practical television the image has not got to be capable of being divided ultimately into vast numbers of minute parts, which for short may be called 'dots,' and that division into strips first of all in any way helps matters. For unless detailed definition is to be defective along the length of the strips, the latter must each be capable of being subdivided transversely into dots to an equal extent that the whole plane surface is divided into strips.

Thus, for a given fineness of grain structure, it makes not the slightest difference in the number of potentially necessary ultimate parts whether the first division is

by strip or otherwise, nor does anything that can be arranged obviate the necessity that each ultimate part must be readjusted to suit the moving picture some 16 times in every second.

"Except as regards the necessary enormous rapidity, the problem is exactly the same as in the telegraph picture printing instrument, wherein a slowly traversing stylus is caused to pass, turn after turn, on a spiral course forming a continuous single strip from end to end of a revolving drum, where the ultimate dots, single or in chains, are caused by the stylus slowly to build up the details of the picture, dot by dot, just as must be done in television, though there much more rapidly.

What's the Use?

"What, however, we have to consider is not the images of single faces, unavoidably so defective and granular in structure, as the limitations of mechanics entail, that no one who has ever been shown one will wish to see it or its like again; but what the public has been promised—namely, scenes as varied, as interesting, and as perfect as those shown daily in every cinema, comprising many persons simultaneously in motion, scenes such as those on the stage, views of passing events like Ascot, the race for the Derby, or cricket at Lord's. What is the use of any method of television which is obviously never capable of being developed to give such desirable results?

We shall be interested to see Dr. Robinson's reply.

TELEVISION IN THE AUTUMN?

OUR readers will notice with interest in another part of this issue we publish an advertisement by the Baird Television Development Co., Ltd. In the advertisement it is stated that Baird Televisors will be on sale at the Wireless Exhibition at Olympia and that they will also combine a straightforward wireless receiving set. Consequently, these televisors will be dual instruments, i.e. instruments for the reception of broadcast sound and broadcast moving pictures.

Our readers are aware that we have, from time to time, criticised in a friendly spirit the various statements made by the responsible officials of the Baird Company in connection with the technical aspect of the Baird system of television, and we still adhere to the views which we have previously expressed in this paper.

The Licence Question.

As to the legal aspect, according to a notice which appeared in the "Daily Mail" recently, and which we reproduce on another page, the Baird Company has not yet been granted a licence, other than an experimental licence, for the broadcasting of moving pictures. We understand from our Legal Adviser, who has carefully considered the legal aspect of broadcast television, that in his opinion a television broadcast service must obtain a licence from the Post Office if a service of a regular nature is to be given and if, at the same time, the Baird Company wish to market receivers for the reception of such a service on their own account, and not in co-operation with the British Broadcasting Corporation.

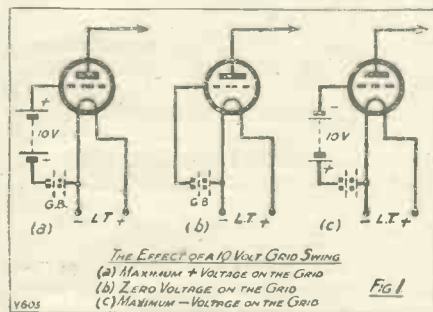


"Far too many good sets are being spoiled for want of sufficient H.T. voltage on the last valve."

By C. E. FIELD, B.Sc.

THERE is no doubt that during the last year or two there has been a great increase in the number of amateurs who build sets with the object of obtaining perfect results from local broadcasting, rather than of obtaining indifferent reception from a great many more distant stations.

The majority of amateurs can obtain strong loud-speaker results if they so desire, and at a fairly low volume can obtain quite pure reproduction, but in far too many cases really loud volume is only produced at the expense of quality.



When this is the case, unless the design of the receiver is bad throughout, the distortion introduced is almost certain to be chiefly *wave distortion* (as distinct from *tone distortion* produced by uneven amplification of different frequencies), and it is very probable that the trouble does not assume serious proportions until the signals are applied to the grid of the last valve.

In this article, therefore, we will consider what factors must be taken into account when making up the last stage of a powerful receiver.

Handling the Swing.

Firstly, it must be realised that although it is important that the last stage shall produce a sufficiently large *output* (i.e. volume of sound), it is even more important that the stage shall be able to handle a large *input*. These two requirements are, of course, partly interdependent, in that a large input will necessarily produce a large output, but a large output does not necessarily indicate that a large input is being handled satisfactorily.

Now, what exactly do we mean by "handling a large input"? As readers are all aware, the signals which are applied to the last stage for further amplification take the form of varying voltages applied between grid and filament of the last valve. The stronger the signals, the higher these voltages, and so the greater the changes in

output plate current, and the greater the volume from the loud speaker. The input to the last stage is thus usually referred to in terms of "grid swing." As an example, take the case of a valve to which is applied a grid swing of 10 volts.

What happens is that at one moment the grid is at 10 volts positive, relative to the normal voltage at which it is held when no signals are being received. If no grid battery were employed, it would then be 10 volts positive to the filament, just as if a 10-volt battery were connected with its positive terminal to the grid, and its negative to the filament.

As one signal wave is received, this voltage becomes less and less until the grid is receiving no voltage from the signals. It is then at zero potential relative to its normal value, or at a negative voltage equal to that of the grid-bias battery, relative to its filament.

Valve Limitations.

After another similar interval, the voltage on the grid will again be 10, but this time in the reverse direction, the condition then being as if a 10-volt battery were connected with its negative terminal to the grid, and its positive to the negative end of the grid battery, or, if the latter were omitted, to the filament. (These conditions are shown in Fig. 1.)

So much for the grid swing which is applied to the valve. Whether the valve can handle this input is another matter.

In order that a valve shall handle a given grid swing it must be able to produce changes in plate current which are exactly proportional to the voltage changes on the grid, so that if, for instance, the grid swing were doubled, changing from 10 volts to 20 volts, the plate-current swing would have to double also.

Obviously this will not occur as the grid swing is increased indefinitely, for two reasons.

Firstly, as the grid *negative* swing increases, the plate current becomes less, and must, therefore, become zero or else cease to decrease uniformly in time, after which further negative grid voltages will not produce proportional effects. Secondly, as

the grid *positive* swing increases, there will come a point at which the grid is at a positive voltage relative to the filament, at which point it begins to perform the same function as the valve plate, and robs the latter of plate current as well as preventing its own voltage from building up.

Correct Grid Bias.

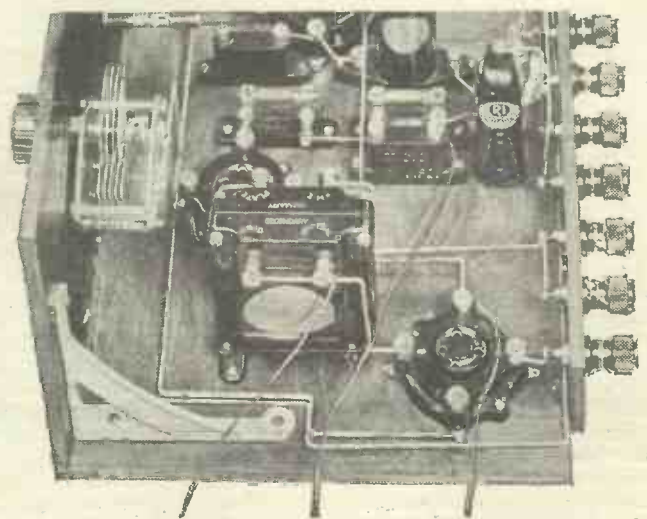
In order that a valve shall handle a certain grid-swing, therefore, the conditions must be such that the maximum negative grid voltage does not cause the plate current to cease altogether, or to stop decreasing uniformly, whilst the maximum positive grid voltage does not make the grid positive relative to its own filament.

In order to prevent the latter occurrence, the *normal* voltage on the grid must obviously be made as negative as the grid swing, so that the signal voltage just neutralises the steady potential, but does not make the grid positive.

A grid battery, of voltage equal to the received grid swing, must therefore be inserted with its positive terminal connected to the valve filament, and its negative to the grid (through a grid leak or transformer winding).

In order to avoid the plate current cutting off when the maximum negative grid swing is received, the grid-battery voltage (i.e. grid bias) must be such that the maximum negative swing will not give the grid such a high negative potential that no plate current can flow.

(Continued on next page.)



The last stage of the "P.W." Four, described elsewhere in this issue, is clearly illustrated in this photograph of the L.F. end.

THE LAST STAGE.

(Continued from previous page.)

To satisfy these conditions, firstly, the valve must be biased at a point midway between zero grid voltage and the negative voltage at which the plate current commences to cut off, and, secondly, the voltage between the bias value and each of these points must be at least as great as the maximum grid swing to be dealt with.

The negative grid voltage at which the plate current commences to cut off must therefore be equal to at least twice the grid swing which the valve is required to handle.

In Fig. 2 is shown the characteristic curve of a valve suitable for dealing with a grid swing of 10 volts. This valve would be biased with - 10 volts, at the point A, and it will be seen that the plate current cut-off, or the bottom bend of the curve, commences at - 20 volts.

Practical Figures.

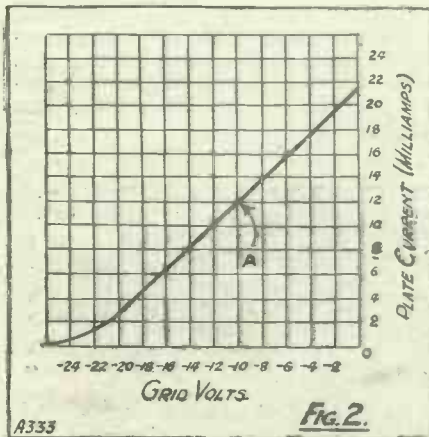
This is all very well if we know what grid swing we wish to be able to deal with, but unfortunately this knowledge is largely a matter of experience.

We may take the following examples as a guide, however.

A grid swing of 2 volts on the last valve will give good loud headphone strength, but very poor loud-speaker results.

A swing of $4\frac{1}{2}$ volts will give moderate results on a horn type of speaker, and for the man of moderate means, and for one who is interested chiefly in listening to concert parties, dance music, etc., in a small room, this would prove satisfactory. A small power valve of perhaps 10,000 ohms would meet the case.

A grid swing of 9 volts will provide satisfactory speaker strength for a medium-sized room (say 14-ft. square), and will



operate most types of cone speaker at reasonable volume. A swing of this strength can be handled by the ranges of power valves having an impedance of about 5,000 ohms, examples being the D.E.P. 610, S.P.18 R., P.M.6., etc.

Until comparatively recently, most of us were quite satisfied with results from a valve of this type, but super-power valves, moving-coil speakers, and an appreciation of what wireless really can do, have ren-

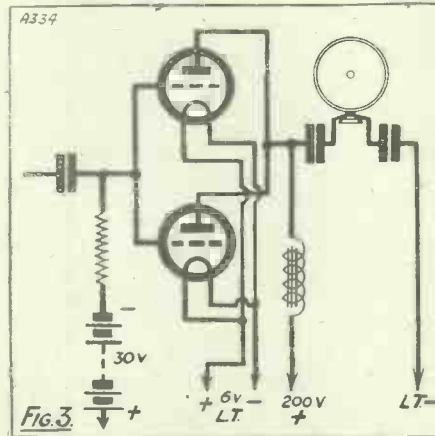
dered these results inadequate for those who require the best that they can get.

In order to operate a cone or moving-coil speaker at a volume similar to that furnished in the studio, without a trace of distortion due to overrunning, we should be prepared to deal with a grid swing of at least 20 volts on the last valve. An input of this magnitude can be dealt with by such valves as the P.M.256, Stentor 6, etc., provided that they are worked from an H.T. voltage of at least 150. This provision is most important, far too many good sets being spoiled for want of sufficient high-tension voltage on the last valve.

For Super Quality.

For still better results, from the point of view of both quality and volume, another valve should be placed in parallel with the one just mentioned, and the H.T. and grid bias increased by 50 volts and 10 volts respectively, the connections then being as shown in Fig. 3.

A well-designed set, terminated with a last stage of this nature, operating a first-class cone or moving-coil speaker, will leave little to be desired.



A word about distortion. The most critical ear will soon accommodate itself to more distortion than the owner of the most uncritical ear would admit tolerating.

Consequently, the listener who is employing a large power valve, and believes he is obtaining perfect results, should try the effect of adding half as much again to both his high-tension and grid-battery voltages.

In many cases the change will show that his previous "perfect" results were being produced by a valve which was being considerably overrun.

RADIO NEWS ITEMS.

AT Southampton recently a man was fined one hundred pounds for smuggling wireless valves into the United Kingdom.

The Norwegian railways have been experimenting with short-wave wireless transmitters, with a view to providing reliable emergency communication in case of a telegraphic breakdown.

Roumania's first broadcasting station is to be erected at Bucharest before the end of the year.

FILLING ACCUMULATORS.

SOME difficulty is frequently experienced in filling small accumulator cells quickly and cleanly without spilling the acid or causing air-locks at the mouth. This is especially troublesome with such cells as are met in the H.T. accumulator where the opening is usually extremely small and tapering.

By adopting a method used almost universally in the wholesale chemistry world it is possible, at the cost of a few pence, to make a piece of apparatus which is ideal for the purpose.

A Simple Device.

A small glass funnel, a short piece of glass tubing, a short piece of rubber tubing, and a clip can all be obtained for about ninepence or tenpence.

First of all, the glass tubing should be drawn out to form a fairly fine passage by heating in an ordinary gas burner, and, when cool, filed and snapped off at the point marked A in Fig. 1. Simply attach to the funnel and clip as in Fig. 2, and the apparatus is complete.

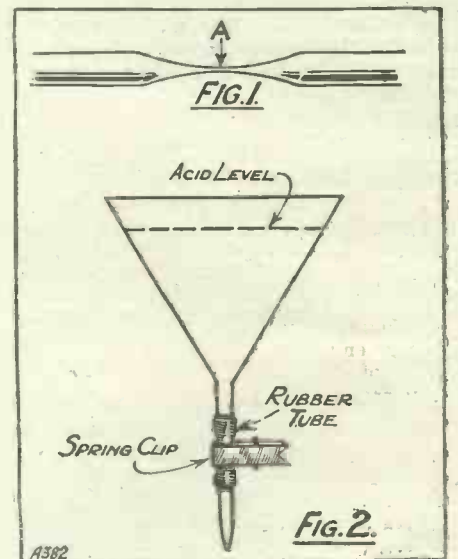
The method of using is to fill the funnel up to the approximate level which corresponds to the capacity of the cell, and by trial and error ascertain the exact volume required, which is marked with a small strip of gummed paper.

Once this is done it is merely a matter of closing the clip, filling the funnel to the correct level, placing the end in the mouth of the cell, and releasing the clip, when the acid automatically rises to the correct level.

Well Worth It.

When only one or two cells are to be filled this may seem a waste of time and money, but anyone who has had the job of filling a 150-volt H.T., consisting of 75 3-oz. cells, will readily appreciate the utility of the gadget.

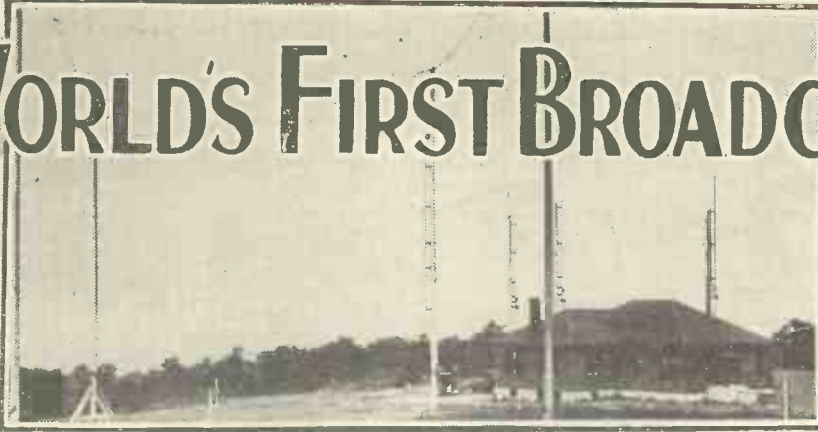
A small pipette is also useful for topping up accumulators, and this might be made the next item to be obtained, or, alternatively you can use your hydrometer quite well for this.



THE WORLD'S FIRST BROADCASTING

BROADCASTING—that is, the dissemination by means of wireless of speech and music—is not so very old. Wireless broadcasting, I am told, was the idea of H. P. Davis, of Pittsburgh, U.S.A., who in November, 1920, opened the world's first broadcasting station.

But few people realise that wired broadcasting, not only as an experiment, or a single person's freakish idea, but as a well-organised practical service with paying listeners, already existed in 1893. I am



at the Royal Opera House four to five times a week during the nine months' season, relays from other famous concert halls. And during the day-time, every half-hour extracts from the latest news bulletins and from the newest editions of the daily papers. Considering the lines to be kept up, the

permanent staff, etc., one really could not expect more twenty and thirty years ago.

Since the advent of broadcasting as we know it in 1928, Telefon Hirmondo has not lost any subscribers; instead, the number

Although radio broadcasts are quite new, a system of landline transmission has been in progress in Budapest for over 30 years.

By
A SPECIAL CORRESPONDENT.

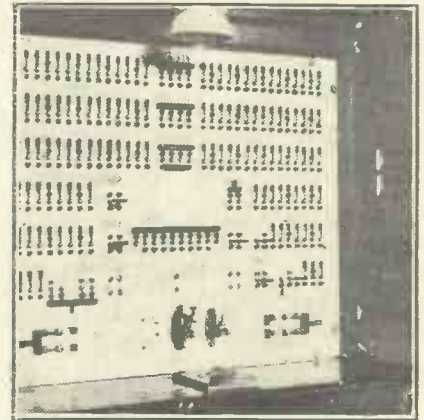


Two of the original loud speakers—installed in 1896—still used for checking purposes at the transmitting station.

One piece of venerable apparatus was still in use at the time of my visit this year; a loud speaker at headquarters for controlling the output. This loud speaker had been installed in 1896 and had not been touched since. It consisted of two single earphones, the same as used for the usual listening posts (120 ohms, and exceedingly sensitive), and attached to each earphone was a long metal trumpet, reminiscent of early gramophone trumpets. The reproduction? Excellent. Compared with the latest "edition" of a loud speaker known the world over, one actually decided in favour of the old 1896 loud speaker!

Value for Money.

You will ask what the listener got for his monthly three shillings and sixpence (3 Kronen—now, since 1924, 4.80 Pengö = 4/-). A complete relay of the performance



A section of the control-room at Budapest.

referring to the "Magyar Telefon Hirmondo" in Budapest, Hungary. As a Hungarian's invention it was only right that the system should be seriously developed in the Hungarian capital. A few years later it was taken up by several towns in Europe and in the United States, but as far as I can ascertain the only two towns where the system is still in force to-day are Milan, with only 500 listeners, and Budapest, with over 6,000 listeners.

In Budapest, the birthplace of Telefon Hirmondo, two insulated wires run along the front of every house between the first and second storey. Anybody wishing to subscribe to Telefon Hirmondo can thus have the connection effected with a minimum of trouble and cost.

Available for All.

The system is built up in the following manner: The whole town is wired up in series in groups of from three to four hundred single earphones, i.e.—150 to 200 listening posts, as each subscriber obtains two single earphones. These groups are wired in parallel to the microphones and batteries. Accumulators are used as batteries, the total voltage employed being only 8 volts for a town of nearly one million inhabitants (900,000). Microphones are installed in the Royal Opera House and other concert halls. In the Royal Opera no less than thirty-two microphones were in use until three years ago. Recently the whole system has been fitted with modern microphones and amplifiers, although these were not really necessary.

has increased imperceptibly due to the amalgamation of the new broadcasting company with the old which now takes over some of the Budapest station's programmes.



A modern radio broadcaster—3 L O, Melbourne, Australia. The photograph shows, among others in the control-room at 3 L O, the crew of the "Southern Cross," the plane that flew from 'Frisco to Australia.

TECHNICAL NOTES.

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

CAPACITY AND RESISTANCE.

CONDENSERS IN PARALLEL—CURRENT CAPACITY—VOLTAGE OVERLOAD—CRYSTAL RECTIFICATION—OVERHEATING, ETC., ETC.

THE calculation of capacities of condensers sometimes seems to offer certain difficulty to the beginner in radio, although, as a matter of fact, it is really a very simple matter. One of the simplest ways to remember how to calculate capacities in series or parallel is to compare with the calculation of resistances in parallel or series.

Probably every experimenter knows that if a number of separate resistances are connected together in series the total resistance is simply equal to the sum of the individual resistances; thus, if the resistances are R_1 , R_2 , R_3 , and so on, and these are connected together in series, the total resistance is R_1 plus R_2 plus R_3 , etc.

If resistances are connected together in parallel, however, the total resistance is less than the resistance of any individual member of the series, and the resultant is arrived at by the fact that the reciprocal of the total resistance is equal to the sum of the reciprocals of the individual resistances; thus, if R is the total resistance and R_1 , R_2 , R_3 , etc., are the individual resistances, then $1/R$ is equal to $1/R_1$ plus $1/R_2$ plus $1/R_3$, etc.

Take a case in point: if three resistances of values 4 ohms, 10 ohms, and 20 ohms respectively are connected together in parallel, and you want to know the total resistance, you simply add together $1/4$ plus $1/10$ plus $1/20$, which gives you $7/20$; therefore $1/R$ is equal to $7/20$, or R is equal to $20/7$, which is approximately 3 ohms.

Condensers in Parallel.

Now, to turn to the question of condensers, the case with condensers is opposite to that with resistances. If a number of condensers are connected together in parallel, the total capacity is equal to the sum of the capacities of the individual condensers. You will notice that this corresponds to the connecting together of resistances in series. So you may remember that for condensers in parallel you do the same as you do for resistances in series—that is, add together the individual values to get the total.

For condensers in series you do the same as for resistances in parallel—that is, add together the reciprocals of the individual values, and the sum gives you the reciprocal of the total value.

Take a case in point. Suppose we have three condensers of capacities 0.006, 0.004, and 0.002, and we connect these together in series, then if C is the resultant capacity, we have $1/C$ is equal to $1/0.006$ plus $1/0.004$ plus $1/0.002$, and you will easily be able to verify that the resultant of the capacity (or the value of C) comes out at 0.00109.

Current Capacity.

There are certain other rather interesting and important points with regard to the combination in series and parallel, both of condensers and resistances. With resistance

in series you will observe that the current-carrying capacity of the combination is no greater than that of the lowest-current-carrying-capacity member in the series, just as a chain is no stronger than its weakest link.

With condensers connected together in parallel the maximum rated voltage which may be applied is that of the lowest rated condenser in the combination.

With condensers in series the resultant capacity is lower than the capacity of the lowest individual member of the series.

FATHER OF THE FIRST FARAD.



This portrait shows Michael Faraday, one of the most brilliant scientists that ever lived.

The son of a British blacksmith, he discovered electromagnetic induction, and thus laid one of the main foundations of wireless.

The unit of capacity, the Farad, is named after him, and year after year he continued to make discoveries any one of which would have made his name immortal.

He was born at Newington Butts, and died at Hampton Court on August 25th, 1867.

Voltage Overload.

When two or more condensers are used in series, it is obvious that, although the capacity is lower than the capacity of the smallest condenser (by "smallest" I mean smallest capacity), the combination of condensers may be used across a higher voltage than would be the case if any individual condenser were used alone. For example, supposing we had two condensers of equal capacity rated at 400 volts each, we could connect these two together in series and connect them across an 800-volt supply.

It is important, however, to bear in mind that the voltage will distribute itself between the different condensers in the series in a way which depends upon the capacity of the condensers. For instance, if the two condensers just mentioned are of equal capacity and are connected across an 800-volt source of supply, there will be 400 volts across each condenser.

If, however, the condensers, although each having a 400-volt rating, are of different capacities, the voltage will distribute itself so that the larger voltage is across the smaller capacity condenser. If one condenser is one-tenth the capacity of the other, it will have ten times the voltage across its terminals, so that although the sum of the two voltages may be equal to the sum of the voltage-ratings of the two condensers, one of the condensers may nevertheless be subjected to a very heavy voltage overload.

Crystal Rectification.

The copper-oxide rectifier is really a special form of crystal detector and is believed to operate on precisely the same principle as the ordinary crystal rectifier. This is borne out by the fact that if the copper oxide is in the amorphous (non-crystalline) form, it has no rectifying properties whatsoever. If it is to give rectification it must be in a crystalline form, and, furthermore, for efficient rectification the crystals must be of a special variety and must be arranged in a special way.

A great deal of the difficulty which has been experienced in getting the copper oxide

(Continued on page 822.)

NEWS FROM SAVOY HILL.

FROM OUR OWN CORRESPONDENTS.

SIR THOMAS JIBS.

THE B.B.C. CONSTITUTION—THE FATE OF NOTTINGHAM—THE GOVERNORS AND TALKS—WILL CAPT. ECKERSLEY STAY?

Sir Thomas Jibs.

THERE is a rift in the lute of new-found accord between Sir Thomas Beecham and broadcasting. The bringing together of the B.B.C. and the Imperial Opera League went well up to a point. Where difficulty is being experienced is in connection with the claim of the B.B.C. to control Sir Thomas. Savoy Hill takes its stand on the ground that where its money goes, or rather where listeners' money goes, there should be corresponding and predominant control. It is understood that in artistic work Sir Thomas Beecham will not tolerate any interference from Savoy Hill. He must have a free hand. The

resultant situation is piquant in the extreme. Without the B.B.C. bang goes the Imperial Opera scheme. With the B.B.C. Sir Thomas is cramped. It is rumoured that Lord Beaverbrook is among the little group trying to patch up a *via media*.

The B.B.C. Constitution.

The new broadcasting "Vigilance group" of members of Parliament has appointed a committee of three to take advantage of the vacation to explore the whole legal position with regard to the possibility of upsetting the Charter and Licence of the B. B. Corporation. It is believed that

(Continued on page 822.)

HAND-CAPACITY TROUBLES

Are you troubled by hand-capacity? If so, the following article will do much to help you.

By J. ENGLISH.



HAND-CAPACITY trouble, as its name implies, is usually due to the fact that the operators' hands, being really objects at earth potential, produce a slight increase in the capacity to earth when brought near to high potential parts of the receiver such as the "grid" side of the tuning condensers. When the operator's hands are removed this slight additional capacity vanishes, so that tuning is naturally altered. Also bringing the hands near to a coil changes its inductance, very slightly, but sufficient with the capacity change to upset tuning appreciably.

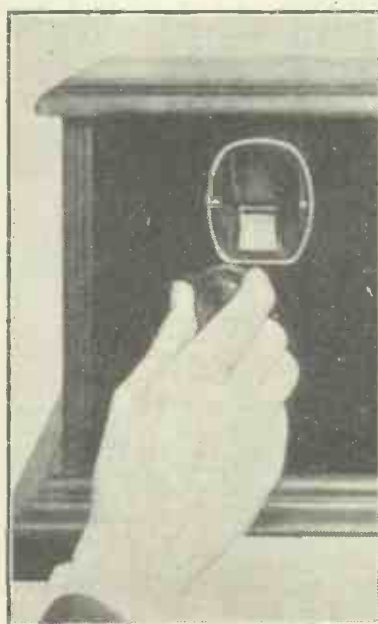
In short-wave receivers this "hand-capacity" produces an even greater change in the tuning. As you are doubtless aware, a very small increase in the capacity of the tuning condenser produces a large change in tuning on these short waves. If hand-capacity troubles are bad in a short-wave set, reception is quite hopeless and the receiver has to be re-designed in order to eliminate such trouble.

Depends on Design.

Now, experienced amateurs, knowing the root-cause of hand-capacity troubles, take precautions when building their receivers to prevent movements of their hands from affecting the receiver. The surest remedy, in almost all cases, is quite simple and consists of ensuring that there is always an earthed conductor between the operator's hands and the coils and condensers of the receiver. You will immediately think of receivers having all-metal panels, which from experience you know to be free from hand-capacity troubles. The complete freedom here is due to the fact that there is a fixed small capacity between all components inside the cabinet and the metal panel. Since this is earthed, anything also at earth potential on the dial side of the panel cannot make any difference at all to these capacities of component to earth, so that "hand-capacity" no longer affects the tuning of the receiver.

Now some circuits where all panel components are at earth potential lend themselves to the use of a metal panel quite readily, but it would be fatal to use anything but an ebonite panel where the panel components are not all at the same potential. We always try to juggle with the circuit so that all panel components shall be at earth potential; but in circuits of the genus

Colpitts, where no part of the tuning system is at earth potential, this is impossible. In the old days the keen experimenter would have fitted the two condenser dials with long "extension" handles; but we more fortunate moderns can now purchase special dials which, beside giving a slow-motion adjustment, have a fairly large engraved metal dial which is insulated from both sides of the condenser. This dial can, therefore, be connected to earth, and we then have the equivalent of a metal panel



Drum control and vernier tuning by means of a geared friction drive do a great deal to prevent hand-capacity troubles.

just in front of the condenser itself, with the added advantage of a slow-motion adjustment.

If your receiver is at all prone to "hand-capacity" trouble and has an ebonite panel, fit these dials, when your troubles will in most cases disappear. Take care, however, to choose a reliable make having really good insulation between the shielding dial and the part which grips the condenser spindle.

Short-wave receivers are very much more liable to "hand-capacity" effects than receivers tuning over the broadcast waveband. Unless a few simple precautions are taken in construction you will find that the

tuning may change appreciably in spite of earthed-screen dials. Also, signals from distant stations very often weaken, and sometimes disappear altogether, when the operator moves a short distance away from the receiver. This is due to the capacity coupling via the headphones producing a very slight change in the capacity of the tuned circuits. This effect is only noticeable on short waves.

Arranging the Lay-out.

The necessary precautions are to see that the tuning coils are placed as far to the rear edge of the baseboard as possible. The coils are then farther away from the influence of the operator's body, and, for this reason, it is advisable to use a wide baseboard when constructing a short-wave set. If the circuit does not permit a metal panel to be used for the reasons mentioned above it is a safe plan to mount the tuning and reaction condensers well back on the baseboard, say 6 in. from the back of the panel, and link them to the dials with lengths of $\frac{1}{4}$ in. ebonite rod.

Obviously the best precaution of all is to use a circuit which permits of a metal panel being employed, and then to construct a cabinet out of sheet aluminium or copper, when the receiver will be completely screened from outside interference. Take care, of course, that the metal does not come very near the coils anywhere.

"Body-capacity" via the 'phones to earth can also be very troublesome in a short-wave receiver, and the only cure is to reduce to the lowest limits the back-coupling to the tuned circuits. Mere screening is useless in these cases, and may even make matters worse. The more valves there are between the detector stage and the 'phone terminals, the less trouble there will be from body capacity. On some short-wave transmissions two L.F. stages following the detector will often provide sufficient volume to work a loud speaker so that no trouble occurs, as the 'phones are not then worn.

The Choke Cure.

As many transmissions cannot be received at this strength we must still wear 'phones and overcome our difficulty by inserting H.F. chokes and earth-shunt condensers in the anode circuits in order to keep as much H.F. energy as possible out of the L.F. amplifier. This will often effect a cure, but in obstinate cases where, for example, a good earth connection does not exist, you will find that an H.F. choke in each 'phone lead will assist matters. In extreme cases binding the 'phone leads with 24 D.C.C. for a distance of two or three feet, and then connecting one end of this wire to earth, is very often effective.

FROM THE TECHNICAL EDITOR'S NOTE BOOK



"AN INTERESTING UNIT."

AN H.F. unit especially designed for the Cossor "Melody Maker," the popular set due to Messrs. Cossor, has been produced by The Peto-Scott Co., Ltd. It can be purchased complete, or by means of a constructional chart which is available it can very easily be assembled by the constructor. It is a straightforward and efficient unit which makes use of a screened-grid valve, and can therefore quite justifiably claim the interesting and alluring title "Seven League Boots for your Cossor Melody Maker."

RIPAULTS' SELF-REGENERATIVE BATTERIES.

Some few months ago I received one of Messrs. Ripaults' Self-Regenerative H.T. batteries, and this has been in constant use ever since. Certainly its voltage has dropped a little, but not yet to such an extent as to warrant placing the battery on the retired list. Readers will perhaps remember a report concerning a Ripault Battery which appeared in "P.W." at about the same period. This particular battery, too, still appears to have a fair reserve of energy.

The "Self-Regeneratives" do seem to have exceptionally long lives. The makers issue a leaflet giving a table showing the average useful life which can be expected from each of the various types in the range, and, as far as my personal experience goes, the figures are of quite a conservative character. The battery I have had in personal use has already exceeded its rated life.



One of the Ripaults' Self-Regenerative Batteries.

It is a very commendable and rather brave thing for a manufacturer to issue details such as the above, and it is to be hoped that their efforts will be appreciated.

Quite recently I received another Ripaults' Self-Regenerative battery—a standard 99-volt Chocolate Label type which retails at 16s. 6d. The term "Self-Regenerative" is not intended to convey that these batteries continue to recharge themselves for ever, but that they rapidly depolarise and come back fresh for another period of use very shortly after being sub-

jected to a hard period of work. Their lives are limited by definite capacities, although these are published, and, as constructors can judge, are usefully long.

BRANDES' BATTERIES.

One always takes something of a chance if one buys an unbranded H.T. battery, more particularly if it is of foreign make. There is extra good reason why a British battery is a sounder proposition. Even if a dry battery is not used it will slowly deteriorate, starting to do so the day it is made.



A Brandes' H.T. Battery.

If the battery were made in Germany, or in some other moderately distant land, one never could tell how long its life had been previous to the purchase of it at some local store. Reputable manufacturers, however, arrange so that their batteries are placed in purchasers' hands as soon after the date of issue from the factory as possible, and large retailers' stocks are not looked upon with approbation.

I was reminded of this by the announcement that Brandes are now making dry batteries for radio G.B. and H.T. purposes. Brandes always have had a name for direct and rapid supplies, so that here is a brand (no pun intended!) which can be trusted.

The Brandes range of batteries is a comprehensive one and includes popular types giving a maximum working current of 5 milliamps. (The B.S. 60 volts in this class costs 9s. 6d.) up to heavy dry batteries suitable for use with big sets. A 60-volter (extra large) type B.L. costs 17s. 6d.

THE "LISSENOLE" GRAMOPHONE.

In the early days of broadcasting radio and the gramophone formed opposing interests. And the worst thing one wireless amateur could say of another amateur's set was that it was "gramophony." Perhaps gramophone enthusiasts used radio sets as terms of opprobrium among each other, too; anyway, the two were definitely rival forms of entertainment.

In due course, however, a spirit of tolerance appeared to develop, until within the last year or so the radio set and the gramophone have tended not only to run parallel, but to link up. Some of the keenest of radio enthusiasts these days have their sets arranged so that records can be played through their loud speakers.

Broadcasting has the limitation that favourite items cannot always be heard when one wants to hear them, but if one has a gramophone one's favourite tunes are always available. And electrically recorded records operating a wireless amplifier by means of a "pick-up" sound every bit as good as the radio. The main requirement is a gramophone having a silent and steadily running turntable.

The new "Lissencola" Portable Gramophone, to which I made brief reference a week or two ago, answers the purpose admirably, while, additionally, it can be used by itself with excellent effect. Its design is far in advance of that met with in the usual cheap portable, for its reproduction is comparable with that obtainable with a good-class cabinet model.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

I have had the Senior type of "Lissencola" in use for a week or two and I find it very pleasing. It has a Garrard motor and costs 67s. 6d. I particularly like its substantial and brightly nickelled fittings, especially the two nice, robust snap locks (keys for which are supplied).

The record carrier is a safe and substantial one. The sound-box is of a very stout nature—a good point this in a portable gramophone. Altogether the "Lissencola" seems to be a first-class job at a second-rate price. It has not the resonant stridency of some portables and is, in fact, a very good



The "Lissencola" Gramophone reviewed on this page.

reproducer. The horn is scientifically designed and has an excellent projection. Our friends Messrs. Lissen should make as big a mark with their new production in the gramophone world as they have in radio.



Low price is not the only attraction

A NEW standard is set by Philips' Seven-Cornered Loudspeaker. Its construction is that of expensive models—a special electro-magnetic movement of the balanced armature type and a cone of ample surface area which maintains its rigidity under all conditions. Consequently Philips' Seven-Cornered Loudspeaker responds to an unusually wide range of frequencies and maintains a very natural tone.

You can regulate the reproduction to suit your own requirements by means of a unique two-position switch.

Philips' Seven-Cornered Loudspeaker is the first to bring quality to a low-price level, to set the advantages of a high-grade instrument within the reach of everyone.

Hear it before you buy a Loudspeaker, or if you have one at the moment, hear it to find out how much better your results might be.

Price **50/-**



PHILIPS *for Radio*

RECEPTION OF 5 S W.

The Editor, POPULAR WIRELESS.

Dear Sir,—Seeing in a recent issue that you asked for reports of 5 S W, I thought I'd drop a line in case you'd received nothing from these parts.

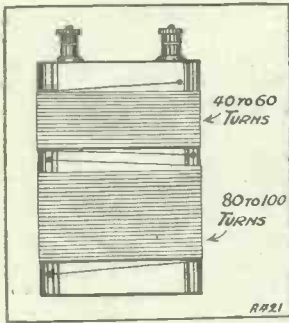
It's easily the best station I get, and my only complaint is unintelligibility; the strength of signals being very consistent for short waves.

The announcer from Chelmsford comes through almost as good as distant broadcast, and the bi-weekly talks to 2 X A D are still received word for word, though since the long days over there we don't get Mr. Prescott's Yankee accent in 5 S W's loud speaker any more.

Why are the London announcers unintelligible? I have it on the best authority that they really are the goods, yet of all the people speaking from London they're the only ones we can't follow. I can only think they must have a special "mike," as when they relay other stations or when 5 X X is on they're perfectly plain—the local announcers, I mean.

I have listened to London on an average four times a week since they started up, for at least three hours nightly, switching off only for the dry talks, i.e. 99.9 per cent of them. I have noticed that 5 S W fades off very gradually on some occasions towards the interval, and then comes up sparkling again on resuming.

I seldom have to go near the set after once tuning in, so it's not the receiving end. As a matter of fact, I'm usually in bed with the loud speaker close by and the set well off the oscillation-point, and I only get up now and again to return the compliment to some local oscillators. It's striking when one has been getting a lot of distortion and mush from London to hear the Chelmsford people announcing, and I am sure this has saved many a listener in the short waves from tinkering with his set and thinking the trouble was his end.



This is the method of mounting and coupling the reaction and primary coils in the constant reaction circuit referred to on this page.

I wish it were possible for Mr. Langridge, the Marconi engineer at Chelmsford, to give us a few short talks (say on short-wave work); his voice simply booms through here on the occasions he speaks to 2 X A D.

My set at present is a three-valver, with coils arranged on a glass tube à la Simmonds, ditto choke, Harmarlund condensers, Ideal 27-1 transformer. I'm using R.C. valves for detector and first L.F., as I found the power valves recommended for the detector gave no kick, and, in any case, you're always rubbing in the fact of a high-impedance valve to precede a high-impedance primary.

CORRESPONDENCE.

RECEPTION OF 5 S W.

THAT FLASH!—CONSTANT REACTION.

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

The aerial is stuck up in the backyard of an hotel, and surrounded by half an acre (more or less) of sheet iron roofing—this short-wave stuff is surely ambitious—it *does* try.

I have not written 5 S W, as I've never heard them ask for reports.

I've never failed to get readable speech even when they've had to switch on to ICW for 2 X A D's benefit.

Best of luck.

Yours truly,

ARTHUR H. RUDD.
P.O. Box 615, Salisbury, S. Rhodesia.

THAT FLASH!

The Editor, POPULAR WIRELESS.

Dear Sir,—The reason your correspondent saw a flash when he received a shock from his set was most probably because the current, or part, passed through his eyes, or the optic nerves. This suggestion was made by Mr. H. E. Slater, in the issue for July 28th.

I have a little book entitled "Elementary Electricity," published by an American firm; and about the physiological effects of electricity it says: "We do not have a special sense to note the electricity, but every one of our senses can be stimulated by the electric current." By transmitting a very weak current through the eye-ball, the sensation of a bright flash of light is produced.

I have experienced the sensation myself, and it occurred in the following manner. In our cellar, which had a stone floor, we had a faulty electric-light switch, and every time it was touched a shock was received. One day a friend was standing on a wooden box looking at it, and I remembered about the phenomena quoted from the book. I asked him to touch me on the forehead, and when he did so I saw a bright flash. I saw the flash better when I shut my eyes and every time he touched me. Of course, I was standing on the stone floor and the current was running to earth through my body.

Trusting this will be of interest to some of your readers.

Yours faithfully,

D. A. WATT.
7, Percy Terrace, Barn St., Haverfordwest, Pem.

CONSTANT REACTION.

The Editor, POPULAR WIRELESS.

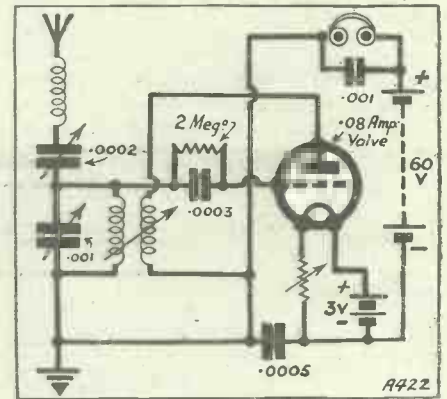
Dear Sir,—In POPULAR WIRELESS, November 19th, 1927, there appeared an article under the title of "Some Constant Reaction Experiments," by Mr. C. P. Allinson, A.M.I.R.E. About a week later I devised a circuit in which the reaction remains constant over a very wide range, i.e.—300 metres to about 2000 metres. For months I have tested this circuit under many conditions, but the reaction has remained quite constant.

You will see that two condensers are used, but the smaller one is merely a "setting-condenser" and can be placed behind the panel out of the way when once set for the particular aerial system. The valve impedance is 18,000 ohms, and this valve should always be used when the circuit is once set.

The necessary details appear in the circuit diagram herewith. I am one of your numerous schoolboy readers. A .001-mfd. condenser was used only to obtain a wide range of wave-lengths in order to see if the set remained stable, and a .0005 mfd. can be used if desired. For usual wave-lengths the coil Z is about 30 or 40 turns plug-in coil. The reaction coil should have about twice as many turns as the aerial coil. A suitable way of mounting the coils is shown in the diagram.

Yours faithfully,

B. J. EDWARDS.
Plumstead, S.E.18.



AMPLIFIER TIME CONSTANTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In reply to Mr. H. L. Kirke, I have always understood the time constant of the condenser-leak combination to be the product of the values of the two components. Organ and orchestral music is simply chock-full of sudden peak voltages which readily produce grid saturation. Since we must preserve the low notes, I do not see how in R.C. coupling grid saturation is to be avoided when these peak voltages occur. The chief difficulty in amplifier design lies in the attempt to give each and every signal input an equal chance. In R.C. coupling the condenser is a "maze," when it ought to be a "one-way route." *Hinc illa lacrimae.*

NOEL BONAVIA-HUNT.

London, N.W.6.

SOME time ago there was a great agitation about the official adoption of Esperanto as a language for international use by the amateur transmitters of the world. Although, since then, the total number of them has increased by an almost unbelievable amount, the transmitters do not seem to have favoured the suggestion in the very least!

The result is that English is the unofficial "International Language," and that the many thousand transmitting and receiving amateurs who live abroad use English for their "radio conversation" and for the remarks on their Q.S.L. cards. A few days ago I received from Brazil a card (from a man who would normally use Spanish, and who is a pure-bred Spaniard himself), whose knowledge of English is apparently better than that of many of our own amateurs!

"Don't Use Esperanto."

A Dutch transmitter, also, emblazons his cards with the slogan "Don't Use Esperanto!" and as the cards are printed in English, it is fairly obvious that that is his choice.

SHORT-WAVE NOTES.

By W. L. S.

I mention all this because the short waves have opened up in this way a problem that has never seriously been encountered by the broadcasting stations. It is as common for a man with a low-powered transmitter to get in touch with a foreigner as with some one in his own country, and were it not for the adoption of some sort of scheme the chaos would be complete for all who were not linguists.

Of course, the numerous "ham" abbreviations and the code of "Q." signals have made the matter still more easy, and at the present time there can hardly be said to be a "language problem" at all.

I wrote some weeks ago of a mysterious noise that has been worrying me on 20 metres, which was eventually traced to a broken strand in my seven-strand aerial

wire. Since then I have found and traced yet another annoying trouble, also due to the aerial.

Need for Care.

At the lead-in end I had, in the usual way, taken the aerial wire through the insulator, twisted it round on itself four or five turns, and led it down. Much dirt had accumulated on this end of the aerial, and the "twists" were apparently making intermittent contact with the main length of the wire. At times, when a strong wind was blowing and causing the aerial to rock considerably, the noise caused by this was enormous! The remedy was, of course, to insulate a few inches of the main wire with tape, twisting the lead-in portion round this instead of round the bare wire.

All these little troubles combine to show how extremely careful one has to be to put up a successful show on the shorter wave-lengths. Also, what good drill it must be for the comparatively simple problems attendant on broadcast work! Here one can use a dirty aerial and know nothing of it, but down below—no!

Stereoscopic Broadcasting

A GOOD receiving set working at its very best, a local B.B.C. station likewise operating in its most efficient manner, and transmitting a programme exactly to the taste of the individual listener. An ether free from all traces of static and local interference, and a loud speaker or a pair of headphones delivering signals of comfortable strength and entirely free from tonal distortion. Imagine all these factors to be combined and you will be very much inclined to say that perfect radio reception will be the result.



Can radio reception ever provide realism without some such measure as that outlined by the author? It makes an intriguing subject for discussion.

By J. F. CORRIGAN, M.Sc., A.I.C.

Absence of Reality.

But would such be the case, even under the above favourable and very infrequently attainable conditions? Unfortunately, it would not, for reasons which the reader will appreciate later on. Naturally, so far as the degree of personal pleasure and satisfaction derived from the transmitted programme was concerned in the above case, we might well say that, under these conditions, radio broadcasting could be considered to have attained a high pinnacle of excellence. Which is, of course, even at the present time, very strictly true. But on the purely technical side of the matter, there is still one factor wanting in all transmissions of sound, no matter whether they be of a radio nature or merely ordinary telephonic transmissions.

There is, in fact, always a certain absence of reality, of living presence, or whatever you like to call it, in all sound transmissions of a radio or electrical nature, just as, for instance, there is an absence of true reality about an ordinary photograph. Compared with a scene as viewed by the eyes, a photograph of the same scene always appears flat, and in some ways unreal.

The objects in the photograph do not stand out in relief from the background of the picture. Thanks to the twin sciences of optics and photography, however, the system of stereoscopic photography came into being many years ago, and by means of it photographic representations of scenes and objects in which the images stand out in life-like relief are obtainable.

Now, in a way somewhat analogous to an ordinary photograph, any radio sound transmission has a "flatness" about it. Listen carefully to the next transmission of your local station orchestra, instrumental combinations, or even to a soloist. Careful analysis of your hearing will convince you of the fact that practically the only factors which characterise the transmitted music are its intensity, that is to say its loudness or softness, and its quality.

Sound-Direction.

Such characteristics of the music are, of course, very faithfully transmitted and received, and they are sufficient in themselves to allow of any listener obtaining a great

deal of satisfaction from the broadcast as a whole. Yet, in any transmission there is always one big factor missing. Such a factor is the sense of *sound-direction*. And it is mainly in consequence of this loss of the sense of sound-direction that a certain



Additionally to the standard microphone, two extra ones are shown above, arranged to give a "stereoscopic" effect.

absence of reality is always an inevitable concomitant of radio transmission. Of course, the lack of such a sense is not of vital consequence, but nevertheless if a practical and a simple system of imparting the sense of sound-direction to radio transmissions could be devised, then the last touch of reality would be given to the broadcast programme.

Duplication Necessary.

The "stereoscopic" transmission of sound was suggested and demonstrated by means of the ordinary telephone a considerable number of years ago. Its application to broadcasting technique, however, was suggested and worked out in some detail by Captain Lewis, late of the B.B.C., and also by Captain Round, of the Marconi Research Department. Theoretically, the projected system of "stereoscopic" broad-

casting is fairly simple, although in practice it needs a duplication of all apparatus.

Consider a speaker whose words are being broadcast and received "stereoscopically." In order to effect this, two microphones will be needed, the speaker standing normally between and a little in front of them, but being free, of course, to change his position with regard to either of the microphones. Each microphone is provided with an amplifier, the two amplifiers being provided with single control, so that if the amplification of the current from one of the microphones is altered it will be altered in like degree for the other microphone. The amplifiers each deliver their output to a transmitter.

Thus, so far, we have two microphones, two amplifiers, and two transmitters. The two transmitters operate on different wave-lengths, wave-lengths which are sufficiently far apart to prevent interference. For the actual generation of ether waves, the transmitting aerials may be situated at any convenient distance apart.

The Receiving System.

Turning now to the receiving part of the system, two complete and entirely separate receivers are necessary to receive the programme in the manner intended. One of the receivers will be tuned to a higher wave-length, the other to a lower one. The output of each receiver can then be dealt with in two ways. A loud speaker may be connected to each receiver, or else the output of each receiver may be delivered to opposite sides of a pair of headphones. In this manner, "stereoscopic," or rather "sound-in-relief" effects will be obtained.

The whole operation will really comprise the transmission of the same sounds simultaneously on two separate wave-lengths, and also the simultaneous reception of these wave-lengths, the outputs of the two receivers being combined in the above manner.

Naturally, such a scheme has its problems and difficulties. These are obvious ones, for, in the first place, a considerable amount of expense would be attached to the system at both its transmitting and receiving ends, owing, of course, to the total duplication of apparatus rendered necessary. Again, the two receivers would have to be consistently reliable, so far as selectivity went.

The Danger of Prophecy.

It is probably facts such as these which in the past have created the opinion in the minds of many that the system as at present projected will never become a practical proposition. However, it is a very dangerous thing to predict forthcoming developments nowadays, and there is no doubt that by the use of such a system the realistic nature of any broadcast programme would be very greatly increased.

INDOOR AERIALS

There are innumerable types and shapes available to the man who wants to use an indoor aerial, and the most efficient methods are discussed in this article.

By J. F. CORRIGAN, M.Sc., A.I.C.

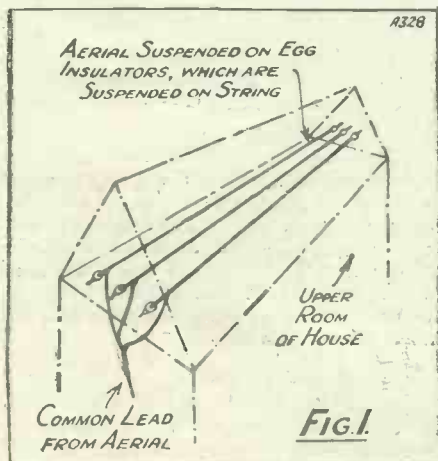
NNATURALLY, there are indoor aerials and indoor aerials. The man who strings up a few pieces of junk wire across the ceiling of his upper room, and who expects, as a result of this, to obtain good crystal reception from his "aerial," will, no doubt, be disappointed.

The essentials of success in indoor aerial construction can be summed up very briefly. In the first place, the aerial wires should be allowed as long a stretch as possible. They should not be placed too near one another, and, also, they should not touch any neighbouring wall, no matter how effectively insulated they may be. Attention must be paid to the insulation of the indoor aerial system at every point, and it is impossible to lay too great a stress on the fact that the high-frequency currents induced in the aerial under the action of the transmitted radio waves are always ready to take a short path to earth by capacity leakage whenever they are allowed to do so.

Preventing Leakage.

Thus, in order to avoid this capacity leakage, the aerial wire or wires should be maintained at least four inches away from any wall or other object, and they should also be led by as short a path as possible to the receiver.

Readers residing in the older types of houses will generally find it an easy matter to rig up an indoor aerial within the space existing between the upper ceiling of the house and the rafters. A suitable and efficient aerial of this type is illustrated in the sketch shown at Fig. 1. Three lengths of stranded or of No. 18 single wire, suitably insulated on egg

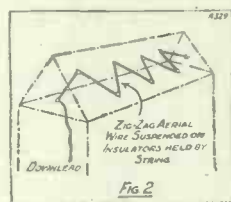


insulators, and joining into a common down-lead, will serve the purpose of an efficient indoor aerial for short-distance crystal reception for years and years. The lengths of wire should be kept about 6 ft. apart. If, owing to limitations of

roof space, this is found not to be possible, then the zig-zag type of aerial shown at Fig. 2 will be found to be more effective.

Another Type.

Again, quite a good indoor aerial for use within a confined space may be constructed by arranging a number of small porcelain insulators on three sides of the brick wall existing above the upper ceiling of the house. These insulators should be suspended on 4 in. lengths of stout twine,



the latter of which are attached to nails driven in the wall. The aerial wire can now be threaded through these, and finally pulled taut. By this method of construction the aerial wire will run round the three sides of the roof space, and will remain supported and adequately insulated at a distance of about 4 in. from the walls.

Readers who are unable to locate a suitable space for aerial erection between the ceiling of an upper room and the roof slating can make an indoor aerial of a very serviceable type by constructing the same sort of thing around the three sides of an upper room. The only objection against this type of aerial construction is that it does not exactly beautify the room and, on that account, may possibly give rise to some pointed comments on the part of the domestic powers-that-be in the household establishment.

If the house is situated in a high position, a single wire suspended along the whole length of an upper landing will make an effective indoor aerial for crystal reception within a short range of the local station.

It should be remembered that indoor aerials of the multi-wire variety tend to be rather directional in nature. For such reasons, therefore, it is best to try to arrange matters so that the down-lead from the aerial system is taken from the side nearest to the broadcasting station. The length of the aerial system should, if possible, point away from the station, and not be at right angles to it.

Good Earth Essential.

It goes without saying that a crystal set used on an indoor aerial *must* be provided with a thoroughly good earthing system. After experimenting with many different types of earths for indoor aerial working with crystal sets and one-valve receivers, I have come to the conclusion that nothing beats a well-soldered connection to a main water-pipe as an efficient and perfectly reliable earth.

It is not such a very difficult matter to solder an earth lead on to a cold-water pipe. The essentials of the job are to have

the water-pipe perfectly bright and clean, and to tin a little of its surface well and thoroughly with a large soldering iron. The end of the earth-lead is similarly treated, after which it can be gently sweated on to the tinned surface of the water-pipe by means of a quickly-applied hot iron. Subsequently, the junction of earth-lead with pipe should be bound up with a little tape, and a little oil, grease, or molten wax should be poured over the tape in order to impregnate it, and to prevent the access of air to the soldered surface.

An earth connection constructed in the above manner, a picture of which is shown, will prove thoroughly efficient. What is more, it will last as long as the water-pipe itself. Care should be taken, however, that the water-pipe selected for the operation goes *directly* into the ground, and that it does not branch off into the hot-water system of the house before returning to the ground.

In providing an earth connection for an indoor aerial receiving installation, always remember that the earth-lead should be insulated equally as effectively as is the aerial down-lead. The earth-lead should be as thick as the latter, also, otherwise resistance losses will be experienced.

Don't Miss Your Copy OF THE SEPTEMBER WIRELESS CONSTRUCTOR

Now On Sale. Price Sixpence.

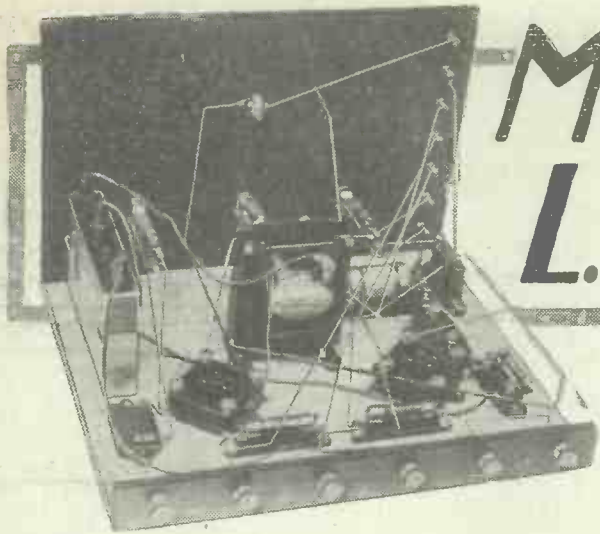
And, finally, as to the actual working of the crystal set in conjunction with the indoor aerial, it should be borne in mind that the indoor aerial will possess a greater self-capacity than an aerial of the out-of-doors type. Therefore, capacity in the receiver itself should be kept down to the utmost minimum, either by the elimination of condensers in the circuit, or by the very judicious use of them. Too great an amount of capacity in a crystal set, apart from flattening the tuning, actually acts as a damping agent, and it damps out weak signal impulses which would otherwise flow normally through the set from the aerial to the earth.

Wide-spaced coils or low-capacity variometers are about the best tuners for the above sort of work, whilst for crystals—well, there is nothing to beat a good semi-permanent detector of zincite and tellurium; or, if the crystal receptionist must have a rather *en hanced* sensitivity, an "ite" crystal used with a cat's-whisker contact.



An efficient earth is an essential part of any radio receiver not employing a frame aerial. The water-pipe earth should be well and truly soldered, and the joint covered over with oiled or greased tape.

MODERNISING L.F. AMPLIFIERS

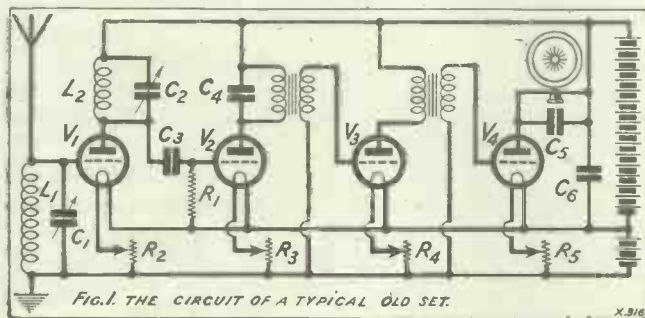


Does your set need bringing up to date?
A few alterations to many old sets will make all the difference between distortion and really good reproduction.
By A SPECIAL CORRESPONDENT.

THERE must be in existence at the present time any amount of old wireless sets with circuits something like that seen in Fig. 1. Many of these veterans are still in use, though their owners probably envy friends fortunate enough to possess up-to-date sets, since they realise, after hearing reproduction of broadcasting in other houses, that their

own apparatus falls very far short of the present-day standard. Mention, however, must be made of the rectifying valve. Probably in ninety-nine old sets out of a hundred this will function on the leaky-grid condenser principle. Much abuse has been hurled at the grid-leak-and-condenser rectifier, which has been held up to scorn as being inevitably a source of distortion. Actually, if the circuits are carefully arranged and if a suitable valve is used there is no reason why at any rate quite passable reproduction should not be obtained with a rectifier of this kind, particularly if no reaction is used.

It is the simplest possible business to convert a rectifier of this kind so as to function on the anode-bend system. A glance at Fig. 2 will show how it is done. The grid leak is disconnected from low-tension positive and is connected to the negative of a 3-volt flashlamp refill, whose positive is taken to the low-tension negative busbar.



Users of sets built three or four years ago need no longer complain that they are missing a great deal if they will spend a little time in making alterations and additions.

So long as the set is to be used for reception only of 5 X X, 5 G B or the local station, the high-frequency side is not vastly important, so that it does not matter if it is somewhat antediluvian. No great degree of selectivity is required, no big magnification per stage is called for.

The Detector.
A high-frequency coupling of the primitive tuned-anode or "mushroom" tuned-transformer type can therefore be left as it stands, though if the set is intended for family use it may be as well to remove the reaction coil, if any, and it is not a bad idea to substitute for the tuned-anode circuit a plain choke coil, or for a tuned transformer one of the aperiodic variety. Actually where quality is desired the high-frequency stages should not be too efficient.

The goodness or badness of the loud-speaker reproduction that any set will give depends mainly upon the note-magnifying department, and it is with the low-frequency side that the present article is chiefly concerned.

For grid-leak-and-condenser rectification the valve used will generally be one of medium-impedance type with an impedance, that is to say, of the order of 30,000 ohms. This should be

followed by a good-quality transformer with a step-up ratio not greater than $3\frac{1}{2}$ to 1. On no account, if you value your quality, purchase a small light transformer to couple the detector to the first low-frequency valve. What is needed is something with plenty of wire on the primary and a core of respectable cross section. Remember that any distortion introduced at this stage will be amplified and made far worse by the second note-magnifying valve, no matter how good it and its coupling may be.

R.C. Coupling.

Therefore, do not economise on the transformer that comes between your grid-leak rectifier and your first low-frequency valve. Luckily even the best nowadays is by no means expensive. If you have no high-frequency stage you will be wise to stick to the grid-leak-and-condenser rectifier unless it is desired to receive only a local station which provides powerful signals.

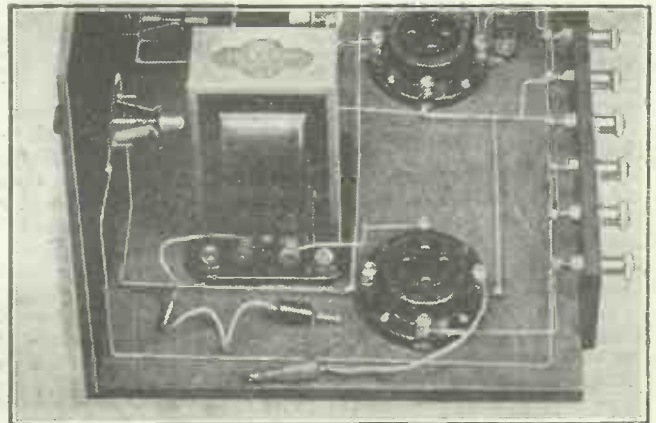
So long as there is a high-frequency stage the change over to anode-bend rectification is good policy. The valve is used as a rectifier and therefore the value of the anode resistance that follows it will depend upon circumstances. If signal strength is good a medium-impedance valve may be employed with an anode resistance of about 100,000 ohms, a grid condenser of .01 mfd., and a .5 megohm grid leak.

On the other hand, if it is found that signal strength is not quite sufficient a high-

(Continued on next page.)

efficient condition by giving it a separate high-tension positive lead and by moving the wander plug of this until signal strength and quality are at their best. Alternatively, a grid battery tapped at every $1\frac{1}{2}$ volts may be used and the grid bias adjusted to suit a fixed H.T. voltage.

For grid-leak-and-condenser rectification the valve used will generally be one of medium-impedance type with an impedance, that is to say, of the order of 30,000 ohms. This should be



A typical modern transformer-coupled L.F. stage. The present design of L.F. transformers allows these to be used without fear—which could hardly have been said of the transformers of yesteryear.

MODERNISING L.F. AMPLIFIERS.

(Continued from previous page.)

impedance valve may be employed with an anode resistance of 500,000 ohms, a .01-mfd. condenser and a 2-megohm grid leak. With such a valve $1\frac{1}{2}$ volts is sufficient negative grid bias with about 90 volts H.T. It must be remembered that the grid leak and the anode resistance are in parallel so far as oscillating currents are concerned.

It is for this reason that a grid resistance of much higher value is recommended for use where the rectifier is a high-impedance valve, which must have a resistance of at least 500,000 ohms in its plate circuit. If the value of the grid resistance is reduced, the magnification obtained immediately falls off.

Grid Bias is Essential.

The first note-magnifying valve is exceedingly important. Too often it is quite up to the work imposed upon it. In other words, it cannot deal with the impulses reaching its grid; it becomes overloaded and horrible distortion results. Speaking generally, it seldom pays to use a high-impedance valve in this position.

If a pair of telephones inserted into the plate circuit of the rectifier show but moderate strength at this point, a medium-impedance valve may be employed. Usually, however, it will be far better to have a "first-stage low-frequency valve," that is one with an impedance of the order of 8,000 to 15,000 ohms. In the out-of-date

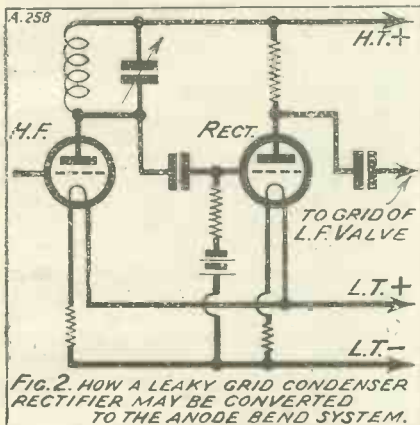


FIG. 2. HOW A LEAKY GRID CONDENSER RECTIFIER MAY BE CONVERTED TO THE ANODE BEND SYSTEM.

circuit seen in Fig. 1, neither low-frequency valve has any grid bias; and I have seen not a few sets whose constructors claimed that they were completely up to date in which no grid-biasing battery was employed.

Filter Circuits.

For good loud-speaker reproduction the last valve in the receiving set should undoubtedly be of the power or super-power type. A power valve, that is one with an impedance of 6,000 or 8,000 ohms, can handle energy sufficient to give loud-speaker reproduction that will fill a small room. For larger rooms the super-power, with an impedance of from 3,000 to 5,000 ohms, should be used.

A filter circuit should invariably be used, as shown in Figs. 3 and 4. A suitable value for the choke is from 25 to 35 henries, and

the output condenser should have a capacity of 1 or 2 microfarads.

Figs. 3 and 4 show the two different methods whereby the Fig. 1 circuit may be brought up to date. In Fig. 3, grid-leak-and-condenser rectification is retained, with transformer coupling between V_2 and V_3 . In Fig. 4 anode-bend rectification is used, and the coupling between the detector valve and the first note-magnifier is of the resistance-capacity type. Several other points call for comment.

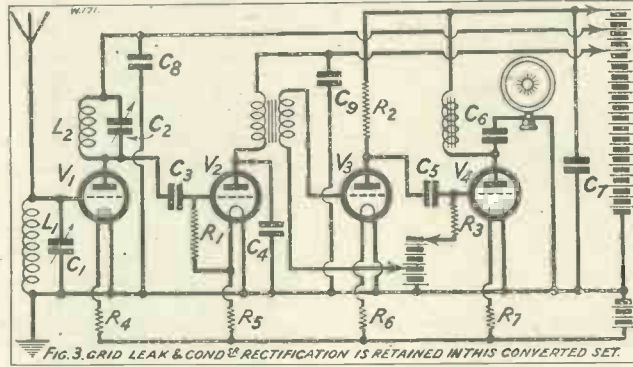


FIG. 3. GRID LEAK & CONDENSER RECTIFICATION IS RETAINED IN THIS CONVERTED SET.

It will be observed that in Fig. 1 the high-tension and low-tension batteries are connected in series, that is H.T. negative to L.T. positive. This combination was introduced some years ago with the idea of obtaining an extra few volts for the plates of the valves.

A Useful Tip.

Its great disadvantage is that should any short circuit between H.T. positive and L.T. negative take place the filaments of all valves are burnt out. In Figs. 3 and 4 the batteries are shown connected in the rational way, that is negative to negative. It will be seen in Fig. 1 that the condenser shunting the primary of the first L.F. transformer (C_4) is wired straight across the primary terminals. The logical position for C_4 is that shown in Fig. 3.

The process of bringing up to date the note-magnifying side of an old set is a simple one, and it is well worth while to undertake it. For quite a small expenditure an improvement in results can be obtained that will come as a revelation to those who carry out the recommendations that have been given.

Best Scheme.

In a circuit of the Fig. 1 type the simplest scheme is to take out the first L.F. transformer, replacing it with an R.C. coupling unit, and adopting the anode-bend detector, as described. Grid bias should be employed on the L.F. side, and an output filter device can be incorporated if a super-power valve is used in the last stage.

Incidentally, the value of the condenser marked C_4 , in Figs. 3 and 4, should not be greater than .0003 mfd., otherwise quality will suffer, the tone tending to become muffled.

ALL DONE BY DAVENTRY!

HOW can the Greenwich Time signal—sent out by the B.B.C. from Daventry—be made to keep a system of electric clocks in perfect time?

Checking the time of a clock is one thing, but putting it right is another. Can the "six pips" from Greenwich automatically be made to alter a clock if it is fast or slow? Can the wireless time signal be made to synchronise a system of clocks, keeping them correct by Greenwich mean time?

The credit for answering these questions in the affirmative goes to Mr. A. E. Ball, head designer of the Electric Clock Department of Messrs. Gent & Co., Ltd., Leicester. He uses a small aerial, permanently tuned in to Daventry, and a four-valve receiving set for effective synchronisation.

It receives the "six pips" of the standard time signal, and utilises the last dot to operate a synchronising device (known as the See-Saw Synchroniser) which was designed by Gent & Co., Ltd., for land-line synchronisation. This, in turn, controls the pendulum of a standard Pul-syn-etic time transmitter, the whole thing requiring no manual attention whatever. It does its day's work in exactly half a minute!

Every morning, whether the house is occupied or not, the apparatus connects up the aerial, switches on the valves, listens for the dots, and corrects the clocks by means of the last "pip"!

If for any reason the time signal is not transmitted, the apparatus waits one

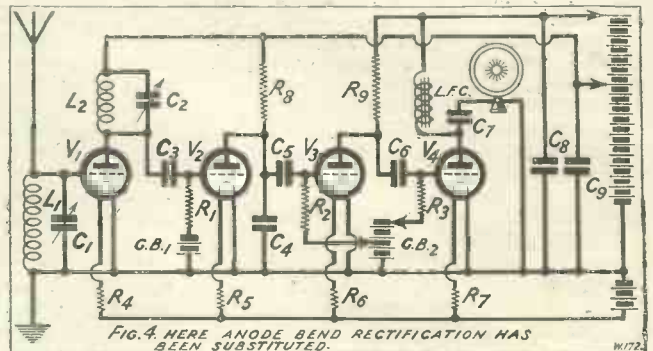


FIG. 4. HERE ANODE BEND RECTIFICATION HAS BEEN SUBSTITUTED.

minute—no more!—and then earths its aerial, switches off its valves, and goes to sleep for twenty-four hours. (This very rarely happens, of course, but if the B.B.C. fails the synchroniser does not.)

Next morning it is ready promptly to time, and when the signal comes it tunes in as before, corrects the clocks, if necessary, and switches off again just as though the routine had never been broken.



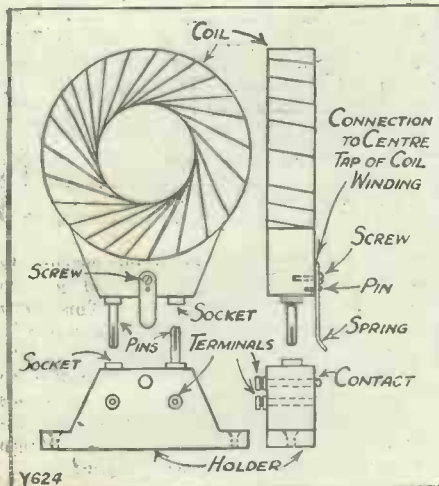
Noisy Mains Units.

SOME listeners think all extraneous and unexplainable noises are atmospheric. But it is really surprising how few of the "thunderstorms" experienced are really due to atmospheric disturbances. A slight leak in an electric cable even some miles away, or an electric tram or train passing over faulty "points," may give rise to noises not unlike atmospheric.

L.T. and H.T. batteries will give rise to almost any form of audible howl, crackle, or screech in loud speakers or headphones, but probably the most irritating of all types of interference is that due to a noisy H.T. eliminator. A hum can, if not too loud, be tolerated, but a steady and prolonged scratchy buzz will spoil even our best tempers. In nearly every case the fault can be traced to overloading the eliminator, perhaps not as a whole, but on one particular tapping only.

The output voltage of the majority of eliminators is adjusted by varying a resistance in series with the positive H.T. lead. In some cases this variable resistance is wire wound, but in others it is of the compression type. Should this particular regulator be called upon to pass more current than it is designed to handle, tiny arcs are liable to take place between the conducting carbon particles, and extraneous noises result.

A simple cure is to remove the overload from the resistor by providing a by-pass resistance placed in parallel. The exact resistance value may be difficult to determine, since the overloaded condition may be due to an incorrect resistance value in the first place. Hence a variable high resistance of the wire-wound variety, with a sufficient current-carrying capacity, should if possible be employed either as a shunt or as a substitute.



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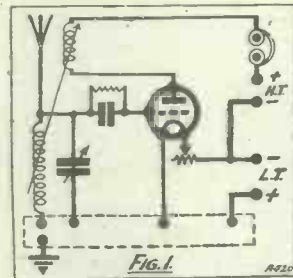
A selection of short articles of an eminently practical nature which covers all phases of radio receiver construction, operation and maintenance.

* * * * *

Simplified Set Wiring.

EVER since the innovation of the American type of set lay-out, utilising both panel and baseboard mounting for components, the aim of all wireless enthusiasts has been to make the wiring of a set as simple as possible without losing any efficiency.

By using the following method it is possible to do away with a number of long wires, without impairing the original efficiency.



Obtain a piece of thin sheet metal (copper is the best for soldering) about one inch wide and as long as the baseboard, and screw it on the base just clear of the

terminal strip. Now mount the components as usual, taking care to keep them clear of the copper sheet.

The wiring is carried out in the ordinary manner, the only difference being that all wires usually joined to earth are soldered direct to the sheet at the nearest point to the component concerned, the sheet in turn being joined to the earth terminal.

Fig. 1 shows an ordinary one-valver using this method, the dotted line showing where the copper sheet is placed. In a three or four-valve set the saving of leads would, of course, be proportionately greater.

In this manner it is possible to make the set much neater, and at the same time to save wire and labour.

Tapped Plug-in Coils.

THOSE who use the particular form of coil which is either centre tapped or X tapped will find the following suggestion of considerable use. The idea may be applied to existing commercial coils or home-made coils. The completed coil may be plugged into its holder without having to connect it in any way to the coil tap, the receiver wiring also remaining permanent and intact.

In adapting coils of commercial design it is only necessary to secure a spring contact as shown, and make connection from this point to the tap on the coil by means of fine wire. The base is prepared by assembling a terminal in the manner indicated.

Care must be taken not to drill near the existing pin or socket elements.

For home-made coils the details in the diagram can closely be followed. In wiring up the receiver connection is made direct from the centre terminal of the coil holder instead of the usual flex lead to the coil itself. When any coil prepared as described is plugged into the holder, contact is immediately made from the tap by means of the spring contact on the coil against the contact stud on the holder.

An H.T. Fuse Tip.

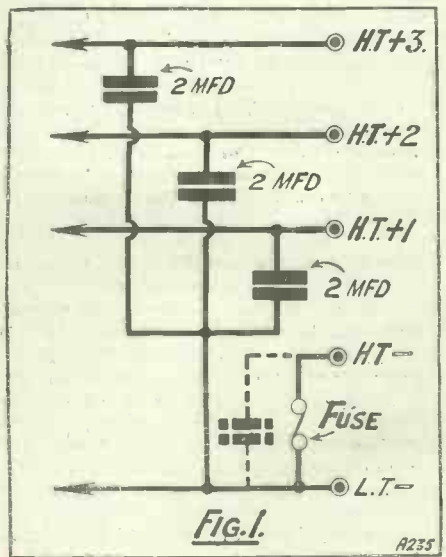
DURING the course of some receiver experiments on the test bench the other day, a rather peculiar effect was brought to light and the experience is recorded, together with the simple remedy adopted, so that others may benefit if they find themselves faced with a similar situation.

A multi-valve receiver was undergoing certain routine tests and the H.T. wander plugs having been inserted into their appropriate sockets, the H.T. - plug being connected last, the L.T. supply was switched on. Nothing happened, however, as far as signal reception was concerned, and although it was confirmed that the valve filaments were operative, the set appeared to be quite dead.

A few quick tests soon ran the trouble to earth. An H.T. fuse was incorporated in the receiver, the location being between the H.T. - and the L.T. - terminals, and the low-consumption bulb filament (60 milliamps) was burnt out.

The defective bulb was replaced with a new one, the set once more switched on but still silence. The H.T. fuse was

(Continued on next page.)



FOR THE SET BUILDER.

(Continued from previous page.)

re-examined and the bulb filament found to be burnt out again.

The set itself was, therefore, examined and appeared to be quite in order, but it was noticed that 2-mfd. condensers were shunted between L.T.— and each H.T.+ terminal, see Fig. 1. Now, if any of these condensers had developed a short circuit across their terminals this would obviously cause a short circuit between the H.T.+ tapping and H.T.—, since H.T.— was joined to L.T.— through the fuse, and was thus in circuit.

The abnormal current under these conditions would be sufficient to blow the fuse-lamp filament. Accordingly, each 2-mfd. condenser was tested separately, but the solution did not lie there, for they were all quite in order. Wherein lay the fault, therefore?

Now it is known that when a large-capacity fixed condenser is initially charged there is a momentary heavy current rush, and although no instruments were available to measure this initial current, it was felt that perhaps this was causing the burn-outs. A 2-mfd. condenser was in consequence placed in parallel with the H.T. fuse, as shown dotted in Fig. 1, and, with a new bulb screwed in, the set was switched on. The adoption of this plan cured the trouble.

Obviously, another and perhaps simpler way to safeguard the fuse would have been to join the common ends of the existing 2-mfd. condensers to H.T.— instead of to L.T.—, and should readers encounter a similar situation they can please themselves which alternative they adopt.

Blackening Metalwork.

THERE are a number of metal articles entering into the construction of radio receivers which often look better and more pleasing when their surfaces are given a black appearance. Such articles comprise, among others, small screws for the purpose of securing panels, angle brackets, various metal clips, metal supports for components, and so on.

In the case of small wood screws, if the heads of the screws are smeared over lightly with vaseline and subsequently held in the fire until the screw-head becomes red-hot, the latter will, on cooling, be found to have acquired a permanent black coloration.

Other articles, however, cannot be treated in this manner, mainly on account of their size. In such cases the following method is recommended.

Procure one ounce of phosphoric acid from the local druggist and dilute this with a pint of fresh water. Into the diluted acid place an ounce or two of clean iron filings.

Immerse in the above liquid the articles which are required to be blackened, and stand the vessel containing the liquid in a pan of hot water. Raise the water in the outer pan to near its boiling point, and keep it at that temperature for about half an hour.

After the lapse of this time remove the metal articles from the bath and wash them well in plenty of warm water. They will be found to have acquired a uniform black appearance, and if they are rubbed sub-

sequently with a little oil they will take upon themselves the slightly shiny appearance which is characteristic of gunmetal.

Strong vinegar can be used in place of the phosphoric acid mentioned above, but the black colour obtained by this means is not so good as that derived from the use of phosphoric acid, which, incidentally, is not an expensive commodity, an ounce of the liquid costing about sixpence.

Notes on Meters.

SOME types of meters are of a universal type which will measure both D.C. and A.C.

The most simple type in this class is the "hot-wire" instrument.

The current, whether D.C. or A.C., is made to pass through a fine wire and in so doing heat it up. Springs keep a constant tension on the wire and as the wire heats up and expands the springs take up this expansion. By this means the indicating needle is operated. It will be readily seen that no matter the direction of the current the resultant heating effect is all that matters, and thus the instrument measures either A.C. or D.C.

A more common type of meter, known as the moving-coil type, is only suitable for D.C., as its action depends on the reaction set up by two magnetic fields.

A still further type of instrument is known as the "soft iron" type, and its construction is unique in so far as the simple construction

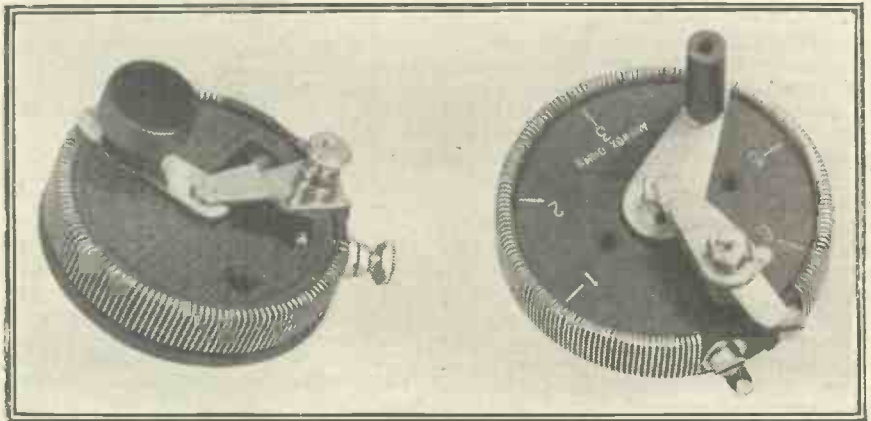
circulate in the moving coil to which the needle is fixed. The action is then similar to that of the ordinary moving-coil meter. The advantage of a thermo-couple meter is that it may be used for measuring high-frequency, low-frequency and direct current.

A Rheostat Refinement.

THE baseboard rheostat takes many forms, and one popular pattern is similar to those originally mounted on the panel but with the knob, etc., removed from the centre spindle, the requisite movement or setting of the movable arm bearing on the circular resistance element being undertaken with the fingers.

If the rheostat is tucked away amongst other components in a compact set this is liable to be awkward, and under such circumstances I find it a good plan to add a "knob" to the movable arm, as this makes it easier to move it round and impart the required adjustment.

As can be gathered from the accompanying photograph, this small refinement is quite simple. Slacken the nut holding down the spring, which usually presses on the movable arm bearing, and remove the arm. A search in the junk box is sure to bring to light a small knob, and this can be attached to the end of the arm by drilling a hole to clear a 4 or 6 B.A. screw and countersinking it on the under side. Now screw the knob over this screw with its countersunk head and replace the arm in position.



Two examples of baseboard-mounting rheostats. It will be noted that each has a variable control to which a knob has been added.

of same. The foundation of the instrument consists of a soft iron framework in the centre of which are arranged two half cylinders, also of soft iron. The inner "U" is free to move, whilst the outer is fixed. Current is passed through a coil in order to magnetise the two half cylinders of metal.

A balanced needle being attached to the inner member causes a deflection to take place over the scale.

A fourth design of instrument, which is now used extensively owing to the minute current taken to operate it, is the electrostatic type of meter.

The fifth and last type of instrument is a thermo-couple meter, in which the action is similar to that of an ordinary hot-wire instrument. Instead of one piece of wire, however, we have two wires of dissimilar metal surrounded by a heater element. The current to be measured is passed through the heater element and warms up the thermo-couple. An E.M.F. proportional to the heat received is thereby generated in the junction, which causes a current to

HINTS FOR YOUR NOTEBOOK.

IF you, or any member of your household, are nervous of lightning, remember that a lightning arrester is very easily bought and fitted to any existing aerial-earth system.

In the ordinary accumulator there is one more negative plate than positive.

The liquid in an accumulator should be kept at the level recommended by the makers, generally about a quarter of an inch above the top of the plates.

Two or three pennyworth of distilled water, obtainable from any chemist, will be all that is necessary to renew a small accumulator's evaporation losses over a period of a year or so.

“It's The Tobacco That Counts.”



*Player's
Please*



REGD. No. 154,011

N.O.C.49

Player's "Medium" Navy Cut Cigarettes, 10 for 6d., 20 for 11½d.

THE keen wireless constructor generally finds that the construction of the cabinet does not present such a great difficulty as the actual finishing of it. There is no doubt about the fact that a french polished finish gives the ideal and most desired result, but everyone knows that french polishing is an art.



HOME-MADE RADIO CABINETS

One of the difficulties encountered in the assembly of woodwork is to obtain a smooth and glossy polish: The following article tells you exactly how this problem can be solved by the constructor.

By H. BRAMFORD.

Another advantage of this process is that it renders the work of staining decidedly more economical, as to some extent it puts a good working surface on to the wood, especially where the material is of a soft nature. When the filling is completed it should be left for some time to set thoroughly.

There should be no attempt to hurry work of this nature under any circumstances.

The next thing to do is to sandpaper the whole cabinet once more, this time with very fine sandpaper. The work is now ready for staining.

There are two kinds of stain, water stain and spirit stain. The latter is best, as it does not raise the grain of the wood, whereas water stain has the effect of undoing to some extent the work which has already been done. Any colour of stain to suit the wood is obtainable. This is in powder form and is mixed with methylated spirits, the quantity of spirits being regulated by the depth or shade of colour desired.

For staining, a soft and perfectly clean brush must be used. The stain should be applied sparingly and not "slapped on," the brush being applied the way of the grain.

When finished, the work should once more be left for some time to dry, as,

although it appears to dry almost instantaneously, this is not the case actually, and it is impossible to make any effort at polishing on a damp surface. If the shade of colour does not appear to be dark enough the process may be repeated, but it must be remembered that the polished work will appear darker than the stained surface.

Final Hints.

We now come to the polishing. First take a wad of cotton wool and form it into a small pad by wrapping around it a piece of clean silk or soft, non-fluffy rag, the former, however, being preferable. Cut a niche in the cork of

the bottle of polish, so that a few drops of the liquid may be sprinkled from time to time upon the wad.

It is essential to sprinkle the polish on to the cotton wool inside the pad, and not on to the outer cloth, and it is only necessary to use a few drops at a time. The more sparingly the polish is used, the better will be the result. The pad is given a small circular motion, the polish being squeezed through at the same time.

The finishing touches are given with a backward and forward movement in the direction of the grain.

Success will be assured if the details given are carefully noted, as skill does not enter into the work at all. When the cabinet is built, it must be well sandpapered all over with rough paper; and a large cork block should be used for the purpose, around which the paper is wrapped.

Smoothing and Filling:

This process should be followed by a further papering with a finer grade to remove all scratches. Remember that everything depends upon the amount of work put into this operation, and the surface of the cabinet should now be perfectly smooth and all joinery quite invisible.

All sandpapering should be carried out by rubbing in the direction of the grain of the wood. (If the paper is used across the grain the work will be scratchy and probably irretrievably spoiled.)

In these days when almost everything is made easy for the constructor, one would expect to find some substitute for this difficult process, although of such a substitute many readers may not be aware. The object of this article, therefore, is to explain how french polishing can be successfully undertaken by the absolute beginner.

The methods described have been actually tried with great success, and the reader may be assured, therefore, that the advice given is of a practical and not a purely theoretical nature. Further, the writer is an amateur, so far as french polishing is concerned, and the results obtained therefore were not the outcome of professional skill.

First let us consider the complete outfit necessary for the amateur polisher. Most of this is shown in an interesting manner in the accompanying photograph.

The whole of the material necessary, sufficient for polishing half a dozen ordinary sized cabinets, costs only 2s. 9d., so it is obvious that the process is a decidedly economical one. The material recommended in the list has been tried, but there are, of course, several makes of polish obtainable, though no guarantee of results can be given, as these have not been tested actually. The complete list of materials is as follows:

The "Kit."

No. 2 sandpaper for first rub down of cabinet.

No. 1 sandpaper for second rub down of cabinet.

A.B.C. wood filling paste.

Turpentine for thinning down paste.

A.B.C. spirit stain in powder form.

Methylated spirit for mixing stain.

A.B.C. french polish.

No. 00 sandpaper for rubbing down after filling.

Cotton wool for pad.

Silk for wrapping round wool.

Soft brush for staining.

Having collected together the necessary paraphernalia, we will now consider the order in which the various processes of finishing must be carried out, remembering that all that is necessary is a little patience and a fair amount of "elbow grease."

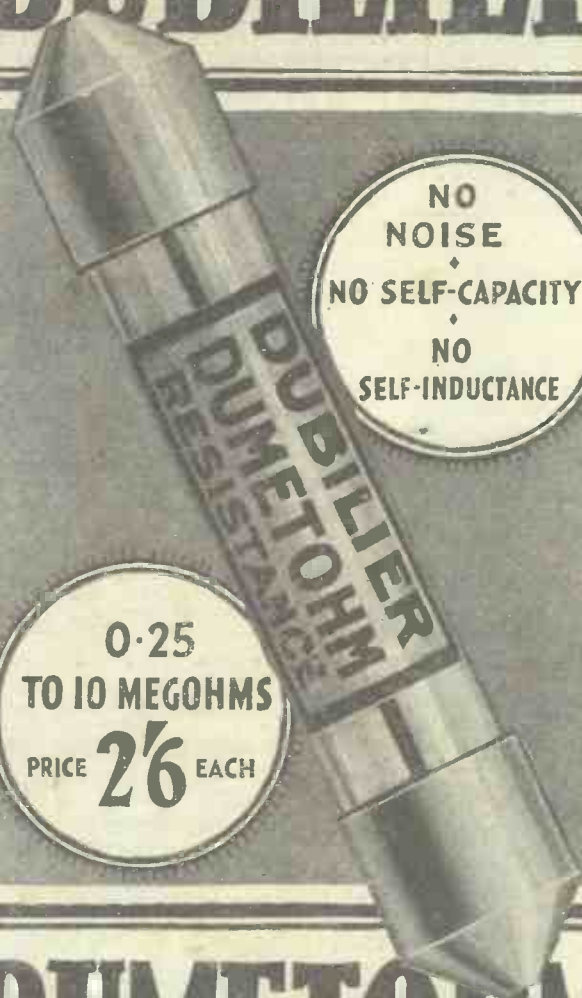


Here is the "french polishing" outfit. It is quite inexpensive and, providing you use it in the way indicated in the accompanying article, it will enable you to impart brilliant professional finishes to your radio cabinets.

All new wood requires filling. This process fills up the grain and enhances the finished appearance of the work by throwing out the markings of the wood.

For this purpose the wood-filling paste is used. If it is too thick it should be thinned down to a pasty mixture with a little turpentine, but it must not of course be used in liquid form. The paste is taken up on a piece of rag, which should be non-fluffy in texture, and rubbed well into the woodwork, this time directly across the grain, as in this manner the paste is worked into the lines of the wood.

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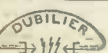
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RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

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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.

PROTECTING THE FILAMENT.

E. B. R. (Chatham).—"What is the advantage of shunting a grid leak across a negative grid-bias tapping and the negative end of the battery?"

The idea underlying this arrangement is that if the wander plug is removed from the battery for the purpose of adjustment the negative grid bias is still applied to the grid, and there is not a heavy increase of the plate current even though the filaments are alight at the time. (This would have a most deleterious effect upon the life of the valve.)

AN AMPLIFIER FOR GRAMOPHONE OR RADIO.

G. S. K. (Torquay).—"So what I should like is a really powerful three or four-valve amplifier, capable of giving great volume and excellent quality on a moving-coil loud speaker. In order that it could be used for dance music I should like it to be just as adaptable for gramophone as for radio, preferably with a switch by which one could switch over from one to the other without delay."

"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.

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

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

"If a set of this kind has been described in 'P.W.' will you please let me know the number, so that I can get particulars?"

Although nothing quite on these lines is being described in "P.W." there is a set very closely fulfilling all your requirements described in the current (Aug.) issue of "Modern Wireless." It is called "The Radio-Gram Amplifier," and is designed specifically with a view to excellent quality and to equal suitability for radio or gramophone.

HOME-MADE COILS.

B. E. A. (Bedford).—"I find making my own coils very fascinating work, but there is one little snag I often strike, and that is the size of the former."

"It is so difficult to cut a former when once the wire is on it that I try to get the former the right length for the winding before I start to wind it. Only on one or two occasions have I got it right, and then it is very gratifying to find the turns go on with just room enough to finish off. But generally what happens is that I either get my former longer than I want, or else I am unable to put on the full number of turns that I intended because there is no room for more on the former. As I am often using different sizes of wire and different numbers of turns for coils I shall be very glad to know how I can find out exactly what length of former to allow for a given number of turns of the different sizes of wire."

There is no need to leave this to chance, because all the various gauges of wire are of certain definite sizes, and consequently if the diameter of the wire is multiplied by the number of turns you are putting on, the resultant length is that which will be occupied by the completed winding. Allow a small margin for fixing off, and also because you will not be able to wind on the wire so exactly that each turn will lie perfectly side by side.

Then you have only to add this small margin to the theoretical calculation of the length the winding will take, to see exactly how long your former should be. Any electrician's handbook or table will tell you the exact diameter of the various types of wire.

For instance, the diameter of No. 30 enamelled wire is given as 0.017 inches, which is the thickness of one turn of the wire. Consequently 250 turns will be 0.017 multiplied 250 times, which is equal to 4.25 inches.

This is the exact size which would be occupied if the 250 turns were laid on perfectly close to one another. As stated previously, it is almost impossible to wind wire so perfectly, so it is necessary to allow just a little extra to cover small accidental spaces. The theoretical length of the windings above for the coil of wire would be 4.25 inches, so we should allow, say, 4 1/2 inches or a little more. This small margin will enable you to begin and finish the wire, and will be sufficient to allow for any little unevenness or imperfection in the winding.

ADDING AN L.F. STAGE.

W. D. Y. (Grimsby).—"The only trouble with the set is that it is not loud enough. Being in a very nice large case it looks the sort of set that ought to work a loud speaker perfectly, but at the time I made it I could

only afford two valves, so I made a Det.-L.F. set.

"Really I suppose it goes splendidly, for I have had a lot of foreign stations on it, and it is everything that could be desired for 'phone reception. But although I do not want a lot of noise I should like to work a loud speaker, and with this in mind I am determined to add a further stage.

"A friend of mine who is using the same circuit had a Det.-L.F. like mine, but he has added a resistance-capacity stage to it and he tells me that it gives good loud speaker results in that form. (Before it was just like mine.)

"Can you tell me what extra parts I shall require and how they should be connected up to give me a Det.-2 L.F. instead of the Det.-1 L.F.?"

Yes. The parts required will be a grid leak, an anode resistance, a fixed condenser, a filament resistance, and a valve holder. The anode resistance, which should be approximately 100,000 ohms, is connected across those points in the present circuit to which the loud speaker leads go (that is to say to H.T. positive and to the plate of the last valve).

The fixed condenser should be of mica and of a capacity of .1 mfd., and one side of this should be connected to the plate of the last valve, and to one side of the new anode resistance. The other side of the fixed condenser should be joined to the new grid leak and to the grid terminal of the new valve holder.

The new grid leak, which should have a value of approximately .5 meghom, should have its other end connected by a flexible lead to a new grid-bias negative terminal. The plate terminal on the new valve holder should be connected to one of the new loud-speaker terminals. The other new loud-speaker terminal should be taken to an H.T. positive terminal, which should have a flexible lead taken from it to a tapping on the H.T. battery.

Generally this H.T.+ plug should be placed at the maximum voltage obtainable. One of the valve holder's filament sockets should be connected to a terminal which can be joined to the L.T. negative wiring of the old set, the other filament socket being connected to the new rheostat. When the remaining side of the new rheostat has been connected to another terminal, labelled L.T.+, and connected to that point on the old set, the alterations will be complete, and you will have added a new resistance-capacity-coupling stage to the existing set.

THE "P.W." "STANDARD" WAVE-TRAP.

G. W. (Lancashire).—"Can you give me constructional details of the 'P.W.' Standard Wave-trap, which I have been recommended?"

The Standard Trap is assembled upon a small wooden baseboard, measuring 3 1/2 in. by 3 1/2 in., and about 3/8 in. thick, the intention being that this

(Continued on page 818.)

A RADIO RESCUE.

CAPTAIN COURTNEY—the intrepid British airman who was forced down into the Atlantic whilst attempting to fly from the Azores to Newfoundland—owes his life to his wireless set. An outbreak of fire in his flying-boat compelled him and his three companions to abandon the plane about 600 miles north-west of Horta, in the Azores. But before the flames had spread, a broadcast SOS from the distressed airmen had advised all liners in the vicinity of the disastrous outbreak, and several vessels rushed to the rescue.

The liners "President Harding," "Cedric," and "Celtic" were amongst those that searched the seas; but it was the Atlantic Transport Co.'s steamer, the "Minnewaska," that eventually reported by radio, "Rescued crew Dornier-Napier plane. No injuries."

The flyers were taken on board and conveyed to New York (to which port the "Minnewaska" was bound) after a long and perilous wait on the partly-submerged flying-boat.

An Important Announcement by the
Baird Television Development Co. Ltd.



Practical
TELEVISION
IS HERE!

IN view of the many contradictory statements which have recently appeared in the Press, we have pleasure in announcing to all who are interested in Wireless Reception that our new Transmission Station at 133, Long Acre, is nearing completion.

Within a very short time we propose to commence broadcasting our own programmes, for those of the Public who own the new Baird combined Wireless Receivers and Televisor Sets.

Where to see it.

This new dual receiving apparatus and televisor will be on view for the first time at the
RADIO EXHIBITION, OLYMPIA
September 22-29 on STANDS 13 and 14

Orders for the new dual sets will be taken at the Exhibition, and as soon as possible afterwards, our special broadcasting services from 133, Long Acre, will commence.

These services, in the first instance, may naturally be somewhat restricted; but, owing to the adaptability of the new Baird Dual Set, you will be capable of receiving the ordinary broadcast programmes.

The Baird Televisor will show, on your screen, the head and shoulders of the person being transmitted and give a living picture with perfect synchronism of movement and sound.

The new Baird Dual Set will revolutionise wireless reception. You must see it at the Radio Exhibition. Further particulars may be obtained at Stands 13 and 14 at the Radio Exhibition.

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 816.)

baseboard shall be screwed down directly upon the wooden base on the receiver. The coil is mounted on this in a horizontal position, with its centre at a height of 2 in. above the bottom of the small baseboard.

This point of the height of the coil is 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 watched.

The coil is wound upon a piece of ebonite, Pavolin, Pirtold, 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. An easy method is to fix an ebonite end disc into the tube and attach this by means of a screw to an upright strip of 3-ply wood, whose lower extremity is similarly secured by means of screws to the edge of the little baseboard.

The coil consists of 64 turns (in a single layer) of 28 D.C.C. wire. As the coil is wound, tappings are made in the 16th and 24th turns, these being the alternative positions for the aerial tap, the ends of the winding 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, the whole coil can be wound without making any tappings whatever, and then the 16th and 24th turns can be prised up slightly with the blade of a pocket-knife, and two short pieces of match-stick about 1/2 in. 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.

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 capacity of this component will depend upon the wave-length of the station it is desired to eliminate.

If the wave of your nearest station is below 400 metres, a .00025 mfd. or .0003 mfd. will be required, while if it is 400 metres or over, one of .0005 mfd. should be chosen. The alternative capacities of .00025 or .0003 mfd. have been given because in some makes only a .00025 mfd. is available, whereas in others, .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 3-in. thick ebonite, 2 1/2 in. by 1 1/2 in., carrying a terminal and two sockets, such as the Clix or Belex 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.

THE "VERSATILE" ONE.

"VERSATILE" (Chopstow, Mon.).—"What are the connections of the 'Versatile' One (in words)?"

The point-to-point connections of the "Versatile" One are as follow:

Connect E terminal to one side of R₁ to L.T. + and to H.T. -. Other side of R₁ to filament +. Socket terminal of L₁ to one side of C₂ R₂, and to fixed vanes of C₁.

Plug terminal of L₁ to moving vanes of C₁. Filament - of valve holder to L.T. -. Anode of valve holder to one side of H.F. choke and fixed vanes of C₁.

Other side of H.F. choke to 'phone terminal. Other 'phone terminal to H.T. +. Remaining sides of R₂ and C₂ to grid of valve holder.

Connect a piece of flex with spade tag to E. Connect a piece of flex with spade tag to moving vanes of C₁. Connect a piece of flex with spade tag to E. This completes the wiring.

SMOKING H.T.

F. H., a Barking (Essex) reader of "P.W.," raises a very interesting question in a letter to the Editor, which, on account of its general interest, is reproduced below.

"Dear Sir," he says,—"Having had a strange experience with my flash-lamp batteries which I use as a high-tension battery, I thought you might like to hear of it.

"I first noticed a strange noise coming from my loud speaker. Thinking that perhaps a connection of the batteries had become loose, I drew out the tray containing these, and then I noticed smoke coming from between them.

"The batteries are placed in two rows of fifteen in each row, and they were not tightly packed. Separating the two rows was a piece of cardboard. I pulled this out and found that it was burnt through in two places.

"I then took out the batteries and found that two of them had burnt through at the bottom, and so through the cardboard into the two opposite ones; also that two or three others were very hot. The batteries were connected up correctly, and I have used this type of H.T. for about three years.

"I have never had anything like it happen before, neither have I heard of such a thing from anybody else, but still, it has happened in my case, so it seems it can happen with others.

"And as there must be thousands using this type of H.T. it seems to me to be a dangerous method, and I thought you might publish a warning, even though it may be the way I had them connected—in two rows. There must be many using them in the same way to save space."

Before dealing with the cause of this battery bonfire it will be appropriate to say a few words of thanks to F. H. for his letter. "P.W." is often very proud of its readers—and can you wonder at it?

Amongst the thousands of letters that "P.W." receives are many that help on the good cause of radio, in one way or another. Again and again money-saving hints or useful little tips have been given by one reader to all others, and it is noteworthy that no sooner does a "P.W."-ite find out for himself some useful little stunt than he, like a good chap, wants to pass it on to fellow readers to help them too.

In our Correspondence columns hundreds of valuable little suggestions have been made from time to time by readers anxious to help others. This letter of F.H.'s does not appear under "Correspondence" because it needs an answer, but it will be noted that he, too, has the right radio spirit.

Having been "stung" himself, he spares time and three-halfpence for a stamp to write a warning to fellow "P.W." readers, who might, unknowingly, get stung too! And by doing so he earns the thanks of all of us, which we are glad to be able to pass on

(Continued on page 820.)

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"ATLAS"
BATTERY
ELIMINATOR

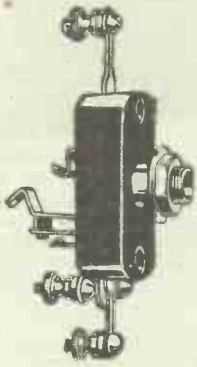
There is never any danger of a weakening battery spoiling the best part of the programme when you use a Clarke's "Atlas" Battery Eliminator. You'll get real reception then—as clear as it is in the studio—without distortion, or interference from battery troubles. No need for recharging. Just plug in.

Clarke's "Atlas" Battery Eliminators are made in a number of types for Alternating Current or Direct Current. The one illustrated is the D.C. 10 type suitable for 200/250 Volt D.C. Mains, providing one Fixed Tapping of 120 volts and one Variable Tapping, voltage of which can be varied from 0/100 volts. Maximum output: 20 m/A. Price £3 15s. Od.

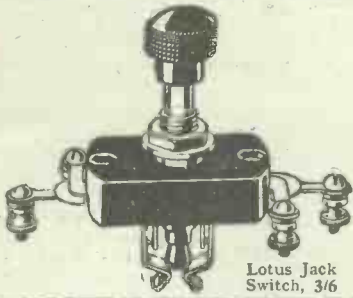
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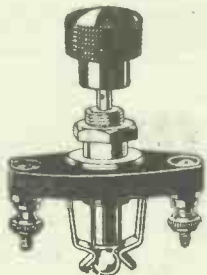
Lotus Jack Switch, 3/6

The Ideal Components for set makers

A contact made with a Lotus Jack, Switch or Plug is perfect. Very careful attention is paid to the detail in these components. They have nickel silver springs and pure silver contacts and are made of the finest bakelite mouldings. They occupy less than 1 1/4" behind the panel and the fantailed spring ends make wiring easy to plan. Any set you make or buy will be more sound, neat and reliable for the inclusion of Lotus Jacks, Switches and Plugs.

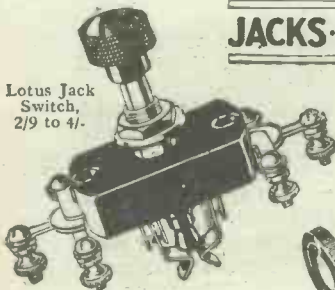


Lotus Jack Plug, 2/-

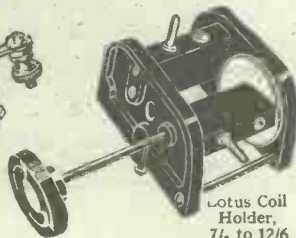


Lotus Battery Switch, 1/6

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REDUCTION IN PRICES
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SIEMENS H. T. BATTERIES
Better than ever — at a Lower Price

STANDARD TYPE (BROWN LABEL)

SIZE NO	VOLTS	OLD PRICE	NEW PRICE
826	30	7/-	6/-
827	36	7/6	6/6
828	54	10/6	9/6
829	66	12/6	11/-
830	99	20/-	17/-
831	108	21/-	18/-
915	120	24/-	20/-

The Standard type batteries, with the Brown label, are of the highest possible quality. No better battery can be made.

WRITE FOR NEW ILLUSTRATED CATALOGUE No. 641.

POPULAR TYPE (GREEN LABEL)

SIZE NO	VOLTS	OLD PRICE	NEW PRICE
1200	60	8/6	8/-
1202	100	14/-	13/-
1204	60	15/-	13/6
1206	100	25/-	22/6

Siemens Battery for Pocket Flash Lamps Now 6d. each.

The Popular type, with the Green label, offers the best value obtainable at popular prices.

SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E.18

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 818.)

to him, and to those other friendly souls and good sports who try to help their fellow radio-men.

Now, about the cause of this smoke, etc. As suggested in the letter above, there was a certain amount of danger of fire, and the question is, how? The answer can be given in two words, "poor insulation."

When flash-lamp batteries are joined together as described, there is quite a big voltage across the battery—about 135 volts in this instance. And if 135 volts get a chance they are going to make some current flow.

When F. H. put cardboard between the rows he no doubt thought it was a good enough insulator. But it wasn't!

Cardboard ought to be first "soaked" in hot wax if it is to be much good as an insulator, and even then it must be thick and strong or the insulation will "puncture" and leakage will occur.

This is what happened in F. H.'s battery at Barking, and probably there was a small hole or two where the cardboard was thin, or there were metallic impurities in or on it. Or perhaps a sharp corner or wire pricked through the cardboard.

As the cells were standing in rows, the positives at one end of the battery were not sufficiently separated from the negatives at the other end of it. No sooner did the volts find somewhere to leak through than they set up a current, and this was powerful enough to heat the conductors across which it was flowing. Hence the smoke, and the danger of fire if anything inflammable were close enough.

To avoid such possibilities in future, it must be remembered that in the properly made H.T. battery every cell is carefully and completely insulated. The black "pitch" covering holds all the metal strips firmly in place. They must not wobble, or wander, or get loose. If a home-made battery is assembled equal care must be taken to insulate all the connections.

It is not wise to stand one row of cells upon another row, because the insulation between may get worn through, and then the contacts on one row will touch the metal of the other row, and the trouble will begin. So if ever you use home-made H.T. again, be sure all the insulation is good, and that there are no loose wires or connections.

COMPLAINTS ABOUT REACTION.

"INNOCENT" (Catford, London, S.E.).—"It is only a one-valve set and neither of the

dials is marked 'reaction.' Yet my neighbour keeps on saying that I interfere with him when I am working the set. Try as I will, I cannot convince him that it is not me. What would you do with a man like that?"

We are afraid, "Innocent," that you are not all that your non-de-plume makes you out to be. For it seems to us extremely likely that you are the cause of the interference complained of!

It is not safe to assume that a set will not interfere because it is a one-valver. Nor is it safe to assume that no reaction is fitted just because the word does not appear on the panel.

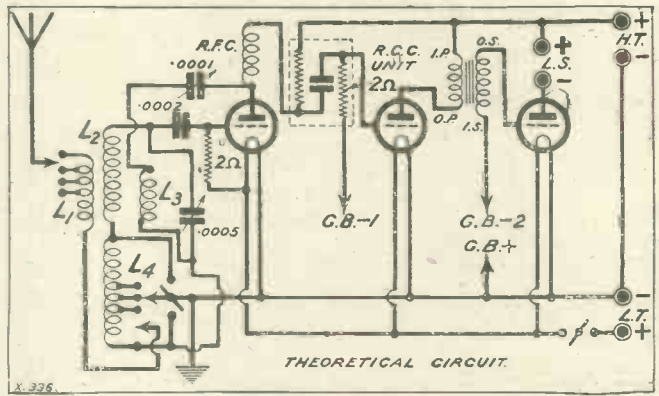
Very often manufacturers of sets use such words as "Strengthen" or "Increase," instead of "Reaction," but almost invariably this latter is what it means. We are quite sure that you do not really wish to spoil your neighbour's entertainment, and frankly we think that unless you take care you are in danger of doing this.

Why not write to the B.B.C., 2, Savoy Hill, London, W.C.2, for their free booklet on oscillation, which explains the whole business in very simple words? We feel sure that you will find it very helpful in getting good results, as well as in assisting you not to interfere with neighbouring listeners.

THE "SCEPTIC'S" THREE.

"ANTISEPTIC" (Henley - on - Thames).—"I have become very interested in The 'Sceptic's' Three since reading about it in 'Correspondence,' etc., and I should like to know in what number this set was described and what circuit was used?"

The "Sceptic's" Three was fully described in "P.W." No. 315 (June 16th issue). The circuit was a straightforward Det. and 2 L.F., with wave-change as shown in the accompanying diagram.



The "Wireless World" says: "We hope that other dry battery makers will follow Messrs. Ripaults' lead and come out into the open with details of the average life which may be expected from their cells."—See page 478, May 2nd issue.

FACTS AND FIGURES

The figures shown on the table below in respect of a "High-class Ordinary Battery" are as a matter of fact identical with those which recently appeared in a Trade Organ, and from the figures quoted it will be seen that **RIPAULTS' SELF-REGENERATIVE H.T. DRY BATTERIES** have very nearly double the life of an ordinary high-class battery.

Capacity and rate at which discharged	Useful Life		
	Ripaults' Self-Regenerative Battery	Any High-class Ordinary Battery	Extra Life Given by Ripaults' Battery
Standard Capacity Discharged at 5 m.a.	550 hrs.	320 hrs.	230 hrs.
Double Capacity Discharged at 10 m.a.	475 hrs.	260 hrs.	215 hrs.
Treble Capacity Discharged at 15 m.a.	500 hrs.	280 hrs.	220 hrs.

STANDARD, 60-volt, 10/6; 99-volt, 16/6. DOUBLE, 60-volt, 15/6; 90-volt, 22/6. TREBLE, 60-volt, 19/6; 90-volt, 29/6.

RIPAULTS' LEAD IN LIFE, EFFICIENCY AND VALUE.

How do we obtain more than 11 volts per cell? Many Technical Experts will tell you this is impossible, and yet, for example, our 60-volt models contain only 40 cells and the total E.M.F. is approximately 64 volts. The common practice of including additional cells to bring up the voltage is misleading unless the purchaser is warned that a Battery containing, for example, 48 cells should give a reading of not less than 66 volts, otherwise deterioration has already commenced. Write for Ripaults' "Life Chart" and "Right Choice" table P/W99, with full range of voltages and prices, also complete copies of technical Press "test" reports.

Obtainable from all Dealers. If any difficulty locally write us. **RIPAULTS, LTD., 1, KINGS RD., LONDON N.W.1**

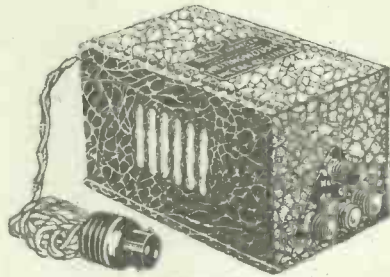
AN APOLOGY
 IN THE HIGH COURT OF JUSTICE
 Chancery Division (Mr. Justice Astbury)
 Between
DUBILIER CONDENSER CO. (1925) LTD.
 and
 Plaintiffs
THE SUPER RADIO COMPANY (a firm)
 Defendants

IN CONSIDERATION of your refraining from continuing the above action I **THE UNDERSIGNED, BERNARD FREEMAN**, trading as the Super Radio Company at 2, Bank Street, Bradford, and King Street, Nottingham, **DO HEREBY ADMIT** that I have sold **ELECTRICAL RESISTANCES** not of your manufacture or merchandize to which the name "Dubilier" has been applied in infringement of your Registered Trade Mark "Dubilier." **I HEREBY APOLOGISE** for such infringement and **UNDERTAKE** not at any time hereafter to sell or offer for sale goods not of your manufacture or merchandize under the name "Dubilier" or any colourable or obvious imitation thereof, to deliver up all articles to which the same name has been wrongfully applied, and to pay your costs of the above action and I authorise you to advertise this apology.

Dated, 23rd July, 1928.
 Signed, **BERNARD FREEMAN.**
 TO THE ABOVE-MENTIONED PLAINTIFFS.

"Popular Wireless" Praises:

The Brand New "EKCO" Permanent Trickle Charger



PRICE

52/6

COMPLETE

"Popular Wireless," dated July 28th, writes:

"For the last week or two we have had under test the new "Ekco" Trickle Charger. The particular model sent to us was the T500 for A.C. mains, which can be supplied to suit any of the usual voltages and frequencies. Its output is half an ampere for 2-, 4- or 6-volt accumulator.

"We have found this latest "Ekco" product perfectly satisfactory. Indeed, we consider it a uniquely attractive proposition. It is certainly safe, silent and sound, and at its price of 52s. 6d. it appears to be unusually good value for money, more especially in view of the fact that the whole outfit has the lasting qualities of an iron box, or something else equally simple and strong in character!"

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Two models are supplied:

T500 for 200 to 250 v. 40 to 100 cycles.
T500a for 100 to 120 v. 40 to 100 cycles.

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AMATEUR WIRELESS 14/3/28 says: "The characteristics of this Valve compare favourably with many well-known makes."

Type	Fil. Volts	Amp.	Imp. Chms.	Amp. Fac	
PR 1	2	.095	30,000	14	H.F.
PR 2	2	.095	28,000	13	Det.
PR 3	2	.095	15,000	8	L.F.
PR 4	2	.095	120,000	32	R.C.
PR 8	3.5.4	.063	23,600	15	H.F.
PR 9	3.5.4	.063	18,000	14	Det.
PR10	3.5.4	.063	10,000	8.7	L.F.
PR11	3.5.4	.063	88,000	40	R.C.
PR16	5.6	.1	19,000	12	H.F.
PR17	5.6	.1	18,000	17	Det.
PR18	5.6	.1	9,500	9	L.F.
PR19	5.6	.1	80,000	40	R.C.
PR20	?	.15	7,000	6	Power
PR40	4	.15	7,000	6	"
PR60	6	.1	5,000	6	"

WHAT OTHERS SAY of P.R. VALVES

Unsurpassed for purity of tone and selectivity—the equal of any," is the opinion expressed in hundreds of letters from satisfied users—the originals can be seen at our offices.

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17p, Paternoster Square, LONDON, E.C.4.

NEWS FROM SAVOY HILL.

(Continued from page 802.)

action of the Privy Council will be necessary. One idea for the forthcoming reorganisation is that when broadcasting has been put on a competitive commercial basis and the receiving licence washed-out, each regional station would be run by a separate commercial company out of the profits on "aether ads."

The Governors and Talks.

The Governors of the B.B.C. are reported to be in something of a panic over the last attack on talks by the newspapers. It is stated that in the early autumn, when they resume their meeting, they will consider washing-out the talks organisation at Savoy Hill and handing over the funds thus released to variety and light music. This would appear to be the first occasion on which the Governors have taken cognisance of a newspaper attack on talks. There is some scepticism as to whether the Governors will accomplish anything in the end, despite the brave tone of recent secret meetings. By the way, it is interesting to note that members of the Wireless Organisation Advisory Committee at Savoy Hill have suggested that the Governors follow their example in issuing a periodical report of what goes on at their meetings. An unkind newspaper commentator remarks that a comprehensive and truthful record of the kind would impose no excessive demand on the space of those journals who might be disposed to publish it.

Will Captain Eckersley Stay ?

Well-informed opinion in broadcasting circles is doubtful whether Captain Eckersley will tolerate the Corporation much longer. The ever-popular Chief Engineer at Savoy Hill is being subject to increasing restrictions in several directions, and pressure is not far from the bursting-point. If Captain P. P. does chuck in his hand, there will be real fireworks. The Press and public will get some first-hand news of what goes on in the inner councils at Savoy Hill. From all accounts, Commander Daniels' revelations would be surpassed. There is, indeed, a rumour that a well-known London daily recently approached Captain Eckersley. He would not, of course, accept an offer of this kind, at least not yet.

A Pouishnov Recital.

Lef Pouishnov is to give a special recital from 2 L O and 5 X X on August 20th. His programme will include thirty "variations in C Minor by Beethoven, and the first broadcast performance of Godowsky's arrangement of "The Swan," by Saint-Saëns.

The Albert de Courville Mystery.

The B.B.C. recently announced with considerable blare of trumpets that Mr. Albert de Courville would do a new series of revues for broadcasting on the now familiar Charlot lines, only with de Courville flavour and elan. The first performance of the new series was to be entitled "Djinn-and Bitters," and to be broadcast on August 25th. Now Savoy Hill simply cancels the de Courville part of the announcement, but promises the performance otherwise. Mr. de Courville has made no statement for publication; but it is understood that a big row is brewing.

TECHNICAL NOTES.

(Continued from page 802.)

rectifier to work properly has been due to the trouble in finding methods of forming the oxide coating in the correct crystalline form and without the admixture of other undesirable copper oxides which, by their presence, militate against the proper rectifying action.

Overheating.

With the copper oxide rectifier it is very important to avoid excessive heating, as this may rapidly break down the crystalline structure of the oxide layer and so destroy the rectifying property. Since the heat produced in this rectifier is generated in the very restricted space at the surface of the oxide-coated copper disc, it is essential to find means to get the heat out and dissipate it as effectively as possible. This is done by introducing large copper discs which serve as cooling vanes and act by dissipating the heat to the air.

Current for Coil-Drive Speakers.

One of the newer applications of chargers and mains units—at any rate, of chargers—is to the supply of the field current for coil-drive loud speakers. As you know, in the coil-drive loud speaker, at any rate in most types, the permanent magnetic field is obtained by means of an electro-magnet, and this must be supplied with D.C. In many types of coil-drive loud speaker, the field coil is designed for taking current at 6 volts from an ordinary 6-volt accumulator. Usually the wattage consumed is about 3 watts, which means $\frac{1}{2}$ -ampere from the 6-volt accumulator.

Field and Filaments.

If, however, your accumulator is not of sufficiently large capacity to supply the current for the filaments and for the loud speaker field winding at the same time, you may do one of two things: You may connect your battery-charger or trickle-charger to the accumulator and leave it in operation whilst the accumulator is working the set—the possible objection to this is that an A.C. hum may be produced (in certain cases) which is not entirely smoothed out by the "buffer" action of the L.T. accumulator.

Field-Coil Current.

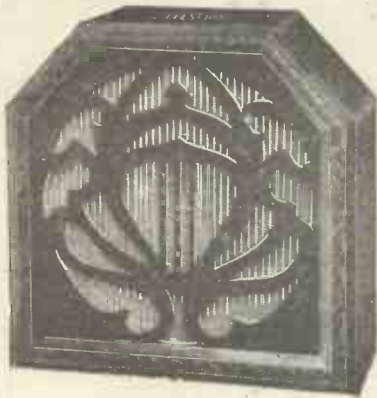
Or, alternatively, you may disconnect the accumulator from the charger, using the accumulator simply to light the valve filaments, whilst the trickle-charger may then be connected direct to the field-coil terminals of the loud speaker. You will find that it is not absolutely essential to have a pure, smoothed-out source of D.C. for the field-coil, and in most cases the rectified output from the charger will be quite satisfactory.

As a matter of fact, the field-coil of the loud speaker acts, as quite an efficient smoothing device itself without anything further, so that even if the output of the charger may not be particularly smooth, the resultant magnetic or electro-magnetic field produced by the field coil may be quite reasonably uniform.

H.T. Coils.

In other cases, coil-drive loud speakers are designed for connecting the field coil

(Continued on page 824.)



MODEL C12.

First on Merit— on Demonstration

The above bold assertion is no idle boast. The wireless press, independent radio experts, musical authorities and the public have literally showered letters of praise upon us.

A prominent wireless trade paper awarded the highest place to "Celestion."

"A long way ahead of its class," and "The embodiment of all that is good," wrote "Popular Wireless" and "The Wireless World" respectively. "Celestion" can justly claim to be the pioneer British reinforced large diaphragm loud speaker.

"Celestion" is British made throughout.

"Celestion" instruments are made under licence. Demonstrations daily without obligation at our showrooms, one minute from Charing Cross.

Models range in oak or mahogany from £5 10s. to £25. Write for full details of all models and of the Celestion "Woodroffe" Type Gramophone Pick-Up, price £4 4s. When ordering Pick-Up please state whether adaptor is H.M.V. or $\frac{1}{2}$ -inch size.

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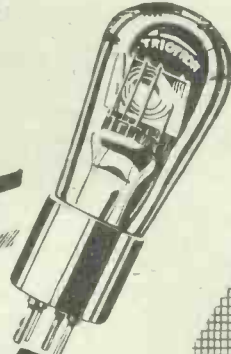
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THE UNIQUE



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The Picture Paper with the MOST News

—SUNDAY GRAPHIC—

TECHNICAL NOTES.

(Continued from page 822.)

straight to the D.C. mains at a voltage of 200 and upwards. In these cases usually the actual current required varies between 25 and 100 milliamperes—that is, between 5 and 20 watts.

If the mains supply is A.C., of course it will be necessary to introduce a rectifier, and you should note that there will be a drop of potential in the rectifier, which means that you will be applying a lower D.C. voltage to the field coil than if the mains were of the same rated voltage; but D.C. In any case, it is probable that in many cases you may have to use a lamp or other resistance in series with the field coil, so that this will provide a simple means of compensating for any loss of voltage in the rectifier.

Talking Films.

As regards the talking film, there are several different systems now in more or less successful commercial use. One is the

MODERN WIRELESS

reception necessitates

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receivers employing

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components and

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circuits. In other words

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constructors must have

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well-known Movietone, another is the Phonofilm, whilst another is the Phototone which has been much talked of in the last few weeks.

It is said that Edison, about thirty to forty years ago, when he was experimenting with the earliest form of "talking machine," had also the idea of reproducing pictures with the talking machine so that "sound and sight" could be simultaneously achieved.

Long-Distance Transmission.

I have a letter from a reader, raising a very interesting point in connection with the passage of wireless waves over long distances. He says "We are now accustomed to explain long-distance reception by Heaviside-layer reflection, but I have sometimes wondered if, during the upward passage of some waves, refraction by the atmosphere might not play a part. If wireless waves are similar to light waves, which are assumed to be propagated in the ether, but are subject to refraction upon entering a denser or rarer medium, may not obliquely-transmitted wireless waves, during their passage through air, the density of which is constantly decreasing, be also refracted along a curved path? I believe mirages

are explained by light refractions of this nature."

He continues his letter on similar lines and ends up, with rather unnecessary modesty: "I am afraid, however, that you can show in a very few words the hopelessness of this theory."

As a matter of fact the argument used by my correspondent is in some ways a perfectly justifiable one, and is a perfectly sound and sensible point to raise.

Difference in Wave-length.

However, the above-mentioned theory is not applicable in this case, for the simple reason that the behaviour of light waves (in regard to refraction) is entirely different from that of wireless waves. It is perfectly true that light waves are refracted or bent from their original path on passing from one medium to another of different optical density or refractive index. It is also perfectly true that light waves are identical in nature with wireless waves.

But at the same time there is an enormous difference in the wave-length of light waves and wireless waves, and it is this great difference in wave-length that accounts for the difference in behaviour in certain respects between the two types of waves.

As a matter of fact, wireless waves will be refracted on passing from one medium to another, but the refraction will be so exceedingly small as to be inappreciable.

It may be of some interest to remark in this connection that the much greater wave-length of wireless waves as compared with light waves is one of the reasons why the reflection—that is, the "regular" reflection—of wireless waves is a matter of very much greater difficulty than the reflection of light waves.

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The three tappings provided fulfil in the one component everything that is needed for the series resistance feed method of preventing low-frequency reaction. Further they permit of voltage adjustment, so making possible only one H.T. tapping on the set.

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BUILD THE 100% CRYSTAL SET (See Page 827.)

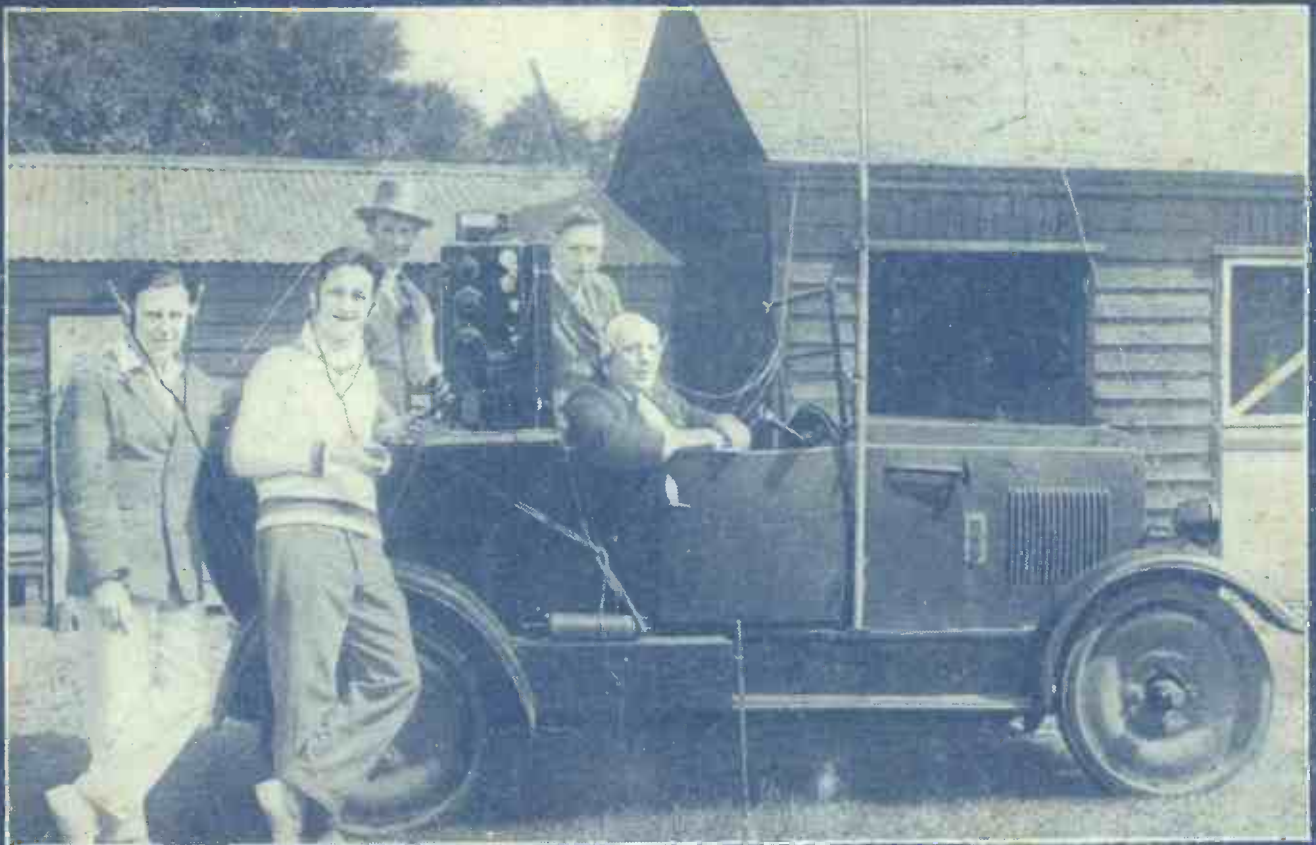
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INCORPORATING "WIRELESS"

August 25th, 1928.

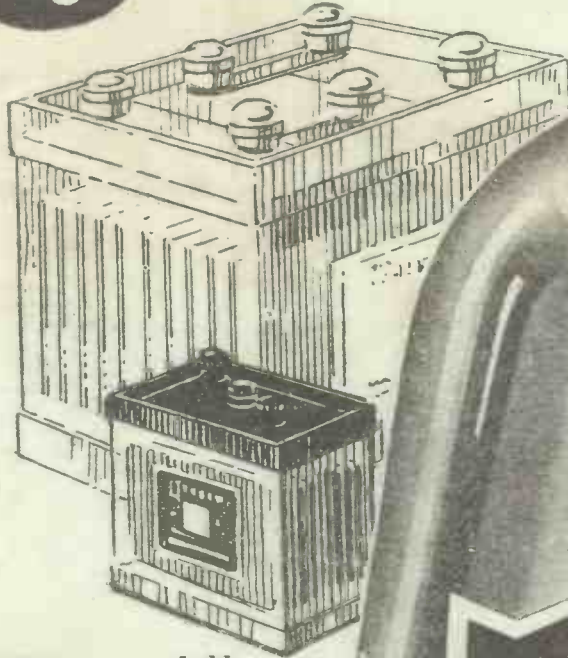


Special Features in this Issue

Television in Colour Dial Dangers Frame Aerials Radio in a Salt Mine
Memories—By The Director of the Cardiff B.B.C. Station
The Regional Scheme Fixed Condenser Fallacies Parking the Electron
THE "FREE-GRID" H.F. AMPLIFIER.

Our cover photo shows the Southend and District Society's portable transmitter and receiving station in action. It was designed and constructed by one of the members and has done good work during "field days."

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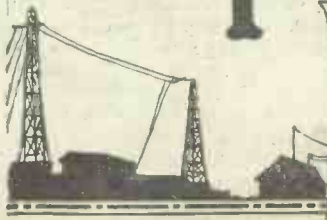
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Popular Wireless



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RADIO NOTES AND NEWS.

B.B.C. Picture Service—The "Sceptic's" Three—3 L O For 35!—B.B.C. and The Commons—The Tuning Signal—The Berlin Show.

Radio Month by Month.

NOW is the time when "new models" burgeon forth and the writers of ad-wax lyrical. They are going to sweep out Olympia next week, ready for THE show, and the doorkeepers are pressing their trousers. Boarding-house radio batteries are running down and their loud speakers are showing symptoms of asthma. Jaded with pierrots, ice-cornets and sand-castles, many holiday-makers begin to think wistfully of their little radio dens at home and the long, cosy, autumn evenings with screwdriver and soldering-bolt.

B.B.C. Picture Service.

AT the time of writing these notes the threatened broadcast picture service has not been sufficiently described in the Press to enable me to comment upon it, other than to say that as I am fairly familiar with most of the current facsimile transmission systems I feel very dubious about this new departure, and I'll bet that many others are not very enthusiastic about it. It will be a long while before any broadcast facsimile or television service attracts £ s. d. from my bank account—if any, for I have not dared look at my pass-book since my holidays.

The "Sceptic's" Three.

IN acknowledging receipt of the decoration awarded by "P.W." to Mr. Elston in recognition of his services as a missionary to unbelievers, that gentleman tells me that he has written to Mr. Bunter of the Stockport Radio Society (see our issue of August 4th, Notes & News). So, unless Stockport backs down (which is unthinkable) there is every prospect of our seeing the newly-converted actually confirming the orthodox in their own faith. I look forward to reporting Mr. Bunter's experience with the "Sceptic's" Three.

3 L O for 35s.

OF course, you want to listen to 3 L O, Melbourne! From almost any point of view it is a thing worth doing, a modern miracle, a stunt to impress the family and make the neighbours jealous. Well, did you get "Modern Wireless" for August? Because, therein is described the "2.35 for Australia." Two valves. Thirty-

five shillings! Plus a bob for the magazine, which contains ten shillingsworth of information.

Fag Ends.

A SANITARY inspector states that the next short cut by scientists will be to produce milk without cows. Why not also jazz without the terrible saxophone? Senatore Marconi has received yet another decoration, a Spanish one. In spite of the claims of some seventy other people, the world is still convinced that he gave it radio. A Wigan policeman is said to have run about for six hours trying to arrest a noisy motor-cyclist. When he tracked down the culprit he found it to be a loud speaker whose owner had gone to the "pictures" and left the set "motor-boating."

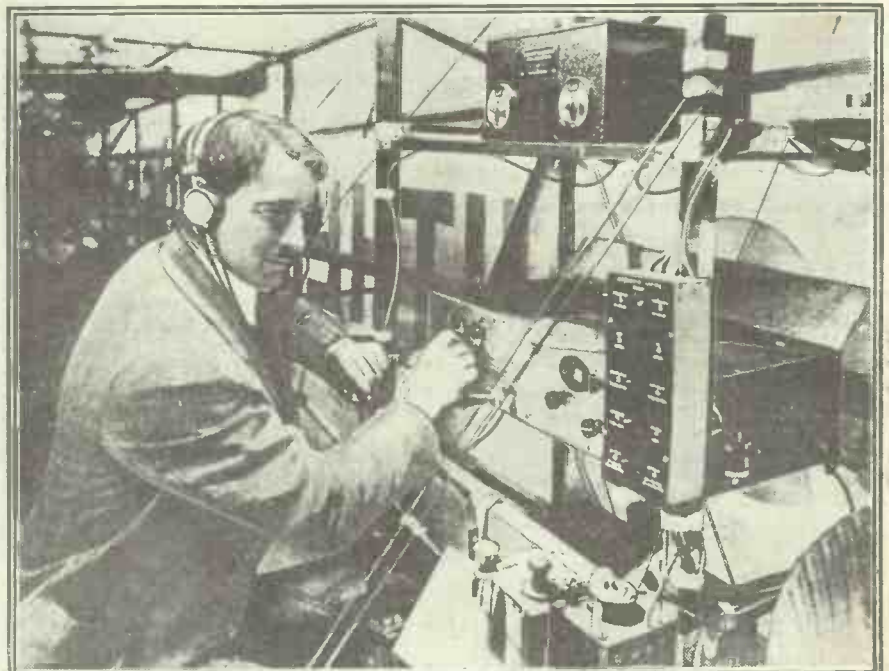
Obituary Note.

JUST to wake them up, I chronicle the supposed demise of the last of the Knights of the Cat's-whisker. The Round Table knows them no more; the Order is defunct; carborundum henceforth is merely a geologist's specimen, and galena a chemist's curiosity. The Chief Liar of the Order has gone to his own place, and the world of radio knoweth him no more. Peace to their ashes and to their headphones. If that does not elicit a spate of letters from die-hards to whom the word "valve" is anathema—I am very greatly mistaken.

Blackpool Trembles.

A SERIOUS-MINDED reader of Blackpool (of all places!), who ought to be making merry instead of fretting
(Continued on next page.)

"CHEERIO" BY RADIO.



This illustration shows Mr. Warner, the wireless operator of the "Southern Cross," tapping out a final message after the plane had landed at Sydney on the completion of its historic flight from 'Frisco.

NOTES AND NEWS.

(Continued from previous page.)

himself, asks me if the ether is not getting overcrowded and what will happen in ten years' time. Not being Old Moore I cannot tell him to-morrow's luck, but he is correct in his surmise about overcrowding the ether. Things are a bit congested, and the various nations are scrambling for allocation of wave-lengths with a fervour which is almost unbecoming. The only way is perfect international co-operation, drastic restriction of radio stations, more selective receivers and lower power.

Stop and Consider.

OUR big monthly brother, "Modern Wireless"—100 pages for 1s.—is now in its prime. It numbers amongst its contributors the "men who know." It is without doubt the most direct, forceful and practical radio monthly published in Europe. It keeps its readers abreast of all the latest developments in radio, radio-gramophone work, and television. It lacks the sensational touch of its transatlantic cousins and makes up for that by providing solid, reasonable, scientific fare. The August number has a special illustrated loud-speaker supplement. Sneak a look at its contents when the book-stall man's back is turned—and spring a bob on it.

The Clock Struck Twenty-Four.

FUNNY! I can't get folk to stand for this one at all. First there was the man who said the strokes actually get out of step and become Tishylike. Now here is M. I. M. (King's Lynn)—apparently genuine initials, but MIM is telegraphese for "laughter"—drops a bomb by informing me that so far as his observations go, when "Big Ben" chimes midnight Copenhagen has reached 1.0 a.m.!

A Question of Date.

BUT hist, a moment! Before M.I.M. grows a laurel wreath, would he be pally enough to say when he last tried comparison of 2LO and Copenhagen. I ask because we are now enjoying British Summer Time, which is *one hour in advance of G.M.T.* Now, I am advised that Denmark does not change to Summer Time, hence as Danish normal time is *one hour in advance of G.M.T.* it must now coincide with B.S.T. Q.E.D. What does M.I.M. say?

B.B.C. and The Commons.

THINGS have indeed reached a fine pass when a responsible, moderate-minded M.P. is impelled to stand up in the house and cast spurnery upon the B.B.C.'s programmes. I think the real trouble is that the B.B.C. has taken upon itself to conceive a lot of high-faluting things about its "functions," whereas it really ought to be guided by public demand. Even the jolly old Post Office would not continue to stock halfpenny stamps or stamp-books if the public showed that it hated the things and wouldn't buy them.

Hot Stuff From The North.

I READ in "The Bulletin and Scots Pictorial," that Mr. D. C. Thomson, Northern Director of the B.B.C., in a speech at Edinburgh referred to the Commons' attack as "the ill-informed and ill-natured denunciation of wireless fare."

Well, lads, I know we don't all think alike on this subject, but when a man talks like that—I quit. I'll argue only with people who think straight and talk moderately. A fellow calling himself "Kamayut" tells the "Daily Dispatch" that as a Buddhist he has no use for the Sunday fare. That's the other extreme.

The Tuning Signal.

THE abolition of the B.B.C. tuning signal is a matter which one can contemplate with lukewarm feelings, tinged with a slight gladness that we need no longer hear that terrible buzz-saw note of the tuning-fork, which certainly was an all-fired nuisance. Most of us, nowadays, keep tabs on our dial readings,

SHORT WAVES.

"Giant Speaker fills theatre," runs a headline in "Science and Invention" for June. Where do they put the people?

Mrs. Blinks: "Very few people wear headphones nowadays."

Mrs. Jinks: "Yes, and I think it's a shame. John's ears were just starting to look natural, and now he's looking as much like a donkey as ever."—"Radio News."

Doctor: "Feeling kind of shaky this morning, eh?"

Malaria Patient: "Oh, heavens, yes. I feel like a mere radio-photograph of my former self."—"Radio News."

Old Mother Hubbard, she went to the cupboard.

To get a catswhisker for her set;

But when she got there, the cupboard was bare—

So Tabby was shingled instead.

THEN FIND THE DAMAGE.

Tube: "How are you getting along with that correspondence course on how to be a radio repair man?"

Crystal: "Oh, I've found out that all it amounts to is that while you're supposed to be fixing one part, you must be sure and break another."—"Science and Invention."

"If I begin the battery once again, I will not leave."—"Henry V."

"My wasting lamps some fading glimmer left—

My dull, deaf ears a little use."—"Comedy of Errors."

and if any slight adjustments are necessary we can perform them while the announcer is saying his little piece. Still, we will remember the tuning note as a kindly gesture on the B.B.C.'s part.

Lucky Courtney.

I SAW Capt. Courtney described in a newspaper as unlucky, but I am not sure the honourable journalist was correct. Unlucky as the gallant airman may be in his attempts to fly to America, he is lucky in having the sound sense to carry wireless apparatus. He is one of those brave men who are courageous enough not to take useless risks for mere show. Good luck—and better luck—to him.

Two Out of Many.

OF "a cloud of witnesses," I select two. The first, whose letter was sent to us by the B.B.C., is R. C. M. (W. Australia), who expresses the pleasure he had in receiving 5 SW on det. and 2 LF., at fair L.S. strength. Second, G. H. (Las Palmas, Canary Islands), who states that 5 SW is without a doubt better than any other station on short waves for purity and volume. America, Java, Germany,

and Italy are "infinitely inferior." Surely these and the other reports I have recorded, plus those received by the B.B.C. and Marconi's, are sufficient to justify an expansion of 5 SW's service?

Tales of "Far Cashmere."

OR thereabouts, anyway. A letter from L. D. (Calcutta) and one from F. H. D. (Bhopal). You know where Calcutta is, but I'll wager you go to the atlas for Bhopal. Well, L. D. says that long waves are a washout; F. H. D. confirms this. L. D. says his reception of 5 SW is "faultless." F. H. D. says that 5 SW is "just wonderful," but (B.B.C. please note) he hopes they will start three to four hours earlier, as he has to sit up to 12.30 a.m. before 5 SW begins. He concludes: "If they could manage to start up at, say, 16.00 G.M.T., it would be a godsend to us people out here." I wonder how much more evidence the B.B.C. will require before it runs 5 SW in earnest?

Is "Earth" All?

NO, this is not a note on human immortality. In May I set aside three letters in a place where I could not fail to find them. They have just turned up, to remind me not to be so clever again. A. A. G. (Sheffield) has a story about a man he knows who says he gets 6 FL, 6 KH, 2 ZY, Stuttgart, Hamburg, Frankfurt, 5 GB, Langenberg, and 5 XX on his crystal set. Besides all this, the other man performs wonders on valve sets, and puts it all down to his special "earth" system, which consists of sixteen separate "earths."

Why Worry?

THESE "earths" are sheets of copper and zinc, buried promiscuous-like in the demesne, coming to a common junction board. And because the crystal man has tried all sorts of aerials and got very little "change," A. A. G. says, "Is the 'earth' the be-all and end-all of radio reception?" The reply is a clearly-encunciated, crisp "Nope!" In the Good Book there is an axiom about all things working together for good. It's like that in radio; there is no star part. In commercial radio telegraphs the "earth" is highly important. In broadcast reception, if the "earth" is not too poisonous, any old thing will do. That's my experience.

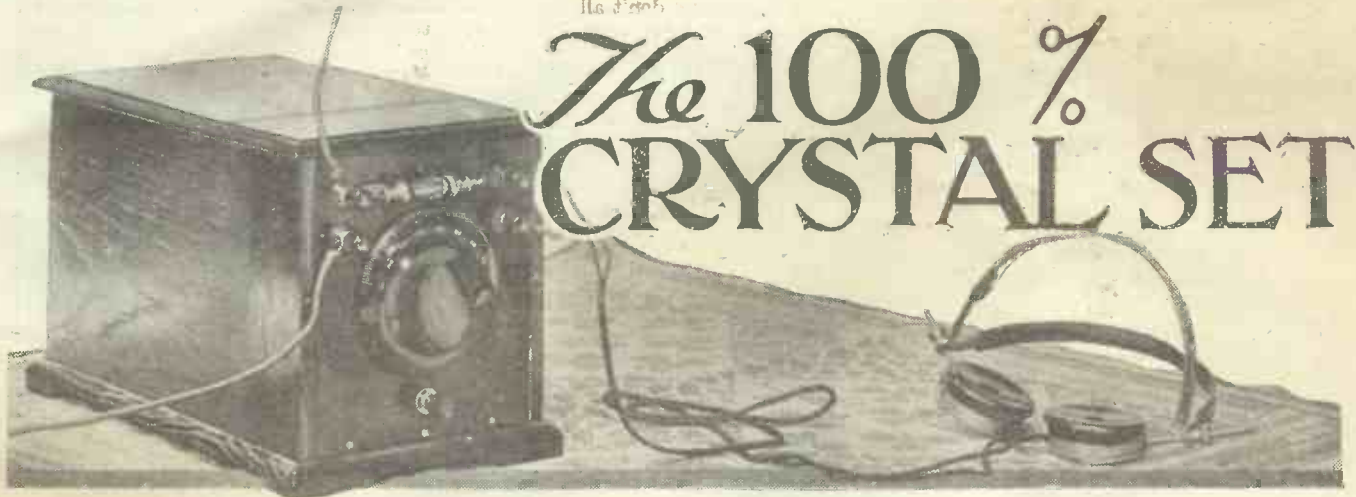
Marked With a Cross.

AUGUST 28th promises some good listening. The Roosters reappear from 2 LO and 5 XX. 5 GB will present, "Let's All Go Down the Strand," being memories of the dear old musical comedies such as "To-night's the Night," "Our Miss Gibbs," etc. 2 LO and 5 XX give a Queen's Hall "Prom" broadcast. By the way, the prospectus of the 1928 "Prom" season looks good. Something for every taste.

The Berlin Show.

AN International Radio Exhibition is to be held in Berlin from Aug. 31st to Sept. 9th. Particulars can be got from 22, Queen Elizabeth Strasse, Charlottenburg. I hope that British radio firms will make a good show, for we are still "on the map" in spite of having won the war.

ARIEL.



The 100% CRYSTAL SET

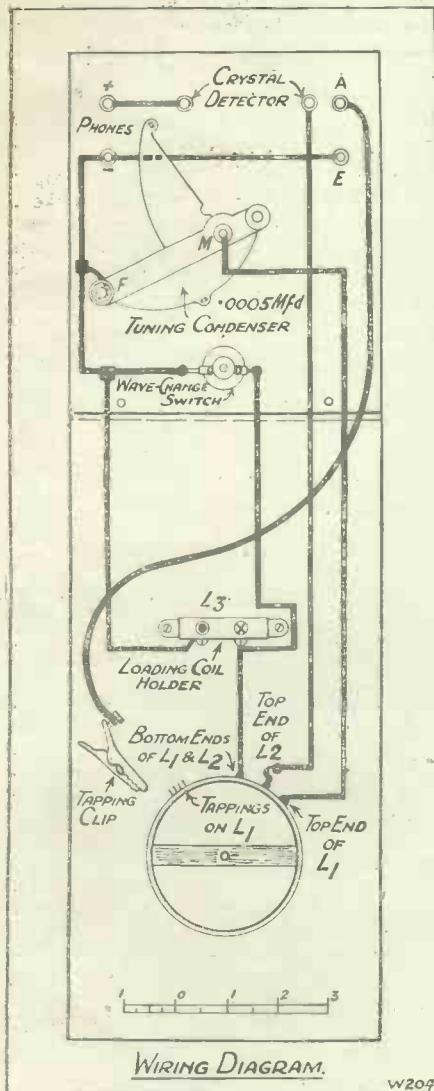
To explain just why this receiver was called the "Hundred-Per-Cent" crystal set we must take the reader back a few months and remind him of the publication of the special crystal circuit called the "Inducto-Crys," which has ever since been used as a standard of comparison for all other crystal sets in the "P.W." laboratory. It is doubtful whether readers in general yet realise the very high efficiency

Fully deserving its name, this set incorporates a special circuit giving high selectivity and remarkably loud results. It is suitable for both broadcasting bands (high and low), and is very easy to make.

By THE "P.W." RESEARCH AND CONSTRUCTION DEPARTMENT.

Other receivers may possess special features, such as wave-change switching, easy construction, and so on, but for these two factors the "Inducto-Crys" circuit remains our actual standard of comparison. Other sets are tested by being connected to a standard aerial and the signal strength, from 2 L O measured, the figure thus obtained being usually expressed as a percentage of that given by the "Inducto-Crys".

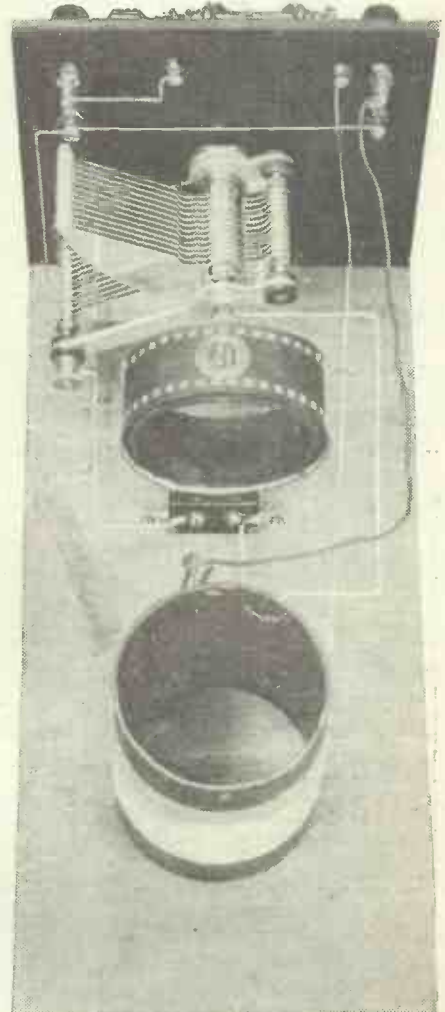
(Continued on next page.)



of this circuit, notwithstanding the considerable stress which was laid upon it at the time of publication (so far as was possible within the limits of restraint involved in the case of all "P.W." test reports!). No doubt when the season for more active construction arrives readers will begin to realise for themselves just how good this circuit is, for the fact remains that for combined high selectivity and loud signals it has never quite been equalled by any other circuit we have tested.

COMPONENTS AND MATERIALS.

- 1 Panel, 6 in. x 7 in. x $\frac{1}{8}$ in. (Any good branded material).
 - 1 Cabinet to fit, with baseboard 12 in. deep. (NOTE:—This is a standard cabinet often used for mains H.T. units, and should be readily obtainable from all the larger cabinet-making firms—Messrs. Arterraft, Raymond, Cameo, Bond, Pickett, Makerimport, Caxton, etc.)
 - 1 .0005-mfd. variable condenser, with plain dial (any good make—J.B., Lissen, Cyldon, Bowyer-Lowe, Igranic, etc.).
 - 1 Crystal detector, cat-whisker or permanent type, such as R.I.-Varley, Brownie, etc.
 - 1 On-off switch (Lissen, Lotus, Benjamin, etc.).
 - 4 Terminals, plain or engraved (Igranic, Eelex, Belling-Lee, etc.).
 - 1 Single-coil socket, baseboard mounting (Lotus, Peto-Scott, Igranic, Burne-Jones, etc.).
- Materials for coil: Piece of insulating tubing, 3 in. diameter, $3\frac{1}{2}$ in. long (Pir-toid used for original, see text), 4 oz. No. 24 D.S.C. wire, 1 oz. No. 32 D.S.C. wire.
- 1 Tapping clip.
 - Sundry screws, wire for connections, etc.



This photograph and the accompanying diagram show that the wiring is 100 per cent easy, as well as efficient.

THE 100% CRYSTAL SET.
(Continued from previous page.)

Weil, now you begin to see why the present receiver is called by the name which you see at the head of this page, for it incorporates this special circuit and certain individual features which will be mentioned in a moment. Now, one of the possible objections to the earlier "Inducto-Crys" designs was that they were primarily designed for use on the ordinary broadcast

the convenience in operation which arises therefrom. Accordingly, it was decided that a receiver design should be prepared incorporating the "Hundred-Per-Cent" circuit, with all its special features, and also a switching scheme whereby it is possible to receive 5 X X by moving a small knob on the front of the panel and retuning on the condenser.

In the present set, the full "Hundred-Per-Cent" circuit was used for the reception of the local station and 5 G B, while on the upper waves a simple loading coil is brought into circuit, which converts the receiver into practically a normal arrangement, since there is no particular point in providing a high degree of selectivity for the reception of 5 X X on a crystal set in any normal area.

It may perhaps be as well to remind the reader, before we proceed to constructional matters, of the features of the circuit with which we are dealing here. Essentially, it consists of the usual tuned secondary circuit composed of a suitable coil shunted by a variable condenser, to which the aerial and earth circuit is auto-coupled. For this purpose, the earth is connected to the lower end of the tuned circuit, and the aerial to a suitable tapping point, which is usually about one-third of the way up the coil.

The special feature of this circuit lies in the method of coupling the crystal and "phones circuit to the ordinary tuned one. Instead of being placed right across the tuned circuit or across a portion of it, as

is usual, they are coupled inductively, a special winding of a certain size being interwoven for this purpose amongst the turns of the tuning coil winding. The special characteristics of the circuit all follow from this arrangement.

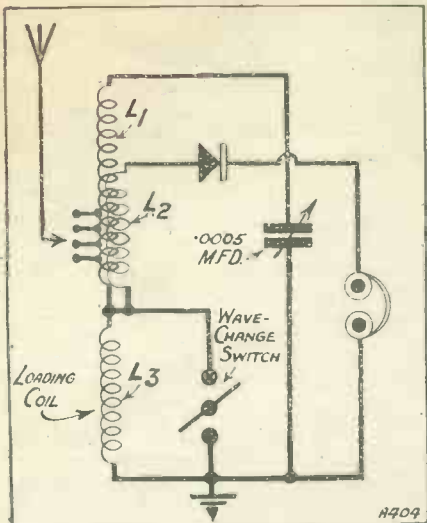
Making a Start.

Now for the "how to make" details. The set is assembled in the now conventional fashion on a vertical front panel, with a rather deep baseboard, fitting into the usual American-type cabinet. On the panel you will see the tuning condenser, the terminals for aerial and earth and tele-phones, a crystal detector, and a small push-pull type on-off switch which serves to bring the loading coil in when required, and to short it out for reception on the ordinary wave-band.

Inside the set upon the baseboard you will find there are only the coils, consisting of the double-wound coil for the special circuit on the ordinary waves, and a socket for the standard plug-in coil which serves for loading purposes when 5 X X is desired. This will usually be a No. 100 or a 150, according to the size of the aerial, and it can, of course, be left permanently in the socket, the changing from one wave-length to another being done simply by the manipulation of a switch on the panel. When the switch is in the "on" position, the loading coil is short circuited, and you are ready to receive on the local station or 5 G B. By pushing the switch to the "off" position the loading coil comes into operation and by turning the condenser you should be able to tune in 5 X X.

The only instructions for building the circuit you will need are those for the construction of the special coil, and these follow. The "former" is a piece of insulating tubing of any good material,

(Continued on page 841.)



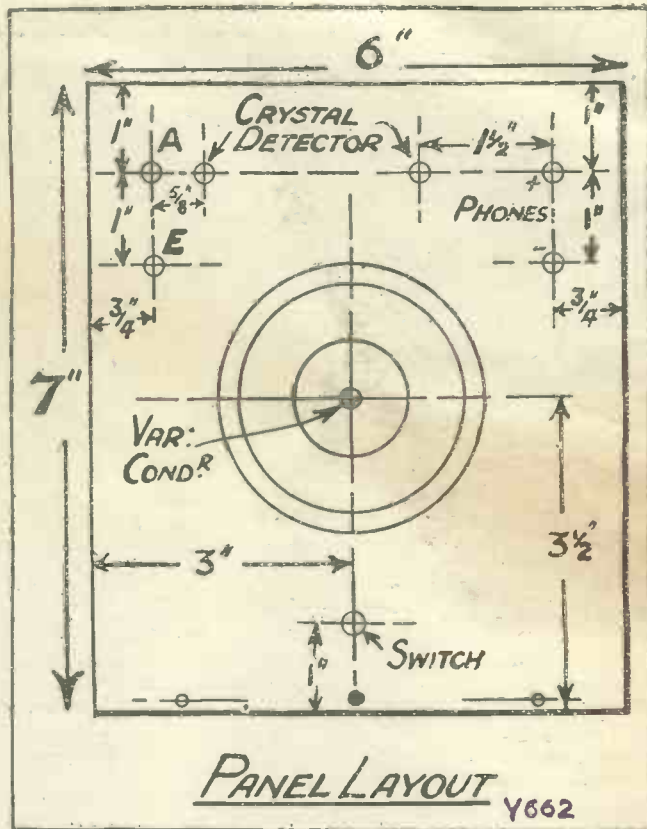
H409

band of 250 to 550 metres, the special merits of the circuit showing up on this band alone.

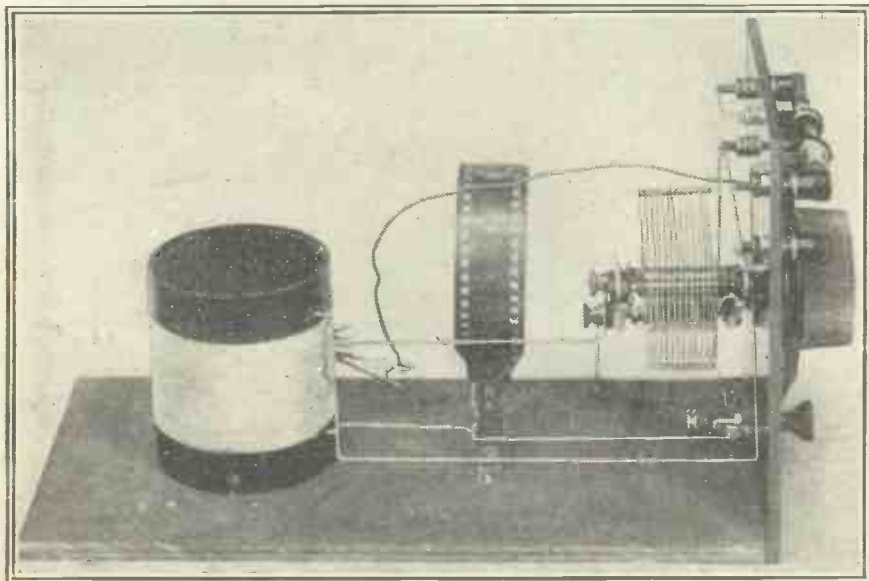
Moreover, it is not very easy to arrange for loading coils to be inserted in such a way as to preserve the special features on the upper wave-band, and in the original design provision for receiving 5 X X was only included as rather a makeshift.

Switching for Crystal Users.

Nowadays everyone is demanding switching for changing from the shorter wave-band to 5 X X, and there is no reason why the crystal user should be debarred from



PANEL LAYOUT Y662



The loading coil for 5 X X is of standard type, having 100 or 150 turns. When not required, the switch puts it out of action.



TELEVISION IN COLOUR.

Interesting details of some of the devices invented to solve the colour-television problem.

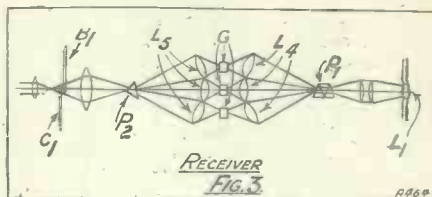
By J. C. JEVONS.

The inventor states that at the transmitting end the selenium cell responds quantitatively according to the different natural colours reflected from the object to be televised.

At the receiving end the light from the incandescent lamp is first passed through a prism, which resolves each ray into the well-known spectrum of colours. The action of the received picture-signal on the vibrating mirror system is then such that, at any given instant, only the particular ray from the spectrum corresponding to the natural colour of the object is selected, and passed through on to the viewing screen.

usual exploring disc is not shown, but in front of each sensitive cell there is placed a light filter, the one marked F being, say, orange-red, whilst that marked F₁ is blue-green.

Two different sets of picture-signals are created in this way, and are conveyed over individual lines, or as modulations on different carrier-waves through the ether, to the receiving station, where they are separately fed to amplifiers V, V₁.



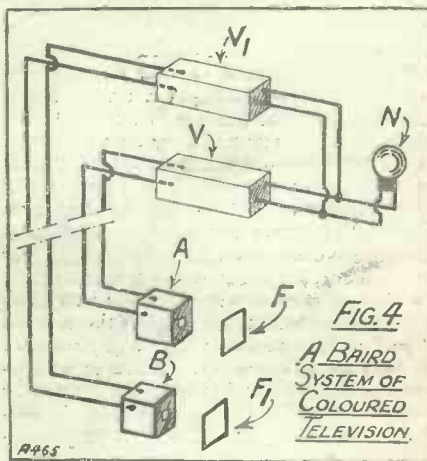
The separate amplification is stated by Mr. Baird to be such that the signals from cell A may be strengthened by the amplifier V to produce voltages of between 200 and 250 volts, whilst those from cell B may be amplified up to between 800 and 850 volts by V₁.

Two-Colour Scheme.

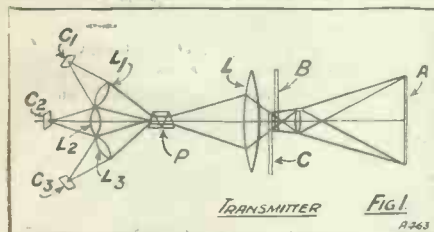
These voltages are then applied in parallel to a neon glow-lamp N. At voltages in the neighbourhood of 200 volts the neon lamp produces a red discharge, whilst when subjected to voltages of the order of 800 volts the glow discharge changes to an arc having a predominantly blue colour.

Thus a "red" signal at the transmitting end will produce a red light in the glow-lamp N, the intensity of which will vary as the voltage of the received signals (after amplification) fluctuates between the limits of 200 to 250 volts.

Similarly a blue light will follow the application of amplified signals of the order of 800 to 850 volts to the lamp N, the result, it is stated, being a reproduction of the natural colour or colours of the televised object.



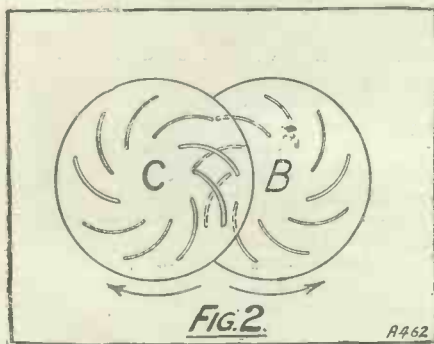
ONE of the first pioneers in television to attempt to solve the "colour problem" was Jan Van Szczepanik, whose unpronounceable name is frequently to be met with in the literature of the subject. As far back as 1897 this inventor designed a television



apparatus in which the object to be transmitted is "scanned" by an arrangement of two mirrors mounted so as to vibrate at right-angles to each other.

Complicated Arrangement.

In this way a ray of light is moved across the object in parallel lines, from side to side, each successive line being slightly displaced in a downward direction from the previous one, so that in a short period of time the entire surface is explored. The ray is used to energise a selenium cell, and the resulting electric currents are transmitted to the distant receiving station, where a similar vibrating mirror arrangement is used to reassemble the completed picture, by vary-



ing the light-rays reflected from an incandescent lamp.

More Recent Attempt.

A more recent attempt to provide colour effects in television is due to two British inventors, Messrs. Stephenson and Walton, who in the beginning of 1923 suggested the system illustrated in Fig. 1.

Light from the object A to be televised is first passed through a pair of rotating discs, B, C, provided with spiral slits as shown in Fig. 2, so that the picture is explored in successive strips over the entire surface.

The ray of light is then focused by a lens L on to a prism P so that the emerging light is analysed into the well-known spectrum or series of prismatic colours. Another series of lenses L₁, L₂, L₃ then concentrate the primary blue, green, and red rays on to three separate light-sensitive cells marked C₁, C₂, C₃.

The action of each primary colour ray on the cells sets up separate electric currents, corresponding to a complete picture signal. The three picture signals so produced are then transmitted simultaneously through separate channels to the receiving station, either as modulations of so many different carrier-waves through the ether, or over separate connecting wires.

At the receiving station light from an arc lamp L₁, Fig. 3, is first analysed by a prism P₁ into a spectrum, the primary colours of which are again focused separately by the lenses L₂ on to three galvanometers marked G. The incoming signals are then applied to these galvanometers and control the aperture of a slit or shutter to a varying degree, so that only light of the proper colour can pass through.

The emerging rays are then separately collected by the lenses L₃ on to a collecting prism P₂, where they are merged together and thrown in natural colour on to a viewing screen by a pair of rotating discs, B₁, C₁, similar to those used at the transmitting station.

Mr. Baird's System.

More recently still Mr. J. L. Baird has protected the arrangement shown in Fig. 4 for securing not only half-tones and high lights, but also colour effects in television.

Two separate images of the object to be televised are thrown separately on to two-sensitive cells marked A and B. The

TECHNICAL NOTES.

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

ELECTRIC-DRIVE GRAMOPHONESWET CELLS FOR TRANSMISSION—FOUR ELECTRODES—
SCREENING, ETC., ETC.**Electric-Drive Gramophones.**

IN addition to the employment of the electrical means of pick-up from a gramophone record it is often an advantage to have the turntable of the gramophone actually driven electrically so as to avoid the necessity for continually winding up the ordinary spring motor.

There are several models of electrically driven gramophones upon the market, but hitherto it has been a case of having an electrically driven or a spring-motor driven machine, and the latter could not readily be converted into the former. The electrically driven gramophone is equipped with a special silent-running motor and is, of course, as a rule a much more expensive affair than the ordinary spring-driven gramophone.

Separate Drive.

The General Electric Company have recently introduced a separate gramophone motor which is known as the "Unit Electric Gramophone Drive." This self-contained unit comprises an electric motor mounted in a frame and coupled to the turntable spindle with governor and speed adjuster.

The motor is designed to give constant driving torque on all voltages over 50. This is accomplished in a very simple way. Instead of the motor being operated direct from the high voltage, it is wound for low voltage and a lamp resistance is introduced in order to reduce the voltage to the correct value (about 6 volts) for the motor. In this way, slight fluctuations of the voltage of the mains have only a very small effect upon the motor and it maintains a practically constant speed.

No Winding.

By the use of this simple arrangement we have an electrically driven gramophone in which the torque (the turning movement) does not fall off towards the end of the record, as is liable to be the case with a spring-driven gramophone. The obvious and particular advantage, of course, is the fact that you do not have to wind it up.

Wet Cells for Transmission.

I have a letter from a reader who has been using small Leclanche cells for transmission and has had great satisfaction with them. Three hundred of these cells were put into use over a year ago and have been giving 35 to 40 milliamps on continuous load during that time.

It is only now that some of the zincs have "gone," and these can be replaced, according to my correspondent, at about 3d. per cell. He confidently expects another six or nine months' service from the new zincs with the old carbons, and when the carbons "go," replacement at the rate of about 4d. per cell will be necessary. However, he considers that the cells have put up an extremely good performance, and as he has no electric-light supply he is unable to employ high-tension accumulators.

There is no doubt that the modern version of high-tension wet Leclanche batteries for use in places where the absence of electric supply precludes employment of high-tension accumulators is an excellent proposition and quite the best, if not indeed the only practicable way out in the circumstances mentioned.

Four Electrodes.

In a recent Paper before the Institute of Radio Engineers, Mr. J. T. Warner raised the interesting and topical question as to the adoption of a standard designation for some of the newcomers amongst radio components. For example the screened-grid

valve, as you know, goes by various names, such as the "screened plate," "shielded plate," "shielded grid," and so on.

Another type of valve is the so-called 4-electrode valve, which is also sometimes known as the "tetrode" (analogous to the triode or 3-electrode valve and the diode or 2-electrode valve). There is liable to be confusion if the term "tetrode," or even "4-electrode valve," is used.

As a matter of fact, the name 4-electrode valve is commonly understood to mean a valve with filament and plate and a second or auxiliary grid, which is sometimes known as a space-charge grid, this grid having the effect of decreasing the impedance of the valve by the removal of the space charge, therefore reducing the amount of high-tension voltage required on the plate. It is for this reason that 4-electrode valves are used in H.T.-less circuits or in circuits employing "low high-tension" (so to speak).

The confusion which is liable to arise by the use of the term tetrode concerns the screen-grid type of valve. In the usual

*(Continued on page 851.)***"STRONG SIGNALS!"**

Large speakers have recently been installed at the London railway termini for the control of crowded platforms. The illustration shows a "Controller" speaking into a microphone fitted up inside a signal-box at London Bridge Station.

NEWS FROM SAVOY HILL.

FROM OUR OWN CORRESPONDENTS.

B.B.C. INVADES GERMANYB.B.C. AND ADVISORS—THE "BRITISH ASS" AND THE B.B.C.—
WESTON'S SUNSHINE CARNIVAL, ETC., ETC.**B.B.C. Invades Germany.**

NOT since the advance on the Rhine has there been such a journeying towards Berlin as the B.B.C. has arranged for this month. It is understood that the following members of headquarters staff will cross the North Sea late in August or early in September: Sir John Reith, the Director-General; Vice-Admiral Carpenter, C.B., the Controller, Captain P. P. Eckersley, the Chief Engineer, Mr. R. H. Eckersley, the Programme Chief, Major C. F. Atkinson, the noted antiquarian, now Foreign Director of the B.B.C., Mr. R. E. Jeffrey, head of "Productions" at Savoy Hill, and Mr. Percy Pitt, who is responsible for B.B.C. music. There is a good deal of secrecy about the movements of this formidable delegation; but merely

the fact that some of the B.B.C. chiefs apart from Captain Eckersley are actually going outside these Islands is in itself a development warmly to be welcomed.

B.B.C. and Advisors.

The account given in POPULAR WIRELESS recently of the opinions of the B.B.C. expressed by friends of Mr. George Grossmith created such a stir in the dovecots that there has been an unusual barrage of denials. Whatever the rights and wrongs of the original controversy, it is good to know that this publicity has greatly strengthened the hands of "G. G." and has established a new guarantee that the interests of "entertainment" in the popular

(Continued on page 850.)



If it is true that "all mischief comes from not being able to be alone," people have had plenty of opportunities for testing their character during the past five years. There must be few people in Great Britain who have not spent in that period several hours listening alone to some kind of wireless transmission.

It is generally admitted that progress in broadcasting has been rapid; there is no reason why, with the active co-operation of listeners, it should not be still more rapid during the next five years. On all sides we hear platitudes about broadcasting being in its infancy, and that it requires a special technique. We do not hear so much about that technique, about the art of broadcasting itself. It is this subject which I propose to discuss in a series of six short articles, after a brief survey of the present position as experienced at a main station.

For the work of a Station Director gives him a wide-angle picture of broadcasting; he is close to it, yet must see all developments. He has a knowledge of general policy; he meets artistes, listeners and all kinds of local celebrities; he has to arrange programmes of a high standard; and he is probably a broadcaster himself. Altogether his is a most fascinating but arduous and responsible job.

Own "Mike."

It is hard to realise now some of the early difficulties in broadcasting. When the ordinary carbon type of microphone was used each instrument in the orchestra had a microphone to itself; one was hanging over the piano, another

This is the first of an exclusive series of articles giving an interesting account of the running of a B.B.C. station by one who is in a pre-eminent position to give the most intimate details.

near the fiddles and another almost on the floor to cater for the 'cello. The announcer had a microphone of his own. One day the announcer's microphone went "phut" without warning; he flew to the nearest "mike," which happened to be the 'cello's, and down on his knees announced the next item. Nobody laughed at the time because the situation seemed so serious. But afterwards it was generally agreed that the announcer was "getting down to his job" in earnest.

On my first day at the Cardiff Station I had a band of Irish Bagpipers rehearsing in my office which, incidentally, was also the studio. My memos. were usually written and signed with a musical accompaniment of varying intensity. The studio itself was so small and so stuffy that even members of the Guards Band have been known to faint in it; the Station Orchestra seemed to become immune to atmospheric conditions, for those members who were not using their mouths in any other way usually smoked during performances. My first act, on moving to the new studio, was to prohibit smoking; it offended the old stagers, but no one now would dream of smoking in a B.B.C. studio.

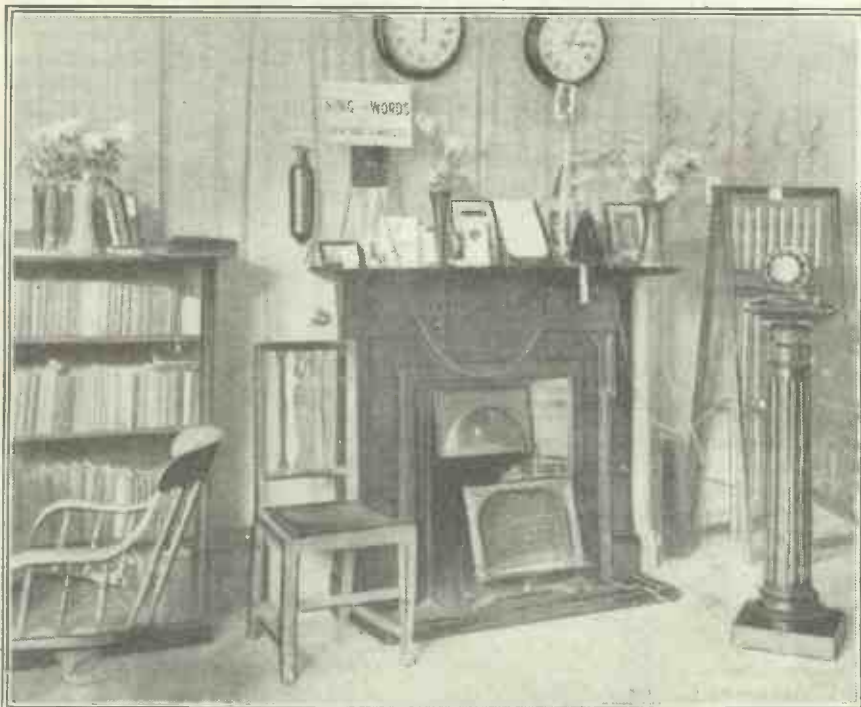
Several Studios.

To-day most stations have two or three studios, which enable programmes to be run smoothly without the old irritating breaks and which make possible the production of modern radio plays and feature programmes. Thus a main station has practically the same facilities as 2LO for modern radio works and has to keep to the same high standard with its programmes. The old patronising use of the word "provincial" does not exist in the B.B.C.

Programmes.

To prepare the local programmes the Local Programme Staff sits in solemn—not too solemn—conclave once a week. London's arrangements for the six weeks ahead are kept in view; the items marked (treble phi) are compulsory and are immediately

(Continued on next page.)



This photo gives a very good idea of the cramped and uncomfortable quarters from which our broadcasters operated in the early days of the old B. B. Company. The Cardiff Station Director of the time had to use this studio as his office. It forms a very striking contrast to the present commodious premises.

MEMORIES.

(Continued from previous page.)

entered into our local programme chart in blue pencil. This chart is particularly useful, as it shows the week's programmes in vertical columns for a period of several months and enables us to appreciate at a glance the balance of programmes over a long period.

Once the programmes for the week have been decided upon and the artistes engaged, we have to write to each artiste indicating the exact items or kind of items required,



Here is a photo of Mr. E. R. Appleton, taken on the occasion of his broadcasting a running commentary of the opening ceremony from the roof of the Welsh National Museum.

stressing the necessity for an early reply giving timing of items, publishers' names, etc. All artistes do not make ideal business men! However, within a fortnight all the items are in, programmes drafted, revised and sent to Head Office and the "Radio Times."

Booking Artistes.

The actual booking of "national" artistes is done through London; local artistes are booked direct at the local station. First-class local artistes are always in great demand, and quite naturally some local artistes who were used frequently in the early days are a little dismayed by the rareness of the broadcasts they make to-day. This is one of the saddest parts of our business, one of the penalties to be paid for progress. In the very early days artistes were sometimes literally dragged out of the highways and byways to sing without payment; most of them realise the present position and accept it in a sporting way, but there are others!

Then come the various rehearsals. The orchestra, in our case the National Orchestra of Wales, rehearses every day of the week except either Friday or Saturday. Artistes invariably rehearse with the orchestra or accompanist on the day of performance and possibly also just before the performance. All these times have to be arranged to suit all concerned, and all the time new pro-

grammes are being arranged. Some people say "I can't think what you do all day at the station." I say "!!!!"

The difference between a Main Station and London? Well, I think the charm of a main station lies in its intimacy. It has unique possibilities for keeping in personal contact with its listeners, for utilising and assisting local talent, for exploring local legend and history, and for stimulating local endeavour.

RADIO WRINKLES.

Do not throw away a pair of 'phones or loud speaker just because it happens to have become demagnetised or insensitive, as it can often be put right by the makers, or by firms specialising in that class of work, for a few shillings.

Several wires running parallel to each other placed twelve inches or so below the ceiling will often give much better results for an indoor aerial than will insulated wire run round the picture rail. Why not try it?

If you have a difficulty in getting the exact reading on the scale because the pointer is blunt, it is a good plan to solder a pin or any piece of wire on to the end of this, bending it over so that it reads very closely and accurately along the scale.

H.F. Instability.

In multi-valve sets where one large grid-bias battery is used, a rather baffling source of H.F. instability is a long grid-bias lead. (An H.F. choke may be interposed to prevent stray pick-up, and if necessary an H.F. by-pass can be provided in the usual way.)

In cases where interference from electric mains is very bad, it should not be forgotten that a frame aerial has very distinct advantages over the usual aerial-earth connections, although such an aerial will give less efficiency on distant broadcasting stations.

When telephones are connected to a crystal set it does not matter which way round they go to the terminals? But this is important when they are used with a valve set, and the connecting tags should always be examined carefully to determine which is the correct method of connection.

When a listener changes his address the fact should be notified immediately to the head postmaster of the district in which he has been living. (This is one of the conditions upon which a licence is issued.)

The combined height and length of your aerial should not exceed one hundred feet?

Don't Lose Licence!

If you are careless about using reaction, and by this tend to interfere with your neighbours' reception, you run the risk of having your receiving licence withdrawn?

If you use a crystal set, remember that a good earth connection is just as important as a good aerial system?

Hand-capacity effects can generally be stopped by reversing the leads to the condenser in question. If this fails, it may be found that a grid lead near to the front of the panel is placed too close to it, and should either be shortened or placed farther back.

If the leads to your grid-bias battery tend to shake when adjustments are made to the set, this can easily be cured by an ordinary elastic band slipped over the battery, thus holding the leads close to the plugs.

Do not let the frayed ends of flexible wires spread out into "whiskers," or these may give rise to shorting troubles.

It is a good plan to look over your grid-bias plugs occasionally to ensure that they fit tightly in their sockets, and are reasonably clean. (Loose-fitting plugs can generally be opened quite easily with a knife blade.)



This is one of the later studios erected and used at Cardiff. You will find it interesting to compare it with the one illustrated on the previous page. Note the microphones used in each instance!

FIXED CONDENSER FALLACIES



IT occurs to me that a fixed condenser is a component that is taken very much for granted. This is, no doubt, due to the fact that it is a small, solid little component, consisting, in appearance, of nothing but a pair of terminals mounted on a piece of black composition substance. But it is really much more than this, as I hope to be able to show you.

First of all, electrically speaking, what is a fixed condenser? It is, as its name to some extent implies, an article capable of holding a charge of electricity, and the charge it is capable of taking depends upon its "capacity." Its structure is quite a straightforward one.

To each of its two terminals is fixed a set of metal plates or sheets, and these two sets of plates or sheets are separated by means of an insulating material. The plates are generally of copper, while the insulating material is sometimes mica and sometimes paper.

Startling Capacity Errors.

The capacity of a fixed condenser will depend upon the area of its plates and the thickness and nature of the insulating material between them. I should mention, perhaps, that in some fixed condensers this insulating material is air, but in the case of that familiar little black fixed condenser which is fitted into the average radio set, paper or mica will most probably be used. And this insulating material is generally referred to as the "dielectric."

As neither the plates nor the dielectric of a fixed condenser have to be moved relatively to each other, once the component is made, these can, and generally are, well and truly buried in a small block of ebonite, bakelite or similar material. Now one of the greatest of fixed condenser fallacies is



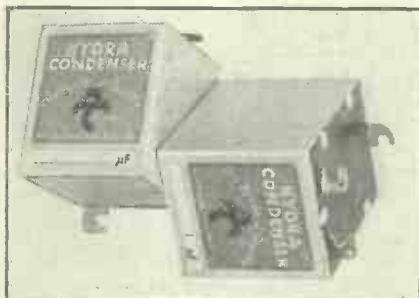
The author has found the fixed condensers made by Lissen, Ltd., exceptionally close to their rating.

that the figures engraved or painted on them truly represent their capacities. Actually these are, in the majority of cases, approximations. There are a few makers whose fixed condensers are very closely "rated," but among the best, five or ten per cent. variations are by no means infrequent.

But it is amongst those cheap unbranded types one sees on sale at suburban stores

The "fixed" is a component generally taken very much for granted, but there are important aspects concerning it that the practical constructor should realise.
By G. V. DOWDING, Grad.I.E.E.

where most startling errors of capacity can be found. You see, anyone could fairly closely duplicate in bulk the products of one of the reputable condenser makers. I mean duplicate them in regard to size and numbers and sizes of plates, etc. But



The well-known Hydra condenser is made internally of aluminium foil and paper. It is very robust and has an excellent power factor.

the most careful production is necessary if values are to be kept fairly closely in order.

The tiniest buckling in the plates during assembly, the slightest extra pressure applied, inequalities in dielectric thickness and variation in dielectric purity and quality may make very great differences.

I remember some time ago testing the capacities of half a dozen fixed condensers of an unknown make. In some cases the capacity varied from the optimistic marking by as much as 50 per cent. I even came across a so-called .004 mfd. which gave a true showing of only .0015 mfd.

Condensers Can "Wear Out."

It takes a very skilful manufacturer to keep his mass-produced fixed condensers within a five per cent. variation, and that some do with great success is, to me, knowing some of the difficulties which are encountered, rather wonderful. After what I have already said, many constructors will no doubt find it reassuring when I tell them that a five per cent. or even a ten per cent. variation in the capacity of the fixed condenser, from the value given in a circuit, can in no one instance that I can

call to mind be of the slightest account. Another fixed condenser fallacy is that the component has an indefinite life and will never wear out. It is true that the fixed condenser which figures in the majority of positions in a radio set stands but little strain and deteriorates so slowly that it can be said that it is almost everlasting, but this is not always the case, especially in regard to fixed condensers employed in mains units. Here the component meets with considerable electrical strains, and strains that are liable to give a definite length to their lives.

Unwanted Qualities.

Much will depend upon the nature of the dielectric. A mica condenser is a very robust electrical device, but there are paper dielectric condensers whose lives in certain circumstances can be compared only with the lives of electric lamps or valves. That is to say, they will function efficiently only for matters of thousands of hours. I say "only," for thousands of hours imply years of use, but years of use is a different proposition to everlasting, and if you meet with trouble in your mains-driven set or mains unit, it may be that the fixed condenser's life has proved shorter even than "thousands of hours."

One further fixed condenser fallacy is



The Dubilier people are specialists in the manufacture of fixed condensers.

that the component has only capacity. No doubt the perfect condenser would have only capacity, but actually all have resistance and inductance as well. The inductance in most cases will be negligible and can be ruled out for all practical purposes. But there are cases where, with faulty construction, the resistance may assume a value deleterious to the proper functioning of the fixed condenser.

SHORT - WAVE NOTES.

Some typical news and views concerning amateur transmission and reception on the higher frequencies.

By W. L. S.

I HAVE recently spent quite a lot of time helping a friend to get his short-wave receiver to operate to his complete satisfaction, and have come up against rather an interesting set of troubles, which, for some peculiar reason, I have never encountered myself.

Among these was a severe "threshold howl," to which most of my readers will not need introduction. The annoying thing about threshold howl, in my experience, is that it can be due to about five distinct causes, and that what we call threshold howl is in reality a whole bevy of different troubles! One of them is undoubtedly due to an unsuitable value of grid leak for the detector. In general, a leak of too high resistance will produce it. The remedy in this case is quite obvious.

Peculiar Cures.

Another variety appears to be due to the primary of the L.F. transformer in some way. Mere substitution of another transformer will often effect a complete cure, or, alternatively, shunting a high resistance across the primary of the existing transformer, or, better still, shunting a 30- or 50-henry choke across it, will generally be perfectly satisfactory.

Just how this trouble is caused I certainly cannot explain. There is no doubt, however, of its existence, and, in general, a cheap transformer will not give the trouble while a good and expensive variety will. It therefore seems that high primary impedance has something to do with it.

I was completely surprised to find that one of the many varieties of howl could be cured by the use of a choke output circuit. Instead of connecting the 'phones in the anode circuit of the last valve directly, a choke was connected in their place (a 32-henry choke was used) and the 'phones and a 2-mfd. condenser were connected in series from the anode of the valve to H.T. negative.

Signals were, if anything, received with a rather clearer and sharper tone (I am, of course, referring to C.W. signals) and all tendency to howl was absent. The same result was achieved by connecting an H.F. choke in series with each 'phone lead. So it really seems as if the primary cause of most of our troubles with "threshold howl" is the presence of H.F. energy in the L.F. circuits.

A good H.F. filter in the detector plate circuit, consisting of two H.F. chokes in series, with a condenser taken to earth from the mid-point, seems the most common-sense way of preventing trouble, and is very effective. The grid howl is, however, something quite separate, and can only be cured by changing the grid leak.

"Hand-Capacity."

Another trouble one finds present in most short-wavers is the old bogey of "hand-capacity." Most earth leads have, of course, a length approximating to the wavelength on which one is receiving, when dealing with 20-metre work.

If they are as much as half this length they are practically useless for the prevention of hand-capacity troubles, since, although the earth itself is at zero potential, the set end of the earth lead is at quite a high potential, and it is often definitely undesirable to use an earth at all!

The safest method of preventing hand-capacity effects is to connect all the sets of moving vanes of the variable condensers to the filament circuit (and it is as well to choose one side for all the connections) and, where necessary, to use metal shields connected to the same point.

Crystal Control.

Amateur transmitters the world over are now beginning to remove the cobwebs from their apparatus in preparation for the bringing into force of the new and narrower wave-bands, and old apparatus is in many cases being most religiously "weeded out" from the other. One thing is clear—in the future the steady wave must be the rule rather than the exception, for the man who sends his transmission "walking round the dial" will be quite capable of wiping out the whole band as far as local stations are concerned.

Crystal control must be developed, and I am glad to see that several stations in this country are now adopting it for general use. The crystal-controlled station always has a note of which to be proud, and for "getting there" it cannot be beaten, for the sheer

attractiveness of the note makes the man at the other end stop and listen!

It has another advantage, these above remarks referring, of course, to C.W. communication. When the telephony station adopts crystal control, "frequency modulation" is impossible. All the modulation which is obtained is real and legitimate modulation of the input, and the sidebands due to frequency modulation which cause such severe interference to other stations are eliminated completely.

More "Bubbles."

Compare the modulation of 2 X A D, 2 X A F and other American crystal-controlled stations with that of some amateur stations, and you will not need to be reminded of the difference. There is no doubt that "C.C." will be employed in most good amateurs' stations in the future.

Some time back I wrote in this column about some trouble with "bubbles" that I had had, which subsequently proved to be due to a broken strand in the 7/22 aerial wire. Although I obviated it at the time by using single No. 14 for an aerial, the trouble came back a few days ago, and much chasing round the transmitter, receiver, and aerial system decided that the latter must be at fault.

Nothing, however, was found wrong with the aerial or earth. After much deep thought the guys were examined, and it was found that the bottom end of one was wrapped none too tightly round a hook in the garden fence, which had become rusted through. Obviously the two were making intermittent contact. The fitting of rubber round the hook cured the trouble, and a better job is now being made of the anchorage of that guy by cutting a notch in a wooden peg, to take the place of the hook!

THE "LO-NOTE" LOUD SPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have recently constructed the "Lo-Note" loud speaker, the description of which appeared in "P.W." a few weeks ago.

Although keeping to the measurements, etc., given by your contributor, I did not follow the method of construction. The finished result is practically the same, and I can thoroughly endorse all the claims made as to volume and purity of tone. The inordinate length of the horn is, no doubt, a great drawback to would-be constructors, but the horn which I have made, although eight feet long, is quite out of sight, as I have placed it perpendicularly behind a tall grandfather clock which stands at an angle in one of the corners of the room.

I am very pleased indeed with it: it is a real pleasure to listen to the fine reproduction, and I can strongly recommend any of your readers who are able to conceal effectively the length of the horn, to undertake the construction.

Your contributor is to be congratulated upon his contribution, and I tender to him my heartiest thanks.

Yours sincerely,

Bradford.

G. L.

DANIELL CELLS FOR CHARGING.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to an article in your paper (circ. August, 1927) concerning the use of Daniell cells for the charging of L.T. accumulators, I enumerate below certain tips that may be of use to other readers by assisting in the successful running of these primary cells.

1. The copper and saturated copper sulphate solution should be inside the pot.
2. Neither the copper, nor zinc rod, nor the undissolved copper sulphate should be allowed to touch the porous pot. This latter can be avoided by making the copper "plate" in the form of a cage of copper gauze into which the copper sulphate is placed.
3. Pot dipped top and bottom in hot paraffin wax.
4. Strength of zinc sulphate solution needs to be only 0.1 per cent.
5. Zincs may be kept amalgamated by adding 4 grammes of mercurous sulphate to every 1,000 ccs. of the zinc sulphate solution.

Yours faithfully,

B. J. DANIEL.

Aigburth, Liverpool.

CORRESPONDENCE.

STRENGTH OF PCJJ

THE "LO-NOTE" LOUD SPEAKER Daniell Cells for Charging.

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

STRENGTH OF PCJJ.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I take up some of your space with a question of interest to myself and possibly to others.

Since the beginning of July I have been absolutely unable to receive PCJJ without being on the very verge of oscillation and then the strength is only R1. Previously I have been able to bank on this station as a stand-by "local," now it is quite a job to find him. I wrote to Messrs. Phillips Lamps, and they say that reports state that the strength is up to normal. The last occasion on which I received PCJJ as previously was when he called the "Italia" on June 21st.

This is not due to an alteration I made in my set as far as I can see, as other stations come in just as well as before.

If any other short-wave enthusiast has noticed anything of this sort I should be very pleased to hear from him.

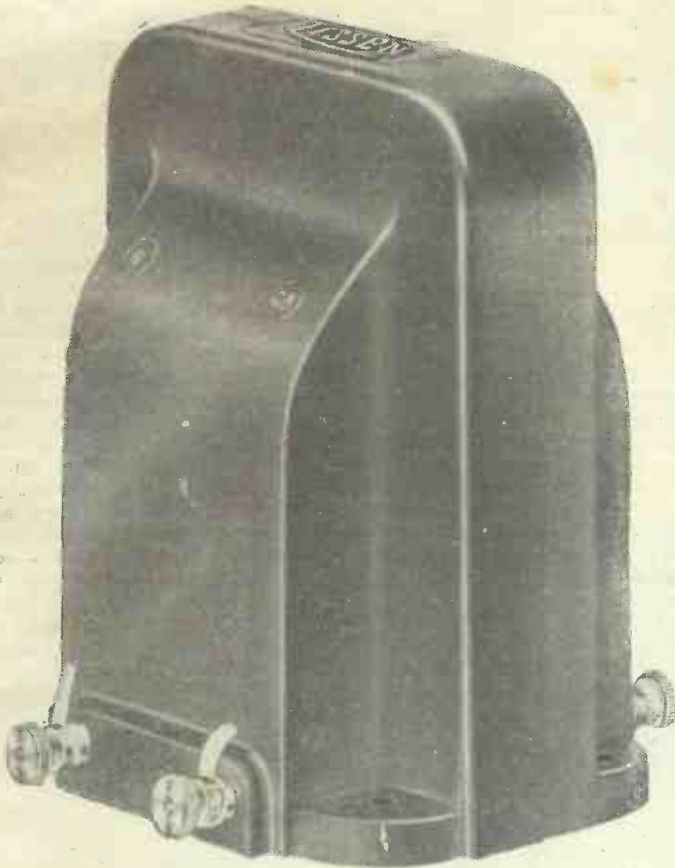
Wishing your paper all success:

Yours, etc,

H. H. O. B.

Broadstairs.

Here is the **SUPER-TRANSFORMER** that **LISSEN** promised you



TWO years ago Lissen replaced every single expensive transformer in the Lissen range because Lissen found it possible to produce a transformer to sell for 8/6 which was as good as every expensive transformer on the market.

That Lissen Transformer has enjoyed the largest sale of any transformer ever marketed.

To-day it still stands unchallenged for value. To-day it is still far better than many expensive transformers offered to the public. It will still be retained in the Lissen range.

But Lissen promised that if a better transformer could be obtained it would be added to the Lissen range.

And here it is—a transformer that gives crystal-clear reproduction of high notes and retains the deep sonority of the bass in a way that is startlingly true. A year ago this latest transformer could not have been made. It is incomparably better than any other transformer selling at any price at all. No transformer, however high in price, can even claim comparison with it unless that transformer has also been produced within the past few months.

For only now has the depth of radio technique yielded the knowledge which has made the latest Lissen Transformer possible. And in certain ways this latest Lissen Trans-

former will prove to have anticipated the advance experience of to-morrow.

For music reproduced to you in a background of utter silence that will make the notes actually seem stereoscopic in form in the way they individually stand out to you, we recommend the latest Lissen Transformer.

PRICE 19/- Ratio 3½ to 1.

This latest transformer represents value in high-priced transformers to the last degree. It represents a big saving in price to the transformer buying public in comparison with every other high-priced transformer available.

7 DAYS' APPROVAL

You can get the new Lissen Super Transformer from most radio dealers. If you have any difficulty, order on a post-card and transformer will be sent C.O.D. by return of post.

LISSEN LIMITED, Friars Lane, Richmond, Surrey

(Managing Director : Thomas N. Cole.)

PARKING THE ELECTRON



Why not charge your own L.T. battery? It is an easy and economical process, as is explained in this article.

By DUDLEY KEITH.

THOUGH you might not judge it from the title, this article is a brief chat about accumulators and home charging, for although perhaps it is not quite scientifically correct to say that we "park" or store the



The Igranic combined L.T. charger and H.T. supply unit.

electrons that we require to use for our sets in the accumulator, yet I think we can say it is sufficiently near the truth to consider the accumulator as a big "parking-ground" for those marvellous little fellows we call electrons, and those of you who are chemically inclined know that the accumulator is a means of converting electrical energy into chemical energy, which can be stored up and then released in the form of electrical energy whenever required.

Main Requirements.

In other words, the electrons can pass through the accumulator during the process of charging, cause a chemical change to take place in the accumulator, and this change is reconverted back into electricity whenever required—synonymous in a sense with "parking" the electrons.

It is to those of you who have electric-light mains that this article is addressed, because it is a pity that a great number of people who have wireless sets and who are on the electric-light mains, do not make use of those mains for charging their accumulators.

It is possible, as you probably know, to use those mains for running the set direct, but a great many of you will already have accumulators and if you are on the mains it is very easy and a cheap matter to charge your accumulator at home and thereby save yourself the trouble and expense of having it charged at the local garage, or by an electrician.

The main requirements for the home charger, besides the charger itself, are an ammeter and a hydrometer. The hydrometer will give you the exact condition of your battery, while the ammeter will tell you the charging-rate you are employing to charge

your battery.

It is, of course, well known that the charging-rate of any accumulator must not exceed one-tenth of its actual capacity, so, for instance, if your accumulator is forty ampere-hour actual capacity you must not charge it at a greater rate than four amps. As a matter of fact, if you go in for home charging, especially if you have A.C. in the house, you will probably find that the trickle charger will meet your requirements better than anything else.

This trickle charger is cheap to run, cheap to build, and is no trouble whatever to look after. You can leave it connected to your set the

whole time, and all you have to do at the end of a broadcast programme is to switch on the trickle charger and allow it to charge the accumulator until you have replaced the amount of energy that you have taken from the accumulator during the time the set has been in action.

You will find with the majority of trickle chargers that the amount of energy consumed from the mains is less than that of an ordinary electric-light lamp, so that it is extremely economical.

Charging on D.C.

If you are on D.C. mains, however, the question is a little bit more difficult to solve, for there is no easy means of stepping up the current and stepping down the voltage from the mains, as you can do with the A.C. charger.

In this case, one can employ an interrupter and then have a charger and rectifier afterwards, or one can place the battery in series with an electric-light lamp which is frequently in use in the house, or in series with the electric fire if this does not pass too much current.

On no account should you tamper with the mains previous to the meter, and whatever you do with your accumulator where D.C. mains are concerned, it is advisable to have a fuse which will blow at anything much over the charging-rate you want to use.

Also, do not forget that the accumulator *must not* be placed right across the mains, otherwise, in other words, the accumulator must not be joined to the positive and negative of the mains direct. A lamp or some sort of article to limit the current *must* be in series with the battery, and don't forget to join the *positive* of the accumulator to the *positive* of the mains.

Finally, do not do anything to the accumulator or the mains unless the electric-light switch controlling that portion of the mains is off.

AN IMPORTANT TEST.



A simple way of finding the polarity of D.C. mains, which is essential if charging is to be carried out. Cut one of the wires going to a lamp socket, dip the two ends in a glass of water to which a pinch of salt has been added, and note from which wire the greater quantity of bubbles rise. This is the negative.

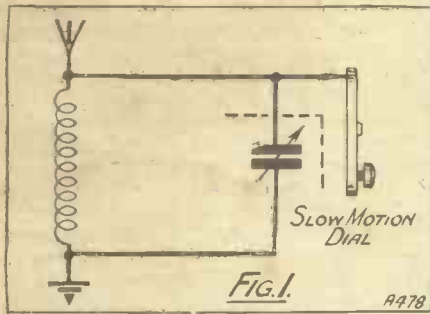
DIAL DANGERS



A great deal of the success of D K reception depends upon the type of dial and condenser employed. This article gives some valuable hints.

By G. P. KENDALL, E.Sc.

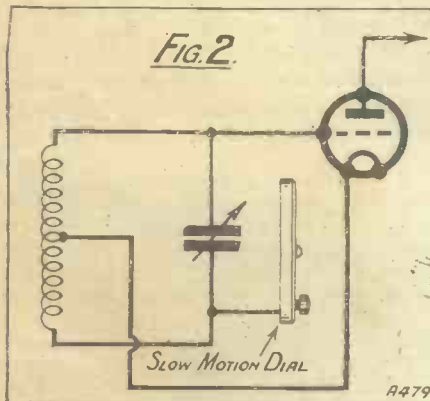
DO you remember the days when all the real lads of the village used to fix extension handles a couple of feet long to their tuning dials, and manipulate them with an air which suggested that bringing in a distant station was about as



easy as balancing a marble on the edge of a razor?

Not a Cure-all.

Thank goodness, modern vernier dials and slow-motion mechanisms have rid us of that particular nuisance, and it is now as easy to turn the dials of our condensers to the exact critical setting for a weak distant station as it is to tune in the local; the relief is so great that we are perhaps a little apt to forget that vernier dials are not such a perfect cure for all tuning ills as



one might think. As a matter of fact, there are several "catches" connected with their use which it is well to understand and make due allowance for.

Now, vernier dials are of three main types: first, there is the kind made almost entirely of insulating material, which is practically free from hand-capacity risks although not possessing one of the special uses of another type. Next, there is the dial which incorporates a good deal of metal in its constitution, which is automatically connected to the spindle of the condenser, and this type calls for a certain amount of discretion to get the best results. Finally, there is the type with a special screening plate which can be connected to earth separately, since it does not actually make contact with the spindle of the condenser, and here again it is important to do the right thing in any particular set.

What May Happen.

Now let us see what is meant by saying that there are "catches" connected with the use of vernier dials in some circumstances. Suppose that we have accidentally wired up a variable condenser the wrong way round, that is with the moving vanes to the aerial or grid side of the tuned circuit, instead of to the earth or filament side, as they should be. If the circuit is at all critical in its tuning the effect will be, of course, to introduce bad hand-capacity effects; if we simply add a vernier dial right away without discovering the error one of several different things may happen.

Suppose, first of all, that we use a dial of the type made throughout of ebonite or bakelite, with little or no metal in its construction. Since the operator's hand will not now approach very near to any "live" metal parts the hand-capacity effects will probably not be very bad, and may be scarcely noticeable, so that there may be just a vague feeling that tuning is not quite so easy as it ought to be, and the mistake in connections may escape discovery altogether.

Disappointing!

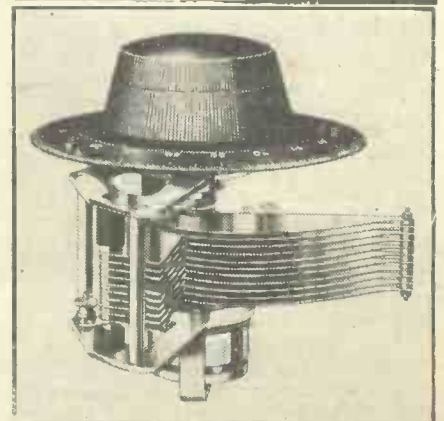
If, on the other hand, we had happened to attach one of those types of dials in which there is a good deal of metal making contact with the condenser spindle the state of affairs would be far worse. Since all this metal would be on the high potential side of the circuit and very close to the operator's fingers the hand-capacity troubles would be very bad indeed, and might be very puzzling to anyone who had imagined that a good vernier dial was a cure for all such difficulties.

Evidently, then, when this kind of dial is used, very special care must be taken to see that the condenser connections are correct, and to emphasise the point the diagram reproduced in Fig. 1 has been specially prepared. Here you will see that the effect of the condenser connections being reversed is to join the metal parts of the dial through to the aerial side of the tuned circuit.

Dangers of Reversal Connections.

A point to note in passing is that with modern condensers hand-capacity effects are even worse than with older types if the connections are reversed, on account of the extensive metal framework used in the latest forms. This frame is usually connected to the moving plates, and when the condenser is joined up correctly the effect is to screen the fixed plates and so prevent hand effects. When the condenser is the wrong way round all this framework is on the high potential side of the current and so body-capacity will be extremely troublesome. This framework is represented diagrammatically in Fig. 1 by the dotted lines round two sides of the conventional sign for a variable condenser.

With the third type of dial, namely the separate screening-plate kind, matters will not be so bad, and if the plate is connected



A typical "K.C." (Dubilier) fitted with slow-motion drive.

to earth the hand-capacity troubles will probably be quite slight. However, the "live" spindle of the condenser is still
(Continued on next page.)

FRAME AERIALS

For selectivity the frame aerial has no equal, and holds many advantages lacked by other types.

By A CORRESPONDENT.

A FRAME aerial has the great advantage that it is small and compact and does not involve the installation work necessary with an outdoor aerial. It is also specially adapted for use with portable or semi-portable receivers.

Owing to the comparative insensitivity of a frame aerial, as compared with an extended outdoor antenna, as a pick-up of electro-magnetic energy, it is usually only possible to employ a frame aerial of the average size when some degree of high-frequency amplification is used; and therefore a frame aerial is commonly associated with H.F. sets, and particularly with the super-heterodyne.

The action of a frame aerial as a pick-up of energy is fairly simple, although perhaps not so commonly understood as that of the ordinary antenna.

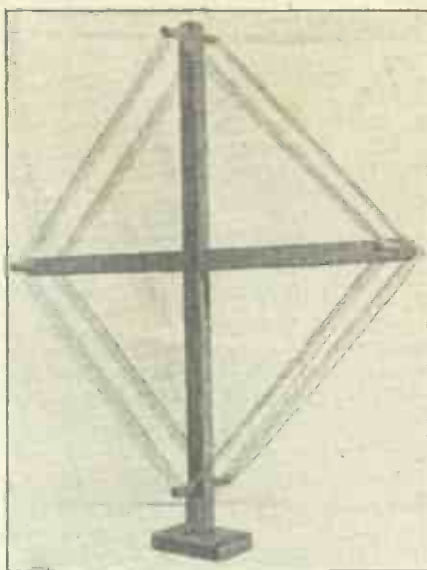
Straightforward Theory.

The theory of the action of a frame aerial, or "loop" as it is sometimes called, is often explained in the following way. Suppose we have two vertical wires, separated by a distance of 200 metres, insulated from one another and from the earth. Now, if a wireless wave proceeds from a direction at right angles to the plane containing the two wires, the wave will reach the two wires at the same time and the voltages induced in the two wires will be, as we say, in the "same phase." If, however, the wave proceeds from some other direction, it will reach one wire a little before the other, and therefore the voltages induced in the two wires will be "out of phase." If the direction of travel of the wave is in the plane containing the two wires, then there will be the maximum phase-difference, and if the wave-length of the waves is 400 metres (the distance between the waves being assumed in this case, as stated, to be 200 metres) the voltages will be, as we say, 180 degrees out of phase. Therefore the voltage at the top of one wire will be a positive maximum, whilst the voltage at the top of the other wire is a negative maximum (or, if you prefer it, a positive minimum).

Now if the upper ends are connected together and the input of a receiver is

connected across the two lower ends, it is obvious that current will flow around the circuit and, if the circuit is tuned by a condenser of the proper capacity, the currents may be comparatively large. The induced voltages will be greatest when the wave and the loop are both in the same plane, since this will result in the maximum phase difference between the voltages induced in the forward and rear wires of the loop.

With regard to the design of loops, it will be found that the current induced in



A typical example of a double-wound frame aerial suitable for use on ordinary broadcast wave-lengths.

the loop is greater the larger the area of the loop and the greater the number of turns of wire on it, and is smaller the larger the resistance of the loop and the longer the wave-length being received.

Constructional Details.

Loop aerials usually consist of several turns of wire upon a rectangular frame, although, of course, the frame may take any other desired shape. The turns should,

be ebonite or all-bakelite dials, where the fingers are well away from the live parts when turning the slow-motion knob, but perhaps even better is the dial with a good deal of metal *not* connected to the moving spindle. This metal then acts as a screen, and helps considerably. Better still would be a dial in which all the metal can be separately earthed, e.g. one of the type with an actual screening plate.

Beware of This!

The one thing *not* to do in such a case is to use one of the type with a lot of metal connected to the spindle, because with one of these the state of affairs will be exactly the same as in the first case we

for best results, be spaced at least $\frac{1}{2}$ in. from one another so as to keep the capacity low, but practical considerations usually result in the spacing of the successive turnings being much less than this. The distributed capacity of a loop increases with the number of turns, rapidly with the first few turns and then more slowly as further turns are added.

A very satisfactory loop for use with a .0005-mfd. condenser may be made by constructing a four-foot square frame and winding upon it six turns of, say, No. 22 wire. Such a loop will have a range from about 200 to 600 metres.

For satisfactory operation of a loop or frame aerial it is not generally necessary to have any earth connection. But in some cases louder signals can be obtained if one end of the loop is connected to earth. When such a connection is made it is probable that the loop acts partly as an ordinary aerial by reason of its capacity to earth. It should be pointed out that the inner end of the loop should always be at the low potential.

SIX USEFUL TIPS.

IF one of the small nuts or screws on a cone type of loud speaker gets loose it is likely to give rise to a dithering effect in reception.

Remember that the mica and not paper condensers should be used for coupling condensers for resistance-capacity or choke amplifiers.

If a fixed condenser of about .002 mfd. is joined in series with the reaction condenser on a Reinartz type of receiver it will completely safeguard the battery against a short due to the accidental touching together of the fixed and moving vanes of the variable condenser.

Trouble due to gassing or popping in a small accumulator is greatly reduced if a small layer of medicinal paraffin oil is carefully poured on to the top of the electrolyte.

If an ordinary drill is heated up to a dull redness and then immersed suddenly into a quantity of heavy lubricating oil the steel will be hardened.

The tuning of short-wave stations is very, very much sharper than that of stations upon the ordinary broadcasting band.

DIAL DANGERS.

(Continued from previous page.)

not far from the operator's fingers, and may cause a little trouble, so you see that even here it is best to see that your condenser is the right way round.

Now what about those circuits in which both sides of the condenser are above earth potential? An example is the Hartley reaction circuit, in which neither set of plates can be earthed, and hence hand effects are apt to be rather a nuisance unless special precautions are taken.

A safe remedy is to use one of the all-

considered, namely a circuit with the condenser connected up the wrong way round.

A circuit which requires very similar treatment is the "split secondary" neutrodyne arrangement, the vital portion of which is illustrated in Fig. 2. The sketch shows what happens with a dial of the type which contains a lot of metal connected to the moving spindle. Just one warning here: With only one H.F. it may be safe to connect the screening plate provided on some dials to earth, but it is wise to try leaving it free, because to earth it may upset the neutralising scheme. With two stages it is generally necessary to leave these plates free.

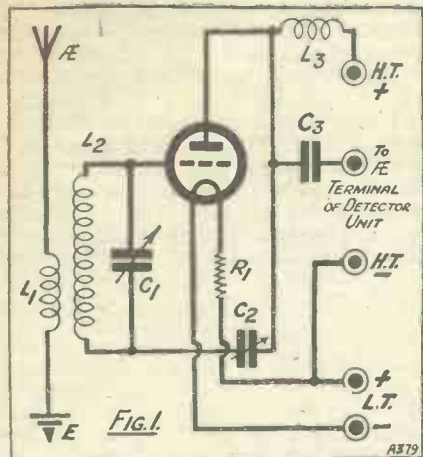
A "FREE GRID" H.F. AMPLIFIER



I HAVE been carrying out some experiments with an H.F. amplifier in which the grid of the valve is left free. The results have been so satisfactory and consistent that I have decided to use a circuit evolved on these lines as a single-stage H.F. amplifier, which I have further specially

An interesting successor to the series of one-valve sets recently described in "Popular Wireless."
 By C. P. ALLINSON, F.Inst.P.Inc.,
 A.M.I.R.E.

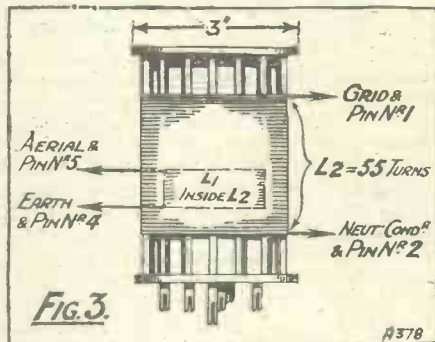
modification as to its connections inside. I have adhered to the baseboard type of construction for this H.F. unit, which commends itself not only on account of its ease of construction, but also because of its cheapness. A 12 in. by 8 in. baseboard has been



Further, it considerably simplifies the construction of the coil itself by eliminating the tapping which would otherwise have to be taken during the process of winding, and it also enables us to dispense with the resistance which I have generally found it necessary to connect in the L.T. return lead to prevent the generation of parasitics. At the same time the circuit appears to be generally more stable, and is certainly easier to adjust in the first place, while there are no hand-capacity effects.

Used With Any Set.

Shunt feed is used for the output, and this is an important point to note since it enables this amplifier to be used with any receiver without the latter requiring any



used, for this allows the components to be well spaced out, eliminating any troubles that might arise from crowding, and making it easy to build and wire the set.

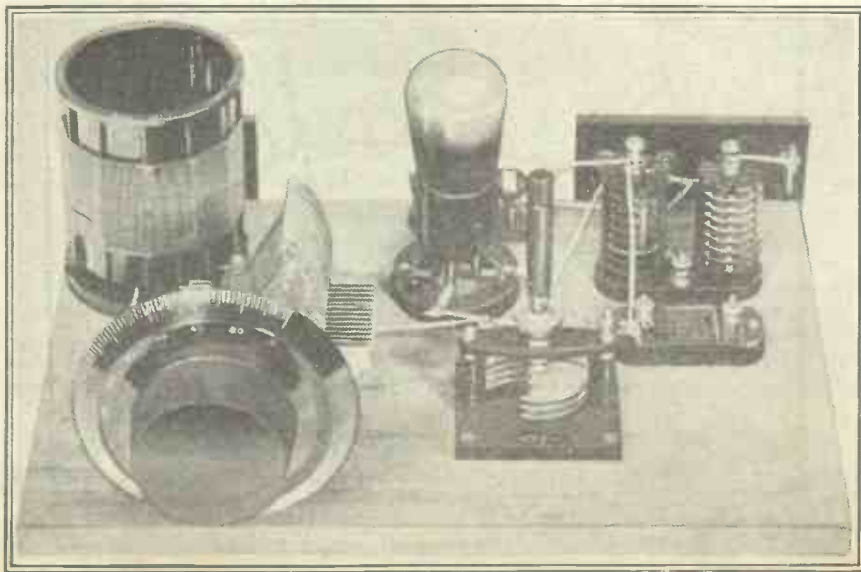
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designed for use in conjunction with the single-valve receivers which I have recently described.

The theoretical circuit will be seen in Fig. 1, and this will serve to illustrate the chief features of the circuit used. It will be seen that the tuned-grid circuit (L_2, C_1) of the valve is connected at one end to the grid in the usual manner, but that the other end goes to one side of a neutralising condenser (C_2), the other side of which is connected to the anode of the valve in the manner usually used in the split-secondary type of neutralised circuit.

Simple Coil Construction.

No tap, however, is provided on the coil for connection to L.T., and one of the results of this is that it is impossible for parasitic oscillations to be generated. A further advantage is that the grid-filament damping of the H.F. valve is not placed across the tuned circuit, thus enabling the maximum selectivity to be obtained, a point that is of considerable importance nowadays.



Only one full-size variable condenser is needed in this set, the reaction control being obtained with the neutrodyne type seen in front of the valve.

A "FREE GRID" H.F. AMPLIFIER.

(Continued from previous page.)

The wiring diagram in Fig. 2 shows the disposition of the components as well as the actual connections employed, and the work involved is so straightforward and simple as to require no comment outside of the usual warning to see that all joints are well made and all terminals tightly screwed down. Grid and anode leads should preferably be spaced out as much as possible

COMPONENTS REQUIRED.

- 1 .0005 Variable condenser (Formo or other base-board mounting type.)
 - 1 Valve holder (Lotus, Bowyer-Lowe, etc.)
 - 1 Baseboard-mounting neutralising condenser (Peto-Scott).
 - 1 Filament resistor (Cylton, Burne-Jones, Amperite, etc.).
 - 1 Six-pin former and base for aerial coupler (Colvern).
 - 1 H.F. choke. This must be suitable for shunt feed (Climax, R.I.-Varley, etc.).
 - 1 .001 Fixed condenser (Mullard, Dubiller, Lissen, T.C.C.; Clarke, etc.).
- Terminal strips, wire for connections, screws and 12 in. x 8 in. baseboard about 1/4 in. thick.

so as to prevent interaction taking place where not wanted.

It will be noticed that no output terminal is provided. This would, however, only mean extra constructional work since the coupling condenser C₃ is provided with terminals, and the free terminal can therefore be used for the above purpose.

We now come to the construction of the coils L₁ and L₂. Those who do not wish

to take the trouble of making one up specially for the purpose will find that a tapped grid or split-primary H.F. transformer can be used successfully.

to the grid. It should be wound in the same direction, the top being connected to the aerial and the bottom to earth.

For average purposes this may be 20



Note the absence of the grid condenser from its usual position. The wire from the tuned circuit goes direct to the grid.

If you want to make it up yourself and use a 3-in. diameter former you will need 55 turns of 22-gauge D.S.C. wound side by side, or the same number of turns of 26-gauge D.S.C. spaced one diameter for the grid winding. If a 2 1/4 in. former is used the number of turns needed will be 65 and 70 turns in each case.

The primary winding should preferably be inside the secondary and should be located at the bottom end of the winding—i.e. away from that end which is connected

turns of 26-gauge D.S.C. wound side by side, though if greater selectivity is required the number should be reduced to 10 or 15.

The sketch shown in Fig. 3 gives the details of this coil showing both pin numbers and destinations of the ends of the windings, so that if you wish to make up the coil on a plain former instead of an interchangeable one you will know how to make the connections. Litzendraht wire will, of course, give greater efficiency if used for the grid coil L₂, and I certainly recommend it where expense and extra trouble are no object.

Long-Wave Reception.

For the reception of 5 X X you will need from 250 to 300 turns for the secondary, depending on the size of the former you use and the method of winding, and for the primary a suitable number of turns will be between 75 and 100. It is not advisable to use thinner wire than gauge 36 for these windings, otherwise the efficiency of the coil will be reduced rather seriously.

Incidentally, if you intend using this unit for long-wave work, make sure that the H.F. choke L₃ is suitable for this purpose, otherwise trouble may result.

The correct type of valve to use is an ordinary H.F. valve of 15,000 to 30,000 ohms impedance, and the highest H.T. voltage available up to 120 volts should be applied to it.

To install this amplifier before any of the single-valve receivers I have previously described, transfer the aerial and earth leads to the appropriate terminals on the H.F. unit, connect it up to the L.T. and H.T. batteries, and connect the free terminal of the coupling condenser C₃ to the aerial terminal of the receiver.

In cases where the earth terminal on the detector unit is not connected to L.T. (as in the case of the "Free Grid" One) link this up to L.T.+ and the installation is ready for use.

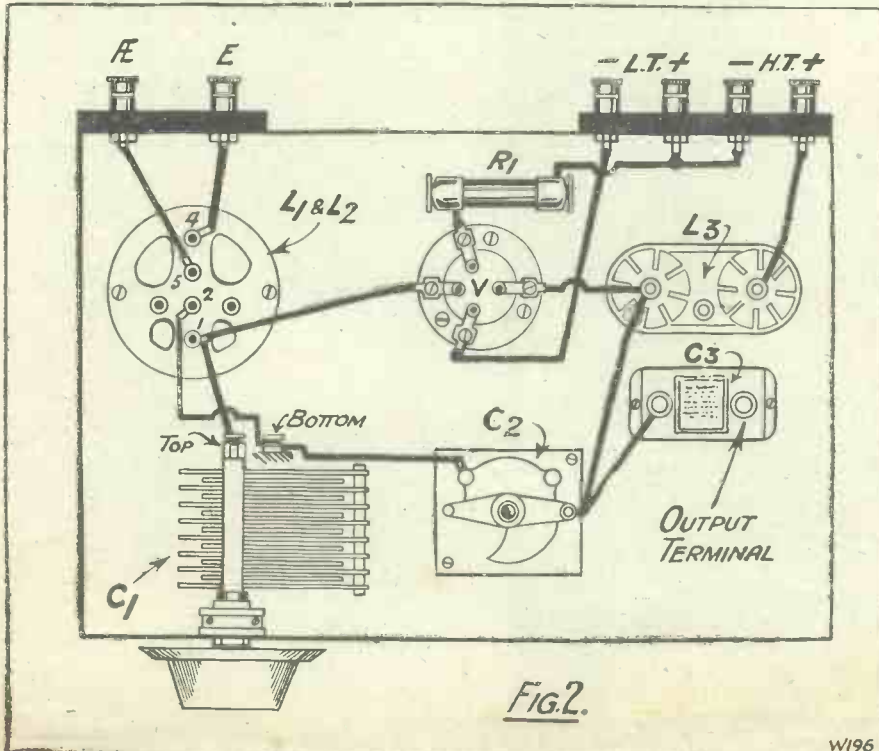


Fig. 2.

THE REGIONAL SCHEME.

Eckersley Rumours—Movies by Radio.
By THE EDITOR.

ALTHOUGH actual work has started on the new London high-power twin-wave station at Brookmans Park, near Potters Bar, there is still no indication that the B.B.C. have yet received permission to start the erection of any of the other proposed Regional stations.

As we have pointed out before, if there is to be excessive delay in the erection of the other stations, the Regional scheme, as a whole, will not come into operation for some considerable time—not, perhaps, for some years.

Although we have no definite authority on the question, there is a disquieting rumour that the other stations will not be started until the new London station has been completed and tests made. If that rumour be true, then the Regional scheme will most certainly be delayed, and it will be a long time before the much-discussed new system is in an actual working state.

It appears that the P.M.G.—after a good deal of hesitation—gave permission for the erection of the Brookmans Park station, but decided to withhold permission with regard to the other stations for reasons which it is difficult to appreciate.

Captain Eckersley and his technical staff know what they are doing, and it may safely be taken for granted that their plans for the new stations are O.K.; but if the P.M.G. is going to license them one by one—waiting until one station is complete and working O.K. before he allows the B.B.C. to proceed with the next one—then we shall all be about five years older before the Regional stations are all in working order.

P.P.E. to Resign?

There have been many rumours also to the effect that Captain Eckersley is rapidly becoming “fed up” with the red-tape restrictions he is experiencing these days, and the word “resignation” has been mentioned.

We sincerely trust that, in this particular instance, rumour will once more be proved a “lying jade,” and that the Chief Engineer will not sever a connection which has proved so very valuable for the B.B.C. and to the technical progress of broadcasting in this country; and we also hope that, for his sake, as well as for the sake of the hundreds of thousands of listeners and amateurs in this country, his work will not be impeded and fettered by red tape and the interference of bumptious and self-important officials, both of the B.B.C. and Post Office order.

Should P.P.E. become so exasperated as to resign, there would be a pretty fine outcry, and public opinion would demand a very careful inquiry as to the “reason why.” And petty officialdom, which might conceivably so disgust the Chief Engineer to such a drastic measure, would inevitably get the worst of it in the long run.

It is always a good plan to leave a useful man in authority free from petty interference. It's a tip Savoy Hill and the gentlemen in the G.P.O. might accept with considerable advantage to themselves.

A demonstration of the transmission of films by wireless took place a few days ago at the television laboratory of the Westinghouse Company at East Pittsburgh before a group of scientists. The apparatus for the transmission, which has been designed by Dr. Frank Conrad, follows in general detail, states “The Times,” the conventional television plan.

Television Broadcasts.

In the demonstration the signals traversed a distance of about four miles, two from the laboratory to the broadcasting station by wire, and two back by wireless. In the first step of the process a small but intense beam of light traverses each picture at the rate of 60 times per 16th of a second, which produces a 60-line picture.

Have You Bought
Your Copy of the AUGUST
MODERN WIRELESS?

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The beam of light passing through the film falls on an electric cell, not unlike an oversized incandescent lamp, containing a thin layer of caesium, a rare metal whose electrical resistance varies according to the light falling on it. The beams of light are then transferred to a high-power transmitter, which converts the electrical impulses to signals of radio energy, and makes them assume definite and varied frequencies, sometimes in audible form.

After these weak signals had been returned to the laboratory, they were picked up by an ordinary wireless receiver, and passed through a mercury arc light. The latter, being affected by the wireless signals, varied its illumination in conformity with the light passing through the film at the back of the transmitter, and the interposition of a perforated disc enabled the audience to see the film reconstructed before their eyes on a ground glass film screen, about 10 in. by 12 in.

It is stated that a regular transmission of motion pictures by wireless from the Westinghouse broadcasting station will begin within a few months.

THE 100% CRYSTAL SET.

(Continued from page 828.)

such as Paxolin, Pirtoid, Radion, etc., 3 in. in diameter and 3½ in. long. This is secured to the baseboard in any convenient manner, the original being fastened down by fitting into one end a little wooden cross-piece secured by two

screws passing through the walls of the tube, and one large screw downwards into the baseboard.

The windings are the vital part of the whole set, and you should take great pains to get these correct. First of all there is a plain winding of sixty turns of No. 24 double silk covered wire, this being marked L₁ on the diagram. Interwoven with the first forty turns of this there is another winding of forty turns of No. 32 D.S.C., which is put on turn by turn along with the other winding. You will find it is quite easy to put the two windings on together if you arrange the two wire bobbins in a convenient position on the table, take the two ends of the wire and twist them lightly together for an inch or so, and pass them through a couple of small holes in the tube to secure them.

Then proceed to wind on the two wires together side by side, one turn of each wire straight alongside the corresponding turn of the other, and proceed in this way by putting on a double winding pushed up quite close, just like any other ordinary single-layer winding, until you have completed the forty turns of each. Then cut the finer wire, and secure the finishing turn with a very small dab of Chatterton's Compound or sealing wax, and carry on with the winding of thicker wire until you have completed the required number of turns.

Then secure the end either by means of another dab of sealing wax or by passing it through a couple of little holes in the tube, as you did when commencing the winding. This is how you carry out the main operation, but it should be added that as you do so you should make tappings in the thick wire winding only at the following turn numbers: ten, fifteen, twenty, twenty-five, thirty, thirty-five, and forty. You will find this quite easy to do if you simply twist up a small loop on the thick wire as you come to each of the turns on which a tapping is to be made, and then carry on as before. Note carefully that no tappings are needed in the thin wire winding. When the coil is finished you can scrape each loop bare with a knife, and it is then ready for the attachment of the tapping clip.

Tuning In.

The remainder of the constructional work is purely a matter of drilling holes, mounting parts in position, and wiring up, and this will present no difficulty. So far as operating the set is concerned, the preliminary adjustments are quite simple, merely being a matter of finding the right size for the loading coil for the reception of 5 X X (No. 150 is the most usual size), adjusting the crystal to give the loudest signals and finding the best position for the tapping clip on the shorter wave coil for the reception of your local station and for the reception of 5 G B.

This latter station usually requires the clip to be placed a little higher up the coil, unless, of course, your local station is one with a fairly high wave-length. In the latter case, however, you are not likely to be interested in 5 G B, since the only station working on a longer wave is Aberdeen, where reception of 5 G B is distinctly unusual on a crystal.

Now it only remains for us to wish readers success with the set, and leave them to find out what excellent results it is capable of giving.

FROM THE TECHNICAL EDITOR'S NOTE BOOK



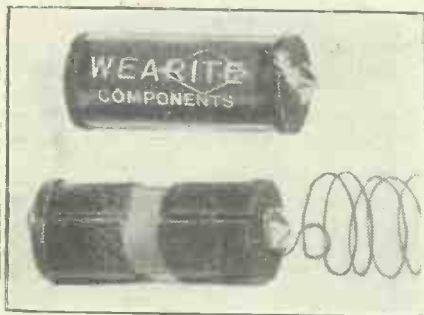
WIRE-WOUND CONDENSERS.

A wire-wound fixed condenser strikes one as being rather incongruous or, perhaps I should say, anomalous. It sounds just as curious as speaking of a mica-dielectric anode resistance. There is, of course, no such thing as this, but a wire-wound fixed condenser has been produced by Wright and Weaire Ltd.

Actually it is not a completely new idea. Constructors will remember the improvised neutralising condensers of earlier days. Those were "wire-wound," for they consisted of two pieces of wire twisted together. But these "Wearite" condensers have orthodox "windings" on small formers.

Each component has two windings. I have had one condenser dissected and photographed so that you can see the construction. It appears together with another untouched sample. You will notice that each winding is joined to one of the connecting ends of the article, the other ends of the windings being left free. The windings are wound directly above each other. They therefore form the plates of the condenser, the insulating covering of the wire acting as the dielectric. The whole device is protected by a transparent covering.

One's first thought is that this wire-wound method of construction is a needless sort of complication that has no real advantages. And from an electrical point of view I cannot see that it has, although I presume



Two of the Wearite Wire-wound Fixed Condensers. The one in front has been partially dissected in order to show its construction.

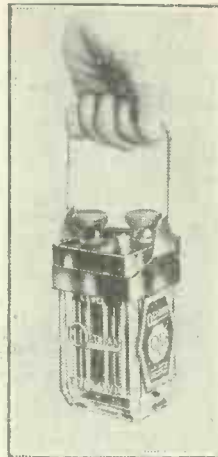
it makes for cheaper production. Actually, a .0001 mfd. costs only 1s. 3d. Also, they seem to be robust, and all are stated to be tested for breakdown at an A.C. voltage of 340.

But what about induction effects one is inclined to ask. We ask that a condenser shall have only capacity. A careful test with a strong oscillation showed that a "Wearite" wire-wound condenser produced a small field, but I am bound to admit that I do not think that in ordinary circumstances

any serious coupling effects would result. The windings appear to be arranged so that some considerable cancelling effect is present.

AN INGENIOUS CARRIER.

I have had numerous accumulator carriers in use during the past two or three years, and most of them have succumbed to the attacks of acid. Some of them



The Oldham Carrier.

consisted mainly of wooden cases having leather handles, and my experience is that one can protect the wooden part of such an article quite successfully by the generous use of anti-sulphuric paint, but that it is very difficult to safeguard the leather strap.

And it is when the strap gives way that the greater risk of damage to the accumulator arises. But I have had the bottom of a carrying case fall out, and this resulted in the complete destruction

of the glass-cased cell, for this fell on to a concrete pavement. What an attraction it is, then, that the Oldham people supply a neat and quite safe carrier with their 2-volt 10-ampere actual O.V.D. cell. The price of this battery, a stout, reliable production, is only 5/6, and the carrier is supplied free of charge. The carrier is an all-metal affair, and is constructed so that it has a maximum of strength and a minimum of weight.

The device fits round a shoulder moulded in the glass case of the cell, and it cannot possibly slip once it is placed in position.

Although the carrier is made of metal it cannot possibly short-circuit the terminals of the battery, as these have large insulating knobs. Messrs. Oldham are to be congratulated on the so complete solution of a nasty little problem.

A MARCONIPHONE L.F. CHOKE.

You can build a ship big enough to carry practically anything in the way of cargo from one mousetrap to twenty locomotives, but if the cargo which had to be carried from one point to another never exceeded, say, twenty tons in weight, it would be a wasteful business to use for this a ship which would carry twenty thousand tons. Apply the idea to radio and you will be able to appreciate that the Marconiphone choke

type M which sells at 12s. 6d., and which measures only 3 in. by 2½ in. by 2½ in., and weighs only 11 ounces, can be and is a first-class component.

There are five types of Marconiphone L.F. chokes available, and this type M seems to be the baby of the family. It is designed as an intermediate valve coupling device and not for use in eliminators or output filters, for which there are other suitable varieties. It has the very excellent inductance of fifty henries, the value it might be remembered which I advised constructors to aim at for the intervalve coupling choke in the "Progressive Four." It is a pity that this Marconiphone choke was not available when this set was described, for inexpensive chokes having this inductance are very few and far between. The maximum current through the windings of this type M should not exceed five milli-

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out, with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

amps, and this does not prohibit the use of such valves as the D.E.L.610 or D.E.5 B., etc.

"PUSH-PULL" AMPLIFICATION.

We recently received a letter from the Ferranti people which I am sure will prove of interest to many of our readers. The letter reads as follows:

"The employment of push-pull amplification in broadcast receivers is patented by the Standard Telephones & Cables Co., Ltd. We are pleased to advise you and your readers that we have made arrangements with that company to incorporate in the price of the transformers the necessary licence for the use of the push-pull system in broadcast receivers.



The Marconiphone Type "M" L.F. Choke.

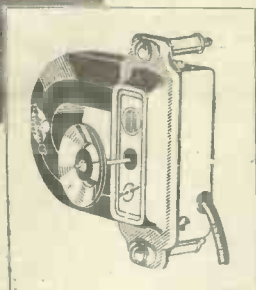
"In order to encourage the continued use of push-pull amplification, we have made only a small increase in the price in order to cover the licence royalty payable.

"There is no doubt that users will appreciate the convenience of being able to have their transformers marked with a definite indication that the royalty has been paid and that they are therefore fully licenced. Yours faithfully, FERRANTI, LIMITED."

This sounds very reasonable and very fair, and I hope every reader will endorse the sentiment expressed.



"Ideal Blue Spot Cone Speakers are sold under full protection of the patents owned by Standard Telephones and Cables and the Hopkins and Lektrophone Corporations."



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The reason is in the driving unit designed on the special four-pole principle. This results in a harmonious balance and spread of the actuating current impossible to attain in the usual one- or two-pole drive. Reproduction is faithfully maintained over the entire range and uninterrupted by vibratory harmonics in the instrument itself. Every note retains its own pure musical quality.

Ask your dealer to demonstrate the "Blue Spot 44" and notice its remarkably crisp rendering of those elusive chords at either end of the scale. You will be surprised that such performance is obtainable at the price—now reduced to :: :: **37/6**

The **BLUE SPOT 44**
CONE SPEAKER

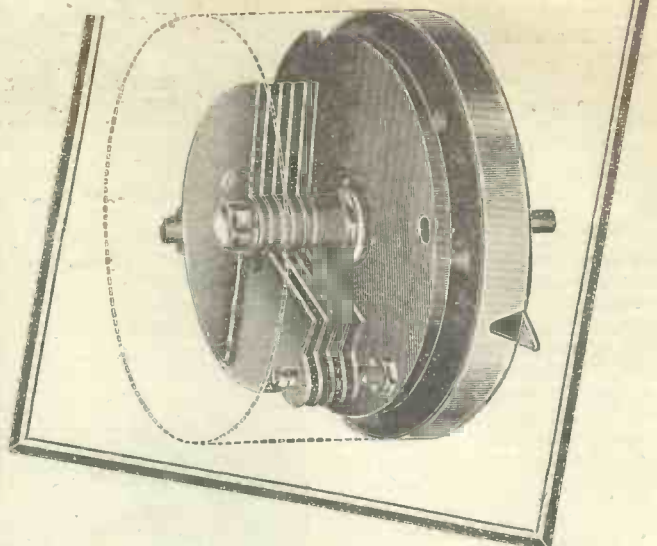
The Blue Spot Cone Speaker is supplied also at the same price in the form of a kit from which you can build up the identical model in your own home.

The new Ideal Four-Pole Balanced Armature Unit, 66A, is now available for constructors wishing to build a cone speaker to their own pattern, but giving results equal to the best models. This new movement is fitted with a special adjusting screw in addition to two padded washers on threaded spindle, 25/- The non-adjusting type, 66A, can be obtained at the newly reduced price, 21/6.

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RADIO IN A SALT MINE

A VERY interesting test was recently carried out by some members of the Radio Transmitters' Union of Northern Ireland, in order to ascertain whether radio waves could penetrate to the workings of the deep salt mine at Carrickfergus, Co. Antrim.

Had positive results been obtained, it was intended that their portable transmitting station would be installed, and that an attempt to send signals out from the working face would be made. Before the laborious task of installing a transmitter at such a depth was undertaken, it was decided that a group of members would make tests on the possibility of reception. This group consisted of Gi-6 M U, Gi-5 M O, Gi-6 Y W and an assistant, Mr. Lamont.

On arriving at the mine, it was found that the method of descent was to stand on two boards across the square steel buckets used in bringing the rock salt to the surface, and one held on to the steel cable by which the bucket was lowered. It is impossible to stand in the bucket itself, as the bottom is sloping to facilitate the "tipping" of the salt at the surface.

"Uncanny Silence."

We were sent down in two lots, each accompanied by the foreman and some of the gear for the tests, and the 550 feet were accomplished in just four minutes. The sides of the shaft were quite close to one as the descent was made, and the only illumination was from a small "smudge" lamp carried by the foreman.

The bucket came through the ceiling of a large cavern, and on stepping out at the bottom we were handed a couple of "smudge" kettles; we, however, chose to rely on a few electric cap lamps which we had brought, and so escape the smell of the burning and smoking wicks.

DO YOU KNOW THAT . . .

So strong and satisfactory are the signals of the Beam wireless telegraph services, that even to Australia speeds of up to 350 words per minute are often attained?

With short-wave sets reaction gives better results when it is fed into the grid circuit from the end to which the aerial lead also is connected?

One of the most frequent causes of failure to oscillate on the short waves is the fact that the aerial is coupled too tightly to the grid circuit?

There is something romantic about the idea of listening to the outside world from the depths of the earth, and, although the purpose of the experiments described were of a serious scientific nature, the account of them makes fascinating reading.

By G 6 Y W.

The first party waited in an uncanny silence for the second lot and the receiver; even the workers at the bottom made no noise as they walked about, as the "floor" consisted of finely-powdered salt, very much like fine sand. After all had reported at the bottom, we walked to a very large



A flashlight photograph taken whilst the interesting experiments were being carried out 550 feet below the surface of the earth. The author is on the extreme left.

cavern which was not being worked, by arrangement with the company. This space was about 50 ft. high and circular in shape, having a diameter of probably 130 ft., and the walls and ceiling were of rock salt.

Erecting the Aerial.

In the process of blasting out the salt a kind of balcony near the ceiling is formed, and by means of a hanging rope a couple of members of the expedition climbed up the vertical face of the salt and slung an inverted L aerial from one side of the cavern to the other. This aerial was about 60 ft. long and 40 ft. high, and to this was connected a receiver capable of tuning from 10 to 6,000 metres and employing two valves. It was, in fact, the receiver used at Gi-6 M U for all reception work.

An "earth" was made by connecting to the steel rails used for running small trucks to the working face.

The first period of listening resulted in hearing absolutely nothing. No signals and a complete absence of atmospherics and background. The silence even at the edge of oscillation was something new to the members of the party and was eerie in the extreme, especially when such a complete silence reigned in our surroundings.

After lunch had been finished, it was decided to listen for the afternoon transmission from the Belfast Broadcasting Station, 2 B E, and soon after commencing to listen a faint carrier was heard which grew in strength until it was about R 5, but no speech could be resolved, though it was quite evident that it was voice-modulated. After a few minutes the carrier faded completely out, and was not heard again for about ten minutes, when the process of coming in and fading out was repeated.

The steel bucket in the shaft some 200 ft. away was suspected of having an influence on this behaviour, so one of the party went along to observe the bucket while signals were relayed to him from the receiver by another member with a flash-lamp, standing at a corner of the passage connecting the cavern with that in which the bucket descended.

The "Resonant" Cable.

It was soon noticed that the signals could only be received when the bucket was at the bottom, and that as soon as it entered the shaft the carrier faded out.

It was decided that the reason for this was that the steel cable was acting as a type of transmission line, or that the signals were passing down the shaft when it was clear.

It is probable that the former was the cause, as the length of the cable was such that a certain amount of resonance with the frequency of 2 B E might be expected.

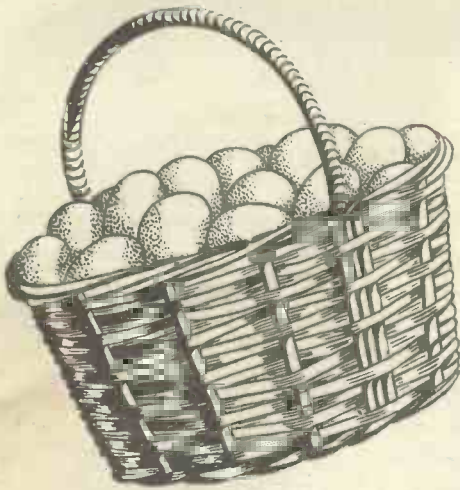
It was not expected to be able to hear any short-wave signals at such a depth, as it is well known that the shorter the wave becomes the less deeply will it penetrate into a medium; but it was thought possible that the long-wave commercial stations would be heard.

ITEMS OF INTEREST.

THE cost of the regional scheme was recently estimated to be about £35,000.

Regular wireless time signals were first transmitted by America (in January, 1906) from the Navy Department Station at Arlington.

The standard mean time clock at Greenwich which gives the world its time and the B.B.C. the six ticks, is kept in a heat-insulated room to which access can only be obtained by means of entry through a series of double doors.



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5496



J.W. Bennett

IT IS QUITE TRUE

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply.

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Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free; simply tell me your age, your employment, and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the world, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address: The Bennett College, Dept. 106, Sheffield.

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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.

IMPROVING THE EARTH.

E. G. (Hanworth, Staffs).—"I have quite a small crystal set, though it certainly does hand out the broadcasting. We wait our turn for the 'phones, and consequently I want to have it as loud as possible. But lately it seems to have gone off a good deal, and by what I can gather from others who have had similar trouble with their sets it seems likely that the

earth is wrong. How can I tell if this is to blame?"

Apart from expensive instruments for testing the earth, we think that the most satisfactory and certainly the cheapest method is to take a good look at the earth. Starting with the earth connection itself, dig down to this and make sure that the wire connecting this to the set is firmly soldered to the earth plate or other metallic object which you buried.

The condition of the earth around the plate also should be noted, because if this is dry the plate will be in poor contact with the surrounding soil. In such a case it is a good plan to take the earth wire through a small pipe down to the earth plate, and to occasionally pour water down this pipe so as to retain moisture always in contact with the plate itself.

Having made certain that the joint to the buried earth is good and that the latter is not unduly dry,

carefully follow up the earth lead, making sure that at all points it is intact and without any broken strands. The wire should be examined right up to the earth terminal of the set, and the latter also should be examined, making sure that the wire is in good metallic contact with the terminal.

Unless care is taken a film may easily form there which will result in making the earth and all the rest of the earth-aerial system inefficient. If an earthing switch is used to earth the aerial attention should be paid to this also. Make sure that its contacts are clean and that there is no leakage across the switch surface such as may be caused by a deposit of copper, soot, dirt, or other foreign matter.

A DUD H.T. BATTERY.

T. I. H. (Aberdeen).—"What are the signs of a dud H.T. battery?"

Generally howling sets in when a battery deteriorates, especially if the full voltage is used for the detector valve. Another common sign of a dud battery is very loud crackling noises, which may be caused by one or more faulty cells in the battery. The surest test of a deteriorated battery is a voltmeter, for in the course of time the voltage of the battery is bound to fall, and this is accompanied by lack of volume and by distortion.

A SET WITHOUT ANY BATTERY.

T. C. H. (Stafford).—"What I should really like, although I suppose there is not such a thing, is a set which takes both its H.T. and L.T. direct from the mains. I know that these sets are available in commercial form, or at least I have seen advertisements dealing with multi-valve sets of this kind, but I only want a two-valve set, Det. L.F. Have details of a set of this kind ever been published, or shall I have to content myself with an ordinary two-valve set attached to an H.T. mains eliminator?"

Such sets are now quite practicable and, indeed, give excellent results in many cases. Quite recently a set of the very type you mention was described in detail in "Modern Wireless" (July issue), and we should certainly recommend you to obtain this number of "M.W." and to carefully read the details of "The Electric Two" before choosing definitely, as it appears to be the very kind of set you are looking for.

(Continued on page 848.)

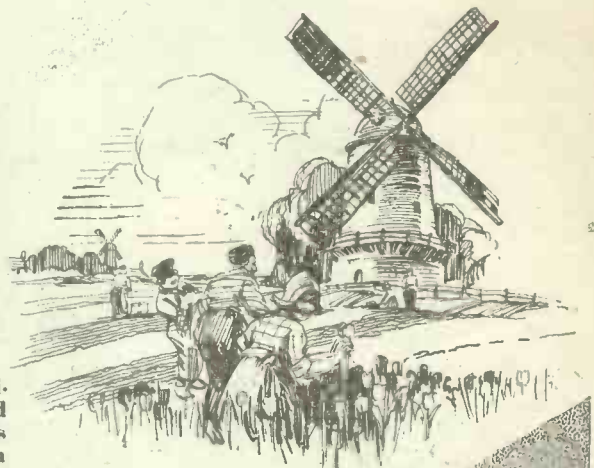
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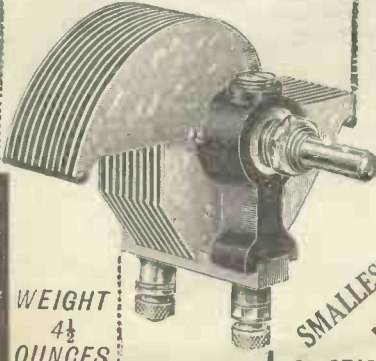
in promoting Dutch Broadcasting. For "BROWN" Loud Speakers, being instruments both of mechanical perfection and distinctive appearance, have taken the country by storm and never waned in popularity.



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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 846.)

A USEFUL H.F. UNIT.

G. R. W. (Wendover, Bucks).—"My set is one of the Melody Makers, and I am going to add an H.F. unit to it. I have the following parts, and should like to know if they are suitable?"

"One .0005 mfd. square-law condenser, one two-way coil holder, one valve socket, H.F. choke, one neutralising condenser, and the usual switches, terminals, fixed condensers, etc., as well as a good cabinet and baseboard. Can you give me in words the connections for a suitable arrangement?"

You will require half a dozen terminals for the battery, leads, etc., and if you have plenty of room in the cabinet you should be able to make an excellent little H.F. unit, connected in the following method. But do not forget that a great deal of the efficiency of such a unit will depend upon the exact spacing of the parts and of the wiring, and unless you have had some experience at this kind of thing it will probably be best to follow a recognised design rather than to try and space your own components out.

The following circuit is recommended. Aerial terminal to one side of the fixed coil socket of the coil holder. Remaining side of the fixed coil holder is connected to the earth terminal, to another terminal marked L.T. negative, and to one filament socket on the valve holder.

To this lead also is fixed a flexible lead with a spade terminal on the end, which can be used for making connection to the centre tap of the plug-in coil which will be placed in the moving coil holder.

MODERN WIRELESS

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The remaining filament socket of the valve holder is connected to one side of an on-off switch. The other side of this switch is connected to a terminal marked L.T. positive.

Another terminal marked H.T. positive is connected to the H.F. choke. The other side of this choke is connected to the plate socket on the valve holder, to a .001 fixed condenser, and to one side of the neutralising condenser. The remaining side of the .001 fixed condenser is taken to another terminal which is marked A₂.

The grid of the valve is connected to one side of the .0005-mfd. variable condenser and to either the plug or socket of the moving coil holder. The remaining side of this, either socket or plug, is connected to the remaining side of the variable condenser and also to the remaining side of the neutralising condenser. This concludes the wiring.

A standard centre-tapped plug-in coil is used in the moving coil holder, the adjacent coil being one suitable for auto-coupling the aerial circuit to the grid circuit. In use the battery terminals are connected up to the set in the ordinary way, the aerial is taken from the set and is connected instead to the aerial terminal on the unit, the vacant aerial terminal on the set being joined instead to a lead to the A₂ terminal on the H.F. unit.

THE "MASTER THREE" ON SHORT WAVES.

I. L. W. (Manchester).—"Some months ago one of the wireless papers (I think it was 'P.W.,' but it might have been 'The Wireless Constructor') gave an account from a reader who had succeeded in making his 'Master Three' work on short waves. I was interested at the time, but did not take particulars, as I had not got a 'Master Three' set.

Since then I have been lucky enough to get hold of one at a reduced price from a friend of mine, and I should very much like to know

how the short-wave coils were made, if it is possible to get the details. Can you tell me where I can get the particulars?"

The short-wave coil for the "Master Three" to which you refer was described by a reader of "P.W." in a letter to the Editor of this journal. Describing how to make the suitable six-pin coil, he said that: "The components required will be: 3-in. length of ribbed former, 3 in. dia., 6 valve legs, a piece of ebonite 2 1/2 in. by 1 1/2 in., 18 enamelled wire (for aerial and secondary), 28 D.C.C. for reaction, and the pitch (or wax) from a few flash-lamp batteries.

"Drill the ebonite to take the 6 pins to fit the coil holder, then trim off, so that it wedges inside the ribbed former. Screw a piece of cardboard (with the aid of the legs) flat down on the ebonite, so that the former and ebonite are flush with each other (as diagram enclosed).

"Next, take a thick board and drill 6 holes, so that the legs will slip in. Knock 6 large nails inside the former, alongside of ebonite, so that one comes at every leg. Melt the wax and pour in until it just covers the nuts.

"When cold, the nails can be withdrawn and the whole former gently eased from the board. The legs can be unscrewed (the nuts being held in place by the wax), and the cardboard peeled off.

"The wire can then be threaded through holes in the former, down inside, and through the nail holes to their respective legs. The number of turns required for W.G.Y., P.C.J.J., and 7 R.L. will be: 3 aerial spaced 1/2 in. apart, 5 secondary, 1/2 in. apart, and 7 reaction, wound close, the aerial being at the bottom and the reaction at top."

CONNECTIONS FOR AN R.C.C. UNIT.

D. F. G. (Gateshead-on-Tyne).—"As the transformer is burnt out I am going to replace it instead with R.C.C. coupling, the parts for which I have on hand. What are the connections for the change over, please?"

The changing over will be a very simple matter, as really an R.C.C. unit's connections correspond with those of an L.F. transformer. The R.C.C. unit consists of two resistances, one of them the anode resistance and the other the grid leak. Between one end of the anode resistance and one end of the grid leak a coupling condenser is fixed, and that side of this condenser which is connected to the grid leak is joined to the grid of the L.F. valve holder. The remaining side of the grid leak goes to the grid bias negative. That side of the coupling condenser which is connected to the anode resistance goes to the plate of the detector valve holder. The other side of the anode resistance goes to the H.T. positive terminal.

THE SET'S SITUATION.

E. G. (Pangbourne, Berks).—"I do not quite know what to do about the set's situation. You see, it is a bungalow with a big garden at the back, and a small one in front. In order to get a good long aerial I have put a mast up at the back, giving a 40-foot-high span between the mast and the chimney, the length between these being approximately 60 ft.

The lead-in from this is at the back of the bungalow, but I shall do most of my receiving in the front. What I should like to know is, is it best to bring the set itself into the front room, bringing the aerial and earth lead to this, or would it be better to have the set in the back room near the lead-in, and carry telephone leads through to the other room?"

In nearly all cases of this kind it is found far better to put the set as close to the lead-in as possible.

Unless great care is taken in spacing the aerial lead well away from walls, etc., it is almost inevitable that serious losses will occur in the indoor portion unless it is short. By having the set close to the lead-in this may be kept very short, and the losses from this may be negligible.

Provided that good, suitable conducting wire is used of fairly thick gauge the comparatively long telephone leads should not matter; and consequently we advise that you have the set in the back room and extend the telephone leads through to the point where you will listen in.

THE "TRAVELLER'S" THREE.

In the wiring diagram on page 742 of the August 4th issue of POPULAR WIRELESS no connection is shown between the + filament terminal on V₁ and the lead joining filament + of V₂ and V₃ and one side of the 2-meg grid leak.

Will readers please note that a connection should be taken from the L.T. + terminal of the valveholder V₁ to the lead which goes to the F + terminals of V₂ and V₃ and to the 2-meg grid leak.

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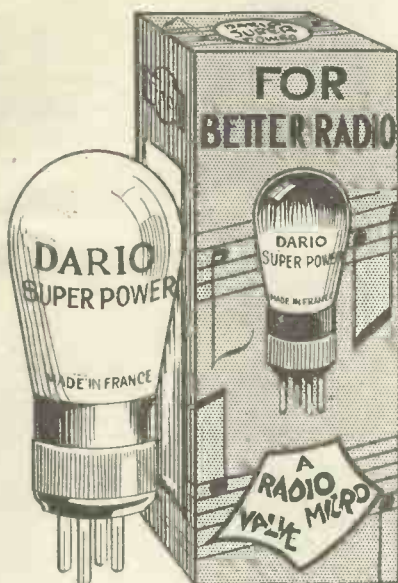
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VALVES**

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VOLTS

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NEWS FROM SAVOY HILL.

(Continued from page 830.)

sense will be encouraged more effectively in future. "All's well that ends well!"

The "British Ass" and the B.B.C.

Perhaps the most important aspect of broadcasting at the moment is the scientific interest in its educational value which has resulted in one of the sections of the British Association devoting a session to its consideration at the annual meeting at Glasgow next month. The day chosen is September 11, when the morning session of Section L opens with a paper on the "Aims and Developments in Educational Broadcasting," by Sir John Reith, the Director-General of the B.B.C., followed by another paper from Mr. Salter Davies, Director of Education for Kent, in which county some comprehensive experiments have been carried out in elementary schools. Discussion will then be opened by Dr. Brockington, Director of Education for Leicestershire, in which Sir William Bragg, President of the British Association, and Sir Oliver Lodge, who undisputedly possesses one of the greatest microphone voice personalities, will join.

The B.B.C. has made arrangements for educational engineers to give advice on the use of receiving apparatus, both in schools and for adult education organisations. There will also be a model studio from which it will be possible for visitors to hear the voices of their friends reproduced in an adjacent room through a loud speaker, and thus be able to judge the extent to which the voice can hold the attention of an unseen audience.

Weston's Sunshine Carnival.

Once again the Cardiff Sunshine Carnival will be one of the season's attractions at Weston-super-Mare, to which people will flock to see famous radio stars, and incidentally to help the funds of the local hospital, which, after all, is the main purpose of the function. This year's Carnival takes place on Wednesday and Thursday, August 22nd and 23rd. It is the fourth, and as each year the financial result has improved there is no doubt about the popularity of the event. The artistes who have promised to attend include George Graves, George Carney, Will van Allan, the Musical Avolos, Mai Ramsey, Billie Hill, Leonard Gowings, Malcolm Scott, and Gwladys Naish. Reduced fares to Weston will be available from many places in the West of England, and special late boats will be put on the cross-Channel service to South Wales.

For Manchester Music Lovers.

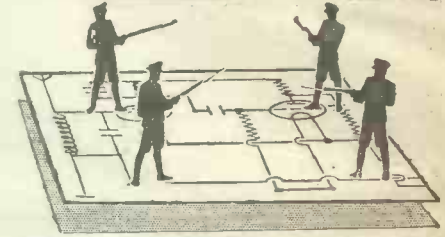
The Manchester Station has again made arrangements to broadcast a considerable number of the Tuesday Mid-Day Concerts from the Houldsworth Hall during the autumn and winter. The season opens on September 18th, when the programme will include items by the Manchester Station Orchestra, which will also appear in several later concerts of the series. No other city in the British Isles provides such facilities to music-lovers as does Manchester through the Tuesday Mid-Day Concerts Society, which has given concerts each year since 1916. The bulk of the credit for the organisation of the work is due to Mr. Edward Isaacs, the pianist.

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TECHNICAL NOTES.

(Continued from page 830.)

type of "4-electrode valve" the outer grid is used as the ordinary control, whilst the inner or auxiliary grid is connected usually to a source of low positive potential and serves, as already mentioned, to get rid of the space charge from the filament.

It is because this grid had the effect of dispersing the space charge that the necessity for the usual large amount of high-tension voltage on the plate is obviated.

Screening.

Talking about screening, I am often asked questions as to whether copper sheet or aluminium sheet or perforated sheets of either copper or aluminium should be used. As a general rule copper sheet seems to be preferred, owing, of course, to its very high electrical conductivity and consequent low losses. But aluminium, although it is not commonly known, has a very high electrical conductivity, quite comparable with that of copper. It is for this reason, and also owing to its cheapness, that aluminium has been largely developed for electric cables.

Aluminium Panels.

Aluminium screens are in great favour amongst American experimenters, and some of the manufacturers over there have put the screens and panels upon the market finished with beautiful designs, giving them an artistic appearance. Polished aluminium has the advantage over copper that it is less liable to lose its "surface."

There is no very serious objection to brass as a screen, but it will be found to be comparatively expensive and its conductivity, of course, not nearly so high as that of copper.

Perforated Screens.

As regards the use of perforated screens, a good many experiments have been carried out with these and they appear to be quite satisfactory, although some experimenters have a slight preference for the unperforated sheet. You should note, however, that if you are intending to use actual gauze, this will probably not be nearly so efficient as the sheet (whether perforated or unperforated) owing to the great resistances and to the fact that the cross wires do not as a rule make particularly good contact with one another. Moreover, it is especially important that all joints be carefully soldered over the whole length and not merely at particular spots.

Comparing Efficiency.

In some definite tests on this point, to determine the relative efficiency of an unperforated copper sheet screen and a screen made of fairly heavy gauge copper gauze (the latter screen put together without any very special precautions) it was found that the unperforated copper sheet screen was much more efficient than the gauze screen.

In this connection I might mention in passing that individual screen covers for valves are increasing in popularity in the United States.

Uses for Transformers.

A low-frequency transformer which has either developed a defect or is otherwise unsatisfactory may often still be made to serve a useful purpose as a choke.

(Continued on next page.)

19 STATIONS ON AN INDOOR AERIAL!

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"This is not because my Cossor 'Melody Maker' is inefficient, as on an outdoor aerial it does all the designers claim for it, but the comparison will serve to show the inefficiency of my present aerial, and incidentally the efficiency of your H.F. Unit.

"Thanking you for a splendid unit.

"I am,

"Yours faithfully,

"A. H. L."

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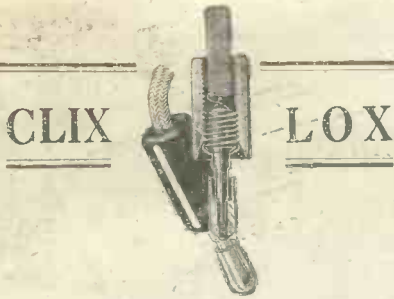
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TECHNICAL NOTES.
(Continued from previous page.)

Usually the trouble, when it develops a fault, is that one of the windings has been burnt out or a fracture has occurred from some other cause, so that there is a break or only a partial connection in the winding. It is a very simple matter to ascertain which of the windings is damaged and which is whole.

A pocket battery, or an accumulator battery of not more than 6 volts, may be used connected in series with a pair of headphones or loud speaker. On including in the circuit the winding to be tested and making or breaking contact, a loud click will be heard in the 'phones or loud speaker if the winding is whole, whereas if the winding is defective, either there will be no click at all or only a very faint one due to capacity effects.

The difference between the perfect and the imperfect winding will be quite unmistakable. Having determined which is the undamaged winding, this may then be employed for various experimental purposes as a low-frequency iron-core choke.

Condenser Microphones.

The condenser type of microphone of which one hears occasionally is not used to any great extent in this country, although it is being successfully used by a number of

any iron in its construction and to various other features, it can be made to give a very faithful reproduction. One of its principal drawbacks is that it is relatively insensitive, but this can fairly easily be overcome by additional amplification.

Moving Coil.

The type of microphone which is in most favour at the present time is the moving-coil, in which the actual moving part or armature is an extremely light coil, this moving in a powerful magnetic field created by an electro-magnet. The moving-coil microphone is in effect a moving-coil loud speaker "working backwards," or in the reverse sense, just as a magnetophone (electro-magnetic microphone) is the same thing as a telephone receiver only working again in the opposite sense.

"Full" Batteries.

I have had inquiries from time to time with reference to the so-called "layer-bilt" dry batteries, which are selling very largely in the United States, and which are also obtainable in this country. It is claimed that these batteries (and from my experience of the same, I think with good reason) that they give up to 50 per cent greater ampere-hour capacity within a given cubage than the ordinary type of cylindrical cell.

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A Special Loud-Speaker Supplement

is included, besides many other valuable features of the greatest interest to every listener and constructor.

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Continental broadcast stations, whilst in the United States experiments have been carried out on this type of microphone for some time past, and there is reason to believe that it will come into much more extensive use than at present.

The condenser microphone is very simple in its essential principles, and in one way it may be said to make use of what is sometimes an annoying characteristic of a condenser. You know how a condenser in which the plates are loose will sometimes hum on low-frequency alternating current. This is due to the vibration of the plates in accordance with the varying electrostatic attraction arising from the application of alternating potentials.

Vibrating Plates.

In the same way, if a condenser charged with a steady high potential is subjected to atmospheric vibrations, so that the distance between the plates is made to vary, fluctuations in the voltage will be produced, and these will, of course, correspond with the mechanical vibrations impressed upon the condenser.

In this way the condenser acts as a microphone and, owing to the absence of

It is quite obvious that an assemblage of cylindrical cells inevitably leaves spaces between, and you may find it rather an interesting calculation to work out what space is wasted. You will find that the relation between the area of a circle and the area of a square into which the circle just fits, so to speak, is about 22 to 28, or roughly 3 to 4—that is, the area of the square is about four-thirds of the circle.

Consequently, taking a considerable assemblage of cylindrical cells, there is a wastage of space between the cells of approximately 33 per cent. of the space actually occupied by the cells.

"Sandwich" Formation.

In the "layer-bilt" battery, the carbon and zinc elements and paste are arranged in flat sandwich formation, and consequently they are adapted to close assembly in a rectangular space. In this way it is claimed that not only are the geometrical space losses avoided, but that the active area of carbon and zinc is increased. The net result of all this, as stated, is that the battery gives 50 per cent. better output than a cylindrical-cell type of battery of the same overall cubage.

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