POPULAR WIRELESS, September 5th, 1931. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE SUCCESS OF THE "SUPER-QUAD" (See Inside)

Popular Wireless

Every Thursday PRICE 3d.

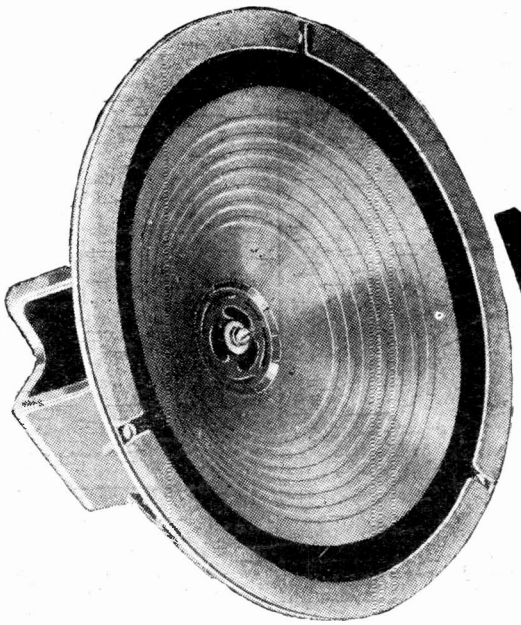
No. 483. Vol. XIX. INCORPORATING "WIRELESS" September 5th, 1931.

THAT SET OF YOURS!

Are your friends criticising it?
Is it as good as you think it is?

It will pay you to
READ AND ENJOY "P.W."
and keep abreast of radio progress

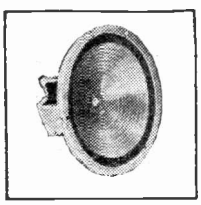
WHAT'S INSIDE THIS WEEK?



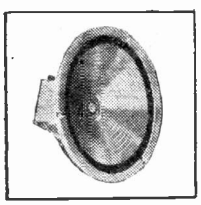
NEW R.K.'S

PRICES NOW FROM 31/6

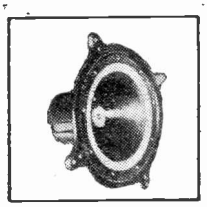
Minor Permanent Magnet Model—A moving-coil speaker to work from a small output valve. Capable of handling outputs up to 2 watts. Performance is comparable with the Senior R.K. Price **£2=10=0.**



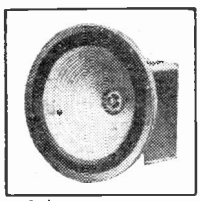
Minor D.C. Model—Similar to permanent magnet Minor, but suitable for 200 volts mains field excitation. Price **£1=11=6.**



1931/2 Senior Permanent Magnet—Incorporates the highest grade cobalt steel magnet, and 10" corrugated cone. New Reduced Price **£5=12=6.**



1931/2 Models. Senior A.C. Model—10" corrugated cone. Incorporates Westinghouse metal rectifier. New Reduced Price **£7=15=0.**
Senior D.C. Model—Similar to A.C. model, but without metal rectifier and suitable for mains field excitation. New Reduced Price **£5=5=0.**



Minor Permanent Magnet R.K.—in fumed oak cabinet. Price **£3=17=6.** In special walnut cabinet, Price **£4=4=0.** Dimensions of cabinet 14" high, 13" wide, 7½" deep.

R.K. reproduction is the ambition of every radio enthusiast. Now—that ambition can be realised. The 1931 range of redesigned R.K. moving coil speakers is released to the public!

In this new range, from the "Minor" D.C. Model at 31/6 to the "Senior" A.C. Model at £7.15.0, there is an R.K. to suit your purpose and pocket. Come and see the new R.K.'s at the **RADIO EXHIBITION, STAND NO. 21** or ask your dealer for a demonstration.

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Branches in all the Principal Towns.
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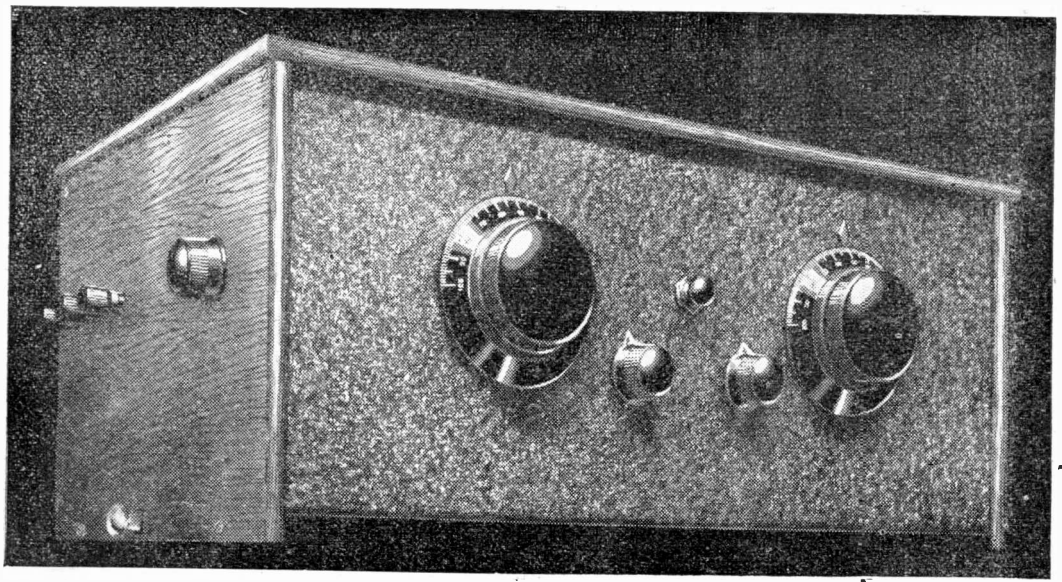


NEW!

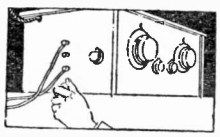
—more powerful—more selective—even better all-round performance

Here is an entirely new standard of Radio value—a powerful 3-valve, Screened Grid Receiver for the amazingly low price of £6.15.0—the Cossor Empire Melody Maker Model 234.

This remarkable Receiver incorporates all the most up-to-date developments in Set design. It uses the very latest types of the famous Cossor Valves. As a result it possesses outstanding performance.

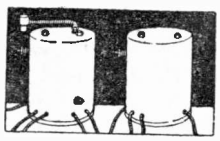
Its selectivity is remarkable—its range is enormous. Even when used close to a Regional transmitter it will cut out its powerful transmission like magic and bring in the programme you want to hear—all the main European stations are within its reach. Its performance is equal in every way to that of the most costly 3-valve S.G. Receiver.

Yet in spite of its efficiency it is so simple that you can easily assemble it yourself—no Wireless knowledge is necessary. Merely bolt the components on to the drilled, all-metal base plate, connect a few wires and it is ready for use. Get full details of this outstanding Set—Use the Coupon.



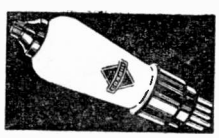
EXTERNAL WAVE-CHANGE SWITCH

Wave Change Switching is effected by operating the switch at the end of the cabinet—"in" for long—"out" for short.



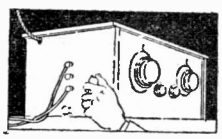
COMPLETELY SCREENED COILS

The coils used in the Cossor Empire Melody Maker are completely screened in metal "pots," entirely eliminating direct pick-up, thus further improving selectivity.



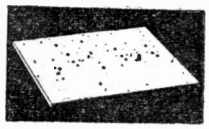
COSSOR METALLISED SCREENED GRID VALVE

Even better performance is ensured by the use of a Cossor Metallised Screened Grid Valve with its record low inter-electrode capacity and its ability to eliminate stray coupling effect between anode and nearby components.



SERIES AERIAL CONDENSER

The variable Series Aerial Condenser permits adjustment of selectivity to give the fine tuning necessary to cut out powerful local stations.



ALL-METAL BASEPLATE

Construction is simpler than ever, due to the Metal Base Plate, which is supplied with every hole drilled, thus automatically positioning every component.

Cossor
EMPIRE
Melody Maker
Model 234

HIRE PURCHASE TERMS

You can obtain the Cossor Empire Melody Maker for only 15/- down and nine monthly payments of 15/-.

£6.15s.

To Messrs. A. C. Cossor, Ltd., Highbury Grove, London, N.5

Please send me free of charge one of your Constructional Charts which tells me how to build the Cossor Empire Melody Maker.

Name.....

Address.....

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P.W. 5/9.31.

Popular Wireless

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THE "NAUTILUS"
THOSE KILL-JOYS
RADIO AND RAIN
QUEEN'S HALL FOR ALL

RADIO NOTES & NEWS

BOBBIE BLUEGUM
SYMPHONY SEASON
GRAMOPHONE NOTE
ENGLISH ELOQUENCE

Exhibition Notes.

I VENTURE to put forward three non-technical suggestions for the consideration of the Radio Exhibition authorities, the first of which is that they would score a huge success with the young fry, the future buyers, if they were to hand out at the doors special carriers for the transport of free samples, souvenirs and catalogues.

Next, how very popular and useful would be a private conference room wherein husbands and wives and/or parents and kids, can settle whether the new set is to be a transportable, portable, radio-gram. table model, "console" type or a set complete with hooks for attaching television extension some day.

And finally, what about a baby park in the charge of Newfoundland doggies?

A Word to the Ambitious.

TO those who have "been through the mill" of set-making and now feel like tackling a more ambitious engineering job this autumn I recommend the "Extenser" Five, a "last word," long-distance-getter, which is fully described in the September "Wireless Constructor." *There's* something to get your teeth into!

In the same issue is a full constructional article about the "Gangster," an S.G. Three which makes you sit up when it begins to sort out wireless waves. Generally speaking, if you haven't yet sampled the "Constructor"—y' orter.

The "Nautilus."

SEE p. 701, August 15th. Mystery solved. The call-letters W S E A are the official ones for C.W. telegraph traffic: K 7 X I is used for telephony on the amateur wave-band.

Several readers send confirmations of this, and T. R. D. himself writes again, rubbing it in. So now, boys, listen for Mr. Ray Meyers on 40 metres, K 7 X I.

I thank J. N. S. (Belfast), J. N. (Glasgow), and J. J. N. (Newton Le Willows) for their letters; also W. J. P. (Bidford-on-Avon) who adds, in reply to J. E. S. (Bagshot) that he has picked up C T I A A (Lisbon), the wave-lengths used corresponding to the frequencies seven thousand and fourteen-thousand kilo-cycles. Write to Abilis Nunes Dos Santas, Junior; Avenida Artonio Augusto D'Aguiar 144, Lisbon, Portugal.

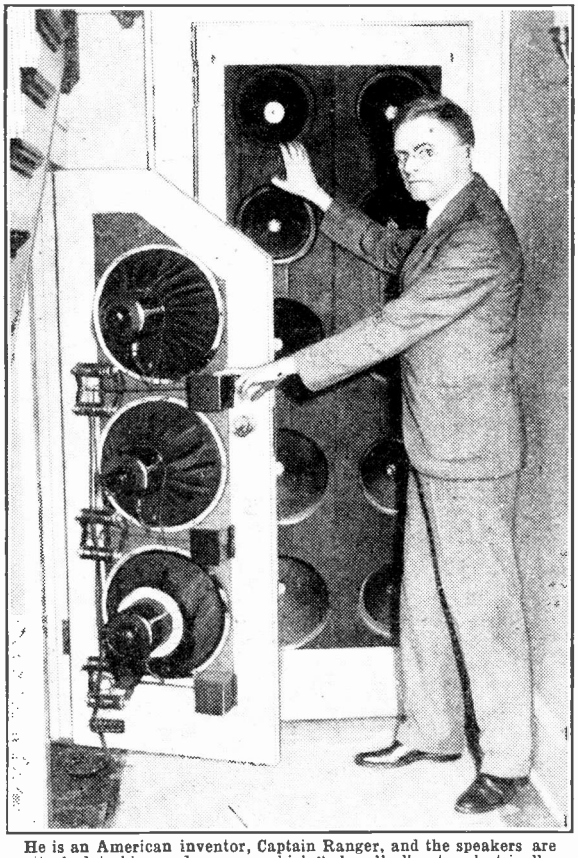
Anyone heard V E 9 G W?

The "Nautilus" (Stop Press).

HARDLY had the words left the nib before more "nautili" came tumbling in, all anxious to convince me. I am convinced on both sides! J. A. N. (Malton), who is also G 2 K O, worked two-way telephony with the "Nautilus" on July 26th, half an hour after the Sub. worked G 2 T K of Hull. J. M. M. (Edinburgh) heard the Sub., and A. S. (Rochdale) and J. H. T. (Newark) both heard him working G 2 T K.

So that is that, and I hope that many of you will keep strict watch on the "Nautilus" and pick up his promised message from the North Pole, and by the way, I wonder what some of the old-time Polar explorers would think of it all! Zepps flying above the Pole, and subs. swimming under it!

A GLUTTON FOR LOUD SPEAKERS!



He is an American inventor, Captain Ranger, and the speakers are attached to his wonder organ which "plays" all notes electrically.

Those Kill-Joys.

THAT Italy, the acknowledged home of romance, should kick out her women announcers because Italians addressed so many love-letters to them, is positively incomprehensible.

I learn in a general sort of way, that the Dictator is not insensible to charms of the fairer sex. Why, then should the radio people be so frightfully Benedictine or Trappist?

Why not use the announcing business as a means of swinging off some of the superfluous Italian girls on the wifeless fascisti. Or, to be less romantic, why don't they merely burn the love-letters and let the pore gals earn their living?

Radio and Rain.

I FONDLY imagined that all the people who blame radio for causing the sort of weather they don't like had been either converted or silenced. But alas! they are still bombarding editors with their theories.

Someone who has the nerve to sign himself "Radio Engineer" has written to the "Daily Dispatch" declaring his belief that radio makes it rain. He says that he noticed that when a certain transmitting station started up the showers began, and that when it stopped so did the showers. Man controls the weather at last! Television will cause snowstorms!

Mr. J. W. Spink tells the "Daily

(*Continued on next page.*)

NEWS—VIEWS—AND INTERVIEWS *(Continued)*

Herald" that this rainy sort of weather "began with broadcasting." I seem to remember a drought which occurred not very long ago!

Queen's Hall for All.

WELL, you either join the crush there or listen-in—you simply cannot ignore it. The B.B.C. says: "Wagner on Mondays and Beethoven on Fridays has become a public tradition, while the alternating Bach and Brahms on Wednesdays have so far proved their popularity in the past that Wednesdays will be similarly disposed this season." Promenade, 2s. (payment at doors only); Balcony (unreserved), 3s.; Grand Circle (numbered and reserved), 5s. and 7s. 6d.; Season Tickets (Promenade only), 35s. Go once and be a Queen's Hall "fan" for ever!

Honour to Faraday.

THE Faraday Centenary Exhibition will be held at the Royal Albert Hall from Sept. 23rd to Oct. 3rd, when amongst other things there will be shown some of the earliest radio apparatus from Marconi's private collection. In connection with this celebration there will be a "do" at the Queen's Hall on Sept. 21st, and the speeches and an orchestral concert will be broadcast, as likewise will the opening proceedings at the Albert Hall on Sept. 23rd.

"Bobbie Bluegum."

A HAPPY idea has been evolved by the Australian Broadcasting Company—the formation of "Bobby Bluegum's Name Club." The rules of the club are simply that the members shall write to their sick friends, but at the same time they must promise to "try and be the fellow your mother *thinks* you are, always speak the truth, and whenever cross, to sing or whistle." By (blue) gum! If radio can influence boys to live up to that it will be a world force indeed!

Symphony Concert Season.

THE B.B.C. 1931–32 season of Symphony Concerts opens at Queen's Hall on Oct 14th and between that date and May 4th, 1932, twenty-three concerts will be given. But what a peculiar allocation of conductors!

Adrian Boult collars twelve of these concerts—or perhaps I ought to say that he is "told off" to conduct twelve. Of the remaining eleven, Sir Landon Ronald and Sir Henry Wood get one apiece; the other nine are allotted to foreigners. Extraordinary distribution, I think!

However, as a low-brow, I don't much care who waves the little stick at the orchestra.

The Bayreuth Relay.

I DIDN'T listen for very long to the relay of Act 3 of "Tristan and Isolde" from Bayreuth on August 18th, because Queen's Hall was playing Cesar Franck's one and only symphony, which I would not miss for anything. But I hung on long enough to judge of the quality, and by thunder! it was rare.

Not a breath of background or of line noise. The playing might have been done at Savoy Hill, so photographic was the reproduction.

SHORT WAVES.

Caller: "Your 'usband ain't listenin'-in, Mrs. Parrish. 'E's fast asleep."

Mrs. P.: "Yes, 'e sleeps with them 'eadphones on every night, and nothin' 'll wake 'im until they say, 'Good-night, everybody,' and close down."—"Punch."

* * *

RADIO POLITENESS.

The Geneva police have issued the following official notice, addressed to local wireless users:

"Wireless-users! You who love music, from whatever country it comes, enjoy it plenteously, with intoxication, but do not oblige your neighbours to hear, when they wish to rest, concerts which charm you. Do not expose the loud speakers on balconies or in gardens. After 10 p.m. have the courtesy to close your windows, and then indulge luxuriously in all sorts of music, gay or sad, classic, popular, or of the dance variety. But do not impose it on neighbours who do not desire it." (Ses you!)

* * *

VERSE AND WORSE.

The wind blew hard, and Sir John Cursem's hat
Right into the Thames did sail.
He said . . (Well, the B.B.C. missed a chance
To broadcast the knight-in-gale).
"Daily Mirror."

* * *

It has been suggested that, instead of broadcasting the roaring of lions and other such "noisy noises," a real change and rest for listeners might be provided by the broadcasting of the deathly silence of an Arctic night.

* * *

SWITCH OFF!

"Oh, yes, my dear; he's got wireless eyes!"

"Wireless eyes?"

"Yes. You see, he's got a broad cast in them."—"Sheffield Weekly Telegraph."

The B.B.C.'s backbone is its engineers and announcers, sure enough. *And* the chaps who thought of the "Escape" talks, of course. I wonder what the Guv'nors do?

Technical Note.

A READER who describes himself as "An Enthusiastic 'P.W.'-er," kindly directs my gaze to a report of the bust-up at the Yorkshire Power Company's place, at Selby, when a large transformer met some lightning and gave it best. "When struck," wrote the reporter or sub-editor, who is evidently a radio "fan," "the transmitter had 1,300 gallons of oil in it."

Very careless of some one; the amount of oil in a transmitter is, as a rule, less than that. The aforesaid transmitter is alleged to have had a range of 33,000 volts to 11,000 volts. No mention is made of its wave-length, but one supposes that this was 20 amps! Or perhaps less than that—say five ohms!

Gramophone Note.

I HAVE not said much about my gramophone life for some time, because what with the garden, hiking, next door's baby wot can't sleep well, and the attractions of radio, there has not been a noticeable amount of gramophoning in our hut lately. However, I am able to announce that after passing through all the various phases of the enthusiast—fibres, permanents, thorns, sword-bladed, spear-edged, etc.—I have come to rest with common, low-down steel needles, one per side. As for records, the only notable occurrence has been the acquisition of the "Death of Minnehaha," out of "Hiawatha," sung and played by the Albert Hall people. Heap big medicine! (H.M.V.)

Pray don't imagine that I am trying to compete with Mr. Stone, though.

Can You Beat It?

OUR Mr. Crawfin writes, hastily, on a postcard—a pickky postcard of Bungay High Street—to inform us that his bees have shown a marked improvement since the Sabbath Bach orgy ceased. Hum! Looks as though his bees are due to have a relapse.

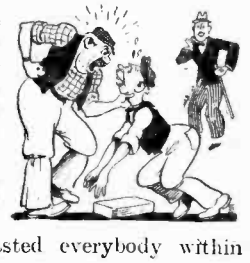
Crawfish adds that the Queen is somewhat fretful, and what would we advise him to do. That's elementary! Introduce her to a stag-beetle who wants lessons in dancing!

Mr. Crawful adds, in a postscript, that he has no connection with the iron bedstead, sleeping only on a mahogany four-poster. That's a relief!

English Eloquence.

THERE'S a yarn going round about Broadcasting House which I think I ought to pass on, though I won't vouch for its accuracy. Here it is, anyway.

One morning, recently, a huge navvy let a heavy stone fall square on his mate's toe (corn and all)! Taking a deep breath the aforesaid mate let out such a fluent flow of expletives that it fairly flabbergasted everybody within earshot.



And an admiring B.B.C. gentleman in spats, standing near, turned and said to his companion:

"Now if we could only put *that* over in the English Eloquence series!"

ARIEL.

HOME TRUTHS FOR LISTENERS

BY CAPT. P. P. ECKERSLEY M.I.E.E.

In this article our Radio Consultant-in-Chief deals in his own inimitable way with the results obtainable from commercial receivers. He suggests a scheme whereby the public would know exactly what to expect from factory-built sets.

THE outstanding problem in the design of receiving sets seems to be how to combine easily understood operation and competitive cost.

It is a problem that seems well-nigh insoluble. An ignorant public (no insults meant—they must be ignorant of wireless), with a desire to listen to broadcast programmes, finds that it can buy apparatus round about five pounds, and is informed it will "pick up" foreign stations galore.

Killing the "Decent" Set.

The conscientious technician tries to give his public a performance which, in his opinion, must be limited by price considerations. The "get-rich-quick" exploiter does not care what performance his sets give provided they make a noise and "pick up" these famous foreign programmes, and sell.

The really decent set, giving a limited performance, does not sell while the cheap set is bought; after a week or so it is usually left, tuned to the local station, making an offensive noise.

The development of wireless has been terribly hindered by the commercial necessity of having to tell a customer that he can "pick up" foreign stations. Some brave manufacturers have, as a matter of fact, made local stations sets, but the success of their venture is, I believe, not yet definitely assured.

Now I feel that something practical and definite might be done to assist manufacturer and buyer alike. The public ought to be told that "distance costs money." It is necessary to tell the public the truth.

A Suggestion.

Suppose the trade associations and the B.B.C. got together to prepare a buyers' guide. This would be widely distributed through the wireless shops, would be printed in the "Radio Times" and would receive publicity in the technical journals and the lay press.

The pamphlet would read this way:

"You have perhaps made up your mind to buy a wireless receiver or you may be giving up your old receiver to buy a new one. The signatories of this pamphlet want to help you with some advice, not, of course, upon the make of set, but as to its type.

"We want first to dispel the widely-held illusion that distant or foreign stations can, in general, be received with the same clarity and quality as the local station. Nevertheless, there are certain foreign stations that give sufficiently clear reception as to afford real pleasure to those who listen to their reproduction.

"Local" and "Distance" Receivers.

"The design of a receiving set to pick up these few worth-while stations is more complicated and therefore more costly than if the set is made to pick up the local station or stations only. While it may be true that a cheap set will receive foreign programmes, it will not and cannot receive them well.

"We think, therefore, you must make up your mind whether you will choose a more elaborate set and be able to pick up some foreign stations, or buy a local set which will give you mostly only local programmes.

"Manufacturers are agreed to market their models according to category, and it would be to their interest and yours if you would demand either a local set or the distant set.

"Distant listening, to give the listener pleasure, demands internal elaboration to achieve simple operation; the ubiquitous set, therefore, must have a higher first cost than the local set. The local set can be designed purely for purpose, others, at reasonable cost, give a quality of reproduction worthy of the transmission."

Something like that. You will see the enormous benefit to the technician, the seller and the public. The technician can really set about giving a decent performance for each category: A local set with a tuning circuit only adapted for fields of above 2 millivolts per metre; a tuning circuit which can be set by the local trader for the best local alternatives; a switch-off "Regional" "National"; a concentration upon "straight-line" detection and amplification and a really first-class performance in quality of reproduction for those who cannot bear knob twiddling.

The designer of the elaborate set will insist upon a stable super-heterodyne or a properly ganged 2 H.F., a filter to cut out heterodynes, a single-handle tuner, and two volume controls. There would, only naturally, be different degrees of elaboration in both types, competition as to cabinets quality, appearance, etc., etc., but the principle of clear division between types would enormously help the designer.

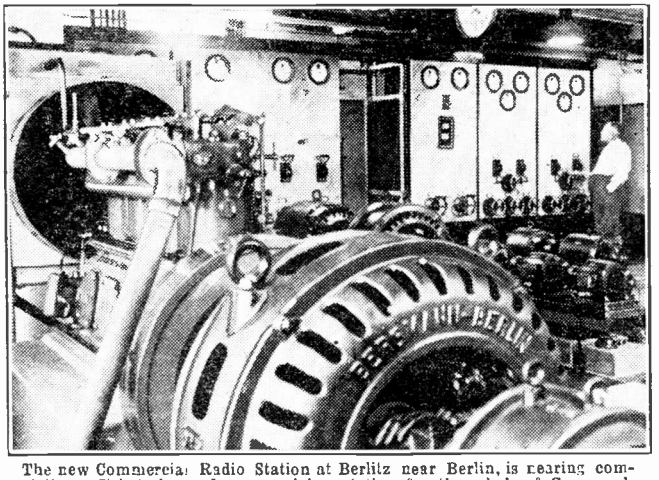
Asking for Trouble.

It is pathetic, I think, to see and to handle the ghastly compromise sets marketed, in nine cases out of ten to-day, on a pure price competition, performance statement basis.

I find I cannot understand the functions of the handles, reaction is fortuitous and surprising, quality varies even on the local station, according to a hair's-breadth adjustment, the "pick-up" of distant stations is remarkable but incoherent, and this flashy little bag of tricks is finally a present to someone's maiden aunt (with instruction book: "Take out of their cardboard boxes valves labelled XYZ/38 and ZYX/83, and place the former in the socket found on the shelf midway on the left-hand side of the set when the back (held by 8 knurled headed countersunk screws) is removed. Care should be taken . . . .")

I expect anyone could find a hundred reasons why my suggestions should not be adopted and how damaging it would be to progress to inform the public of the truth. But you who have no interest in these matters, you, the keen constructor, anxious that others should possess the results you with your knowledge can achieve, you surely are in sympathy?

A NEW STATION FOR GERMANY.



The new Commercial Radio Station at Berlitz near Berlin, is nearing completion. It is to be used as a receiving station for the whole of Germany's overseas communications. Above you see a photograph of the power room.

STATIONS WORTH HEARING

Some practical distant-programme notes compiled by a special contributor who nightly searches the ether in order to obtain really up-to-the-minute information for "P.W." readers.

FOREIGN stations really have begun to come in now, almost every night seeing additions to the log. Well, the more the merrier, or, as a friend of mine prefers to put it—the more the many-er.

Just in case, though, the long-distance man should begin to gloat too soon, I must remind him that it is more than likely that we shall have one or more setbacks between now and the end of September. As a rule, these bad periods do not last more than two or three days, but in wireless you never can tell—that is what makes it so interesting.

Reception on Long Waves.

The long waves require little comment since, except at times when the weather is thundery and atmospherics are therefore troublesome, all of the familiar stations can be heard. One, though, that I have not heard for some time, though I expect to pick him up very soon, is Reykjavik, Iceland's big 21-kilowatt broadcaster.

It is worth while trying for him when conditions are favourable—if he is coming through you will find him just above Kalundborg's settings. Another which I have never received very well, though I used to hear him very fairly during the winter, is Lahti.

This Finnish station is rated at 54 kilowatts, and one would expect to have almost as good reception from him as one gets from the 40-kilowatt Motala. Unless you have a very selective set you should try for him at times when Huizen and Radio-Paris are not working, for it is only 7 kilocycles away from each of these big stations.

Down at the bottom of the medium wave-band matters continue to improve, and there are many stations really worth tuning in if only it were not for the frequent and horrible heterodynes that one finds.

These are caused mainly by the illicit wanderings of French and Swedish stations, and it is quite surprising to find how much trouble even a 250-watter can cause when he starts roaming. However, reception between about 220 and 260 metres is distinctly interesting since it enables the enthusiast to indulge in the sport of dodging the heterodyne.

Dodging Heterodyned Stations.

He will find station after station coming in with respectable strength, and he has to go on until he discovers one which is completely free from a heterodyne whistle. Konigsberg, Cork, Nurnberg, Beziers, Gleiwitz, Toulouse P T T, Horby, Leipzig, Moravska-Ostrava, Lille, Rennes, Bratislava and Copenhagen are low-wave stations that are worth attention.

Going up to the region of 300 metres and above, there are many interesting stations ready to be logged and worthy of the efforts of every lor
tance enthusia

Amongst th
Lisbon on 29(
Zagreb on 3(
Marseilles on
Bucharest on
Belgrade on 4
Lyons Do
466 m., and
vall on 542 m
of these w
ceivable last
and it will
resting to see when they first mak
reappearance this autumn.

Of the more powerful semi-r
received stations I can recommend
notice Heilsberg on 276·5 m., Kc
293 m., Hilversum on 298·8 m., Ba
on 349 m., Lwow on 381 m., Berlin
ben on 418 m., Madrid Union R
424 m., Prague on 487 m., and M
501 m.

Abreviations for Your Log.

Prague is showing a big improvement just now, and most of the others are making much more frequent appearances in the log.

Speaking of logs, by the way, may I remind you to adopt during the coming season in your wireless diary abbreviations that I find very useful. "V.G." stands for full loud-speaker strength—that is, with the output valve fully loaded.

"G" means good loud-speaker volume, the programme being audible in any part of an average living-room. "M" signifies moderate loud-speaker strength. Below this come "F" for fair and "W" for weak. "H" stands for heterodyned. "J" for completely jammed and "S" for spark interference.

SHORT-WAVE NOTES

News and views regarding an exciting and fascinating wave-band.

By W. L. S.

OUR record-breaking month of August has certainly not been too kind to us, even from the radio point of view, although radio conditions have not, perhaps, been so thoroughly wicked as the weather. We may hope, however, for a better period from now until the end of November, if my previous logs provide anything to go by. The "autumn" period seems to provide some good DX reception, whatever the year as a whole may be like.

There has been so little "on the air" that is worthy of note that I propose to keep more to the technical side this week.

Worth mentioning is a letter from "G. T.," of Ormskirk, who praises the S.G. detector for short-wave work in no uncertain language. He uses a circuit given in "P.W." some time back, obtaining reaction from the screen of the valve, and finds it good.

Delightful Reaction Control.

The chief advantage is the delightfully smooth reaction control (effected by the usual variable condenser, and not by variation of volts). This, coupled with the great sensitivity, make "G. T." proclaim that he would not exchange it for all the triodes in existence.

Seeing that "G. T.," to quote his own words, "raises his hands in supplication" for some remarks on hand-capacity effects, I may as well mention some experiments of mine on the subject.

I recently scrapped my metal-box receiver and reverted to one with an ebonite panel and baseboard, also leaving out the S.G. stage. The combined effect of these changes, as might be imagined, was a sudden arrival of the father of all hand-capacity troubles! I could not get near the L.T. switch, let alone the dials, without chasing signals right out of audibility.

The use of the usual copper foil behind the panel made things considerably worse. *Everything* was live, even the earth terminal!

Finding, however, that the cathode pin on the detector valve, although earthed like the rest of the stuff, was relatively "dead," I extended the foil underneath the baseboard, taking care that it passed immediately under both the valve holder and the coil.

This improved things enormously, and anyone but myself would probably have been satisfied. To put the finishing touch on things, I connected everything that had to go to earth on to the nearest possible point on the foil.

This was done by taking a series of bolts through the baseboard from the foil, and soldering connections on the tops of them. The result of this piece of work was the absolute and complete absence of any troubles from "H.C."

I can now handle anything on the panel, and also the 'phones and cords, when receiving the weakest of signals down to 15 metres, and there is not the *slightest* change. On 10 metres there is a small amount of trouble, but, then, 10 metres always *was* entirely different from any other wave.

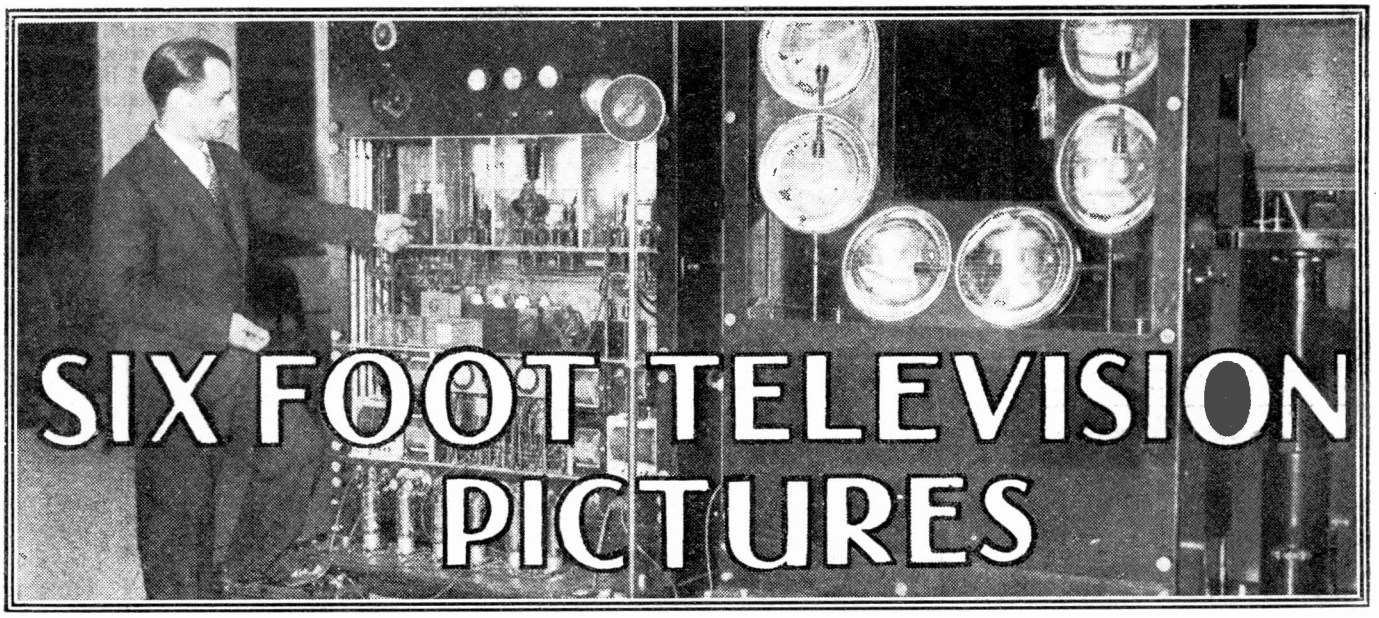
Perhaps this experience of mine will help "G. T." and others. The old, old hint of "tuning" the earth-lead by means of a series condenser might also be borne in mind.

Aeroplane Short-wavers.

Another point brought up by readers is the identity of stations like "Buffalo." "Buttercup," and so on. I believe these are R.A.F. aerodromes carrying out short-wave telephony experiments with planes in flight.

I have heard "Ferret" and "Firefly Yellow Three" hard at it on about 80 metres on several occasions. Incidentally, if you are close to an aerodrome, it is not advisable to oscillate hard on these gentlemen, or you will probably cause them some severe interference.

Did anyone, by the way, hear any short-wave signals from the Graf Zeppelin during the recent visit? I was out with a portable, with the idea of sitting as near her transmitting aerial as possible, but search was fruitless!



SIX FOOT TELEVISION PICTURES

By A. DINSDALE, M.I.R.E.

The description of a demonstration, and the gear used during it, in which surprisingly large and clear television pictures were produced on a screen.

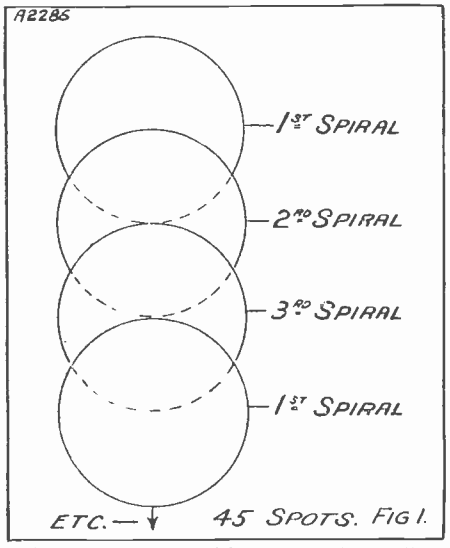
IT is now some time since students of television the world over came to the conclusion that, in order to possess real entertainment value, the present "peep-hole" type of television receiver will have to be replaced by a type of instrument which can project brilliant images on to a screen having several square feet of area.

That this fact is recognised by television workers themselves is evidenced by the fact that nearly all of them are now devoting much time and energy to image projection apparatus.

Full of Enthusiasm.

The latest worker to demonstrate along these lines is U. A. Sanabria, a 25-year-old Chicago experimenter. His name has cropped up from time to time in connection with television matters for several years past, but I was never able to gather much information, either directly or indirectly, about his apparatus and results, and I must confess that I have, in the past, been inclined to dismiss him as being of negligible importance.

DEVELOPING DETAIL



The holes of each spiral half-overlap those of the previous one. (See Fig. 2.)

It was with considerable interest, therefore, that I responded to a recent invitation to witness a demonstration of his 6-ft. screen apparatus at the New York offices of the Shortwave and Television Corporation, of Boston.

The chief engineer of this concern is Hollis S. Baird, who is also 25 years old and has done much creditable work on television. Baird and Sanabria have just agreed to work in collaboration with each other, though independently in their own respective laboratories.

During the first part of the demonstration, images only 2-ft. square were shown on a large semi-transparent glass screen. These images were very brilliant, the colour being the characteristic neon red. After a few minutes the screen was moved farther away from the receiver projector, which was then re-focused and started up again.

Cinema Style.

This time images 6-ft. square were shown and we all had to move back as far as the limits of the room would allow. By means of a triple lens turret on the transmitter, three views of the subject could be shown: (1) a very close-up of the face only; (2) head and neck; (3) head and bust.

The degree of detail in each case was truly remarkable, being comparable, I should say, to similar views exhibited by the average home cinema projector. The degree of screen illumination, I should judge, was about half that of a cinema theatre screen. The transmitter and receiver were separated by a distance of about 100 feet, and they were connected together by wire cables.

Judging from the phenomenal amount of detail visible in the images, I was quite prepared to be told that some equally phenomenal number of image lines was being employed. Judge my surprise, therefore, when Sanabria informed me that he was using only 45 lines.

I was equally surprised to learn that the speed of transmission was only 15 pictures per second. So long as you kept your head still, and there was no rapid movement on the part of the subject, there was scarcely any of that annoying and eye-straining flicker which I have learned to expect, even with 72-line images and a transmission speed of 20 per second.

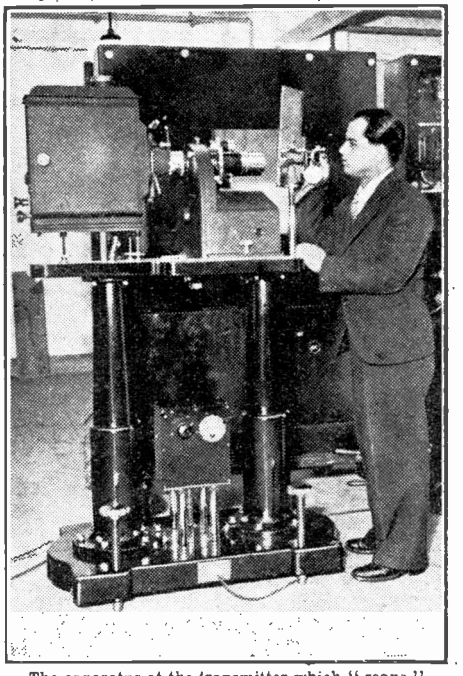
A Real Test.

As a supreme test for detail and realism, a plain, transparent glass bottle of plain water was held up before the transmitter and shaken about. The high lights on the bottle were very realistically portrayed, and the appearance of the water sloshing about within the bottle was exactly as it should be.

There were no spurious high lights or shadows in any of the images, and the edges

(*Continued on next page.*)

A LIGHT-SPOT PROJECTOR



The apparatus at the transmitter which "scans" the artiste with a spot of light

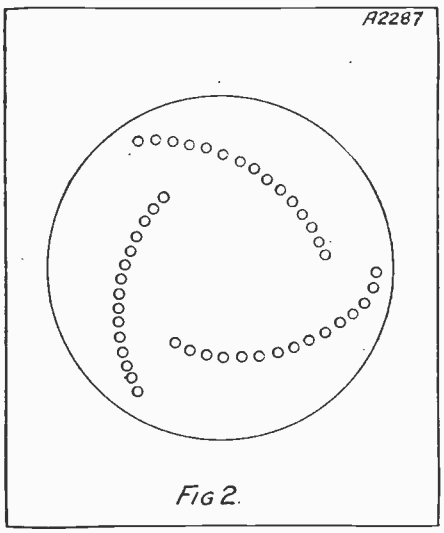
SIX-FOOT TELEVISION PICTURES

(Continued from previous page.)

were clear cut, without any evidence of the usual blurring due to aperture distortion.

As a final test, a card was held up before the transmitter on which were printed a number of thin black lines. As was subsequently proved, by stopping the transmitting disc and allowing stationary light

AVOIDING "STRIP EFFECT"



By having three spirals of holes instead of the usual one ribbon or strip effect commonly encountered in other systems is obviated.

spots to fall on the card, each line had a width only one twentieth the diameter of the light spots. And yet those lines could clearly be seen on the receiving screen.

Sanabria declared that he could enlarge the images up to 10-ft square without undue loss, but explained his inability to do so that day because it was impossible to make the room completely dark, and also the room was not long enough to enable the assembled guests to get far enough away from the screen.

To all outward appearances, there is nothing unusual about Sanabria's transmitter, which is of the flying spot type. The light source is a 1,000-watt gas-filled incandescent lamp. The light spot, after passing through the scanning disc and objective, strikes a mirror set at an angle of 45° which bends the light spot round 90° on to the subject being televised.

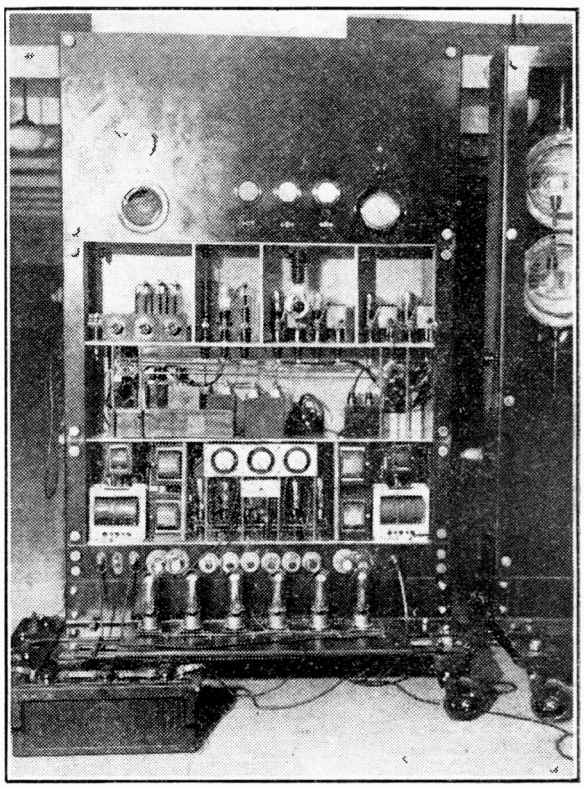
Method of Scanning.

In front of the subject there are mounted the usual photo-electric cells, of which there are eight—two above, two below, and two on each side of the subject. In contra-distinction to usual American practice, these cells are quite small (no bigger than an ordinary receiving valve), and each one is set at the focus of a large spherical mirror.

The unusual feature of Sanabria's transmitter is that, instead of employing a single-spiral disc, he uses one having three spirals of 15 round holes each, each spiral being slightly offset with respect to its predecessor. so that the holes of one spiral half overlap those of the previous spiral, as shown in Fig. 1. The layout of the disc itself is shown in Fig. 2.

This type of disc, used in conjunction with a similar one at the receiving end, enables a considerable improvement in the detail of the image to be obtained along the line of the image strips; it does not improve transverse detail. In other words, since horizontal scanning is employed, horizontal detail is improved, but vertical detail remains unimproved.

THE PHOTO-CELL AMPLIFIER



After the reflected light from the subject has fallen on the photo-electric cells the above amplifier magnifies the electrical impulses and passes them on to the transmitter.

A further advantage is that "strip effect" is almost completely eliminated. This strip effect is caused in single spiral systems by the difficulty of so drilling holes in the disc that the strips fit *exactly* edge to edge.

The disc used at the receiving end measured 44 in. in diameter, and carried forty-five 2-in. lenses arranged in three spirals. The light source at the receiving end consisted of a special neon arc which Sanabria has developed, and about which he would say little, except that it will operate on an input as low as 40 volts, and only consumes 1 amp.

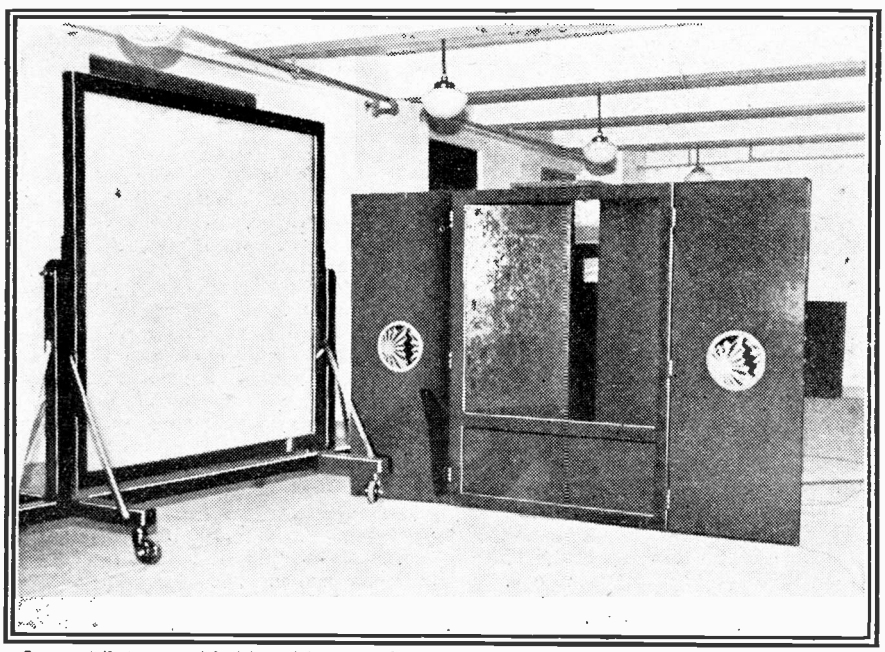
Improvement in Detail.

Pressed for further information as to the cause of the vast improvement in detail over that expected from a 45-line system, Sanabria explained that his photo-electric cell amplifier at the transmitter was largely responsible, but of its special characteristics he would only say that it is designed so as to steepen the wave front of the signal impulses. This feature, he said, aided considerably in the production of clear-cut, finely detailed images.

As to the wave-band required, this is only about 15 kc. wide. Nevertheless, much of the success is undoubtedly due to the triple spiral disc and its associated optical systems. It is well known that in order to increase detail, especially for projection work, it is necessary to increase the number of holes in a disc of the single spiral type.

(Continued on page 829.)

AS GOOD AS A HOME CINEMATOGRAPH



Our contributor saw television pictures on this screen which he declares were as good as those usually given by a home cinema outfit.

MR MARCONI HAS A LOT TO ANSWER FOR!

BY SOPHIE TUCKER

Miss Sophie Tucker, the famous American revue star, has some interesting views on wireless, and she talks about both English and American broadcasting in the following exclusive article.

THIS radio broadcasting business.

I guess it's about the biggest thing this old world of ours has struck in centuries. Everyone seems to have gone radio crazy. Old men and young men, society ladies and young girls—they've all caught it—all talking like bearded science professors from Oxford or Cambridge.

If it isn't ohms or valves or aerials or resistances that's biting them, you will see them looking down the newspaper columns, licking their pencils, and marking off the time when their favourite crooning baritone will croon to them over the ether. Mighty soon we shall have babies in perambulators lisping in terms of crystals and condensers.

It's the same in America. You can't get away from radio. Journals and magazines and text books, all on radio, shout at you from the bookstalls. There's a radio store around the corner of every street. Mr. Marconi has a lot to answer for. That's dead certain.

Still, there's precious few folks want to avoid radio now. It's as much part of life as riding on the subway every morning to work, and riding home again at night. There are plenty who would sooner miss a night's rest than their evening's radio entertainment.

The Man Who Hated Radio.

I remember, though, the story of a New Yorker who lived in a block of tenement flats. The architect who designed them had done his thinking before loud speakers were the craze. The New Yorker hadn't reckoned on them, either, when he signed up the lease agreement.

He just wanted to read and smoke and live the peaceful life. But every time he picked up his book, a guy in a neighbouring flat started on the knob twiddling. If it wasn't dance music from upstairs, it was grand opera from below. It was just too bad, the New Yorker said.

He complained, of course. But it was no good. They told him to pickle himself or buy a radio set of his own.

He said he didn't want a radio set. He just wanted to read and smoke and live the peaceful life, and it was just too bad that all this noise was going on when he wanted to read. They called him a whole bunch of things, and added that if he didn't want a radio set, he would just have to pickle himself.

One day, when a radio dame from below had just reached top C half a second before a saxophone from above arrived at bottom D, the poor New Yorker snatched up a newspaper. He read an article which said that folks living near an electric generating station had a thin time with their radio sets.

Peace at Last.

That set him thinking. After a while, he went out and bought a powerful X-ray coil—for his rheumatism, so he said. When he turned on the coil, the radio sets upstairs and downstairs suddenly ceased.

The owners were on their hands and knees looking for the mice that had got into the works. Well now, that just shows you what lengths some people must go to in order to escape the radio.

"A GRAND THING!"

"Personally," says Miss Sophie Tucker, "I have no kick against radio. I think it's a grand thing."

Personally, I have no kick against radio. I think it's a grand thing. It gives poor folks a chance to hear good entertainment, and goodness knows, there's plenty can do with an extra song or two in life. It's cheap entertainment, too, right in your own homes. Sure, radio is a great scheme.

Mind you, it's not like the real thing. Hearing a good singer through your speakers is fine, I know; but, at the best, you can never hear more than a good voice. It would be a whole lot finer if you could see the singer which, from what these television wiseacks tell us, you will be able to do pretty soon.

But even then, it wouldn't be the real thing. You would be able to know, perhaps, everything about the singer's performing ability, but you couldn't get a line on his personality.

Personality. That's the thing that counts. Lacking personality, the finest singer in the world will never get very far. Take any of your big stage artistes—the really successful folk. They have personality written across them from head to feet.

You can admire artistes for their cleverness, but you can't love them for it. It's the personality you love, not the cleverness. The personality gets at you deep down somewhere inside you. It often gets you before the artiste opens his mouth. And it is just that thing which the radio can't bring to you.

Just the Same in U.S.

Broadcasting in England and broadcasting in America is pretty much the same sort of business. Some folks won't believe it though. They talk a lot of hot air about the great differences between the two countries.

Well, I see it this way—a microphone looks like a microphone whether it's made in England, America, Germany, or Timbuctoo. The studios, too, are pretty much the same, so from a singer's point of view there's no difference at all.

I have heard some people talk about the ordeal of singing in front of a microphone. Nerves, and so on. Such a difference, they say. Of course there's a difference. A microphone box can't look like a flesh and blood audience whichever way you regard it. It's not built the same.

But I can't get wise to all this talk of nerves. Naturally, I would rather sing to

(*Continued on next page*)

A NOVEL RESISTANCE

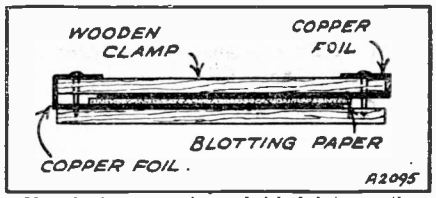
How a "P.W." reader achieved a fairly low value.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a constant reader of your fine paper, I thought that you might be interested in a rather novel low resistance I have made.

I wished to make a fairly low resistance (about 1,000 ohms). I tried a strip of blotting paper soaked in Indian ink but found the resistance too high, even when the strip was very short. So what I did was to sandwich a piece of the paper between two plates of copper foil just like the dielectric of a two-plate condenser.

LIKE A CONDENSER



The blotting paper is sandwiched between the copper foil like the dielectric of a condenser.

Finding this resistance a trifle too low, I added two other pieces of paper between the two plates, thus making a resistance suitable for my purpose.

Hoping this will be of use to you.

I remain,

Sincerely yours,
C. JAMES ROE.

Finchley.

A DE LUXE SET

The experiences of a "P.W." enthusiast.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose herewith a photograph of my "1931 De Luxe" Receiver, as this set was built from knowledge derived from POPULAR WIRELESS and "Modern Wireless." It started off with the circuit of the "Magic" Four in the original hook-up, and with certain minor alterations ended up in this.

Stations Simply Roll In!

The set employs S.G., Det., R.C. and Transformer, and except for the R.C. coupling is the "Magic" Four de luxe. Foreign stations simply roll in for the conditions prevailing here. I have often heard the National programme. Bucharest is, perhaps, the best station I receive from Europe, even to the 160 beats per minute of the metronome. Purity is exceptional. A few particulars of the balance of the circuit may perhaps interest you. Home-built eliminator (A.C.) capable of 50 m.a. at 200 volts, 4-volt Philips valves throughout. Magnavox 10½-in. M.C. loud speaker, battery type. Regentone charger with fool-proof switching from charger to set. M.A. with shorting switch in series with all valves. Concealed panel lights, Paillard induction gramophone motor, Toman pick-up, sub-baseboard wiring. The switching arrangement from radio to gram. and the amplifier circuit is original. The reproduction on the moving coil with the original circuit on radio was perfect, but greater brilliance was found with a pentode in the last stage. Instability however, was creeping in, so I decided to have pentodes only in the gramophone amplifier circuit. With a simple 8-point switch and a lot of complicated wiring, I succeeded in accomplishing all that I wanted. When switched to radio the pentodes are off (there are 6 valves in the cabinet—2 pentodes in parallel)—and the four valves of the radio circuit are on. When switched to gram. the H.F., Det. and S. Power are off and the first L.F. and pentodes are on. Sounds a little complicated, but it was done, and the results are really gratifying.

I have been subscribing to POPULAR WIRELESS for over three and a half years.

Yours respectfully,
FRANK T. COOPER.

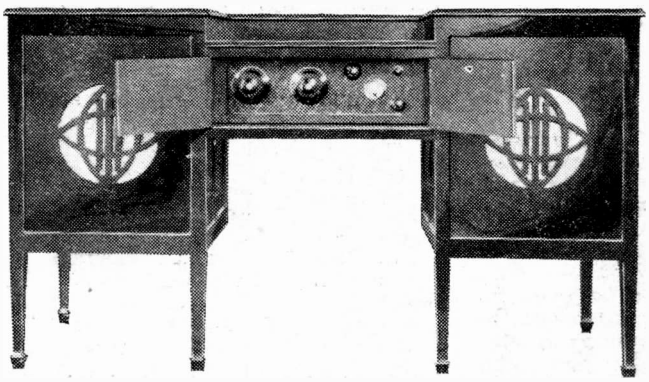
Bombay.

PRACTICAL POINTERS.

Copper Wire—Screening, etc.

A quarter of a pound of No. 24 S.W.G. D.C.C. wire has a length of fifty yards, two feet, three inches.

BUILT IN BOMBAY



This is our Bombay correspondent's fine outfit. It is a development of the "P.W." "Magic" Four.

A quarter of a pound of No. 26 D.S.C. wire has a length of 81¼ yards.

* * *

Sets which employ only one high-frequency stage can often be screened effectively by one upright screen. But when two H.F. stages are employed it is usually necessary for much more elaborate screening to be used.

* * *

When fixing up a potentiometer to get smooth variations of H.T. supply remember that it must be disconnected when the set is switched off, or there will be constant drain on the H.T. battery or supply.

MR. MARCONI HAS A LOT TO ANSWER FOR

(Continued from previous page.)

a hundred per cent real live audience. Anyone would. I like the applause and appreciation. It does your heart good to know someone's liking your act. It keeps you up to high water level. An audience, too, has personality, like an artiste. Artiste and audience react on each other.

The great difference between English and American broadcasting is from the listener's point of view. There are more radio stations in New York than in England, Ireland, Scotland and Wales all heaped together. Then again, commercial firms in America "buy up the other." They arrange the concerts, and give themselves publicity at the same time.

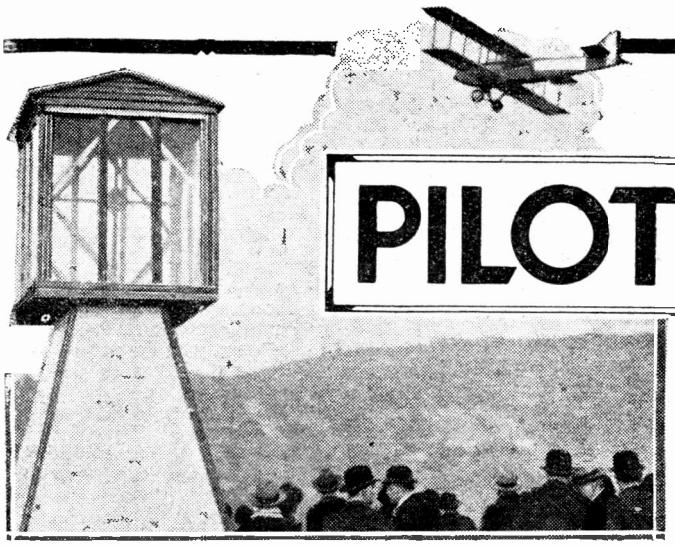
A Tall Order!

Well, it's queer to the English way of thinking, but it's not a bad idea. If you heard a poor radio concert, I guess you wouldn't jump at buying the wares of it. Consequently, the firms who organise American radio concerts are good entertainment value.

It's a tall order asking me which is best—English or American broadcasting. It's too much a question of personal opinion and individual choice. Actually, I don't think there's anything to choose either way, except that American listeners have a wider variety of programmes to choose from.

I have had mighty little chance to give attention to the British broadcast concerts. The few I have heard have been good—some of them really fine. I can't see that British listeners have any kick against the B.B.C. There seem to be concerts to suit every taste—real highbrow stuff, and the other sort, too—what is called lowbrow.

I don't like that name. It's what gets to the heart of the world, or, at least, most people in the world, and if there's anything low in that, then my name's not Sophie Tucker.



PILOTED by RADIO

Taking the bearings of an aeroplane in flight from two different places, and then plotting its position on a map, is not the only way in which radio can guide air liners. A much more ingenious scheme, which gives immediate indication, is explained here

By A. S. CLARK.

AS the heavy three-engined air-liner drones its way through the fog, passengers may look askance at the misty banks rolling past the windows and wonder whatever induced them to go by air. But what of the pilot, the man responsible for all their lives? Is he worried?

No, not a bit! Let's just take a peep at him as he sits at his controls. There he is, as complacent as possible, although he can hardly see beyond the nose of his machine. But what is the secret of his unwrinkled brow?

Listening As He Flies.

Why, radio. A pair of headphones are sewn in his helmet, and he is listening—listening to a continuous note which sometimes breaks up into a letter in the Morse code coming through above a blurred background.

Immediately he hears that Morse signal, he knows he is off his correct route. What is more, he knows whether he is too far to the right or too far to the left, and you will feel the aeroplane bank slightly as it turns back to its proper course.

The effect is certainly wonderful, far more wonderful than the means by which

INTERLOCKING "L's" AND "F's"

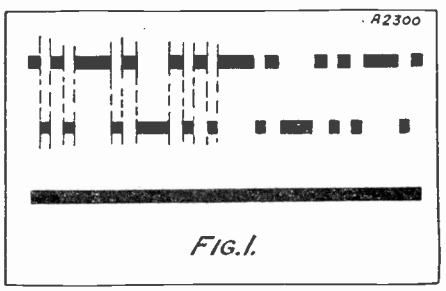


FIG. 1.

By transmitting suitable letters in the right relation to one another, it is possible in effect to obtain a continuous signal.

it is obtained. The latter is extremely simple, but, nevertheless, very interesting, as you will agree when you have read the explanation.

Two Letters Transmitted.

First of all have a look at Fig. 1. You will recognise the top line as being a series of F's in the Morse code, while the second line contains L's in the same code. (The first and last L's are incomplete merely for purposes of the diagram.) The bottom line represents a continuous buzz, as though the key were being held down permanently.

One Continuous Buzz.

In Morse the breaks between the signals which make up a letter are equal to the length of a dot, and the time between two letters is the same length as that taken by a dash. Keeping this in mind, look at Fig. 1 again.

What do you spot? The letters are so chosen that the *dash* in one comes exactly opposite the *pause* between the letters in the other case. Also, the dots in either case come dead opposite the short pauses in the composition of the other letter.

The result is that if both letters are received at the same strength, they fit together like pieces in a jig-saw puzzle, and the effect in the telephones is one long buzz.

Now for Fig. 2. Suppose we are flying from A to B. Our machine, like the crow, will go along the straight line joining the two points.

Situated at B there would be a station radiating in two definite arcs of 90 degrees. These two arcs will join one another exactly along the line A B. By means of special directional apparatus there is no overlap, each signal keeping to its own right angle.

Keeping "Course."

Over the arc that lies on our right-hand as we go towards B the signal is the letter F, while in the arc on our left the letter L is transmitted. These two letters are transmitted so as to interlock, as explained in Fig. 1.

By means of automatic apparatus at the transmitter they are kept continually interlocked. Also, their strength is kept exactly equal the whole time.

As long as our aeroplane keeps accurately on the line A B, it will pick up both letters at the same strength, and the continuous buzz already mentioned will be heard, and all will be well. Immediately, however, the slightest digression to either side is made, reception is "unbalanced."

If our deviation is to the right, then the F will come in more strongly than the L, and it will be possible to pick out the letter F above the blurred background. If, on the other hand, we wander to the left, then the L will predominate.

The farther we are from the line A B, the louder will the letter indicating deviation be heard. If our pilot hears the F coming through, he will turn to the left, and if it is an L that he hears, then round to the right we must go.

When an airman becomes really used to another route of this kind, he can tell quite well how far he is off his course by the strength at which the indicating signal is received. A beacon of this type is at present in operation along a part of the Croydon to Paris air-route.

HOW THE BEACON WORKS

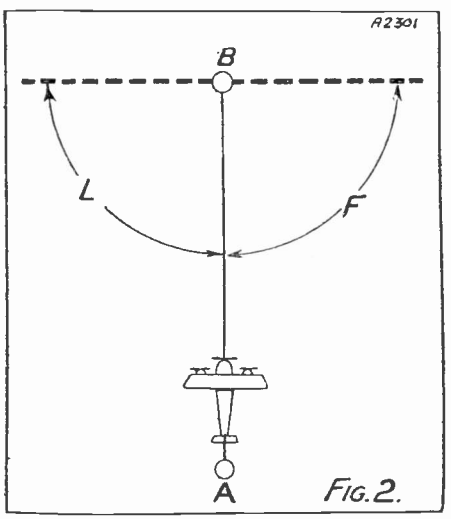


FIG. 2.

Showing the angles through which the directional station transmits in relation to the correct course.

The actual transmitter is situated at Abbeville, which town is at a point intermediate between Croydon and Le Bourget aerodromes.

Invaluable In Fog.

The service is available to pilots flying either towards or away from the transmitter, because it has a radiation over 360 degrees, the second 180 degrees being really a replica of what has been described in Fig. 2. The only difference being that the same letters are radiated in diagonally opposite quadrants.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot in any circumstances guarantee their return, as it is our practice thoroughly to dissect much of the gear in the course of our investigation!

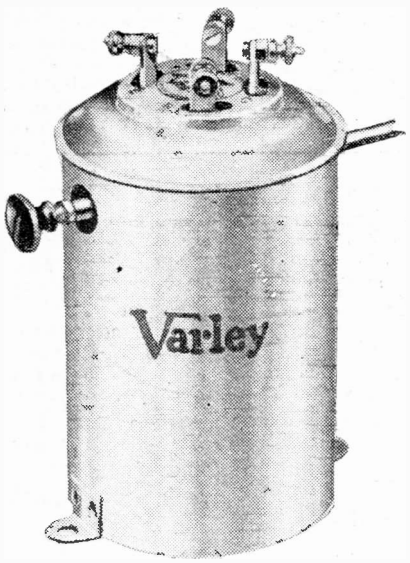
And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are, therefore, framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

NEW VARLEY COIL.

ONE must always feel prejudiced in favour of a component that makes set construction simpler, for I am sure no one wants to do unnecessary work.

But if sacrifices are made for that end, then the conscientious constructor can but ignore the article.

However, this is not necessary in the case of the new Varley Intervalve H.F. Coil, for this is a very efficient component and possesses other qualities besides that of simplifying set assembly.



The Varley H.F. Intervalve Coupling Coil.

In reference to this last, it is a completely screened device, so that it renders the usual more or less complicated screening methods quite unnecessary.

Further, it has a wave-change switch and can cover ordinary and long waves with equal effectiveness.

It has been designed primarily to operate in conjunction with the Varley Constant Square-Peak Band-Pass Coil, and its switching can be ganged with that on the C.S.P.

We have thoroughly tested the new Varley coil and find it to be a very good coil indeed. It can be used either as a tuned anode or tuned grid coil, and costs 8s. 6d.

"P.W." readers will be interested to learn that both this new coil and the very efficient Varley Constant Square-Peak Band-Pass Coil can now be supplied for use with Extensers, so obviating wave-change switches. But the Square Peak demands a special Extenser, and this "Cyldon" are able to supply.

"MAGNUM" VOLUME CONTROL.

Messrs. Burne-Jones & Co., Ltd., recently submitted one of their new "Magnum" volume controls. It is available in two values, half megohm and two megohms, at the price of 5s.

In construction it is particularly compact, its overall dimensions being 1½ in. diameter by ¾ in. deep. It is completely enclosed within a black casing, and the three terminals are neatly grouped at the back.

The action is smooth and unmarred by any "dead spots" or jerkiness.

TWO BAEDEKER LOUD SPEAKERS.

There is something rather attractive about the names of the two speakers that recently arrived from Baedekers Trading Company, Birmingham. The one is called "Nico" and the other "Alfio," and they are priced at 42s. and 73s. respectively.

"Nico" is built into an oak cabinet with a polished walnut front, and is certainly a nice instrument in appearance.

The "Alfio" cabinet is of similar material but over the silk gauze of figured gold that covers the cone is a fret of black wood which is quite striking.

Both speakers give pleasing results. Personally, I would pay the extra and go for "Alfio," for it is markedly superior, although "Nico" has quite a respectable response.

A W.B. VALVE HOLDER.

In the course of some experimental work I happened across a component which had wandered from the construction department. It was a W.B. four- or five-pin Universal valve holder. And it has points which merit at least its brief description in this page.

It costs only 1s. 3d., but it is so designed that it can be mounted either vertically for a screened-grid valve or horizontally for ordinary types, and it will take either four-pin or five-pin valves. The main part of its structure is an excellent bakelite moulding. It should be noted that it is not of an anti-microphonic character.

WEARITE VOLUME CONTROL.

It is not often that a volume control is asked to pass much in the way of current; indeed, usually it is a matter more of micro-amperes than milliamps. But the current-carrying capacity of such a component provides some measure of indication as to its technical efficiency, from which it will be gathered that the Wearite volume control—a product of Messrs. Wright & Weaire—which is able to pass 1 milliamp (i.e. having a resistance of 500,000 ohms, it can safely be joined between two points across which there is a potential difference of 500 ohms), is an article deserving a mead of commendation.

But it is also essential that a volume control should have a smooth action and provide an even adjustment from minimum to maximum. I find that in these respects, too, the Wearite grades as A1, so that I have no hesitation at all in recommending its use in "P.W." receivers.

A CLIX VALVE HOLDER.

The valve holder that is illustrated on this page is a Clix panel-mounting type, and is due to Messrs. Lectro-Linx.

Its special feature is that it is fitted with helically resilient sockets of a special design enabling easy but efficient contact with valve pins to be made.

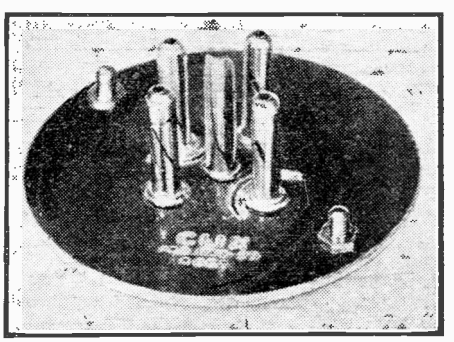
Also it should be noted that very little solid dielectric is employed, and that electrical losses have been reduced to a minimum.

The five-pin type (as illustrated) costs 6d., and the four-pin 5d.

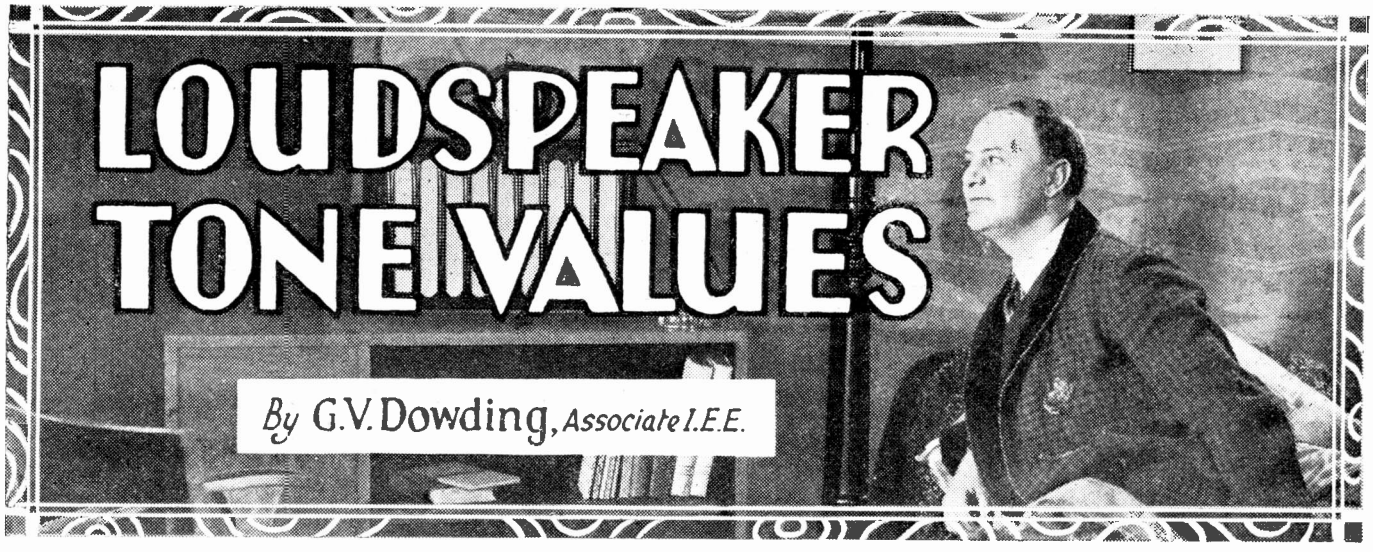
For certain kinds of sets this Clix product is just the very thing, and for factory produced receivers it should be absorbed in large quantities, and I believe already a number of the leading set makers are including them in their designs.

"MOTOR" LOUD SPEAKERS.

I recently received from Messrs. Tekade Radio and Electric, Ltd., a copy of a catalogue dealing with their "Motor" Loud Speakers, Units and Chassis. It is a nicely produced brochure and one that is well worth sending for.



The Clix panel-mounting valve holder.



LOUDSPEAKER TONE VALUES

By G.V. Dowding, *Associate I.E.E.*

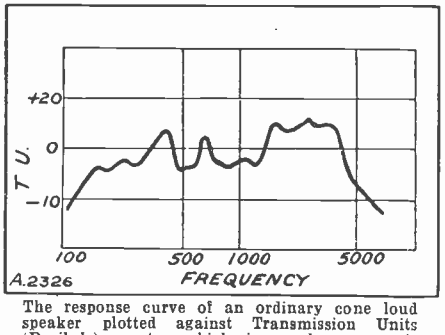
MANY of you will no doubt remember the friendly argument that I had with Victor King early this year. There was no umpire or referee to award points in that verbal encounter, so no verdict is on record. But I have just received the following letter from my old friend in which he returns to the attack.

"My dear G.V.D., I have read the proof of that little article 'Electrified Music' (it appeared in last week's P.W.—Ed.) with great interest, and herewith my compliments to your Mr. H. A. R. Baxter for hitting the nail so accurately and so firmly on the head. It always has been my contention that the B.B.C. wastes its time and its, or rather *our*, money when it tries to transform the happy parlours and kitchens of the land into so many miniature Queen's Halls.

Radio Robbery.

"They sadly over-rate the powers of the medium through which they operate. Those B.B.C. music pundits could just as usefully employ their time trying to wheedle the Fifth Symphony out of a children's comband jews'-harp band as in an endeavour to reproduce the works of the Great Masters

THE AVERAGE SPEAKER



The response curve of an ordinary cone loud speaker plotted against Transmission Units (Decibels), a system which gives a closer approximation of what is heard than straightforward degrees of overall voltage-amplification.

as performed by great orchestras on the loud-speaker diaphragms of their ten (or is it twenty ?) million listeners.

"They can and do manage to get over with very thin imitations of the real things and, apparently, many people find these imitations both instructive and pleasurable. But it should never be forgotten that they are at the best the merest imitations.

Another friendly argument between "P.W.'s" Technical Editor and Victor King concerning a subject of vital importance to all radio enthusiasts. You will enjoy reading the two distinct points of view brought forward by these popular wireless experts and will no doubt form conclusions of your own.

And I am not sure, G.V.D., that they even merit that term. My dictionary says that an 'imitation' is 'that which is produced as a copy.'

"But radio actually *changes* the very pattern of a musical composition. Instruments are robbed of their individual characteristics, notes are suppressed, and others exaggerated, spurious tones are developed, and, in many instances, the pitch of some of the notes actually raised an octave through the excision of fundamental frequencies and the retention, and even magnification, of their harmonics.

"And this in the best of sets. Certainly we are all striving to reach the straight line output, and that ideal may one day be attained, but even then faithful copies of original musical performances will only be possible given a volume approaching that produced in the original instance, and who wants full-bodied Queen's Hall emissions in one's own home ?

Lay the Halos Aside !

"No, it is time the B.B.C. realised that they are at the one end of a huge transformation process, a machine that hands out something very different from what is put into it. Seemingly, they are smugly satisfied so long as they can vibrate the ether with fairly good etheric representations of the sounds engendered in their studios, and don't care a tu'penny piece what happens to their goods after that.

"No service after sales ! If they would only lay their halos aside for a while and face up to this they could make broadcasting vastly more popular than it is.

"Here is my suggestion, G.V.D. (and I know you will heartily disapprove). The B.B.C. should sling overboard all ideas of educating the public in conventional musical matters, and should concentrate on the building up of an art of loud-speaker music.

"Instead of studying the effect of a broadcast musical performance in terms of the more or less perfect manner in which their microphones and transmitters can handle them, they should analyse and remodel them in accordance with what is heard in the average home on the average radio receiver.

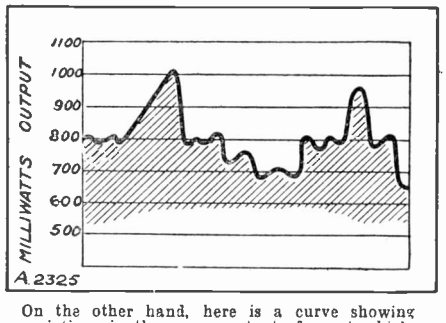
Too Many Musicians?

"It is always safe to work to averages, you know. When sets in general improve, the average will go up. It is a great thing to have a radio orchestra of one hundred and forty musicians, but I maintain that twenty musicians would be able to please listeners better if they were made to play, not for the microphone, but for the normal cone loud speaker.

"Brother Boult's bass section is pure waste, and he has scores of unnecessary strings. Jack Payne and his merry boys number less than twenty, I believe, but you can take it from me that he gets over with twenty times the effect.

"I wonder if any one listener would ever have credited the big B.B.C. orchestra with more than a score of instrumentalists if he hadn't been told that it exceeded the century at a cost of, possibly, six or seven times that of the B.B.C. Dance Orchestra ?

NOT REALLY SO BAD !



On the other hand, here is a curve showing variations in the power output of a set which, in fact, would probably pass quite unnoticed!

"And don't tell me one hundred and forty expensive music producers are essential for public performances of a calibre suited to the dignity of the corporation. The average listener (note my constant use of that word average) doesn't care a hoot

(*Continued on next page.*)

LOUD-SPEAKER TONE VALUES.

(*Continued from previous page.*)

about that: what he wants is good stuff coming from his loud speaker.

"Reverting to Jack Payne, I surmise he is one of the very few B.B.C.-ites who really comprehend the limitations of the connecting link between the B.B.C. and their audience. That is why he is one of the most popular 'turns.'

Maybe there are more listeners learning to appreciate and enjoy dance music than there are those who are going 'classical,' for that reason. I don't know—that is surmise.

Jack Payne Knows!

"But I am firmly convinced that if there were a ballot only a tiny majority would vote for the retention of the 'Symphony Orchestra' in favour of 'J. P.'

"And I wonder if there would be a great outcry if suddenly, and without previous announcement, Jack Payne and his bunch took over all the chamber and symphony broadcasts? Not jazzing them, but handling them 'concert' fashion.

"I am inclined to think there would be thousands of letters written to the papers praising the B.B.C. on its vastly improved transmissions. Indeed, I would go further and say that such an event would signalise the commencement of the public's real education into the pleasurable absorption of this kind of music.

"And Jack Payne would demonstrate what already he seems to know—that it is the melody that matters in microphone music, for it is generally only the melody that retains its original structure; the greater part of the harmonic construction goes west.

"There ought to be a school of loud-speaker music where qualified teachers would impart to their pupils instruction in harmony and counterpoint based on the frequency characteristics of the cheap cone loud speaker. Now, G. V. D., what have you have to say to that?"

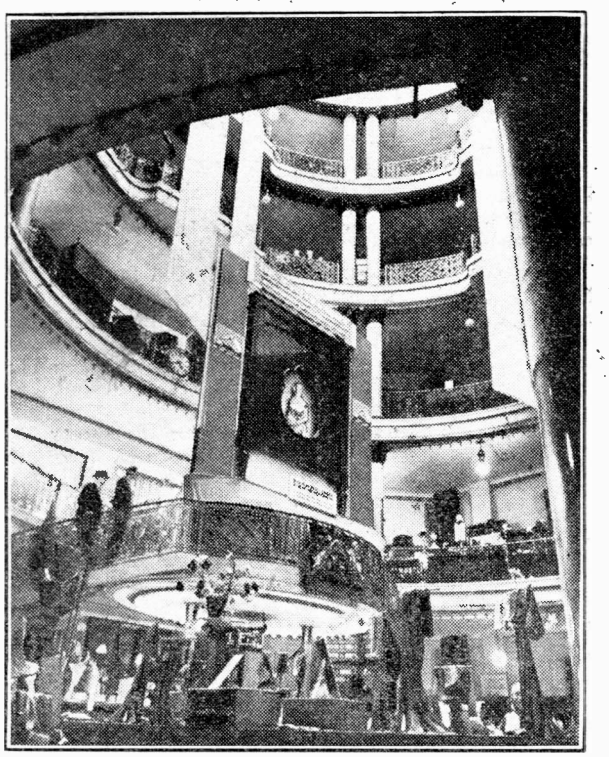
Mr. Dowding's Reply.

There is a great deal that I could say, but there won't be enough space for more than a few brief remarks.

In regard to the accusation that music is completely mangled through the radio, it is my opinion that both he and Mr. Baxter sadly underestimate the qualities of the average radio outfit. But in a sense Victor King's argument is unanswerable as are all cases framed against imperfection. Only a perfect thing is able to withstand every criticism but, unfortunately, there is no perfection in this imperfect world.

However, present-day radio is by no means one of the least perfect things in existence. I think that where my worthy friend goes wrong is in confusing harmony with harmonics. A common error. Harmony comprises combinations of notes, harmonics are the partials of these individual notes and composers do not write *tunes* with these. As a matter of fact, it is dubious whether most of the Great Masters knew there were such things!

WORLD'S BIGGEST RADIO-GRAM



Claimed to be the biggest radio-gram set in the world, this H.M.V instrument is 22 ft. high and weighs over a ton. It was exhibited at a London store.

Dubious Harmonics.

And harmonics ranging above the four or so thousand cycles of frequency where the average radio set "cuts off" are much less important than many try to make out. The higher the note the vastly fewer are its harmonics in the audio range. That is why the higher the note played on a violin the less its rich individualism. A "Strad." cannot get away with anything much more than can a cheap half-crown violin on its "E" string, but virtuosos generally use this string more to demonstrate their agility and technique than to vaunt the tone of their instruments. A harmonic that has a frequency greater than that of the highest "audio" frequency is of little moment. A high violin note will only have three or four harmonics of dubious usefulness while low notes will have hundreds well within the audio range, harmonics pitching where the fundamentals of "toneful" piano notes lie.

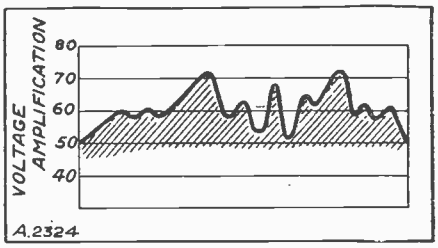
As for the bass, here I must admit that the average radio receiver fails rather badly, but not so badly as Victor King would apparently like us to believe. Even so, bass does not play such a vital part in music that its partial reproduction is going to ruin a composition entirely. Now if the average set were good at both the bass and the high note ends, but failed in the middle——!

There is little need for me to pursue the subject further, for I have dealt with it at some length in a "Modern Wireless" article entitled "Do we Want the Higher Frequencies?" to which those who are interested can refer. It may or may not have been published by the time these words are in print—I am afraid I cannot say definitely.

Anyway, I believe that it will extinguish the bogey Victor King has conjured up.

It is my considered opinion that the B.B.C. is doing right in ignoring such

YOU WOULDN'T HEAR THEM



Although the voltage-amplification variations shown look very nasty, it is unlikely that even a keen ear would hear the difference between these and a completely straight-line response.

limitations as are imposed on the reproduction of their music by radio receivers. They can do nothing else. It is very easy to talk about "averages," but what on earth is the average set?

Some loud speakers may have pronounced peaks at 1,000 cycles, others at 500; how pleased listeners would be if the B.B.C. struck an average and diminished their transmissions at 750 cycles!

Whatever they did to try to pander to "averages" they would very seriously upset a great many receivers and instil vastly more false values into radio than does their splendid "straight line" output.

That Mangled Music.

It is not difficult to write glibly about the mangling loud speaker twisting all music round to its own peculiar form, but what mangling there is is in many respects so different in individual cases that it will not, on the whole, conform to type.

But as the mangling is of a uniform nature in each instance, the various kinds of broadcast music retain their comparative individualism. The B.B.C. Symphony Orchestra playing Bach may sound different on Jones' set from what it does on Smith's outfit, but at least it always sounds the same on the same set and exhibits the same degrees of difference from, say Jack Payne's orchestra.

And, don't forget, my ear has a different curve from yours, but that doesn't matter a scrap so long as the things we hear retain the same bases of comparison. In radio broadcasting we look to the B.B.C. for a base in the shape of a straight line of comparative perfection.

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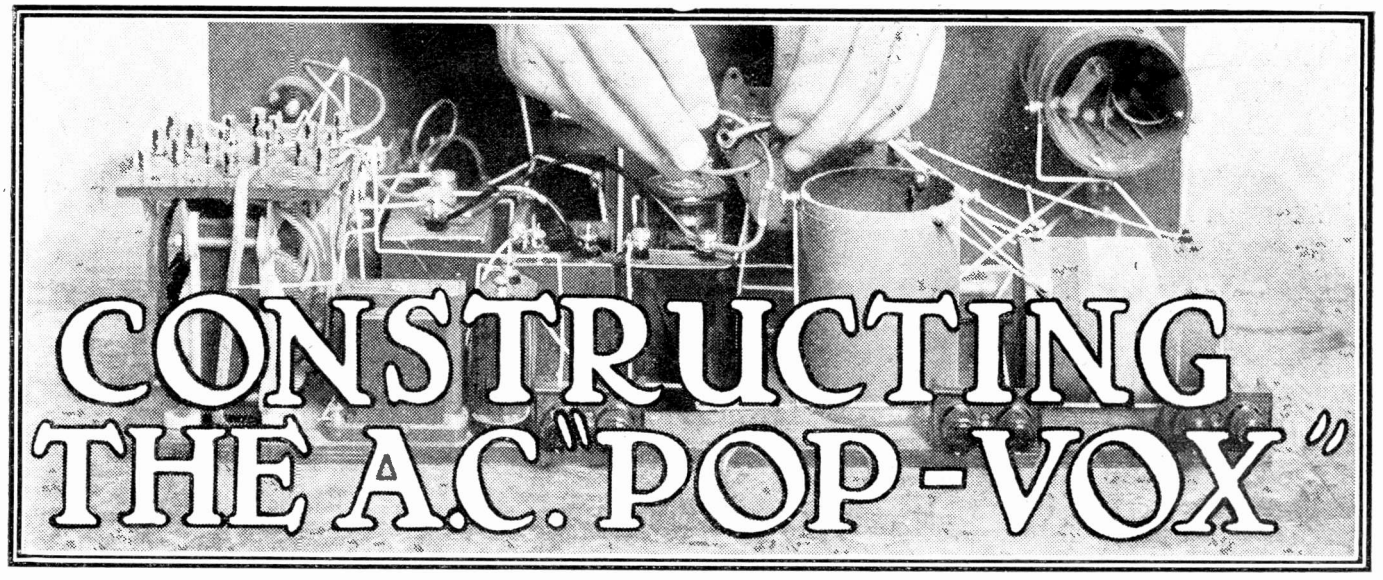


CONSTRUCTING THE A.C. "POP-VOX"

IN last week's "P.W." we told you quite a lot about the design of the A.C. "Pop-Vox," and we briefly touched upon most of its important features.

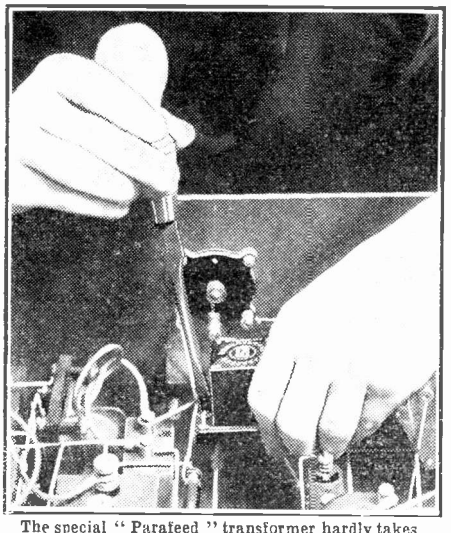
This week we must confine ourselves more strictly to considerations of actual construction.

Even so, it is impossible not to "enthuse" about the set, for the striking simplification due to extenserised tuning and other "P.W." features is reflected in the practical form in which the receiver emerges.

You will realise that by using A.C.

Last week we did not have space to go fully into the actual construction of this excellent receiver. In this article, however, we deal with the matter in detail, and mention all the little points with which you are likely to be concerned.

PLACING THE "PARAFEED"



The special "Parafeed" transformer hardly takes up any space at all, and it has very useful slots on the terminal heads, enabling a screwdriver to be used for tightening up.

valves a gain of at least one stage is achieved, as compared with a battery-run set. In other words, you will get quite four-valve results from a Det. and 2 L.F. circuit. And you will be struck by the straightforwardness of the layout as shown by the wiring diagram.

Remember that this diagram (it appeared last week) is drawn to scale, and a little "rule" can be made from the "inches" marked at the top of it. You can measure with that "rule" every dimension, and so get your own layout exactly right.

As regards the components to be used, we are repeating the list given last week, which shows the actual makers of parts used (those first mentioned) and, following, suitable alternative makes that may be employed.

Watch the Spacing.

When all the parts have been collected, and have been given the usual "once-over" to guard against loose terminals, etc., they should be placed on the baseboard in position. See that everything fits snugly, and that the spacing is as shown in our wiring diagram.

Stand the panel up in place, and make sure that its components are not going to foul those on the baseboard, when in position.

If all seems O.K., commence the panel drilling by making the three holes along the bottom to take the fixing screws. If these are drilled through when the baseboard and panel are positioned in the cabinet you will ensure a good close fit and no gaps or overlaps.

Complete the panel drilling by means of the dimensions given on the panel layout diagram. You can then mount the various components on the panel, but do not fix it to the baseboard at this stage.

Now carry on with the layout of the baseboard parts, fastening the "Contradyne" Coil by means of a short strip of wood wedged into the former and screwed to the baseboard.

Alternatively, the former may be secured by a strip across its top, or by any other handy method which holds it firmly in place.

Aim at Short Wiring.

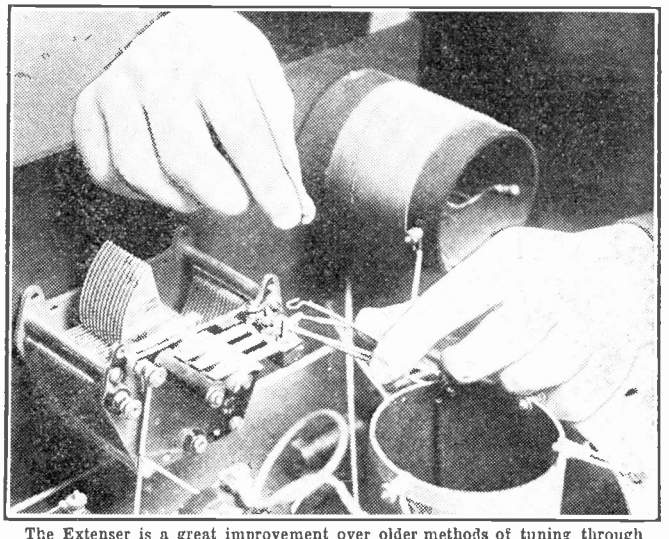
Note that each valve holder is placed with the grid (G) terminal arranged for short wiring to its appropriate connecting-point. And that coil units, transformers, etc., have a right-way-round, and must not be mounted with terminals facing otherwise than as shown if our own results are to be duplicated with your set.

When all parts are screwed in position you can wire up the baseboard components, starting with the heater-windings that employ metal-covered flex. Remember when wiring to use the pliers with moderation, as well as with firmness and enthusiasm when tightening up the nuts!

There is no compulsion to solder, but, of course, as this is a mains set that process

(*Continued on page* 814.)

THE "EXTENSER" CONNECTIONS



The Extenser is a great improvement over older methods of tuning through two wave-bands. The wave-change switch is now a thing of the past; two of the connections which went to this component now go to the self-changer contacts. The third one is eliminated completely.

THE MIRROR OF THE B.B.C.

MR. ASHBRIDGE HUSTLES.

THOSE TALKS—TELEVISION—SCHNEIDER BROADCAST ARRANGEMENTS—STREET ARTISTE DISCOVERIES

A FORTNIGHT or so ago papers in the North of England described the "flying visit" of the Chief Engineer of the B.B.C., who went to Newcastle and the North-East to decide what should be done about the experiment of trying to synchronise the wave-lengths of North Regional and Newcastle.

Immediately on arrival at Newcastle, Mr. Ashbridge set out with his testing van column, which he kept in movement until nearly dawn traversing both ways the service areas of the transmitters involved.

He was back in London just after lunch the next day. A few days later he set out for Scotland overnight, did a thorough inspection of the new station at Falkirk and was back in London by the day train, arriving within twenty-four hours of his departure.

For all the quietness of his demeanour, there is probably no greater hustler in the country than the Chief Engineer of the B.B.C. Incidentally, I gather he was very well pleased with what he saw in Scotland.

Those Talks.

I congratulate the B.B.C. on their Autumn and Winter Talks, as recently published. There is certainly much more general interest and entertainment value. But I cannot understand the unrestrained joy of some daily newspapers at the alleged discovery that the announcement of the new series means a radical change in B.B.C. policy.

True, there is to be more flexibility and scope on the Regional waves, but it should be realised that this is being purchased at the heavy price of much more rigidity and limitation on the National waves, particularly on 5 X X, which provides a multitude of listeners with the only programme they can get. In the result, listeners to London, Midland and North Regional will gain substantially; whereas listeners to 5 X X will lose a good deal of the lighter fare to which they had become accustomed under the old regime.

I agree that a move forward has been made; I would be much happier, however, if the principle of flexibility and scope had been applied to both main sets of programmes. Until this is done, sound and consistent contrast cannot be achieved.

Television.

The summer season topic seems to be television. First of all, we were deluged by claims about Cathode Rays from America, probably a part of their television publicity campaign.

Then there is a prompt rejoinder from Baird Television, who contend that the experiment with the portable transmitter in B.B.C. studio No. 10 marks "an entirely new era."

These claims will be received as were those of the Americans, with reserve. Considerable progress has undoubtedly been made, enough to make it possible for the B.B.C. occasionally to vary the nature of the experimental transmissions.

In these hard times, the success of anything British will be welcome to all of us. Personally, I wish the Baird Company every success, but I still think it will be a long time before we have a regular television service.

Savoy Hill is very cross indeed, but probably will continue with the experiments in various forms. It is a fact that successive Postmasters-General show keen interest in television, and even Downing Street sends distinguished visitors to demonstrations in Long Acre.

Schneider Broadcast Arrangements.

The running commentary on the race for the Schneider Trophy will in many respects be the most important outside broadcast of the whole year, and listeners may rest assured that every effort will be made by Mr. Gerald Cock and his staff of organisers and engineers to bring into every home not only a description of the race but something of the atmosphere which makes it the world's most thrilling contest.

Technically, the broadcast should be perfect, as extensive line tests will be carried out for many days prior to the race, while the helpful co-operation which the B.B.C. always gets from the Post Office telephone service, over whose lines all outside broadcasts are done, will be such that possible breakdowns are reduced to negligibility.

The B.B.C.'s observation post from which the running commentary will be carried out is to be on Ryde Pier, and the commentator will be Squadron-Leader Helmore, who has described some of the Air Force Display events at Hendon Aerodrome during the last few years.

I do not know at the moment who will assist Mr. Helmore on Saturday, September 12th, but it will not be Flight-Lieutenant Ragg, who did so when we won the Trophy in 1929, because Mr. Ragg is at present on service in Mesopotamia.

Street Artiste Discoveries.

The auditions for street artistes, from which, as I mentioned some weeks ago, the Vaudeville department at Savoy Hill was hoping to find sufficient talent to put on another "Kerbstone Performers' Programme," will bring some newcomers to the microphone on Tuesday, September 8th.

Among them are Jack Wilson and E. Johnson (songs with banjo accompaniment), James Elliott (dulcimer solos), Molly Molloy (soprano, with her husband at the piano), Stephen Francis Dance and Partner (the latter a 14-year-old girl accordion-player), and S. Vicarage, one of those lightning "spoon players" who works to the accompaniment of a barrel-organ.

The last entertainment by street artistes was so successful that the B.B.C. has gone to a lot of trouble to arrange the forthcoming one.

"HULLO, GRANFER!"

This is "Miss Exide" greeting an old pal at the radio round-up, held recently at Clifton Junction.

FOR THE LISTENER

By "PHILEMON."

Our popular contributor is now abroad, and this week he has more interesting things to say about radio in Italy.

REALLY you must have been having some pretty bad weather in England lately, for it has been almost impossible for me to get into touch by radio with you with any clearness or comfort. The atmospheric barrage has been practically impenetrable.

I have been able to get the Promenade Concerts all right on the shorter wave-length; but one gets such pots of good music out here on the Continent that, when one seeks London through the air, it is for a change; for a play, for a talk, for vaudeville. And in this respect the history of last week has been a tale of disappointment.

I see that we are to have discussions again this autumn. Mr. Holt Marvell and Mr. S. P. B. Mais are to present us with a series of discussions on "Living Dangerously."

In the matter of discussions there is a good deal of leeway to make up. In the past, some of them have been rather wearisome.

They have been formal and futile. I have switched out of discussions more often, I think, than out of any other kind of item.

Many of the previous discussions have failed because of the impression that they were prearranged and, so to speak, "put-up jobs." One has even heard the disputers turning over the pages of their manuscript!

Too Cut-and-Dried.

It is all written down. No doubt it has all been censored and passed for broadcasting. The very jokes have been rehearsed. And the whole thing has been lacking in sharp-edgedness, like the acting of a poor company of amateur actors who speak their parts not as if the words were being

(*Continued on page* 828.)

One of Telsen's latest achievements

TELSEN MANSBRIDGE TYPE CONDENSERS

Telsen have installed the most advanced plant in the world for the manufacture of Mansbridge Type Condensers. Only genuine Mansbridge foil paper and the finest linen tissue are employed in the exclusive method of manufacture. Every Telsen Mansbridge Type Condenser is hermetically sealed from the atmosphere and Post Office standards of insulation are adopted throughout.

The preliminary research, the most modern plant in the world, the finest raw materials, the latest methods of manufacture and the final test, all combine to give Telsen Mansbridge Type Condensers a high insulation through years of service with freedom from breakdown. The type of construction employed makes them genuinely non-inductive.

The following values are guaranteed within 5 per cent.:

Cap. mfd.	500-volt. test. Price	1,000-volt. test. Price
·01	1/6	2/6
·04	1/9	2/9
·1	1/9	2/9
·25	2/-	3/-
·5	2/3	3/3
1·0	2/3	3/6
2·0	3/-	5/-

TELSEN

ALL BRITISH RADIO COMPONENTS

Another Telsen achievement

TELSEN DUAL-RANGE AERIAL COIL

The Telsen Aerial Coil is the very latest development in dual-range aerial coil design. It incorporates a variable series condenser which can be set to give any desired degree of selectivity, making the coil suitable for all districts, whatever reception conditions may be. It has been tested in various parts of the country, and down to distances of four miles from Regional stations, a single tuned circuit will definitely separate the Regional programmes. This adjustment also acts as an excellent volume control and is equally effective on long and short waves. The waveband change is effected by means of a three-point switch. A reaction winding is provided and the primary and secondary windings are separated so that the aerial circuit can be isolated in mains driven or screen grid receivers.

Telsen Aerial Coil with Variable Series Condenser incorporated .. Price 7/6

TELSEN H.F. TRANSFORMER AND AERIAL COIL

This Coil is primarily designed for H.F. amplification in conjunction with screen-grid valves. It is arranged so that it can be connected as a tuned-grid or tuned-anode coil, or alternatively as an H.F. Transformer.

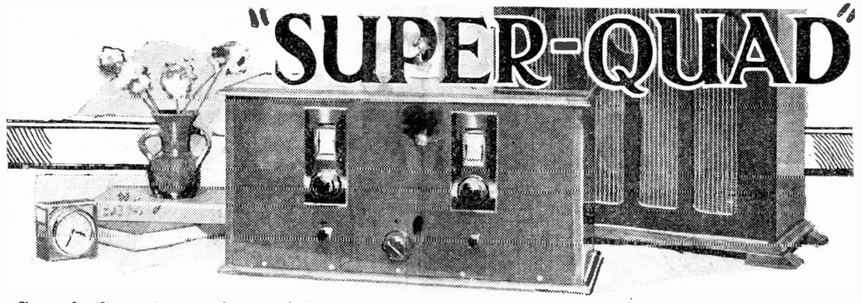
It also makes a highly efficient aerial coil where the adjustable selectivity feature is not required. A reaction winding is incorporated. When used as an H.F. Transformer the wave-change is effected by means of a two-pole switch. When connected otherwise a three-point switch should be used.

Telsen H.F. Transformer and Aerial Coil. Price 5/6

TELSEN

THE LARGEST RADIO COMPONENT MANUFACTURERS IN THE WORLD

THE SUCCESS OF THE "P.W." "SUPER-QUAD"

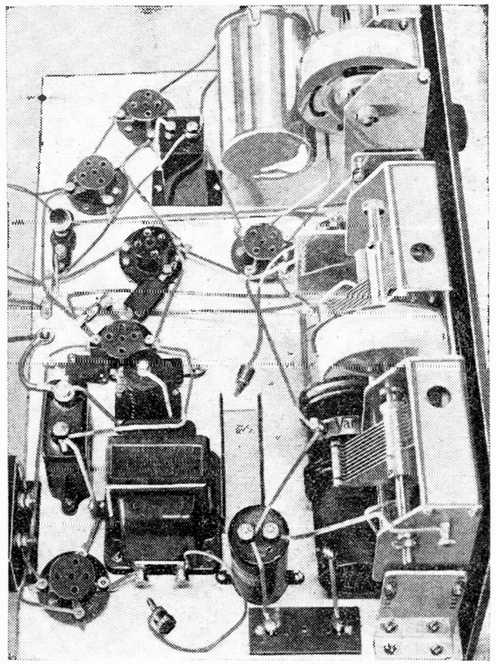


Some further notes on a few specially interesting aspects of the now-famous "P.W." "Super-Quad."

By K. D. ROGERS.

IN writing an article dealing with the success of the "P.W." "Super-Quad"—the set that has set the British Isles talking—it is difficult not to reiterate some of the views that have already been expressed by previous writers on the subject.

Besides a lot of congratulatory letters—even though it is unusually early for these to come in—we have received much correspondence from readers who either wish to make certain component changes, having "some of the things on hand," or who query whether the set can be used with (1) any mains unit, (2) four and six-volt valves.



PACKED WITH POINTS.

The "P.W." "Super-Quad's" phenomenal success is mainly due to various novel features incorporated in the design.

The H.T. Supply.

These are all perfectly legitimate and sensible questions, and so I propose here to deal with them, and at the same time I hope to make this article interesting to non-querist readers.

Let us deal with the mains unit question first, for the H.T. supply is a vital factor in the achievement of real success. Part success, if such a term can be used, can be reached with most sets, even when the H.T. supply is poor and the set is starved of power, but such "part success" is not easily obtained with a super.

A badly operated "Super-Quad" is a most disappointing affair, for, though the receiver is not a greedy one—it takes remarkably few milliamps and requires only 120 volts H.T.—it must be supplied with adequate power to enable satisfactory results to be obtained.

Electrically a super-het is a complicated affair, and if the oscillator and mixer valve (the bi-grid valve) is starved of H.T., and if the intermediate H.F. valve is similarly rationed, the electrical characteristics are upset and the results are very seriously impaired.

Thus a 120-volt (or even better, 150-volt) battery is desirable if anything like justice is to be done to the "Super-Quad." Below this figure the S.G. valve and the output valve will hardly be at their best.

Using a Mains Unit.

Now, when it comes to using a mains unit the answer to (1) is, not with *any* mains unit. As pointed out by Mr. Briggs last week, a unit giving 20–25 m/a is preferable in order to have a reasonable safety margin. Also, you need have a unit with only two tappings, one of which should give about 80 volts for H.T.+ 2, the screen grid of the S.G. valve. The remaining terminals on the set being joined together and connected to the max. tapping on the mains unit. Furthermore, the unit should be of good make to ensure that the output is properly smoothed and de-coupled.

So we would say: "Go ahead and use a mains unit by all means, but be sure it is a good one, and has an adequate margin of power. 25 milliamps at 120 or more volts would be O.K.

Now for point number two. The question of valves is an important one, for you can easily make or mar a set by the choice of these very important accessories.

Six-volt valves are not at the moment suitable, because as far as I know there are no 6-volt double-grid valves available. There is a 4-volt bi-grid, I believe—of foreign manufacture—but at the moment I have not had an opportunity of trying it on the "Super-Quad," so should not like to say yes or no regarding its suitability.

This therefore restricts us to two-volters. And very fine valves they are, too! Here's my selection for the "Super-Quad": Cossor double grid, Osram S.22 or Mazda S.G. valve for the intermediate stage. Osram H.2, Six-Sixty 210 H.L., or Cossor and Mazda H.L.210 valves for detector (Eta, Fotos, Lissen, Tungsram and Dario, also make suitable valves) and a good power valve from either

AT FULL POWER SUPER-HET USING ONLY FOUR VALVES.

of these mentioned makes for the output. The P.2 is well worth trying here.

Too many people fail to realise the tremendous differences that can be obtained merely by changing one valve in a set, and the consequence is that far too many people try out a set with practically any old valves and then appraise or condemn it on such a trial.

Keep Up to Date.

It is expensive to get new valves with each new set that one builds, but a little thought will show that a periodic modernising of one's stock would be advantageous. Money is tight these days, but if you can replace your two-year-old detector with something more modern, or if you can add a P.2 or S.22 to your stock, you will be surprised at the increased results you obtain on the majority of sets.

The "P.W." "Super-Quad" is one of these sets. Every valve pulls its weight, and that is the secret of the set's phenomenal success. The components, the Bandpass filter, intermediates, oscillator, and transformer, were all chosen for a purpose—to make one whole that would astonish everybody who heard it.

That is why we publish in our lists of components—the "Super-Quad" list is reproduced herewith so that you can refresh your memory—the names of the actual makes used, separately from alternatives that can be employed if desired. And yet, with all that, we find readers on occasion using something quite different, some component that not only did not figure in our list, but is quite unsuitable.

A Magnificent Set.

The "Super-Quad," when properly built with the correct parts, is an astounding success. *Your* "Super-Quad" can be just such a success as the original model *IF* you keep to the parts specified.

Take, for instance, the Telsen 1 : 7 transformer. You may be tempted to ask would a 1 : 3 do? Probably you have one "in stock" and would like to use it.

It would *work*, there is no gainsaying that, but the original 1 : 7 was chosen for a definite purpose, a purpose the 1 : 3 would hardly fulfil in its entirety; and though you would get good results with a 1 : 3, you would just miss the peak of perfection the designers of the set aimed at.

There is one point in the "Super-Quad's" construction that may cause a little doubt. That is the wiring of terminals A and C on the band-pass filter. On the wiring diagram A is shown as being the terminal further away from the panel and C the nearer. We learn, however, that Messrs. Varley are now placing the band-pass unit on the market with the position of these terminals *reversed*, so that A is nearer the panel and C further away.

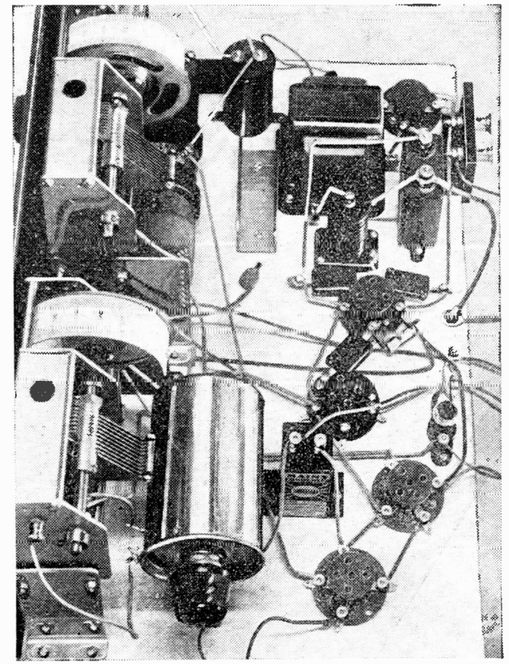
Watch This Point.

This makes no difference to the connections, only to their *position*. A still goes to the aerial terminal and C to the variable condenser. So if you get one of the new coils, carry out the connections of these two terminals according to the *lettering* of the wiring diagram and not the actual *positioning* shown.

If you do connect it wrongly, taking the aerial to C and condenser to A, the set will work, and work well, but you will be wasting the band-pass coil, for it will not be band-passing at all.

There is another question that I have heard asked quite a few times lately concerning the "Super-Quad." It concerns the interchangeability of the bi-grid valve with that of an S.G. type. Admittedly the theoretical depiction of the bi-grid valve looks like the S.G. symbol—except for one fact. The grids are

(*Continued on page* 832.)



EFFICIENT OSCILLATION.

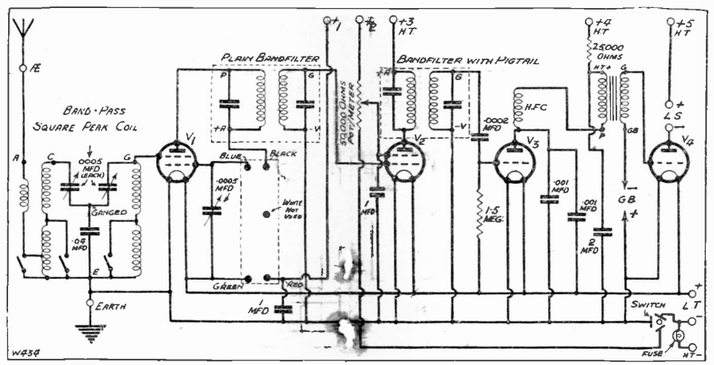
The oscillator and condenser are clearly shown in the foreground.

THESE ARE THE FEW PARTS—

1 Panel, 16 × 8 in. (Paxolin, or Peto-Scott, Parex, Permcol).
1 Cabinet, baseboard 10 in. deep (Camco, or Pickett, Osborn, Peto-Scott, Ready Radio).
1 ·0005-mfd. two-gang condenser with vernier drum drive (J.B., or Polar, Lotus, Cyldon, Formo).
1 ·0005-mfd. condenser with vernier drum drive (J.B., etc.).
1 Square-Peak aerial coil (Varley).
1 Oscillator unit type 0.2 (Wearite, or Lewcos OSC.126).
1 Band filter unit with pig-tail (Wearite, or Lewcos).
1 Band filter unit (Wearite, or Lewcos).
1 3-contact push-pull switch (Ready Radio, or Bulgin, Peto-Scott, Wearite, Telsen, Goltone).
1 25,000-ohm Spag. res. (Lewcos, or Bulgin, Ready Radio, Telsen).
1 50,000-ohm potentiometer (Colvern, or Sovereign, Igranic).
5 4-pin valve holders (Clix and Wearite, or Telsen, Lotus, Bulgin, Formo, Igranic).
1 5-pin valve holder (Clix, or Telsen, Wearite, Bulgin).
2 1-mfd. fixed condensers (Formo and Dubilier, or T.C.C., Igranic, Hydra, Helsby, Peto-Scott).

THE FIRST SUPER-HET FOUR EVER Ffeatured

PROPER PARTS PROVIDE PERFECT PERFORMANCE



SUCCESS MADE CERTAIN BY SYSTEMATIC SELECTION

RECOMMENDED ACCESSORIES

LOUD SPEAKERS.—Blue Spot, B.T.-H., Amplion, Celestion, Undy.

VALVES.—1 Double grid (Cossor or Osram); 1 S.G. (Mazda or Cossor, Osram, Six-Sixty); 1 H.L. type for 2nd Detector (Six-Sixty, Mazda, Fotos, Osram, Lissen, Cossor); 1 L.F. valve of power type (Mazda P.220A or Osram P.2). If other valves are used, characteristics should be as near those of valves mentioned as possible).

BATTERIES.—G.B. to suit last valve. H.T. 120–150 volts super capacity (Drydex, Pertrix, Ever Ready, Lissen, G.E.C.).

ACCUMULATOR.—Voltage to suit valves (Exide, Ediswan, Lissen, Pertrix, G.E.C.).

MAINS UNIT.—State voltage and type of mains, and give details of set when ordering (Heayberd, Regentone, Lotus, Atlas, R.I., Ekco, Tannoy).

—NEEDED FOR THE "SUPER-QUAD"

1 2-mfd. fixed condenser (Dubilier, or Formo, T.C.C., Igranic, Hydra, Helsby, Peto-Scott).
1 ·04-mfd. non-inductive fixed condenser (Dubilier).
1 1·5-meg. grid leak and clips (Loewe, or combined grid-leak and holder, Dubilier, Telsen, Ferranti, Ediswan, Ready Radio, Igranic, Graham-Farish, Watmel, Varley).
1 ·0002-mfd. grid condenser (T.C.C., or Ready Radio, Telsen, Goltone, Ferranti, Ediswan, Igranic, Formo, Watmel).
2 ·001-mfd. fixed condensers (T.C.C., etc.)
1 H.F. choke (Lewcos, or Ready Radio, Peto-Scott, Telsen, R.I., Varley, Lotus, Wearite).
1 L.F. transformer, high ratio, 1:7 (Telsen).
1 Fuse holder (Ready Radio, or Bulgin, Telsen).
1 Terminal block (Junit, or Belling & Lee).
2 Terminals (Eelex, or Belling & Lee, Igranic, Clix, Goltone).
Battery plugs and spade terminals (Belling & Lee, or Eelex, Clix, Igranic).
G.B. battery clip (Wearite, or Bulgin, Burton).
Glazite, wire, screws, flex, etc.

TELSEN LOUD SPEAKER UNIT

The Telsen Loud Speaker Unit is pleasing to the most sensitive ear. The deep notes of the bass, the brilliance of the soprano, and the crispness of diction are clearly reproduced without any distortion.

It employs cobalt steel magnets, and the detachable rod which carries the cone is fitted with cone washers and clutch. The entire unit is enclosed in a beautifully moulded bakelite dust cover.

Telsen Loud Speaker Unit, Price 5/6

TELSEN

THE LARGEST RADIO COMPONENT MANUFACTURERS IN THE WORLD

TELSEN BINOCULAR H.F. CHOKE

An inductance of 180,000 microhenrys—a self-capacity of ·000002 microfarad—figures which prove that the Telsen Binocular H.F. Choke fulfils its purpose to the utmost and meets the demand of modern set designers and builders. Owing to the binocular formation the external field, and therefore unwanted reaction effects, are reduced to an absolute minimum. It covers the whole broadcast band and it is free from parasitic resonances.

Telsen Binocular H.F. Choke, Price 5/-

TELSEN STANDARD H.F. CHOKE

The Telsen Standard H.F. Choke utilises the minimum of baseboard space. It is designed to cover the whole broadcast band and has an extremely low self capacity. The inductance is 150,000 microhenrys and the resistance 400 ohms.

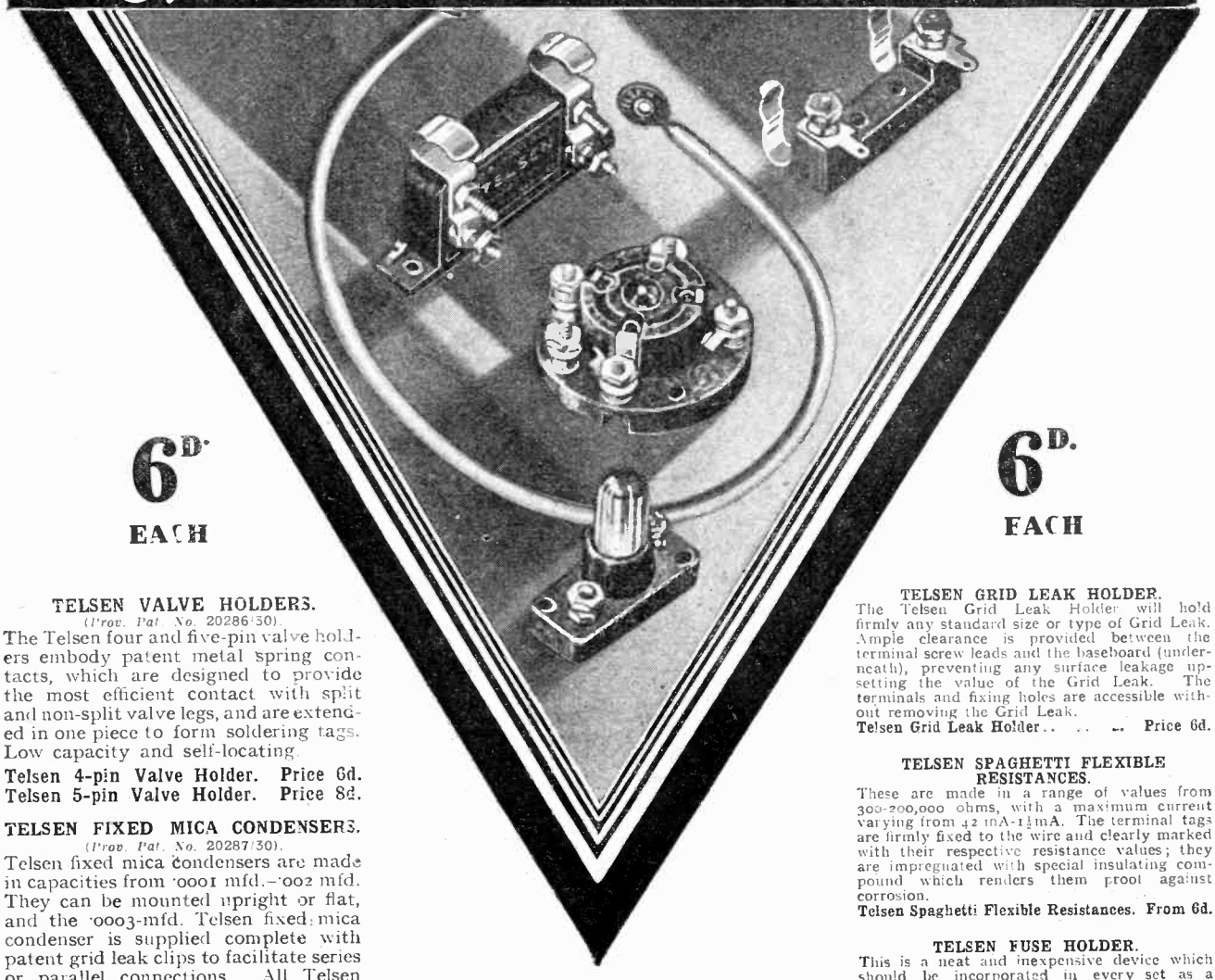
It has proved very popular, and has been incorporated by set designers in many of the leading circuits.

Telsen Standard H.F. Choke, Price 2/-

TELSEN

ALL BRITISH RADIO COMPONENTS

Typical of Telsen value



6D. EACH

TELSEN VALVE HOLDERS.
(Prov. Pat. No. 20286/30).

The Telsen four and five-pin valve holders embody patent metal spring contacts, which are designed to provide the most efficient contact with split and non-split valve legs, and are extended in one piece to form soldering tags. Low capacity and self-locating.

Telsen 4-pin Valve Holder. Price 6d.
Telsen 5-pin Valve Holder. Price 8d.

TELSEN FIXED MICA CONDENSERS.
(Prov. Pat. No. 20287/30).

Telsen fixed mica condensers are made in capacities from ·0001 mfd.–·002 mfd. They can be mounted upright or flat, and the ·0003-mfd. Telsen fixed mica condenser is supplied complete with patent grid leak clips to facilitate series or parallel connections. All Telsen fixed mica condensers are tested at 500 volts.

Telsen Fixed Mica Condensers. Price 6d.

6D. EACH

TELSEN GRID LEAK HOLDER.

The Telsen Grid Leak Holder will hold firmly any standard size or type of Grid Leak. Ample clearance is provided between the terminal screw leads and the baseboard (underneath), preventing any surface leakage upsetting the value of the Grid Leak. The terminals and fixing holes are accessible without removing the Grid Leak.

Telsen Grid Leak Holder.. .. .. Price 6d.

TELSEN SPAGHETTI FLEXIBLE RESISTANCES.

These are made in a range of values from 300-200,000 ohms, with a maximum current varying from 42 mA-1½mA. The terminal tags are firmly fixed to the wire and clearly marked with their respective resistance values; they are impregnated with special insulating compound which renders them proof against corrosion.

Telsen Spaghetti Flexible Resistances. From 6d.

TELSEN FUSE HOLDER.

This is a neat and inexpensive device which should be incorporated in every set as a precaution against burnt-out valves.

Illustration shows the Telsen fuse holder in use with the standard type of radio fuse.

Telsen Radio Fuse Holder .. .. Price 6d.

TELSEN

ALL BRITISH RADIO COMPONENTS

CONSTRUCTING THE A.C. "POP-VOX"

(*Continued from page* 801.)

makes a fine, safe job of the joints if you prefer it. But good tight screwed-down joints are just as effective, though they must be made very thoroughly and carefully.

Get all the real wires done before you put in the spaghetti wiring, otherwise you may damage the tags or insulation of the latter components. And as you go along continually remind yourself that good, firm joints are vitally necessary in a powerful mains set of this type.

When nearing the end, you can fix the panel in position and complete the wiring to it. (If fixed earlier in the proceedings it is unnecessarily in the way.)

You will have noticed that no external screens are employed, and this simplifies wiring considerably. It is rendered possible by very careful layout of all the components and by well-considered selection.

Watch Those Wires.

Be particularly careful of flexible leads, and those to the coils, for if the lettering on these is not watched carefully a mistake here may prevent the whole set from working. And, by the way, insulated staples, obtainable in pennyworths at any electrical shop, are very useful for holding the mains flex firmly to the baseboard, and similar work.

Every wire must not only connect firmly where it is supposed to, but must be held well away from all metal, etc., which it is not supposed to touch. There should be no possibility of any wire bending and touching a neighbouring wire or component.

Pay particular attention to the "mains" end of the set, where the big transformer and rectifying valve are placed. You will notice that the input from the mains plug must go via one lead direct to the mains switch, as shown in the diagrams. From the other side of that switch one lead goes to the appropriate O terminal on the transformer. The other mains flex lead from the plug goes as explained in the maker's literature to that terminal on the mains transformer which corresponds with the voltage of your own mains. (Be specially careful about this part of the work.)

When you have finished wiring don't be in a hurry to try the set, but go patiently over it, with a friend checking off the wires, if possible, to make sure it is correctly connected. When you are *sure* all is as it should be, you can prepare to try the set out.

Suitable Valves.

For the rectifying valve you need one of the U60/250 type. In the V1 valve holder you will require an A.C. HL; for V2 a similar (A.C. HL) valve (or the special detector valve "A.C. Det." marketed by "Six-Sixty"); and for V3 a P.625.

For the "radio" test, you should pull out the radio-gram switch to disconnect the pick-up. Adjust the Selector knob about half-way round, the differential reaction at zero, and the volume control two-thirds of the way to maximum.

When you are sure all is O.K., turn on the switch which controls the point to which your plug is connected. You will have to wait two minutes or so for the valves to "warm up."

Eliminating Hum.

At the end of that time tune in on the Extenser, gliding over long or medium waves merely by rotating the dial. Alter volume and reaction adjustments as necessary for the stations you are receiving.

You should, of course, hear no hum. But if your set hums switch off and pull the plug from the mains socket, to look for the cause of the trouble.

(It occasionally happens that placing the mains plug round the other way in its socket will remove hum, but generally there is no hum at all, or if there should be it is due to a wrong connection somewhere.)

You ought to receive dozens and dozens of stations on an ordinary aerial; the procedure for the distant ones being to pick up the weak programme or carrier on the Extenser, using reaction if necessary, and then turn the Selector knob till the maximum strength is found. You will find it makes a tremendous difference and yet you can hear sufficiently well to tune even if the Selector is not set properly at first.

For long waves—that is to say, for tuning from 100–200 on the Extenser dial—the Selector must be right round as far as it will go in a clockwise direction, this being the long-wave position in which the aerial is joined to stud B, and so direct to the A terminal of the "P.V." unit.

Provision for Pick-up.

Finally, a word about the gramophone side. In our own tests with a variety of pick-ups we found that all that was necessary was to connect the two terminals direct to the pick-up.

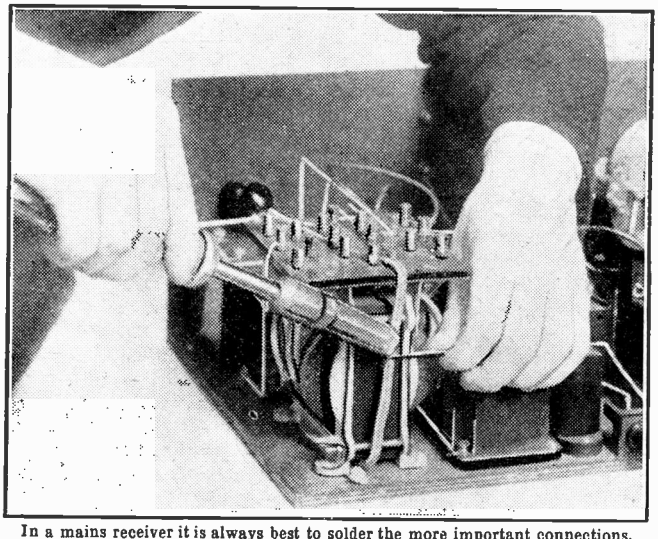
Some readers may prefer to use negative grid bias as well, and it can instantly be seen if this effects an improvement, merely by joining a 1½-v. neg. bias battery in series with the pick-up across the two terminals.

If this should prove advantageous the further step of providing "automatic" bias is easily made. All that is necessary is to join a 1,000-ohms "Spaghetti" to the cathode terminal of V_1, and take all the wires which previously went to that terminal to the other end of the "spaghetti," with the exception of the lead from the 2-meg. leak.

The final cathode connections of V_1 would thus be to the leak and 1,000 ohms "spaghetti," the other side of this "spaghetti" going to the moving vanes of the Extenser, etc.

(A fixed condenser is sometimes employed across such a resistance, but this is often unnecessary.)

SOLDERED CONNECTIONS ARE BEST



In a mains receiver it is always best to solder the more important connections, as some of them carry quite high voltages and heavy currents. If you do not feel like tackling the job, though, make sure that all connections are well screwed down.

SELECT YOUR COMPONENT MAKES FROM THIS LIST.

1 Panel 21 in. by 7 in. (Permcol, or Peto-Scott, Goltone).
1 Cabinet, 21 in. by 10 in., baseboard (Camco, Pickett, Gilbert).
1 Selector Coil (Goltone, or Ready Radio, R.I., Formo).
1 Single-pole double-throw push-pull Switch (Wearite, or Goltone, Igranic).
1 ·0005-mfd. Extenser (Cyldon, or Formo, Wavemaster).
1 ·0001-mfd. or over differential reaction condenser (Ready Radio or Telsen, Lotus, J.B., Formo).
1 1-meg. Volume Control (A.E.D., or R.I.).
1 Mains Switch (Bulgin, or Igranic).
1 P.V.1 and P.V.2 Coils (Parex, or Ferranti, Lewcos, R.I.).
1 Coil Quoit (Peto-Scott, or Wearite, Goltone).
1 ·0003-mfd. fixed condenser (Dubilier, Goltone or Ready Radio, Telsen).
1 2-meg. leak and holder (Lissen, or Ediswan, Ferranti, Igranic, Telsen).
2 5-pin valve holders (Telsen, or Lotus, Clix, Bulgin, Igranic).
2 4-pin valve holders (as above).
1 H.F.C. (Varley, or Lewcos, Ready Radio).
2 1-mfd. fixed condensers (Lissen, or T.C.C.).
3 2-mfd. fixed condensers (Lissen, or Dubilier, Ferranti, and Formo).
3 4-mfd. fixed condensers (Formo, or T.C.C.).
1 Parafeed L.F. Transformer (R.I.).
1 Output Choke (R.I., or Bulgin, Lotus, Telsen).
2 Smoothing Chokes (Wearite, or Ferranti, Igranic, Varley).
1 50,000-ohm Spaghetti resistance (Ready Radio, or Bulgin, Telsen, Sovereign, Peto-Scott, Igranic, Goltone).
1 25,000-ohm Spaghetti resistance (Lewcos, or as above).
1 30,000-ohm Spaghetti resistance (Bulgin, or as above).
2 1,000-ohm Spaghetti resistances (Lewcos, or as above).
1 200,000-ohm resistance (Graham Farish, or Peto-Scott, Wearite).
1 Mains Transformer (Igranic universal type B).
3 Terminal Blocks (Belling & Lee), Copper sheathed cable for heater leads. Flex, Glazite, screws, 2 oz. 24 DSC wire for hank coil, etc.

THE VALVES TO USE.

For V1.—A.C. HL type (Cossor, Osram, Mazda, Eta, or Six-Sixty).
For V2.—A.C. detector type (Six-Sixty), or A.C. HL type (Eta, Mazda, Cossor, Osram).
For V3.—P.625 type (Osram, Mazda, Eta, Six-Sixty, or Cossor).

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British Blue Spot. British Thomson-Houston. Whiteley Electric. Undy, Celestion, Amplion.

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G. P. Kendall

Mr. G. P. Kendall, B.Sc., has now joined the staff of Ready Radio as Chief Engineer. He was, for many years, Assistant Technical Editor and Chief of Research in "Popular Wireless" and "Modern Wireless."

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EASY PAYMENT ORDER. Please despatch my Easy Payment Order for the goods specified for which I enclose first deposit of £.....

Name .....

Address .....

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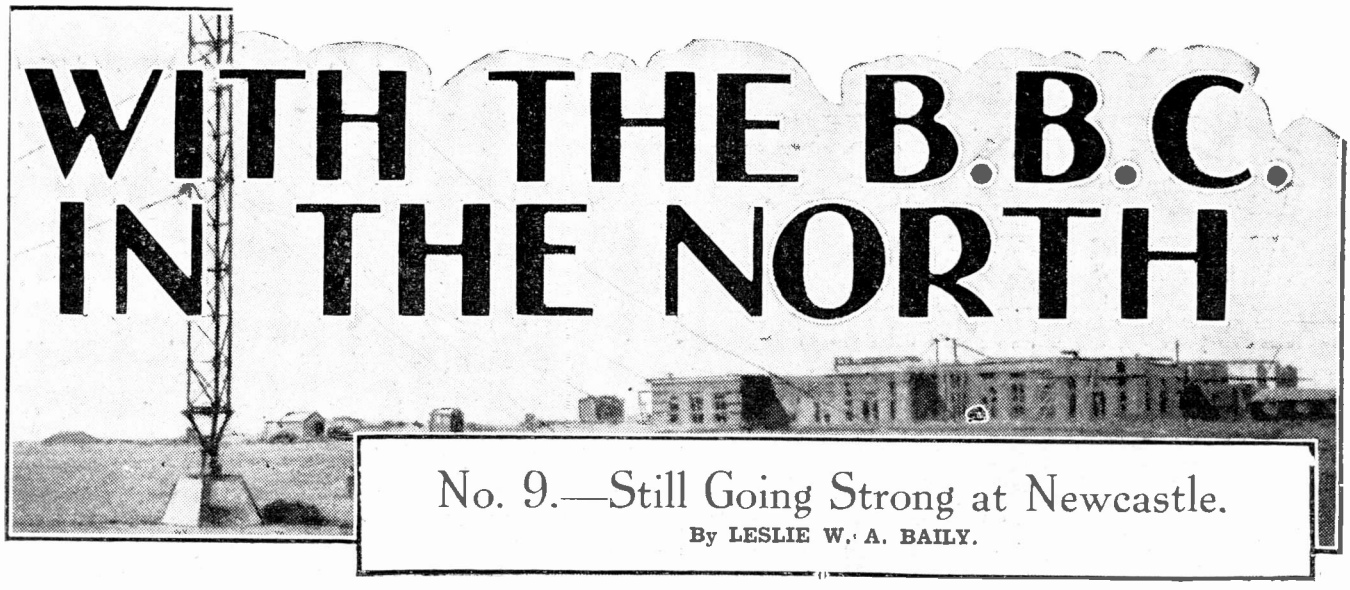
Kit required .....

WITH THE B.B.C. IN THE NORTH



No. 9.—Still Going Strong at Newcastle.

By LESLIE W. A. BAILY.

This week our Special Correspondent, who is touring Northern B.B.C. stations exclusively for "Popular Wireless," describes his visit to Newcastle-on-Tyne.

THE original London, Birmingham, and Manchester B.B.C. transmitters were opened in November, 1922. Newcastle followed in December. The first famous trio, 2 L O, 5 I T, and 2 Z Y, are nothing more than memories, but 5 N O remains, the grand old veteran of B.B.C. transmitters.

And 5 N O will continue to remain, for so far, the Regional scheme has not succeeded in penetrating its alternative programmes to Tyneside, and so the local transmitter must stay on duty for a little while longer.

A Real "Old Stager."

1922–1931, and still going strong! Since December 24th, 1922, the Newcastle transmitter has broadcast a total of 25,000 hours. The engineers at 5 N O proudly pointed out to me among the brightly glowing transmitting valves one which has been in steady use for over three years without showing any of the usual signs of old age.

After its extraordinary opening night 5 N O settled down to a remarkably uneventful career. Its history has lacked "incidents" since that night when, after promising Newcastle a broadcasting station by Christmas, 1922, the B.B.C. found that the studios would not be ready in time, so that a lorry drawn up in the yard of the Co-operative Wholesale Society's factory in Blandford Street had to be improvised as a B.B.C. studio. Nobody on the present Newcastle staff remembers that hectic evening.

The Same Transmitter.

Tom Payne, the first station director, now runs a wireless business in the city. He was followed in turn by Bertram Fryer, E. L. Odhams (now editor of "World Radio"), Gordon Rule, and finally G. L. Marshall, formerly station director both at Edinburgh and Glasogw.

The transmitter is still in the erstwhile stable outside which the lorry-studio was parked on Christmas Eve, 1922. It is one of the famous Marconi "Q" type sets, plus tuning-fork wave-length control apparatus which was installed when 5 N O went on the National common wave (288·5 metres) nearly two years ago. It is now being used for the experiment of synchronising 5 N O with the North Regional transmitter at Moorside Edge, on 479 metres.

In my article on the Glasgow station I have already described the "Q" type transmitter, so let us now travel a mile across the heart of Newcastle to New Bridge Street, where a building of peculiarly ecclesiastical outward appearance is occupied by the studio, offices, and control-room. It dates back to the 18th century, and until the B.B.C. took it over in 1926 it was a maternity hospital.

One of the main hospital wards is now "No. 1" studio—I say "No. 1" because the name sticks as a reminder of the time when there were several studios in this building. "No. 1" (the walls of which are hung with old-fashioned curtainings of the 1926 era) is now the one and only.

When Mr. Marshall first came, 5 N O was in the heyday of its glory as a "main" station. As I sat in the very charming waiting-room at New Bridge Street I looked around at the signed photographs of celebrities on the walls and reflected on the change that has come upon 5 N O. I read the signatures of Peggy O'Neil, Myra Hess, Sybil Thorndike, Robert Radford, Owen Nares, Miriam Licette, and many others. They had all broadcast in "the old days" from Newcastle.

Doing Its Share.

Now Newcastle (like Leeds) is a "feeder" for the North Regional transmitter. Two or three times a week it sends a programme up to Moorside Edge. Its staff was reduced and its orchestra abolished long ago. More recently part of the building has been sublet as offices.

By all accounts, however, there is some excellent programme material in Northumberland and Durham, and it is the duty of 5 N O to collect this and throw it into the North Regional pool.

The control-room contains the usual amplifiers and switchboards. The landlines bringing programmes from London or Manchester come to this room. Here the programme is amplified and then sent over another line to the Newcastle transmitter.

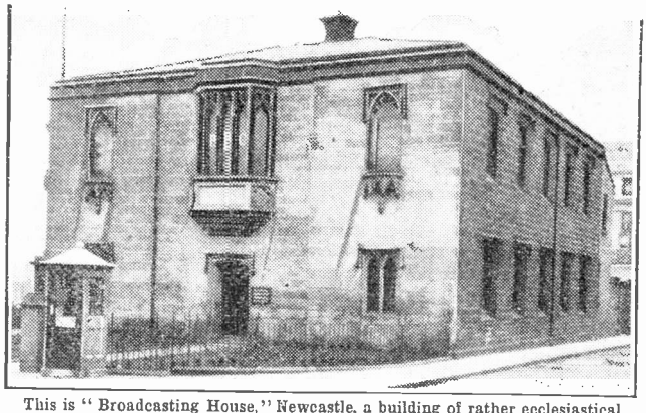
Important Work.

When the landline system is reorganised (as already announced in my Leeds article in this series), the Newcastle control-room will have another duty to perform. It will pass the National programme forward over a new underground cable to Edinburgh, for distribution to the Scottish transmitters.

Sixteen points for "O.B.'s" are permanently wired to the Newcastle control-room. A 5 X X receiving station on the outskirts of the city is connected to the control-room for "wireless link" relays.

There are nine engineers at Newcastle. The others of the station staff are the station director, a newly-appointed announcer, two lady secretaries, and a commissionaire.

MODERN USE FOR AN OLD BUILDING



This is "Broadcasting House," Newcastle, a building of rather ecclesiastical appearance which dates back to the eighteenth century. It houses studio, offices, and control-room.

CAPT. ECKERSLEY'S QUERY CORNER

GRID-LEAK AND BIAS VALUES—IMPROVING QUALITY.

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers. Don't address your questions to Capt. Eckersley, however—a selection of those received by the Query Department in the ordinary way will be answered by him.

Grid-Leak and Bias Values.

L. V. (Deal).—"In a resistance-capacity coupled L.F. stage grid-bias is applied via a high resistance of the grid leak type.

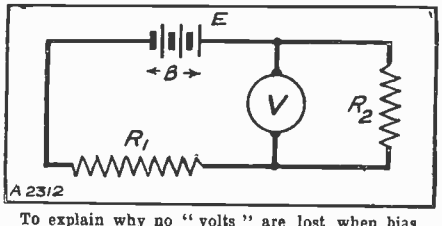
"I am sometimes puzzled by this circumstance, and fail altogether to understand why the resistance of the 'leak' does not affect the amount of bias actually received by the grid of the valve. For instance, if the grid leak has a resistance of one megohm and applied bias at the biasing battery is 4½ volts, the grid is said to be biased 4½ volts.

"As I understand it, the grid still remains at 4½-volts negative potential if the resistance of the leak is increased to 10, 20 or even a 100 megohms.

"Is there any limit to the increase in the resistance of the grid leak? If not, how can one remove bias from the grid of a valve?

"Air, after all, I am told, is not a perfect insulator and may, therefore, be regarded as a high resistance. What, then, prevents the grid from remaining biased when the leak is removed, so that only air separates the grid from the negative terminal of the biasing battery?"

HOW IT WORKS



To explain why no "volts" are lost when bias is applied to a valve via a grid leak, it is necessary to resort to Ohm's Law. Read what our Radio Consultant-in-Chief has to say about it.

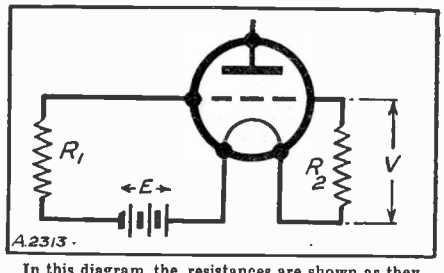
May I, at the risk of seeming to go too far back to the elements, point out the fundamentals of Ohm's Law. I do not want you to think I am being sarcastic. Lots of engineers I know are shaky on this point.

B is a battery of voltage E, V is a voltmeter *which it is assumed does not take any current at all.* R_1 is a resistance and R_2 is a resistance.

Now the voltage measured by V is dependent upon the current I multiplied by R_2. But the current I=E divided by R_1+R_2.

Thus the voltage at V is given by E times R_2 divided by R_1+R_2. Now if R_2 is very big compared to R_1, the voltage V will be virtually equal to E. If R_2 is small compared to R_1, the voltage V is very much smaller than E.

A PRACTICAL ILLUSTRATION



In this diagram the resistances are shown as they appear in a circuit in practice. R_2 represents the valve's impedance between grid and filament, and R_1 the value of the grid leak through which the bias is applied.

In a valve we have a resistance R_1, the grid leak, and R_2, the valve's internal resistance between grid and filament (see the second sketch).

But if there is negative on the grid the resistance R_2 is nearly infinite. It is, in fact, very large compared to R_1, and so, as we have seen, E equals V. But R_2 is finite; it is the resistance of several megohms in the valve holder, etc. If R_1 is several megohms R_1 becomes comparable to R_2 and V gets less than E until, if R_1 is infinite (air) while R_2 is finite (valve holder), V is much less than E and equals O.

I cannot do better than explain things thus, and hope you will puzzle out the analogy from my original "model."

Improving Quality.

R. R. (Huddersfield).—"In a reply to 'T. W. (Kensington),' regarding the use of 'gapped' iron-cored apparatus in receivers to improve transient response, I notice that Captain Eckersley suggests that, since transient distortion occurs in so many stages of the chain between microphone and loudspeaker, there may be little object in endeavouring to effect improvement in this respect in one's receiver.

"May I permit myself the impertinence of asking your Chief Radio Consultant if this is an expression of opinion or a statement of fact? That is to say, is it definitely established that loudspeaker reproduction can never rise above the level of quality afforded by the worst 'distorter' in the whole broadcast chain? Or can improvement in, for instance, one's receiver achieve results better than those given by a receiver which is no better than the weakest link in the chain?"

My statement was a matter of opinion—since making it I have to add a fact.

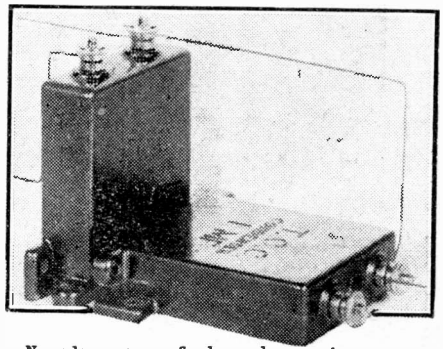
Recently I had occasion to test a design of a power amplifier under working conditions. I hesitated whether to use two transformers, one from receiver to a line (short), the other from line to power amplifier.

The (quality) input was from the North Regional Station, which is the latest B.B.C. design of transmitter. The loudspeaker was, *in my opinion*, the best for detecting transient distortion, and was, therefore, a very good loudspeaker. The transformers were of the same type as used by the B.B.C. Means were arranged for including or excluding the two transformers—the substitute being resistance capacity.

The observers were both used to the judgment of quality. The result, taken of course by turning one's back and guessing which was the better quality, came out in favour of R.C., but even then mistakes were made and it took an acute ear listening for some time to detect the effect.

With an "ordinary" loudspeaker, a slightly inferior transmission, a wrongly designed or adjusted circuit in *any* part of the chain could have made the effect indistinguishable. There is, in fact, very little in it, so my opinion still stands.

FIXING FIXED CONDENSERS



Nowadays, some fixed condensers have very useful "double feet." They enable these components to be mounted in two positions.

"SQUARE PEAK"

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9 Kc. SEPARATION!

In his test report on the Varley "Square Peak" Band-pass Coil, the technical editor of "Popular Wireless" writes: "A beautifully made component . . . . Will increase selectivity to an extraordinary extent . . . . covers exceptionally wide wave-bands, viz. 220-580 and 1,000-2,300 metres . . . . Gives a constant station separation throughout the whole of this range, a fact that proves the practical perfection of its design . . . . Sensitivity was maintained at practically normal level—no mean feat in view of the sharp station separation given . . . . The best commercial wave-change coil-unit that has yet been produced."

The "Square Peak" Coil gives a constant square-topped peak and separation of substantially 9 Kc. over the whole of *both* wave-bands. Easily replaces most existing aerial coils. Needs no screening.

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OUR SPECIAL CORRESPONDENT

Tells of the hard work and training that goes to the making of an hour of broadcast revue.

NOT long ago, Mr. Philip Ridgeway (alias Mr. Ramsbottom of "The Ridgeway Parade") commenced a long and enthusiastic search for a girl with a Voice that was Different. As he himself appreciatively expressed it at the time, he wanted a girl "with Spring in her voice." Some hundreds of young ladies presented themselves for his approval, and with characteristic thoroughness he gave each one an interview and an audition at Savoy Hill.

A Tall Order!

Mr. Ridgeway himself told me exactly what he was seeking. "Many people," he said, "are under the impression that I am looking for a first-class soprano singer. That is quite wrong.

"What I want," he said, "is a girl whose voice can express all the beauty and freshness of English youth. She must have a speaking voice that is clear, natural, and beautiful; which in some indefinable way expresses the scent of an English flower. The sort of voice that novelists write about and young men dream upon."

This sounded to me a pretty tall order, but Mr. Ridgeway had unbounded faith in his own judgment and his ability to find the right girl. It cost him many hours of hard work before he discovered Miss Babs Farren.

Perhaps it is sheer coincidence that Miss Farren conveys to the eye all those things which her voice conveyed to Mr. Ridgeway, and to the millions of wireless listeners who have heard her.

She is slim and short, with a wonderful pink and white complexion, very, very blue eyes, and neat bobbed hair that is the colour of rich, creamy butter. She conveys a lasting impression of neatness and compactness and very wholesome Englishness. And her voice—well, to me it was soft and low and essentially Springlike.

Born For The Stage.

She gave me, too, a vague idea that she is a little surprised with herself—surprised that she should so suddenly have become the centre of popular attention. She regards herself, I believe, as just an ordinary English girl, with, perhaps, a gift for stage work—that is, possessing a pleasing voice and appearance, and an ability to dance rather more than averagely well.

As a matter of fact, stage work is in Miss Farren's blood. Her father was Fred Farren, who produced a number of musical shows at the Empire Theatre, London, some years ago. Miss Farren's earliest ambition was to become a great singer, but on second thoughts she decided she might do better as a dancer. She was trained to dance, and made her first stage appearance at the age of ten.

Although she is still very young, she has travelled the length and breadth of England in various stage shows. Two years ago she was in "Marjorlaine" at the Gaiety Theatre, where she ran away with the Press notices.

Hard Work.

She has also been to America in vaudeville. When she was playing in Detroit she hardly saw daylight for three whole weeks, for she had to give four performances a day, and there was no window in her dressing-room. Her vaudeville engagements in New York kept her occupied seven days a week.

"It was terribly hard work," she told me when I visited her at her flat near Queen's Club. "The conditions were very different from those I had experienced in England. I missed English faces and the atmosphere of England so much that I was genuinely glad to return home. You see, I am a true Londoner. A Cockney, in fact. I was born near Vauxhall Gardens."

I asked her to tell me something of her wireless experiences.

"Before my agent sent me a card for Mr. Ridgeway's audition, I had never given a thought to appearing before the microphone," she answered. "I had heard that it was such a terribly difficult business to obtain an audition with the B.B.C.

"Well, the audition came, and I found it all very strange and mysterious, although I was not in the least nervous. The number of people who dashed in and out of the announcer's box rather amused me. They all seemed in such a tremendous hurry.

"Mr. Ridgeway, of course, was in charge, and after I had sung two songs, he asked me to recite, and then to cry with him, just to test my feelings and emotions. A little later I was told he had chosen me."

"You were thrilled?" I asked.

Soon "Found Her Feet."

"I was gratified," answered Miss Farren, guardedly. "You see, Mr. Ridgeway knew nothing of my stage experience—he did not even know my name. He chose me simply because of my voice."

"Are you ever nervous before the microphone?"

"Not now. But during my first rehearsals I was terrified. I tried to remember all the things I mustn't do, and altogether got terribly scared of myself. Mr. Ridgeway, however, was wonderfully kind to me, and I owe a very great deal to him. He took me under his wing and soon made me feel as though I had been doing wireless work as long as he has."

Miss Farren's hobbies are as simple as her voice is beautiful. She loves reading—there was an open copy of "The Good Companions" on her table. Her favourite author is Dickens, and it is for this reason that she enjoys the Dickensian style of Priestley.

A DELIGHTFUL SINGER

Miss Babs Farren, "the girl with Spring in her Voice."

All Editorial communications should 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 reception. 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

JUST A BROKEN LEAD.

We have often commented on the friendly way in which some readers have tried to help others by publishing their experiences, and the following amusing letter from a Cardiff reader explains itself, and may afford some valuable hints to those who have experienced a similar trouble.

"I hope you will be able to find room in 'P.W.' somewhere for this letter, because after all the naughty things I have said I ought to do penance. The least I can do is to put other people wise, if possible, to what caused me to lose handfuls of hair, and to gain the scornful disdain of the wife. (She hates me tinkering about with the set, but I notice that as soon as I put it right she is as pleased to listen as anybody.)

"It is a 'Flexi-Coupled Comet' with a 'Selector' coil, and it found its way among the foreigners like Thos. Cook himself. At the end of last February and March we were getting dozens of stations, but after the brighter weather got here (Yes, there was some!), and holidays, and one thing after another, we did not use the set so much.

"This last few weeks, instead of getting better as the evenings are getting darker, it seems worse. And in the end, Cardiff was the only station coming over with a real punch, and although I could sometimes hear others, they were not worth listening to.

"Fed up with the whole thing, I was just getting ready to lose my temper with it, and bash something to bits, when I noticed that adjusting the 'Selector' coil made no difference at all. It had done in the past, and that gave me the first hint of what was wrong.

"I undid the wiring to it, took it off, opened it up, and found that the flexible lead connected to the knob-control to the coil itself was broken through, except for one stingy little strand of wire.

"Hastily grabbing a new piece of flex, I soldered it on in place of that old one and, Oh Boy! she was off again—and what a difference!

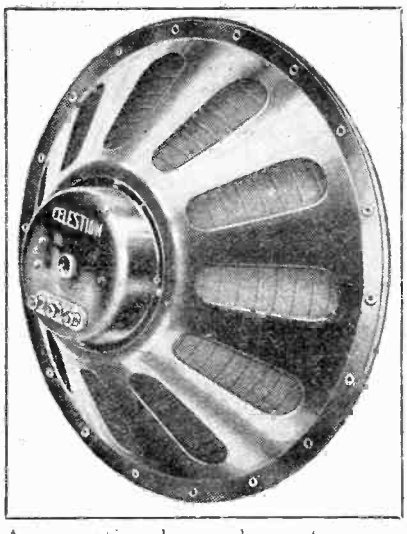
"Just that simple wire was the cause of the whole trouble, and I do not mind admitting

(*Continued on page* 824.)

YOUR BIT TOWARDS ECONOMY

Have you ever thought how difficult it is for a newsagent to order just the right number of copies of any particular paper each week? You can make his task much easier if you place a regular order with him. You will not only help him to order correctly and avoid waste, but will make sure of getting your copy regularly each week.

See also page 825.



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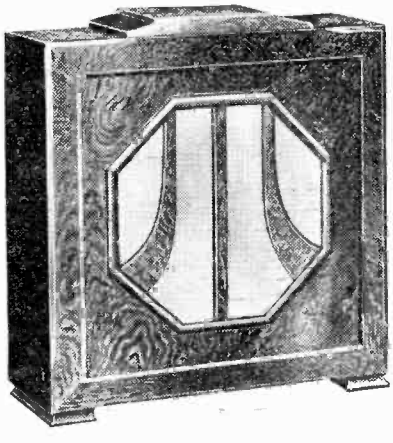

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 822.)

I nearly smashed up the set, I got so fed up with it. However, if this will now save anyone else some anxiety I shall feel it really was worth while."

SAVING H.T. CURRENT.

P. B. S. (Wiltshire).—"I found the real trouble was the long loud-speaker leads which seemed to be wasting H.T. battery current. Since I put in a choke-filter output the whole question of battery supply has been more satisfactory. In fact, it is now so good that I am adding the extra valve I have always aimed for bringing it up to four valves with real loud-speaker reproduction.

"I suppose I shall need a larger battery in this case. And, apart from the choke, is there anything you can suggest to improve the life of the battery as, to me, the constant H.T. renewal is the one bugbear of wireless?"

When buying the new battery be sure that you get one of adequate size to provide the current required by the four-valve set. If you get too small a battery it will always be over-run, and consequently its life will be invariably much shorter than it should be.

You can ascertain from the battery-maker how much current (in milliamps) it will usefully give, and your valve curves will tell you exactly how much anode current the set is taking, if you have no milliammeter in circuit to measure this anode current.

The filter output and the adequate capacity of the battery are the main safeguards in economical running. Apart from these, good points to watch are to keep the battery in a cool place, dustproof; and, of course, protect it from stray metal, wires, or such things as scissors being laid upon it, as these can easily ruin it. Also use the correct grid bias.

EXTENSERING AN OLD SET.

T. L. (Manchester).—"They tell me it is not so bad in London, but I do not mind telling you money is 'tight' up this way. So, instead of being tempted by one of your new sets, I am going to make my old detector and two L.F. run through this season again.

"I have been looking into it pretty thoroughly, and I have come to the conclusion that it is on the tuning side that changes are necessary, and the detector and L.F. stages can stand exactly as they are. So what I want you to do is to tell me how I can connect up a 'Selector' coil and 'Pop-Vox' coils (which I am going to make myself from specifications in 'P.W.') to give me complete and efficient tuning, in front of the present set. I also want a Contradyne coil.

"I should like the whole of the connections before the first valve, but those after it need not be repeated as it is the usual arrangement of resistance-coupled detector followed by a L.F. amplifier transformer coupled, and power valve.

"I am satisfied with all that, but what I want is sharp tuning and easy wave-change.

"My one extravagance is going to be an 'Extenser,' for I have realised that the really modern set must have this, so please give the wiring in words."

Yours is a very good plan, and the wiring of the new arrangement that we suggest would be as follows:

Aerial lead-in to the A terminal in the "Selector" coil. B and C terminal on this coil to A on the medium-wave "Pop-Vox" coil (P.V.1).

X on the medium-wave P.V.1 coil to one end of the Contradyne coil, and to one of the wave-change contacts on the Extenser. The other side of the Contradyne coil goes to the No 1. terminal on the P.V.2 coil.

(*Continued on page* 826.)

"P.W." PANEL NO. 35.—AUTOMATIC GRID BIAS.

"Automatic" or "Free" Grid Bias is obtained in sets using A.C. valves by passing the anode current of the valve in question through a resistance.

* * *

This is usually about 1,000 ohms, and is connected between cathode and "earth," the grid return of the valve also going to the latter point.

* * *

It is generally necessary to by-pass the resistance with a large fixed condenser.

"WHY IS IT SO NOISY TO-DAY?"

Perhaps the switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception?—or one of the batteries seems to run down much faster than formerly?

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 scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you 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.

LONDON READERS, PLEASE NOTE: Inquiries should **NOT** be made by 'phone or in person at Fleetway House or Tallis House.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 824.)

E on that coil goes to earth terminal, to the moving vanes of the "Extenser" and to the negative filament lead of the first valve. Terminal No. 2 on the P.V.2 coil goes to Y on P.V.1, and to another wave-change contact on the "Extenser."

Terminal No. 3 on the P.V.2 coil goes to Z on the P.V.1 coil, and to the third wave-change contact on the "Extenser." The G terminal on P.V.1 coil goes to the fixed vanes of the "Extenser" and to one side of the grid condenser.

The other side of the grid condenser goes to the grid of the first valve and to the 2-megohm leak, as usual.

We expect you are using a differential reaction condenser, and in any case we should certainly advise this as you are overhauling the whole of the tuning, and wish to get good sensitivity.

The connections will be from R on the P.V.1 unit to one set of fixed vanes on the differential reaction condenser, the other set of fixed vanes on that condenser to H.T.—, and the moving vanes on the differential condenser to the plate of the first valve. That completes the new wiring.

WHAT SORT OF H.T. BATTERY?

"Davin" (Romford).—"What sort of H.T. battery is required to run a three-valve set? I find there are so many different kinds at different prices, and should be glad of some guidance on this point?"

The main things to watch in connection with H.T. battery supply to a three-valve set are (a) the voltage and (b) the current. Taking these in turn, the *voltage* will depend upon the requirements of the valves you are using.

In all probability you will find that the valve manufacturers recommend at least 120 volts for the last valve of the set. Get a battery to suit this, and then, if preceding valves require a *lower* voltage, this can easily be tapped off by an extra H.T. lead plugged in at the correct point on the battery.

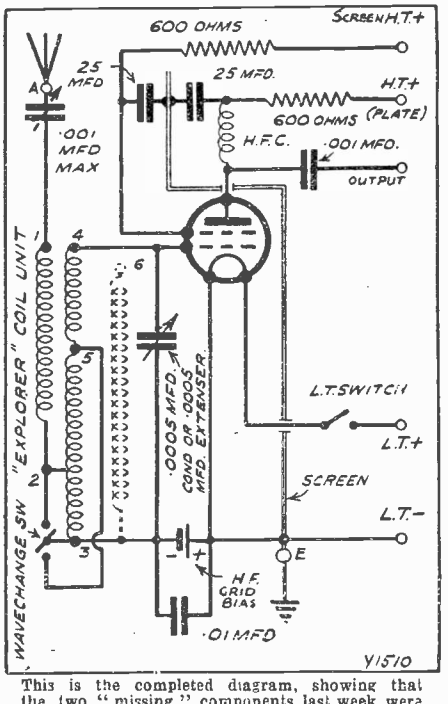
As voltages are always plainly marked, you cannot go wrong over this part of the business.

Where you are more likely to make a mistake is in choosing the wrong type of battery for the *current* required. All the anode (or plate) current required by your valves must come from the H.T. battery.

The total anode current that your own set requires must be ascertained. It can be measured by a milliammeter placed in the H.T. negative lead, or it can be calculated from the valve makers' curves, but this latter is not a job for the novice. Then get a battery which can deliver that current. Remember that the ordinary small size H.T. battery, even of high voltage, can supply economically only about 5 milliamps.

MISSING LINKS, No. 15.

AN S.G. H.F. UNIT.



This is the completed diagram, showing that the two "missing" components last week were the grid-bias battery and its by-pass condenser.

If the set's anode requirements are above 5 milliamps, you require a big-capacity battery. Moreover, if you attempt to supply such a set from the smaller battery, you will find that this battery will deteriorate very quickly indeed, owing to its being discharged at a rate greater than it was intended to stand up to.

If your set uses a big power valve, and the total anode current is found to be considerably above 10 milliamps, you will require a *treble* capacity battery, or what is called the "super" type; and, as the various makers now generally state the correct discharge rates for their H.T.B.'s, any experienced dealer can soon tell you which is the correct battery to use for your own particular requirements.

TECHNICAL TWISTERS

No. 77.—ELECTROLYTIC CONDENSERS

CAN YOU FILL IN THE MISSING WORDS?

The chief peculiarity of the "electrolytic" condenser is its enormous . . . . . .

* * *

Another feature of this type of condenser is that it must be connected in circuit according to its . . . . . and wrong connections will destroy its usefulness.

* * *

Its great capacity is obtainable because the dielectric is merely a very . . . . film formed between the plates by the action of the polarising current.

Last week's missing words (in order) were: Millions. Kilo, Kilo, Kilo. Meg, two million.

A LEAD-IN QUESTION.

B. G. (Rickmansworth).—"As I had accidentally cut off the aerial lead-in short, I had to join it outside the window, which I did by cleaning the wire carefully with sandpaper (each strand separately), winding them together and twisting with pliers, afterwards coating with vaseline.

"Then I covered the join with insulated tape. Is this O.K. for a permanent lead in?"

Well, you have certainly done all that can be done with a twisted joint, but we are afraid it will not now be as satisfactory as a well-soldered joint.

The ideal plan is to have no joint at all, but to run the wire to the set *in one piece*. A good soldered joint is almost as good, but often deteriorates in time, and we are rather afraid that your twisted joint will deteriorate more rapidly.

WHEN THE GRID CHOKES.

W. A. (Wokingham).—"I am very troubled by the behaviour of my set, which is a detector and two L.F. (one resistance and transformer).

"I have had it in use about eight months, and it has always given perfect satisfaction until the last fortnight, when it misbehaved in a very curious way. Without any definite warning, signals would suddenly get weaker and weaker until they went away altogether.

"Nothing whatever seemed to be wrong inside the set, and when I switched it on the next time it was O.K. again. Sometimes it is all right for several days, and sometimes it refuses to work at all after the first few minutes. Whatever could be the cause of this?"

Apparently yours is a case of 'grid choking.' This means that electrons are being piled up on the grid of one of your valves, and have no pathway back to the filament.

The likeliest place to look for the trouble is in the grid-leak circuit of the resistance-coupled stage, where the normal pathway by which electrons leak away from the grid is across the grid leak, through the grid-bias battery (from negative to positive), and so to the filament.

Any break in this circuit such as a defective flexible wire from the grid-bias battery; a break in the battery itself or a defect in the grid leak which is acting as a resistance would cause the symptoms you mention.

We think if you look carefully at the wiring of this part of the circuit and test the components by substitution if possible, you will find that one of them is faulty and has been causing your trouble.

FOR THE LISTENER

(Continued from page 802.)

uttered for the first time out of their heads, but as if they were reciting what was written in a book.

I am also bound to say that many of the previous discussions have failed because of the impression that the men taking part in them have not been quite sincere. They have not always believed what they said. They have been arguing for argument's sake, as we used to do in the days of Mutual Improvement Societies.

Don't Flog a Dead Dog!

They have been anxious to score off each other rather than to elucidate the truth. Such stuff is always poor stuff. It is a dead dog, and no amount of beating it can bring it to life.

We don't want a discussion between two disembodied points of view, which would be abstract and academic, but between two living men, each of whom occupies one or other of the points of view with his whole heart. We do not want to know what these two men have read about in books, but what they have actually found and felt in living their lives out.

A discussion on "Living Dangerously" between two sheltered spinsters would be mere footling. This discussion is not going to be worth while unless either Mr. Marvell or Mr. Mais has lived, or is actually living, dangerously.

They must know something about it first hand.

The Dangerous Liver.

It amuses me to try to conjecture beforehand which of these two young gentlemen is the "dangerous liver"! Which is the advocate for "safety first"? Which is the turbulent, daring, experimental fellow?

I have my doubts about Mr. Marvell. I know him to be successful. Can one live dangerously and be successful? Or is he leading a double life? Is his success a mask behind which lurks a disobedient, adventurous, pioneering, dare-devil soul?

I know little about Mr. Mais except from articles of his which I have occasionally read. Is he poor? Is he always losing his job because of the outrageous, divinely heretical, things he says and does? Which of these two is casting himself as a seed upon stony ground? We must "wait and see."

I, myself, am in no doubt about this matter. If somebody had not "lived dangerously" we should not be now living in the safety we enjoy. But it wasn't me! I am but a poor swimmer. I move fairly well when I am in my depth; but when I get out of my depth, I am frightened and lose my style entirely!

NEXT WEEK.

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"P.W." THURSDAY. 3d.

SIX-FOOT TELEVISION PICTURES

(*Continued from page 792.*)

But increasing the number of holes automatically entails reducing their diameter, unless a disc of unwieldy proportions is used, and a reduction in aperture diameter means a considerable loss of light in the received image. Sanabria has succeeded in breaking through this vicious circle, achieving both detail and adequate illumination for projection.

In fact, his images are undoubtedly the best I have seen to date. Although the apparatus shown was unquestionably a laboratory set-up, the fact that it worked so well and gave a good image 6-ft. square, augurs well for the development in the near future of a simply operated receiver, sufficiently compact for home use, which will project an image, say, 2 ft. square on the living-room wall.

Two-Way Scanning.

But there still remain the problems of enlarging, without loss of detail, the field of view which the transmitter can handle, and transmitting by wire or by wireless the enormously wide frequency bands which will then result.

Sanabria is at present endeavouring to work out a system of scanning in two directions at right angles to one another (i.e. vertically as well as horizontally) which may solve the first problem.

Recent accounts in America of the six-foot television images now being demonstrated by U. A. Sanabria, have aroused considerable interest as to the light source which he is using at the receiver, and the inventor has just revealed the secret of his lamp.

All television workers to date have made use of neon lamps because this light source is the only one known which will respond sufficiently rapidly to the modulation of the incoming high-frequency television signals. For the production of small images, flat plate type neons are used, but for projection work the crater type is employed, because this type concentrates an intense glow in a tiny area of the cathode.

But the amount of light obtainable from even a crater type neon is totally inadequate for the purposes of projection on to a large screen.

New Type of "Neon."

Sanabria, however, hit on the plan of heating the cathode to a high temperature, thus heating up the small area of gas in which the glow discharge takes place. This causes the gas in the tube to give a very much brighter light and, best of all, it breaks down at from 15 to 25 volts, instead of the usual 140 volts, making the tube as responsive to weak signals as a modern loud speaker is to weak speech impulses. In this way, much finer shades of detail can be faithfully portrayed.

The hot cathode is similar to the heating device used in an indirectly-heated cathode type of valve.

A great possibility of this departure is that gases other than neon may be more easily and advantageously employed than was the case heretofore, thus enabling images of different colours to be shown.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

H.F. Coupling.

AN H.F. transformer or a tapped anode coil forms a suitable coupling, at any rate in the majority of cases, for a screened-grid valve. If a plain tuned-anode circuit is used with an H.F. amplifier there is a considerable likelihood of oscillation setting in, particularly if the coils are more than ordinarily efficient.

This is due to the fact that an S.G. valve, notwithstanding the presence of the screened grid and the positive voltage applied to the same, still has a certain amount of inter-electrode capacity.

In consequence of this, even though we take as much care as possible to avoid stray couplings, both magnetic and capacitive, the circuit will oscillate if the high-frequency anode voltage exceeds the grid voltage by more than the critical amount.

The circuit can be rendered more stable by introducing losses into the aerial coil, but what is gained in one way is lost in another, and in making the aerial coil less efficient we also lose, of course, both in amplification and selectivity.

One method which is now often used is to connect the anode to an intermediate point on the anode tuning coil, whilst another method which is not perhaps quite so simple as the tapped tuned-anode coil is to wind a second coil over the tuned coil so as to produce in effect an H.F. transformer.

Although, as I say, this latter method is not perhaps quite so simple or easy, it has certain advantages in regard to the circuit and is often to be preferred.

Are They Atmospherics?

This is the time of the year when crackling and other noises heard in the loud speaker are commonly attributed to atmospherics. There is naturally some justification for this, but at the same time you do not want to jump to the conclusion that all such noises emanate from outside the receiver itself.

Clearly the "acid" test in this matter is to disconnect the aerial from the receiver; if the noises still continue and are not diminished in loudness, then the aerial system can scarcely be blamed.

If the interfering noises are merely diminished when the aerial is disconnected it suggests that they are due to atmospherics and that, in the absence of the aerial, these are being picked up (with much less strength) by the coils of the receiver.

There is just one word of warning I should like to give you. Even if the crackles are definitely associated with the aerial, that is to say, if they disappear when the aerial is disconnected and recur when the aerial is reconnected, it still does not necessarily follow that they are true *atmospherics*. It may be that some bad

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

contact in a switch or the aerial is causing the trouble.

On the other hand, if the interfering sounds proceed unabated irrespective of whether the aerial is connected or not, it is quite evident that they are produced within the receiver itself.

L.T. Switches.

A very common cause of trouble of this kind is a defective L.T. switch or filament rheostat.

I have often found, and I expect you have, too, that the type of low-tension push-pull switch which has a plunger entirely free to rotate is very apt to cause trouble of this kind.

There are all manner of other causes of internal cracklings, and sometimes it is not at all an easy matter to discover them. A defective H.T. dry battery, a bad contact in a coil, or for that matter in any other component in the receiver, as well as frayed insulation in a transformer, are all liable to give rise to "atmospheres."

I once had a particularly baffling case in which the trouble was sometimes evident and would at other times disappear altogether, and after a great deal of patient searching it was found that there was a broken wire in the L.F. transformer which was making intermittent contact.

This, however, is quite unusual, and your troubles are far more likely to be due to low-tension switches, rheostats, or H.T. batteries.

The Earth Connection.

Reverting to the question of stability in a receiver, you will generally find that in the case of a set having one or more stages of high-frequency amplification it is particularly important to have a short earth lead and a good connection to ground.

If the earth lead is long or wandering, or if the earth itself is a bad one, there is a great liability to oscillation setting in. Generally you will find that this liability is greater on the longer wave-lengths, although it is difficult to draw any hard and fast rule, and a good deal depends upon the precise nature of the circuit.

Where the ordinary aerial and earth system is used it is clearly essential to have a proper earth, but what is not so generally known is that, even with a frame aerial, where a fair amount of high-frequency amplification is used, good results can often be got in the way of stability by adding an earth connection.

Stray Coupling.

In wiring up a receiver it is very important to arrange the wiring so as to avoid as far as possible stray coupling. This has always been an important consideration, but in these days, when sets are so "compacted," notwithstanding the advantages gained by screening, it is more than ever necessary to give the most careful consideration to the spacing of the various conductors.

When two conductors, for example two wires or busbars, are adjacent, especially when they are carrying high-frequency currents, the condenser effect which they produce may have a serious influence upon the operation of the receiver.

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

You want to bear in mind that any two conductors separated by an insulating medium or dielectric form a condenser and the capacity of this condenser depends upon the area of the conductors and upon their nearness together. The larger they are in area and the closer together the greater will be the capacity.

A Cause of Trouble.

So you see that you always have these condenser or capacity effects between the various wires of the set and it is purely a question of whether the capacity produced is *sufficient* to upset the working of the receiver.

A particular case in point, probably the most notable case of unwanted capacity causing trouble in a set, is that of the inter-electrode capacity in the valve.

As you know, the anode and the grid of a valve must form a condenser, and in the old days when we were content with a comparatively low magnification per stage, this anode-grid capacity did not seriously matter, although it clearly imposed a limit upon the degree to which the amplification could be pushed.

As soon as we tried to get extra amplification the valve went into oscillation, because the energy in the grid circuit was amplified in the anode circuit and then fed back owing to the capacity between these two electrodes.

One of the most notable advances in high-frequency amplification was the introduction of the neutralising condenser which, like most important inventions, is extremely simple in principle.

Balancing Out Valve Capacity.

The neutralising condenser is a small added condenser which has the effect of counter-balancing the inter-electrode capacity of the valve and so enabling the magnification to be pushed up to a very much higher value than previously.

The neutralising condenser must, of course, be variable, and must be adjusted until its value exactly balances the inter-electrode capacity of the valve.

When this state of affairs is achieved, the impulses due to the capacity in the valve and the impulses due to the capacity in the neutralising condenser are of equal strength and opposite in phase and consequently they cancel each other out.

I mention all this because the action of the neutralising condenser is sometimes rather a mystery to newcomers to radio, and also to emphasize the importance of avoiding stray capacity effects in other parts of the circuit.

You will realise, therefore, the importance of giving as much spacing as possible to the various parts of the wiring, also of avoiding the wires running close together and parallel to one another.

The precautions are specially necessary in the aerial and other high-frequency parts of the circuit. Bear in mind also that the too close proximity of a high-frequency-carrying conductor to a *screen* is bad practice, because it results in interaction between the conductor and the screen with consequent loss of energy.

Testing Pick-ups.

A very common type of query which I get from readers is on the question of pick-up sensitivity: they want to know "What is the most sensitive and suitable pick-up to use?"

This is about as easy to answer as the question: "What is the best motor-car for me to buy?" It depends so very much upon a variety of circumstances and conditions, and all I can really tell you is that there are now quite a number of excellent pick-ups on the market; some are more sensitive than others, but even that does not necessarily mean that those which are in themselves more sensitive will necessarily be the best choice for your particular set of conditions.

Choosing a pick-up is much like choosing a valve, and if you are in doubt you will be best advised to consult your dealer, or an expert friend, explaining the details of the circuit and other conditions.

THE SUCCESS OF THE "P.W." "SUPER-QUAD"

(Continued from page 809.)

actually reversed in their relative positions with the filament.

The control grid (taking the radio frequency input) of the S.G. valve is nearer the filament than the screen grid; while in the bi-grid valve the control grid is further than the inner or second grid.

Obviously, then, the bi-grid and S.G. valves are not interchangeable, though with a different circuit an S.G. valve could be used as detector-mixer, together with a separate oscillator.

It is here that the "P.W." "Super-Quad" again scores over other circuits, for it does not need a separate oscillator, the bi-grid carrying out double duties.

I hope I have succeeded in clearing up some of the little points of which some readers may be doubtful, and in showing how very important it is that in a receiver containing such fine qualities every component should be of the best, and properly chosen for the job it has to do.

The Pitch of Perfection.

A typical analogy would be to compare the "P.W." "Super-Quad" to a Schneider trophy 'plane as against the heavier and slower standard flying-boat. The "Super-Quad" is a combination of carefully selected parts—is, in fact, a "hotted-up" receiver, though this process of "hotting" in no way makes the set tricky to operate. It does, however, enable results to be achieved that would be impossible with an ordinary four- or five-valver, and achieved with such amazing simplicity of construction and operation as to astound even the "hardened" radio fan.

But, like the Schneider 'plane, things must be quite right with every part. There must be no "this-will-do" attitude in its construction, or the set will be but a travesty of its proper self. Take pains to follow all the directions carefully and you will have one of the most astonishing receivers of the year, a set which will make you the envy of your neighbour who is probably still struggling along with that old five-valver of which he used to be so proud.

The "Super-Quad" is a winner; it's far and away ahead of anything that has ever been done in four-valve battery sets—a definite milestone in radio progress.

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