

The Wireless 6^d Constructor

Vol. XIII.

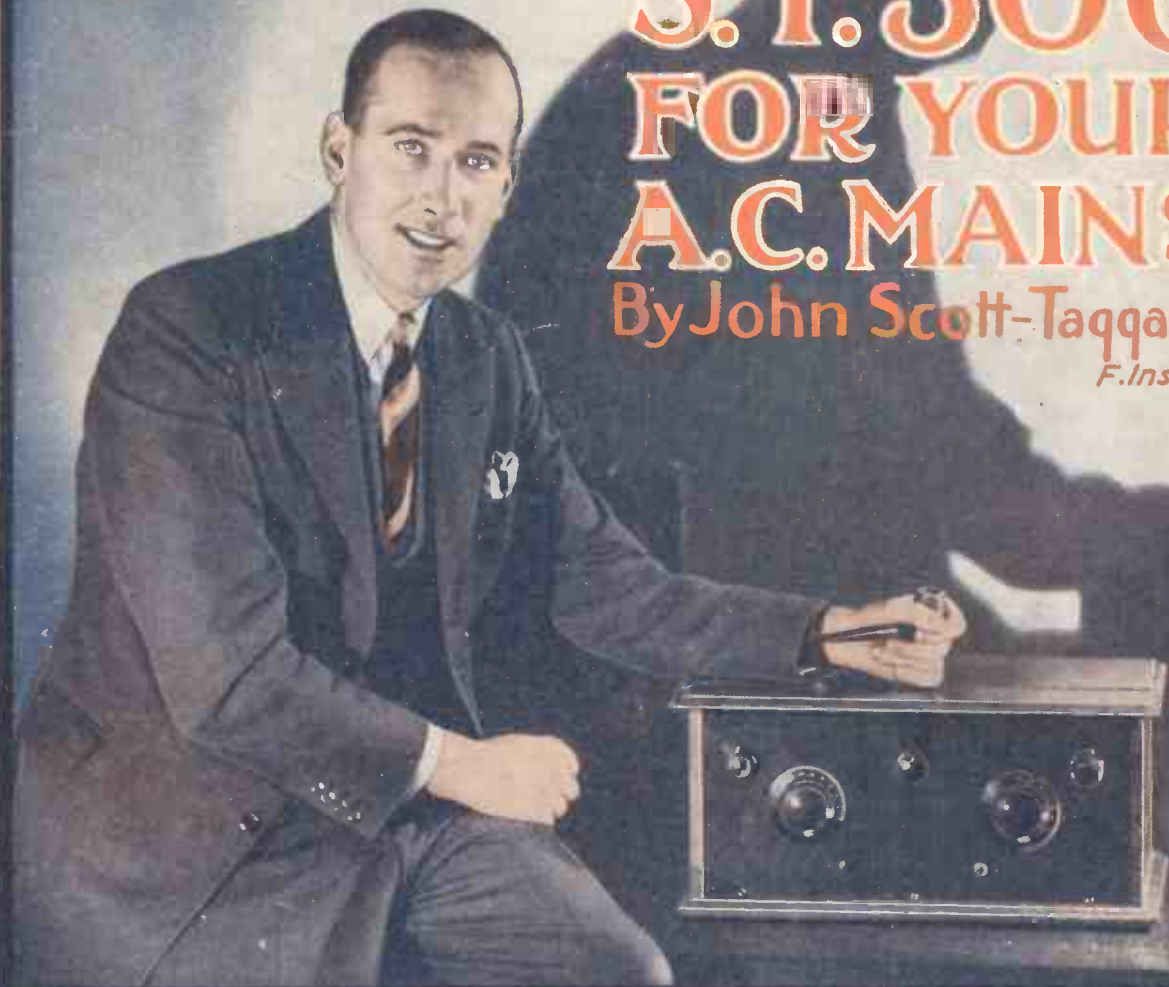
APRIL, 1932.

No. 66.

This Month

The
"S. T. 300"
FOR YOUR
A.C. MAINS

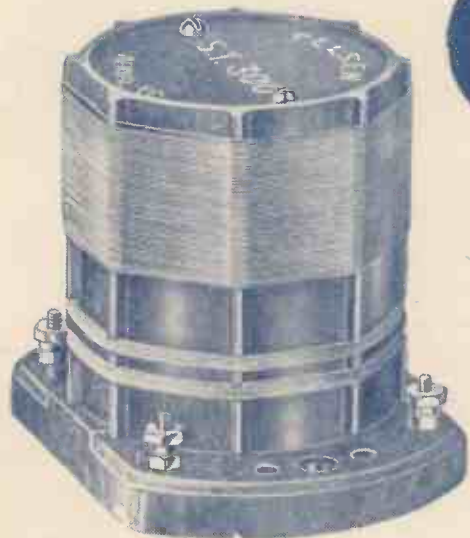
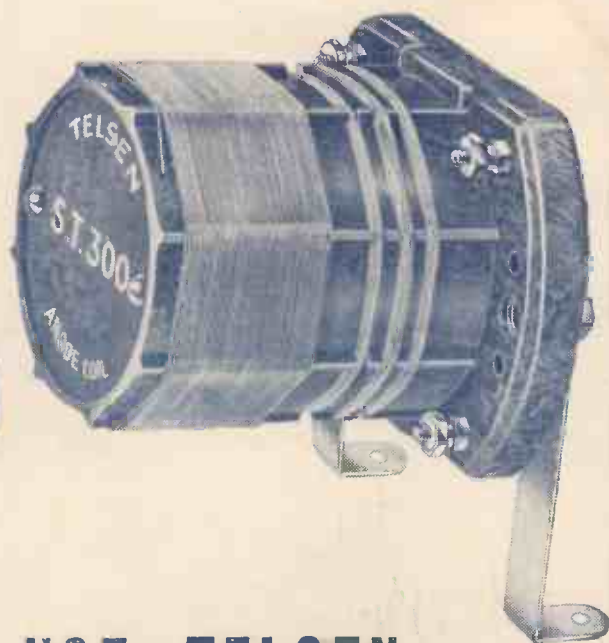
By John Scott-Taqqart
F. Inst. P.



TELSEN COILS SPECIFIED

FOR THE
A.C. "S.T.300"

AS DESIGNED BY Mr. JOHN SCOTT-TAGGART.



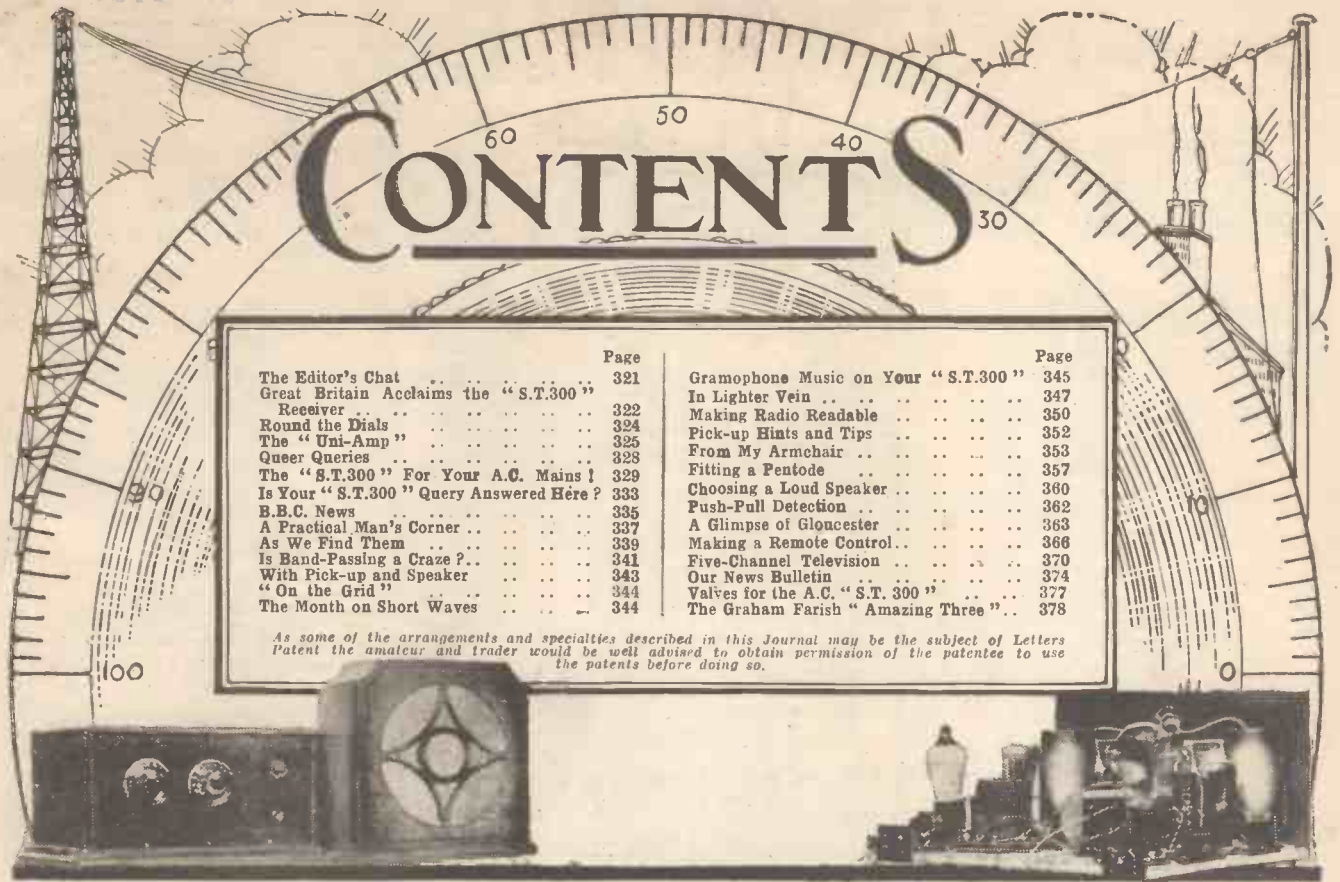
USE TELSEN
100% BRITISH
COMPONENTS for
the A.C. "S.T.300"

ASK YOUR RADIO DEALER

FOR

TELSEN

"S.T.300" COILS



	Page		Page
The Editor's Chat	321	Gramophone Music on Your "S.T.300"	345
Great Britain Acclaims the "S.T.300" Receiver	322	In Lighter Vein	347
Round the Dials	324	Making Radio Readable	350
The "Uni-Amp"	325	Pick-up Hints and Tips	352
Queer Queries	328	From My Armchair	353
The "S.T.300" For Your A.C. Mains!	329	Fitting a Pentode	357
Is Your "S.T.300" Query Answered Here?	333	Choosing a Loud Speaker	360
B.B.C. News	335	Push-Pull Detection	362
A Practical Man's Corner	337	A Glimpse of Gloucester	363
As We Find Them	339	Making a Remote Control	366
Is Band-Passing a Craze?	341	Five-Channel Television	370
With Pick-up and Speaker	343	Our News Bulletin	374
"On the Grid"	344	Valves for the A.C. "S.T. 300"	377
The Month on Short Waves	344	The Graham Farish "Amazing Three"	378

As some of the arrangements and specialties described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentee to use the patents before doing so.

SHORT WAVES on the A.C. "S.T.300"



This Adaptor is an entirely new design and enables you to enjoy Short-Wave Reception whether your set is A.C. Mains or Battery Operated. . . No extras whatsoever are required, and it can be

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for 'A.C. Mains and Battery Sets

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We specialise in the famous "S.T.300" and also the A.C. "S.T.300." Ready wired and tested. Every set is hand-made and tested by skilled craftsmen, thus ensuring perfect and guaranteed performance.

- Special screen Sandblast finish **2/-**
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- 60,000 ohms Spaghetti Resistance - 1/6
- S.G.H.F. Binocular Choke - 3/6



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Described in this issue.

1 megohm - - **5/-**

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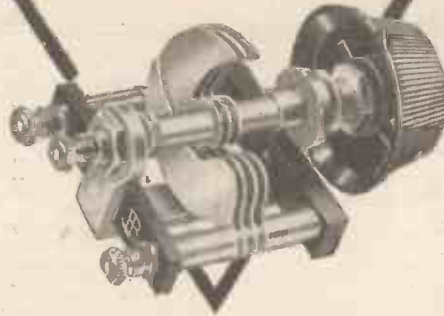
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SPECIFIED IN THE "S.T. 300"



J.B. DIFFERENTIAL.
'00015, 4/-; '0001, 4/-.
Insulated centre spindle. Baka-
lite dielectric between vanes.
Also made in capacities of —
'0002, '00025, '0003.



J.B. MIDGET, '00004.
Complete as illustrated, 4/-.
Small dimensions. Low minimum capacity.
Ebonite insulation. Rigid one-piece frame.
Also made in capacities of — '00025, '0002,
'00015, '0001 and '000025.



J.B. POPULAR.
Slow-motion type (35/1).
Capacity, '0005. Complete with 3"
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vanes. Rigid nickel-plated frame.
High-grade ebonite insulation.
Also made in capacities of — '0003,
'00025, '00015.



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C.O.D., CASH or H.P.

KIT-BITS

Selected Components

CASH or C.O.D.

You pay the Postman. We pay all Post charges on all orders over 10/-

A.C. "S.T.300"

2 Lotus .0005-mfd. slow-motion tuning condensers	13 0
Peto-Scott .00004-mfd. air-dielectric variable condenser	3 6
Pair Telsen "S.T.300" coils	11 6
Wearite output choke, H.T.5	12 6
Set of specified valves	2 15 0
Specified cabinet	15 0

"S.T.300" BATTERY MODEL

1 Pair Colvern "S.T.300" coils	12 0
2 Ormond slow-motion condensers	13 0
3 Valves as specified	1 19 0
Cabinet as specified	15 0

A.C. CONVERSION KIT

These components will convert your Battery "S.T.300" to the new A.C. Model described (this month).

1 Peto-Scott panel, 16" x 7", ready drilled	4 6
1 Peto-Scott .00004-mfd. air-dielectric condenser	3 6
1 W.B. horizontal 5-pin valve holder	1 0
2 W.B. 5-pin valve holders	1 8
1 Wearite H.T.5 output choke	12 6
1 Lissen .001-mfd. fixed condenser	1 0
1 Lotus jack and plug, No. 3	4 6
2 T.C.C. 1-mfd. fixed condensers	5 8
1 Formo mains type 1-mfd. fixed condenser for loud-speaker circuit	2 6
1 Lewcos 600-ohm Spaghetti resistance	9 9
2 Lewcos 1,000-ohm Spaghetti resistances	1 6
1 Lewcos 60,000-ohm Spaghetti resistance	1 6
1 Lewcos H.F. choke, type 11	6 0
1 Lissen H.F. choke, disc type	2 0
1 B.I. Paraflex L.F. transformer, 6-1	8 6
2 Dubilier 1-mfd. fixed condensers, type 9200	5 6
3 A.C. valves, as specified	2 15 0
	£5 17 7

CASH or C.O.D. £5-17-7, or 12 monthly payments of 10/9.

RECOMMENDED ACCESSORIES

* HEAYBERD ELIMINATOR "M.W.1." As specified by the Author for the A.C. "S.T.300." CASH or C.O.D. £6 7 6 or 12 monthly payments of 11/8.

ULTRA IMP Permanent Magnet Moving-Coil Speaker with input transformer. CASH or C.O.D. £2 15 0 or 12 monthly payments of 5/-

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A.C. MODEL

PILOT AUTHOR KITS IN SEALED CARTONS

KIT "A" Author's Kit less valves and cabinet

CASH or C.O.D. £5.7.0

or 12 monthly payments of 9/10
Specified Valves £2:15:0
Specified Cabinet 15/-

KIT "B"

Author's Kit, with valves less cabinet. CASH or C.O.D.

£8.2.0

or 12 monthly payments of 14/11

KIT "C"

Author's Kit, complete with valves and cabinet, but less Eliminator*. CASH or C.O.D.

£8.17.0

or 12 monthly payments of 16/3

FINISHED INSTRUMENT

£10:10:0

Complete with valves and cabinet but less Eliminator*. Factory wired—Aerial tested—Royalties Paid. or 12 monthly payments of 19/3

The Heayberd Eliminator Type M.W.1. (£6-7-6 Cash Price) as specified by the Author is an essential accessory for the A.C. "S.T.300." If required, add 11/8 to each monthly payment.

as described in this month's issue.

This is the Kit of Parts actually used and specified by John Scott-Taggart

1 Peto-Scott panel, 16" x 7", ready drilled	4 6
1 Peto-Scott baseboard, 16" x 10"	1 3
1 Terminal strip, 16" x 14"	1 3
2 Lotus .0005-mfd. slow-motion tuning condensers	13 0
1 Peto-Scott .00004-mfd. air-dielectric variable condenser	3 6
1 Ready Radio .00015-mfd differential reaction condenser	2 6
1 Telsen .0001-mfd. differential condenser	2 0
1 Pair Telsen "S.T.300" coils	11 6
1 W.B. horizontal valve holder	1 0
2 W.B. 5-pin valve holders	1 8
1 Lewcos S.G. H.F. choke, No. 11	6 0
1 Dubilier 1-mfd. condenser, type 9200	5 6
1 Ready-Radio 3-point push-pull switch	1 6
1 B.I. Paraflex L.F. Transformer, 6:1 ratio	8 6
1 Wearite H.T.5 output choke	12 6
1 Dubilier .001-mfd. fixed condenser	1 0
1 Lissen .001-mfd. fixed condenser	1 0
1 Graham Farish "Omnic" 1-meg. grid leak	1 6
1 Lotus No. 3 jack and plug	4 6
2 Dubilier 1-mfd. condensers, type 9200	5 6
2 T.C.C. 1-mfd. condensers	5 8
1 Telsen 1-mfd. condenser, for coupling L.F. transformer	2 3
1 Formo mains type 1-mfd. condenser for loud-speaker output circuit	2 6
1 Lewcos 600-ohm Spaghetti resistance	9 9
2 Lewcos 1,000-ohm Spaghetti resistances	1 6
1 Lewcos 60,000-ohm Spaghetti resistance	1 6
10 Bellini-Lee type "R" terminals	2 6
1 Peto-Scott "S.T.300" screen	2 0
1 Peto-Scott sheet copper foil, 10" x 7"	1 0
Glazed connecting wire, screws, twin flex, etc.	1 6

Use this detailed Price List when ordering parts for the A.C. "S.T.300." Any items sent separately, if value over 10/-, sent Carriage Paid or C.O.D.—all Post charges paid.

BATTERY MODEL

as described in the February issue.

KIT "A" Author's Kit less valves and cabinet

CASH or C.O.D. 72/6

or 12 monthly payments of 6/8
Valves as specified £1:19:0
Cabinet 15/-

KIT "B"

Author's Kit, with valves, but less cabinet. CASH or C.O.D.

£5.11.6

or 12 monthly payments of 10/3

KIT "C"

Author's Kit, complete with valves and cabinet. CASH or C.O.D.

£6.6.6

or 12 monthly payments of 11/7

FINISHED INSTRUMENT

£7:12:6

Complete with valves and cabinet. Factory wired—Aerial tested—Royalties Paid. or 12 monthly payments of 14/-

This is the Kit of Parts actually used and specified by John Scott-Taggart

1 Panel, 16" x 7" x 3/16", ready drilled	4 6
1 Telsen .0001 differential condenser, with black knob	2 0
2 Telsen 1-mfd. Manabridge condensers	4 6
1 Telsen binocular H.F. choke	9 0
2 ReadyRad 3-point switches	3 0
1 ReadyRad .00015 diff. condenser	2 6
1 Peto-Scott standard screen, 10" x 6", with notches filed	2 0
1 Peto-Scott terminal strip, 16" x 14" x 3/16", ready drilled	1 3
1 Peto-Scott baseboard, 16" x 10"	1 3
1 Peto-Scott copper sheet, 10" x 7", about .006" thick	1 0
2 Ormond .0005-mfd "S.M." condensers	13 0
1 Pair Colvern "S.T.300" coils, with supporting pillars, special "S.T.300" windings and terminal connections	12 0
1 Dubilier .001-mfd. type 670 condenser	1 0
1 Graham Farish "Meto" 1-meg. grid leak	1 6
1 Lewcos H.F. reaction choke, Ret. M.C.	2 6
1 Lewcos Spaghetti resistance, 20,000 ohms	1 6
1 Varley "Nictet" L.F. transformer, 3:5:1, type D.P.21	7 6
2 Lotus valve holders, type T.H.K.	1 0
1 W.B. valve holder (S.G. horizontal)	1 0
10 Bellini-Lee terminals, marked	2 6
1 J.B. midget condenser, .00004-mfd.	4 0

Use this detailed Price List when ordering parts for the "S.T.300." Any items sent separately, if value over 10/-, sent Carriage Paid or C.O.D.—all Post charges paid.

Messrs. PETO-SCOTT CO. LTD. 77, City Road, London, E.C.1.

Please send me C.O.D./CASH/H.P.

"S.T.300" BATTERY MODEL KIT A/B/C. (Strike out wording not applicable.)

A.C. "S.T.300" KIT A/B/C with/without specified Eliminator. for which I enclose £ s. d. CASH/H.P. Deposit.

NAME.....

ADDRESS.....

W.C.4/32.

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For those whose requirements are met by a cheaper battery, we make the JUNIOR. Worthy to bear the Pertrix name. Of its kind and at its price by far the best.



100 volts.

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9/-

11/-



The WIRELESS CONSTRUCTOR

Published by the Amalgamated Press, Ltd., Fleetway House, Farringdon Street, London, E.C.4.

THE EDITORS' CHAT



This month we are able to present to readers an unusually attractive number. It contains not only details of an "S.T.300" for A.C. mains, but also several other powerful articles from the pen of John Scott-Taggart dealing with important aspects of radio to-day. There are also how-to-make details of two units, and readers themselves have contributed one most enjoyable feature in the form of letters to the designer of the "S.T.300."

THE tremendous success of the "S.T.300" is by now a matter of common knowledge. Designed by John Scott-Taggart, it marked in no uncertain way the importance of his return to radio journalism and the enormous interest which hundreds of thousands of readers take in his set designs.

Sound and Efficient

And it is inevitable that in these days of rapid progress, when electric light mains are available in the homes of millions of people, that extremely great interest in the "S.T.300" set for A.C. mains should be aroused. Consequently, in response to the almost frightening number of requests from readers for an A.C. version, we feature in this issue of THE WIRELESS CONSTRUCTOR Mr. Scott-Taggart's "S.T.300" for use with A.C. valves.

The set incorporates automatic bias, and also automatic bias switching in combination with the pick-up.

It is unnecessary on this page to enlarge upon the technical qualities of the A.C. "S.T.300" set. A brief glance at Mr. Scott-Taggart's fully descriptive article on other pages will convince those readers who have been waiting for an A.C. version of a thoroughly sound and efficient set that here, in the "S.T.300," is the very thing they have been looking for.

A Leading Article

Mr. Scott-Taggart also contributes in this issue another important article based on the controversial subject of band-passing. "Is Band-Passing a Craze?" asks our distinguished contributor in an article which contains several "straight-from-the-shoulder" remarks about this interesting topic.

Another feature from Mr. Scott-Taggart's pen which is introduced

in this number of THE WIRELESS CONSTRUCTOR is entitled "From My Armchair." This is a new series of articles in which, month by month, Mr. Scott-Taggart will informally chat to readers about divers radio matters.

Among other features in this issue we should like to draw our readers' attention to the two easily-made novel

The B.B.C.'s announcement of the rebuilding of Daventry National and Midland Regional transmitting stations must have come as something of a surprise to most listeners. In all probability the D.N. and M.R. transmitter will be rebuilt in the neighbourhood of Droitwich. For some time past one of the B.B.C.'s mobile transmitters has been engaged in

"THE WATCH ON THE RHINE"



This is one of the German radio engineers employed in watching wave-lengths and "policing" the ether to prevent heterodynes and similar troubles.

and useful units—one, the "Uni-Amp." This is a complete single-valve amplifier, which may be immediately linked up with any existing set; and, secondly, the pentode output-unit, which enables a pentode valve to be used very satisfactorily with most ordinary receivers.

testing the suitability of various sites in the neighbourhood.

It is understood that one of the main reasons for the decision to rebuild the station on a new site is that the new Empire transmitter would clash with Daventry National and Midland Regional on the present site.

Great Britain Acclaims

Bandmaster's 15th and Best Set 18, Upper Plymouth Grove, Longsight, Manchester.

Sir,—Having built up Mr. J. S.-T.'s "S.T.300," I got it going straight away. Marvellous and incredible is my verdict, and I know a little bit about building. This is my fifteenth set, and far away the best—nothing to compare with it. Station after station rolls in; they seem to be waiting behind each other just ready for work. I also tried a pentode. It's a great set with a pentode (using a Varley D.P.9 choke).

Yours, etc.,
W. WILSON, Bandmaster.

Sixteen-year-old Boy's "S.T.300" Success

101, Hampton Road,
Redland,
Bristol.

Sir,—I am very pleased with your "S.T.300." Last October I purchased a commercial kit set, and was not altogether pleased

Unprecedented enthusiasm has been wonderful three-valver that was Constructor." Read these representa- have built the set and astonished

with it. I decided to build a new set and, being only 16½ years old and no exceptional radio fan, I looked round for a suitable set. On Thursday, January 14th, I was told by a wireless dealer that a new set was coming out next day designed by a well-known expert. I decided to build the set. The parts arrived on Wednesday,

the 20th. By 10 p.m. on Thursday night I had the set going.

I have not yet logged or counted the various stations I have received, but I am sure my list will be very large, considering the aerial I have got—which is not very good.

I may say that I am now a real fan!

Yours truly,
W. T. MEDWAY.

[This letter is not only a testimonial to the set's efficiency, but to the rapidity with which it can be built.—ED.]

Nottingham Reader's Delight

81, St. Stephen's Road,
Swinton,
Nottingham.

Sir,—I feel I must write and tell you how delighted I am with the new set I have just constructed—the "S.T.300."

Although I have had a set for about two years, I am by no means well up in wireless, but I decided to construct the set just designed by you. I have just completed it and got it working, and I must say the simplicity with which I followed your instructions made the building of the set a real pleasure, and it surpassed my expectations both in volume and tone. The only difference I made was that I put in a Lewcos transformer and included a fuse bulb.

Yours sincerely,
A. H. DENTON.

First Set—Over 40 Stations

310, Woodstock Road,
Belfast.

Sir,—Please accept my best wishes for your latest set, the "S.T.300," which I built in two evenings. I find it very satisfactory, as it has done the greater part of what you claim. I have tuned in at least 40 stations at good strength at first attempt.

This being the first set I have built, I can recommend it as a set easily constructed by any amateur.

Yours truly,
J. PACE.



The designer of the
"S.T.300"—Mr. John
Scott-Taggart,
F.Inst.P.—with the
original set.

the "S.T.300" Receiver

aroused by John Scott-Taggart's described in the February "Wireless" letters from delighted readers who themselves—and their friends!

"Does All You Claim"

10, Elbourne Road,
Tooting Common,
London, S.W.

Sir,—I am just writing to let you know that I have built your "S.T.300," and find it the best "Three" I have ever come across, and it does everything you claim for it.

I built exactly to specification, except that I used a Ferranti A.F.5 transformer.

The "S.T.300" is nearly as selective as my super-het., but with this difference—that for all-round listening it is superior because of the clearness of reproduction on foreign stations, and freedom from mush.

Yours faithfully,

H. T. ROBERTS.

P.S.—I use a Regentone W.I.A. eliminator for the H.T., and the "S.T.300" gives no trouble in the way of hum, etc.

Scotland Hails the "S.T.300"

27, Deedes Street,
Airdrie,
Lanarkshire.

Sir,—It gives me great pleasure to congratulate you on such a fine set as the "S.T.300." I have just completed it, and the stations logged were more than I ever got previous to the "S.T.300."

The selectivity of the set is great. I will tell my wireless enemies about it, as there is great rivalry between us as far as this goes.

The foreign stations come in a treat. To-night I tuned in over 30 stations, and this was my first night. The tuning is new to me, yet I bet I will log another 40 before the end of the week. I am only nine miles from the Glasgow station, and this was my trouble before I met your "S.T.300";

but it doesn't trouble me now, thanks to you.

Yours faithfully,

P.S.—I shall be pleased to give a trial to anyone near here who would like to try it.

**SPECIALY MENTIONED
BY OUR READERS**

SELECTIVITY—

"A revelation."—"At least forty stations at good strength at first attempt."—"Selectivity is great."

QUALITY OF REPRODUCTION—

"The quality I am having now with the 'S.T.300' is just perfect."—"For all-round listening it is superior (to a super-het.), because of the clearness of reproduction on foreign stations."

Reader Scraps His Super-het.

Spofforth, Harrogate.

Sir,—Having built your "S.T.300," I should like to let you know what amazing results I have obtained.

The set has only been working three days, but I have logged nearly 60 stations—all at excellent volume and quality.

The selectivity is a revelation for a set so simple, and for my locality is all that can be desired. I am using a Mazda P.240 in the output, and use a B.T.-H. permanent-magnet moving-coil speaker, and can get enough volume to fill a dance hall.

It may interest you to know that for the last six months I have used a six-valve super-het., but have now scrapped it in favour of the "S.T.300"; and, although it sounds rather tall, I find the

"S.T.300" definitely better for range, power and quality.

Speaking about quality, I have owned dozens of sets during the last year or two, but the quality I am having now with the "S.T.300" is just perfect—much better than most expensive commercial sets.

"HIGHLY SATISFIED."

[This reader encloses his name and full address.—ED.]

Three American Stations!

"Rhodesia,"

Greenhill Lane,
Wortley, Leeds.

Sir,—I got my "S.T.300" coils yesterday, and by night was "on velvet." I read and re-read your article in the CONSTRUCTOR—and wondered! (You know what I mean)—seeing that I have tried about six circuits since Christmas with more or less moderate sets. Here the Northern Reg. is particularly troublesome. However, I need not have had any doubts, as I can go back to your "S.T.100" days—and other sets of yours—so I should nearly know you by now.

Most of the old favourite continentals returned, when I thought they had said good-bye for ever, with N. Reg. and N. Nat. at each end of the dial. And now—Ye Gods! I even received Langenberg after a few minutes with barely a whisper from the Big Fellow; also, approximately 40 stations on L.S. after completing receiver last night. And, last but not least, after 1.30 a.m. I got through to WBBM, WEA F, WBA P. [Americans.—Ed.]

I thank and take my hat off to you. **YOU HAVE NOT LET US DOWN!**

Yours faithfully,

J. RHODES.



ROUND *the* DIALS

Practical notes on what stations to look for and how to get the foreigners that are coming over well.

A PART from one or two periods during which bursts of atmospheric spherics have been troublesome, the conditions for long-range reception in the past few weeks have remained almost ideal. And two incidents which happened to come directly under notice will serve to show how particularly good conditions are for sensational reception.

A Pleasant Surprise

The first instance was that of a set builder who was making a straight detector and two L.F. set with two circuits of tuning preceding the detector.

The tuning on this class of receiver is bound to be sharp, and one would not normally expect maximum long-distance results to be got from it without a few weeks' experience in handling the dials; but the constructor who made it got the shock of his life when he first attempted to tune it.

He had been trying to finish it before the dance music from London closed at midnight, but was not successful in this, and it was about ten minutes past twelve before the batteries were connected up. Just to make sure that the set sounded lively, and in the hope of tracking a late European, he switched on and tried his luck at reception.

Aforesaid luck was right IN, for the first station he heard, coming through fairly loudly, was an American. And the first announcement coming from the loud speaker was: "This is W G Y, the General Electric Co.'s station at Schenectady, New York."

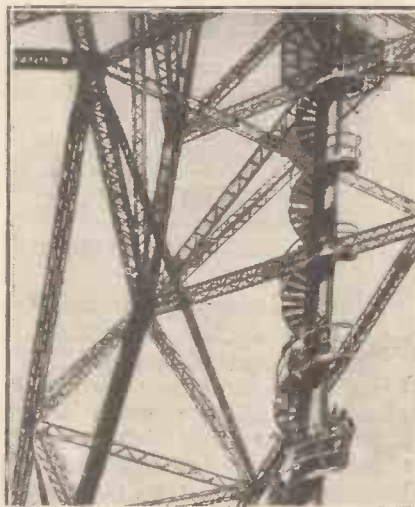
Not Very Difficult

Numbers of other people have succeeded in picking up America in the small hours of the morning on perfectly ordinary sets and on ordinary wave-lengths; one of the best stations being W P G ("the World's Playground"), which can be heard coming in a few degrees above the London

National programme, when conditions are superlatively good.

Generally there is no way of knowing whether it will be a good night for reception or not, and the enthusiasts who sit up are often disappointed (though the thrill of tapping into an American programme direct across the Atlantic is certainly worth a night's vigil or two). But the second instance of good reception occurring during the past few weeks was a sensationally satisfying one.

BERLIN'S SPRING CLEAN



The men on the spiral staircase are the tail of an army of cleaners descending from the top of Berlin's radio tower after giving it an annual clean. It takes about 5 tons of paint!

On this occasion the receiver was a super-heterodyne, and while combing the wave-lengths round about 280 metres to ascertain what the distant European stations were doing the owner was surprised to tune in an American programme *before midnight*. In this case the station was Hartford, Connecticut, W T I C, on 283 metres.

On a really good night, with a good set, so many Americans can be tuned in that the most sceptical sceptics would be completely convinced that there is no European relay or other

such explanation to account for the results.

The only inference that can be drawn from the facts is the rather amazing one that American programmes from many stations are receivable quite easily in this country.

So far as Europe is concerned, daylight reception continues to be phenomenally good, and it is surprising what a number of programmes and interesting items there are on the air during daylight hours. Hilversum, for instance, on 299 metres, is worth watching for any time after breakfast, and several of the German stations start off before 6 a.m.

An Unknown Station

On the long waves, Warsaw has been worthy of its kilowattage, and all the Scandinavian stations have been in fine form, with Kalundborg particularly vigorous.

Considering the power employed, this station can certainly claim to be one of the marvels of Europe's broadcasting, for its range and reliability are almost phenomenal.

Several readers have been querying who is the very long-wave transmitter giving music without announcements right at the top of the wave-band near Huizen.

Actual details of this, sufficient to identify it, have not been forthcoming, and at the various times I have tried for it the station has been provokingly absent. Can anyone throw any light on these very long-wave transmissions?

The Prague Plan

Although a great deal has been said against the Prague Plan, it is definitely working well in the main, for heterodyne interference has been conspicuously rare when one considers the numbers of programmes which can be received and the real punch with which the various stations are arriving.

No doubt the fine weather will soon be taking the edge off the really long-distance reception which is now possible, but there is every evidence that this particular season will long be remembered as one of the very best on record.

If it is fair to pick out a few stations where so many are good, the following are worthy of special attention: Trieste, Heilsberg, Hilversum, Bordeaux, Brussels No. 2, Brno, Toulouse, Radio-Romande, Katowice, Beromunster, Prague and Brussels No. 1.

THE "UNI-AMP"



SOME say three stages of amplification are needed for radio-gram work and some say two are enough. Which is right? Well, like all such matters, it all depends.

Three are always enough, but two will do the job only when certain conditions are fulfilled. The amplifier must give really powerful magnification, the pick-up must be sensitive, and great volume must not be expected. Even then there will be little, if any, power in hand.

How Many Stages?

So if you want colossal volume, or wish to have plenty of power in hand, and have to use a somewhat insensitive pick-up or use low-mag. valves in your amplifier, then three valves are indicated. But many receivers, especially those using H.F. amplification, have only one L.F. stage.

The detector can be used as an amplifier for pick-up work, and the question then arises as to the best way of providing the third stage. This is where the "Uni-Amp" (the universal one-valve amplifier) can fill the bill very nicely.

It enables an extra stage to be introduced between the detector valve and the pick-up, and also supplies a volume control just where it is wanted—across the pick-up itself. And you don't have to make any alterations to the set at all.

An Ideal Unit

In circumstances such as these the old method of just sticking another L.F. stage after the set does not "line up" at all. Remember you have a power valve in the output position, and most likely an output filter or transformer.

Before you could add another L.F. stage the valve would have to be

This "add-on" amplifier has a circuit which can be changed in a moment from one specially suited to pick-up work to one for use after a detector valve for loud-speaker radio reception.

By A. S. CLARK.

changed for one of the L.F. type, and the output arrangements would have to be removed and connected up again after the extra valve. All of which we are able to avoid.

But suppose we want to add an L.F. stage to a receiver that has no such stages, so that it will work a loud speaker on radio. Here the

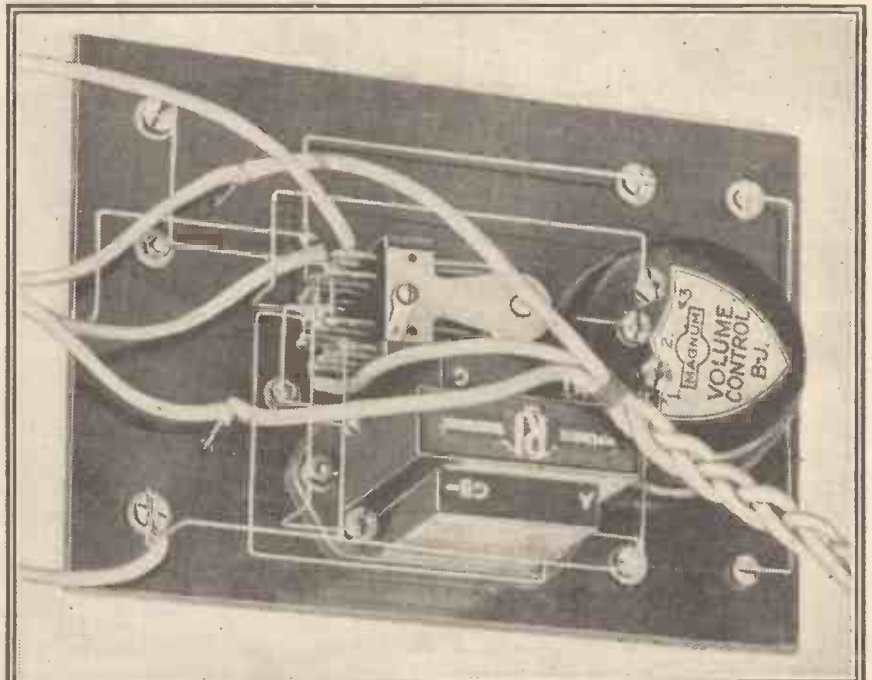
objections just raised do not crop up, and the "Uni-Amp" is once more able to fill the bill very nicely.

If you glance at the circuit diagram you will see two little amplifier schemes shown at the top. Circuit One is the arrangement of the "Uni-Amp" when used in the first way described, and Circuit Two the same amplifier as it is used following a detector valve.

Alternative Circuits

In the one case the transformer precedes the valve, and in the other it follows the valve. How, you will inquire, can two completely different circuits apply to the same amplifier?

EVERYTHING ON JUST A SIMPLE PANEL



No baseboard is used in the construction of the amplifier, and it is connected up into circuit by means of an adaptor plug which fits into a valve holder on the receiver.

THE "UNI-AMP"—continued

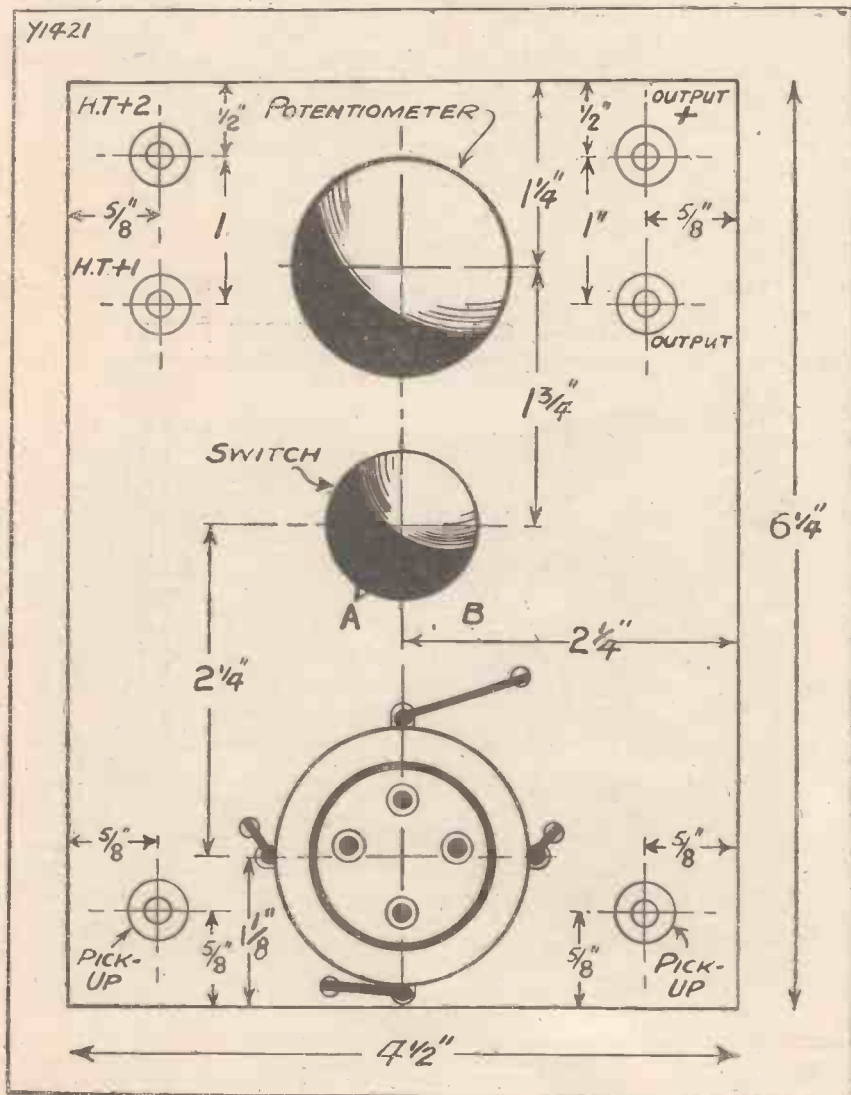
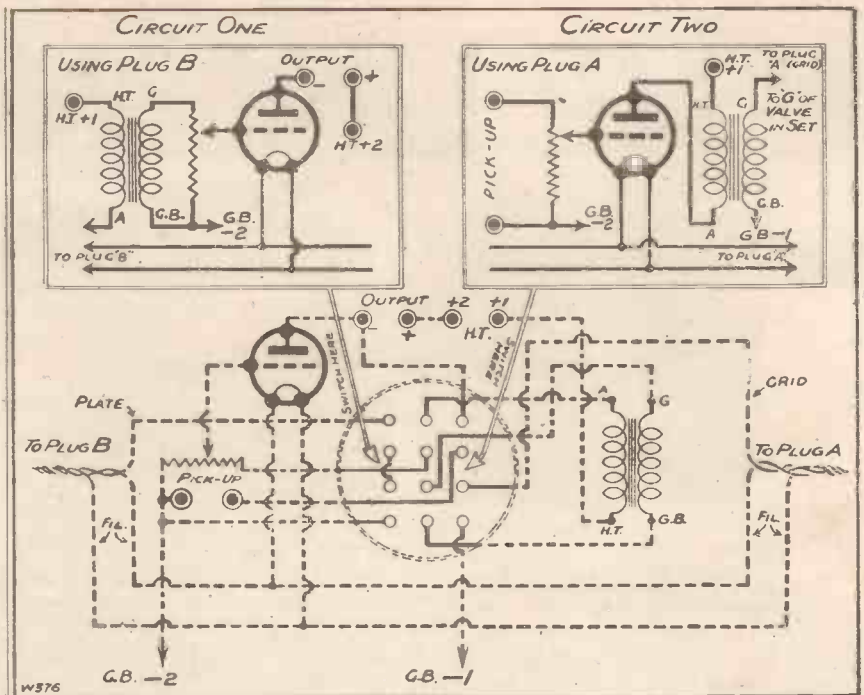
And the answer is—the switch incorporated in the "Uni-Amp."

This is of the four-pole change-over type, and by one movement it completely changes the nature of the circuit of the unit. It is this ingenious switching that gives the universal property to this amplifier.

Connected up to the amplifier, by means of flex leads are two valve adaptor plugs. To connect up in the Circuit One manner, plug B is used, and for connecting up as Circuit Two, use is made of the plug A.

The Two Plugs

To put the plugs in use simply entails the removal of a valve from the set and the insertion of the plug in its place. The valve is then replaced in the top of the adaptor plug and the amplifier is then connected.



In the special diagram above you see the complete circuit of the "Uni-Amp," with its change-over switch, and in the small diagrams are shown the different circuits which are obtained by altering the position of the switch. To the left is the drilling layout, and you will see that an ordinary "spring" valve holder is mounted on the ebonite.

You will find the diagrams are easy to follow when you come to make up the amplifier. It is constructed on a flat panel without a baseboard, and is best housed in a case of the instrument type.

You can see how it looks when completed, and fitted in such a case by the heading photograph, which also shows how the flex leads are brought out at either end of the case. Those at one end are for the A plug, and those at the other for the B plug.

The wires for the G.B. battery can be brought out through the side of the case. A separate battery is needed if one is not already in use in the receiver.

Easy to Build

Beyond the adaptor plugs, with which I will deal in a minute, there is very little about the construction requiring comment. A very neat way to arrange the flex leads to the plugs is to plait the three wires together and bind the beginning and end of the plait with a few turns of fine wire or thread.

Both of the plugs are the same when purchased, but differ from one

The "Uni-Amp"—continued

WHAT YOU REQUIRE

- 1 Ebonite panel, 6½ × 4½ in. (Permacol, Goltone, Lissen, Becol, Ready Radio, Peto-Scott, Wearite).
 - 1 Instrument-type case for above (Cameo, Pickett, Osborn, Gilbert, Ready Radio, Peto-Scott).
 - 1 Four-pin valve holder (Telsen, Lotus, Clix, Igranic, Graham Farish, Bulgin, Formo, W.B., Wearite, etc.).
 - 6 Terminals (Eelex, Clix, Belling & Lee, Igranic, Bulgin).
 - 1 Four-pole change-over switch (Wearite, Utility).
 - 1 1-megohm potentiometer (Magnum, Sovereign, Wearite, Colvern, Ready Radio, Igranic).
 - 1 L.F. transformer. (R.I. Hypermite, Telsen, Igranic, Lissen, Varley, Ferranti, Lewcos, R.I., Goltone, Atlas, Formo, Climax).
 - 2 Valve adaptor plugs. See text. (Lissen.)
 - 2 Battery plugs (Belling & Lee, Igranic, Clix, Bulgin, Eelex).
- Wire for wiring (Glazite, Lacoline, Jiffilix, Quickwire).
Flex, screws, etc.

another after they have been doctored slightly. As obtained the plugs have four pins underneath which fit into any valve holder, and on top there are four valve-leg sockets into which any valve will fit.

The grid pin and grid socket are internally wired together, so also are the plate pin and socket and also the two filament pins and sockets. Around the plug are four terminals, one joined to grid connection, one to plate connection and the other two to the filament points.

Removing the Pins

What you have to do to the plugs is to take a hacksaw or file and remove one of the pins on the underneath. In the case of the A plug it is the grid pin that is removed, and in the case of the B plug, the plate pin.

Having explained all that, I think we can now get along to the connecting up of the amplifier. First of all we will suppose you want to use it with a pick-up in the manner first described.

To start, you remove the detector valve from the set and insert the A plug, and then replace the detector valve if it is of the L. or L.F. type. If it is not, place such a valve in its place and put the detector valve in the holder on the amplifier.

If you are using an L. type valve as detector you will require an H.F. or H.L. type valve for the amplifier.

There is no connection to the plate terminal on the A plug, and the fact that the grid pin has been cut off prevents any radio from breaking through on to the record reproduction.

The leads from the pick-up are joined across the terminals marked for the pick-up on the amplifier. Grid bias -1 will have to be plugged in 3 or 4½ volts negative, according to the voltage required by the valve in the detector position of the set, and -2 should be put into 1½ volts negative.

H.T.+1 can be plugged into the maximum high-tension voltage available. The terminals output and

H.T.+2 do not have to be connected up for this arrangement.

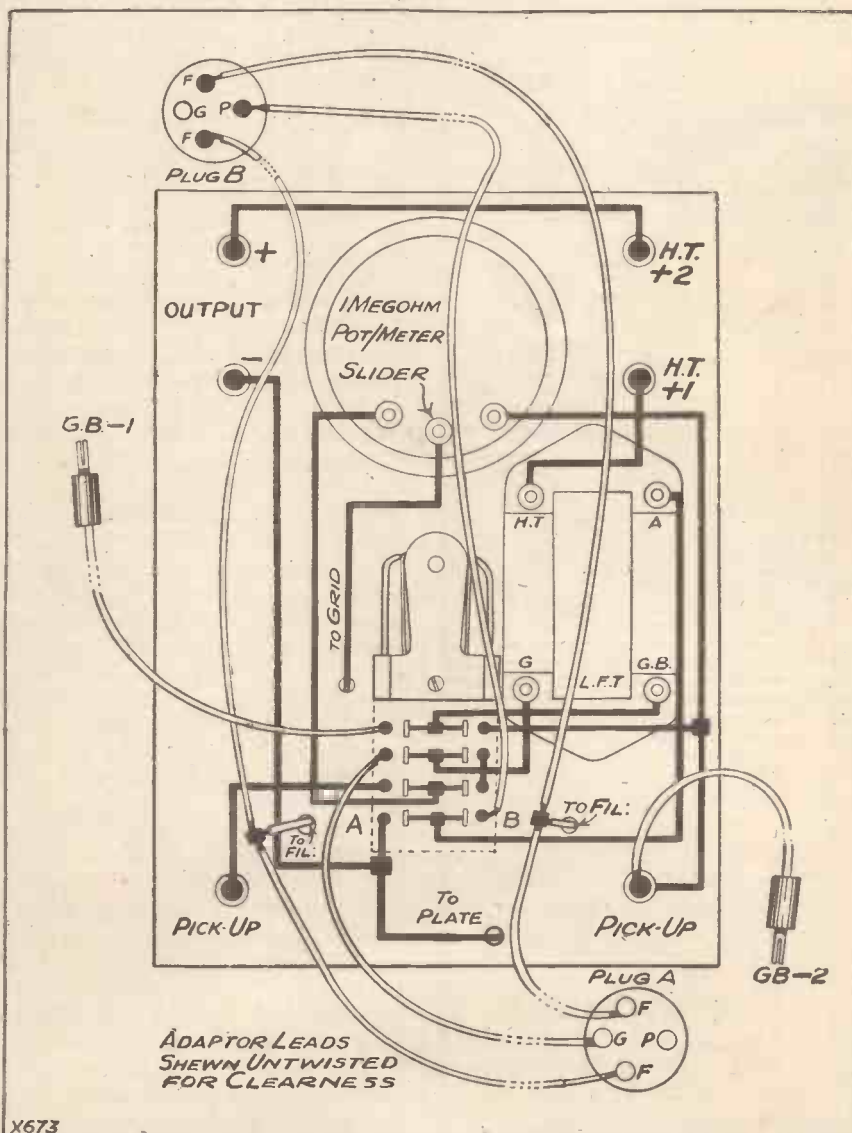
That completes the connecting up. Volume controlling should be carried out with the volume control on the amplifier, any other volume control that may be on the set being set at maximum and left there.

On Pick-Up

If you follow out the connections you will find that the scheme is as follows. The pulses from the pick-up go via the volume control to the valve on the amplifier which is connected to the primary of an L.F. transformer.

(Please turn to page 380.)

THE WIRING FROM POINT-TO-POINT



The plugs, to each of which there are three connections, are wired up with flexible wires, and the whole job of connecting up will only take a few minutes.

Using an L.T. Transformer

DOES the 4-volt winding on an L.T. transformer designed for a four-valve A.C. set give more than 4 volts when only two valves are used?" asks a Coventry reader.

And this question is a useful reminder, for the heaters of A.C. valves may easily be over-run if the load taken from the transformer's secondary is very much less than the designer intended. In the case quoted, for instance, the two valves would impose only half the load, and possibly the voltage developed in such circumstances would be excessive.

An Extra Load

It would certainly be wiser to impose an extra load by means of a resistance capable of passing at least 1 ampere, than to risk the damage that might result from under-loading the secondary.

TOO NEAR THE SCREEN



Many a good tuning coil is permanently hampered in action by being fixed in place too close to a screen or other large metal surface. This decreases efficiency and restricts the tuning range, so always avoid the mistake that this constructor is making.

A lucky Liverpool reader raises a point that may prove of general interest about milliammeters. His good luck takes the form of an uncle bent on giving him a birthday present, and the interesting point that he raises is: "What good is a milliammeter?"

A Curious Question

"I know I ought to be pleased at the chance of getting one," he says, "but when I come to think of it, what exactly am I going to do with it? I have heard that it can be used to check distortion, but as my set is



Some details about unusual radio faults and some suggestions that may help you to achieve better radio reception.

By P. R. BIRD

going perfectly at the moment, even this would appear to be a white elephant.

"It seems a curious question to raise, in view of all that has been said about the desirability of the milliammeter, but what use is it apart from measuring resistances and such more or less laboratory tasks?"

This is quite a good point to make, for there is a tendency for the usefulness of the milliammeter to be taken for granted, whereas many people no doubt would be glad of a reminder of the ways in which it can be used to help reception. Here are some of the chief points.

Varying Readings

If connected in the H.T. negative lead of the set it will keep a check on the total H.T. current. A note should be made of the normal current, and if the reading is one day found to be higher it is a clear warning that something is wrong. Possibly a grid-bias plug is not making proper connection, or some insulated connection somewhere has failed, or a valve gone soft.

If, on the other hand, readings show the H.T. current to be below normal, there may be a partial failure in the H.T. supply to account for this, or too much grid bias on one of the valves—faults which might not be noticed in the early stages, or which might have proved puzzling without the milliammeter reading.

Placed in the plate circuit of the last valve, the milliammeter will indicate distortion by "kicking" on loud passages. Similarly, if it is a sensitive one, it can be used in the

plate circuit of the low-frequency valve.

When the filaments have been switched off, and the H.T. is on, the milliammeter should show no reading at all, but many a surprised reader has noticed that in such a case a milliammeter wired in the negative H.T. lead does not come to rest at zero, but on, perhaps, half a milliamp or so.

Waste of H.T.

On investigation he has found that this is due to a dud condenser, or to faulty insulation somewhere permitting a constant drain on the H.T. supply, even when the set is switched off. This is of particular importance if the set uses dry batteries, for such a drain is sure to shorten their life considerably.

Embodied in a simple valve voltmeter, the milliammeter makes one of the handiest instruments with which the experimenter can deter-

HOW IS YOUR SET BEHAVING NOW?

If you are troubled by a radio problem, remember that the "Wireless Constructor" Technical Queries Department is fully equipped to help you.

Full details of the service, including scale of charges, can be obtained on application to the Technical Queries Department, "Wireless Constructor," Fleetway House, Farringdon Street, London, E.C.4.

SEND A POSTCARD, on receipt of which the necessary application form will be sent by return.

LONDON READERS, PLEASE NOTE. Applications should not be made by telephone, or in person at Fleetway House or Tallis House.

mine the effect of various coupling arrangements, different types of aerial, etc. And by connecting a sensitive milliammeter in the plate lead of the detector valve somewhat similar effects are obtained, and a number of interesting comparisons can be made.

Watching Tuning

Accurate tuning, for instance, can be shown up on a milliammeter in the plate circuit of a detector far better than by ear, and alterations to the aerial, different earths, correct adjustment for S.G. valves, etc., can all be "watched" by their effects on the detector's plate circuit.

There are, of course, many other uses, but those named will at least remind readers of the many valuable aids to reception which such an instrument affords.



The S.T. 300 for Your A.C. MAINS!

By JOHN SCOTT-TAGGART, A.M.I.E.E., F.Inst.P.

The original "S.T.300" has already achieved an unprecedented popularity, and in producing a model suitable for A.C. mains our distinguished contributor will earn the gratitude of tens of thousands more constructors.

ON my desk—before ever I set pen to paper—are placed a dozen letters from readers who have worked the "S.T.300" set with A.C. valves and have written to tell me of the extraordinarily good results they have obtained.

It makes me curious to know what

they have done—the circuit, the loud speakers used, the components, and so forth. Because here in this issue I give my own version of my "S.T.300" for use with A.C. valves. Perhaps all readers who have worked out their own conversion models will write to me giving details of changes, form of

grid bias, type of eliminator, valves, etc. This data would greatly interest other readers. Meanwhile, here is my own "S.T.300" adapted to A.C. mains.

There are so many constructors who already have mains units which they like to apply to different designs

THE PARTS NEEDED FOR "S.T.'s" NO-COMPROMISE MAINS SET

- 1 Panel 16 in. × 7 in. (Permeol, Peto-Scott, Becol, Wearite, Goltone, Ready Radio).
- Cabinet to fit, with baseboard 16 in. × 10 in. (Ready Radio, Peto-Scott, Pickett, Camco, Osborn, Lock, "Moreo," Gilbert).
- 1 Terminal strip 16 in. × 1½ in. (Permeol, etc.).

- 2 .0005 - mfd. slow-motion tuning condensers (Lotus, or Ormond, Polar No. 2).

- 1 .00004 - mfd. max. low-loss, low-minimum, variable air-dielectric condenser (Peto-Scott, or J.B. Midgett).

- 1 .00015 - mfd. differential reaction condenser (Ready Radio, or Telsen, J.B., Polar, Cyldon, Dubilier, Igranic).

- 1 .0001 - mfd. differential condenser (Telsen, or Ready Radio, Polar, J.B., Cyldon, Igranic, Graham Farish).

- 1 Pair "S.T. 300" coils (Telsen, or Colvern, Goltone, Sovereign, Wearite).

- 1 Horizontal 5-pin valve-holder (W.B. Universal, or Parex).

- 2 Five-pin valve-holders (W.B., or Lotus, Igranic, Graham Farish, Bulgin, Wearite, Magnum, Telsen).

- 1 S.G. H.F. choke (Lewcos No. 11, or

- R.I., Telsen binocular, Ready Radio S.G., Wearite, Varley).

- 1 Reaction type H.F. choke (Lissen, or R.I., Lewcos, Varley, Telsen, Climax, Wearite, Peto-Scott, Ready Radio, Tunewell, Sovereign; Graham Farish, Lotus, Atlas, Magnum).

- 1 Three-point push-pull switch (Ready Radio, or Lissen wave-change 3-pt.).

- 1 Jack and plug (Lotus No. 3).

- 2 1-mfd. condensers for aerial side of screen (Dubilier type 9200, or Telsen; T.C.C., Formo, Sovereign; Peto-Scott, Helsby, Hydra, Igranic).

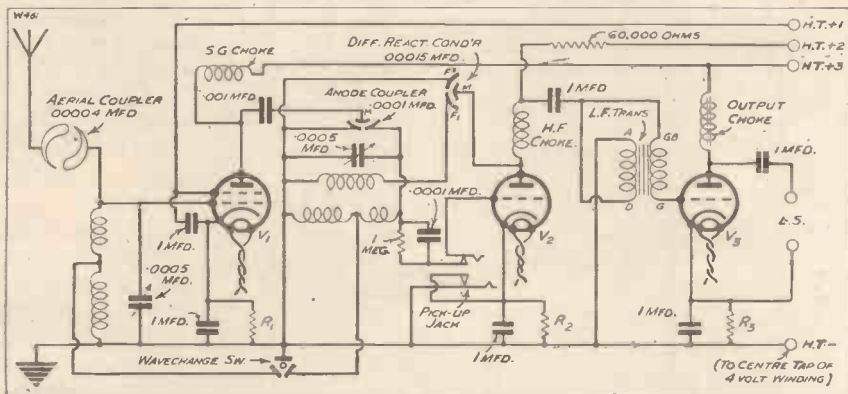
- 2 1-mfd. condensers (T.C.C., or Dubilier, Telsen). Note: These condensers should be of the flat type for space reasons.

- 1 1-mfd. condenser for coupling L.F. transformer (Telsen, or Dubilier, T.C.C., etc.).

- 1 1-mfd. condenser for loud-speaker output circuit (Formo "mains" type, or other 250-volt working type).

- 3 Spaghetti resistances (for values see article) (Lewcos, Sovereign, Varley, Tunewell, Igranic,

BASED UPON THE ORIGINAL CIRCUIT



The circuit incorporates all the original "S.T.300" features plus certain modifications providing for full results with A.C. mains valves and pick-up switching.

- 1 .0001 - mfd. differential condenser (Telsen, or Ready Radio, Polar, J.B., Cyldon, Igranic, Graham Farish).

- 1 Pair "S.T. 300" coils (Telsen, or Colvern, Goltone, Sovereign, Wearite).

- 1 Horizontal 5-pin valve-holder (W.B. Universal, or Parex).

- 2 Five-pin valve-holders (W.B., or Lotus, Igranic, Graham Farish, Bulgin, Wearite, Magnum, Telsen).

- 1 S.G. H.F. choke (Lewcos No. 11, or

- 1 L.F. transformer (R.I. Parafeed, preferably 1:6 ratio, or Varley Niclet).

- 1 Output choke (Wearite H.T.5, or R.I. Audirad, Ferranti B8).

- 1 .0001-mfd. fixed condenser (Dubilier 670, or Lissen, T.C.C., Ferranti, Telsen, Graham Farish, Goltone, Sovereign, Igranic, Formo, Watmel).

- 1 .001-mfd. fixed condenser (Lissen, or Dubilier, T.C.C., etc.).

- 1 1-meg. grid leak with terminals or tags (Graham Farish Ohmite, or Loewe, Igranic, Dubilier).

- Telsen, Bulgin, Lissen).

- 1 60,000-ohm Spaghetti resistance (Lewcos, etc.).

- 10 Terminals (Belling Lee type R, or Bulgin, Igranic, Eelox, Glix). Note: Large terminals should not be used, owing to space considerations.

- 1 "S.T.300" screen (Peto-Scott, Magnum, etc.).

- 1 Sheet copper foil 10 in. × 7 in. (Peto-Scott, etc.).

- Glazite, Lacoline, Quickwyre, Jimlinx. Screws, twin flex, etc.

The "S.T.300" for Your A.C. Mains!—continued

that I felt an all-electric "all-in-one" model of the "S.T.300" would not satisfy the majority of readers. My own tastes would emphatically lie in the direction of an A.C. mains unit (which should be adequate for A.C. valve requirements) which could be attached to any future designs, and I advise readers who are planning to use their A.C. to adopt this plan.

Converting the Battery Model

The battery model "S.T.300," i.e. the standard one described in the February WIRELESS CONSTRUCTOR, is eminently suitable for use on the A.C. mains. The detector valve is decoupled (this is, of course, particularly advantageous if hum and instability is to be avoided), and only the simplest alterations are required. As I foresee that some readers who have already built or may build the battery set will want to convert later, I have made my A.C. set adhere to the same general layout as before.

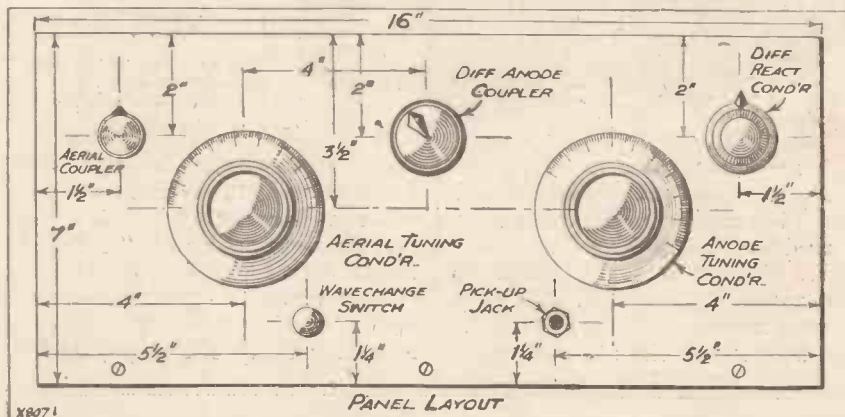
You will notice that from the front the A.C. model looks almost identical to the standard one. The on-off switch is, however, replaced by a pick-up jack, as the average constructor with a mains set desires provision for gramophone reproduction.

The on-off switch, of course, is inserted in the feed to the mains unit, which should give D.C. at 200 volts and raw A.C. at 4 volts. Details of valves and unit are given separately. The H.T. tapping for the S.G. screen should be variable on the eliminator

that you avoid the error of using one with too small an output for the set.

I think you should also consult valve-makers' curves to see what current you will take (it may be as low as 23 milliamps., but owing to

EVEN MORE POWER AVAILABLE



Constructors need not fear that this is merely a battery set "twisted" round because all the controls remain the same. On the contrary, it is an "S.T.300" re-planned for optimum mains results.

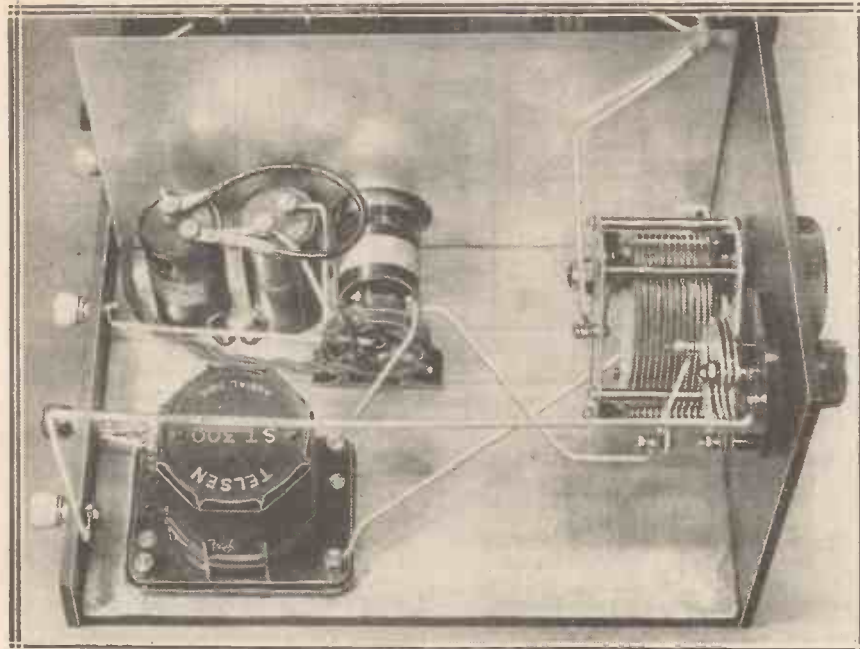
and may be used as a volume control.

The total H.T. current taken from the eliminator will vary according to the types of valves used, and I suggest, if you buy an H.T. unit,

wide differences in types you may take 30 milliamps.). I give values for some types later.

As regards circuit changes, these will be seen by studying the diagram. The grid of the first valve is given a small negative potential by means of an "automatic" grid-bias resistance (shunted by 1 mfd.) between cathode and "earth." The L.F. transformer is resistance-capacity-fed, a 60,000-ohm spaghetti of good make being used (and please don't tie knots in it!—spaghettis are kittle-cattle).

PROOF OF ITS FUNDAMENTAL SOUNDNESS



The fact that the mains version remains fundamentally similar is proof of the soundness of the original "S.T.300" conception, for the high efficiency of A.C. valves calls for very special design if a full performance plus complete stability are to be obtained

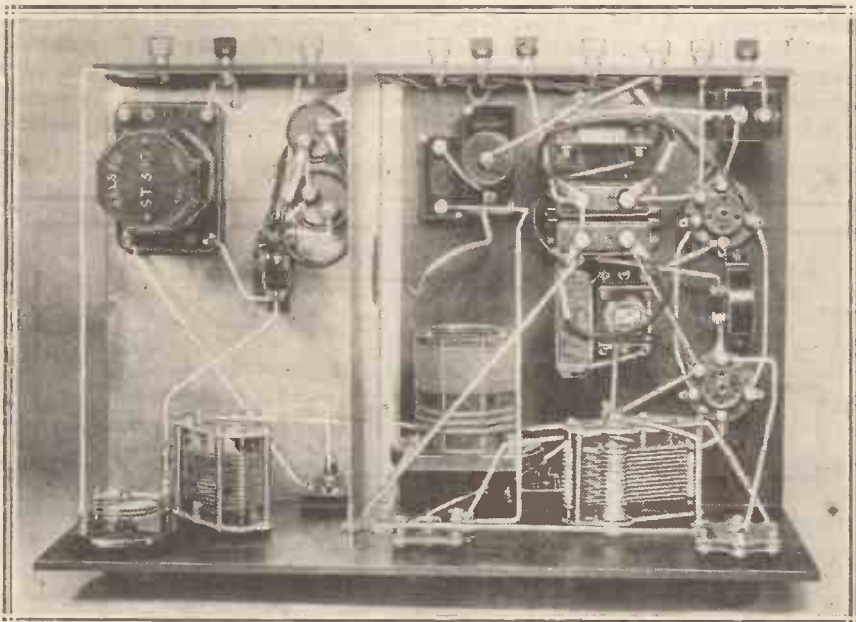
Transformer Ratios

The transformer itself—if a Parafeed is used—is a 1:6 ratio model wired as a 1:7 auto-transformer. (You can, however, use a standard 1:3 Parafeed wired as a 1:4.) The Niclet used in the battery model "S.T.300" may also be used in this mains set, but it should be wired as a 1:4.5 auto-transformer.

The coils, condensers, chokes and several other components have been changed in this mains model, but they are interchangeable with those previously used, and no particular significance attaches to the change. I do not advise the use of high-minimum .00004-mfd. aerial couplers, particularly in this A.C. version, where the amplification is so great

The "S.T.300" for Your A.C. Mains!—continued

"SPAGHETTIS" FOR SUPPLYING AUTOMATIC GRID BIAS



Automatic grid bias is applied by means of the voltage drop across resistances, which are connected to the cathodes of the various valves as shown here and in the wiring diagram. In the case of V_2 the bias is automatically removed when you switch over from gramophone to radio.

owing to the greater mutual conductance of most A.C. valves. Keep to the types advised if you want maximum control and selectivity.

The small negative potential for the grid of the detector valve when the latter is used as the first amplifier for gramophone work is obtained by automatic grid bias. The values of all the grid-bias resistances depend on the makes and types of valves used. I give a separate table for these, but the valve makers will always assist readers who require special advice or information.

Radio-Gram Switching

The change-over from radio to gramophone is effected by switching over the grid of the detector from the anode tuned circuit to the pick-up plug, which has been inserted in a jack chosen because of its reasonably low capacity and very convenient terminal arrangements, which obviate soldering to tags—an unpleasant task to many constructors; when radio is being received, the automatic grid-bias resistance of the detector is shorted by contacts on the jack, but when the pick-up plug is inserted the grid bias comes into action.

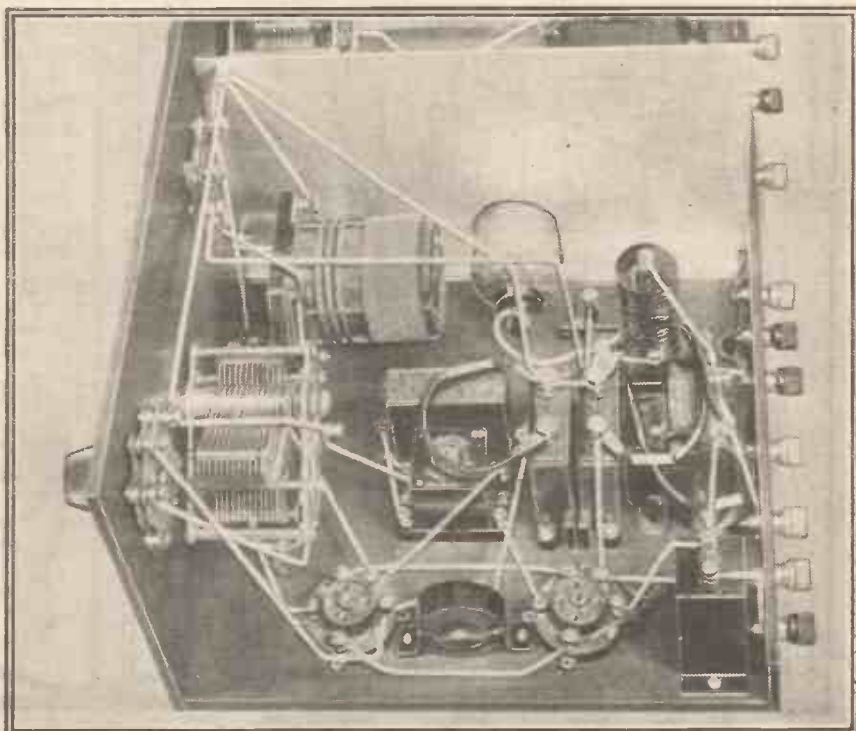
There is no volume control in the set, because for radio the S.G. tapping on the eliminator will serve, and there are also the selectivity controls which may be used. For gramophone purposes an external volume control is now so common that a fitment on the set was deemed unnecessary.

Feeding the Loud Speaker

I have used an output L.F. choke and 1-mfd. condenser for feeding the loud speaker. It may be as well to point out that the two 1-mfd. condensers next to each other on the L.F. side of the screen are of the flat pattern. Cylindrical ones could not be fitted in this space unless the baseboard were carried farther back. The terminals mounted on the terminal strip should be of the threepenny type; the larger variety would project too far inwards in this set.

I have fitted a safety condenser of .001 mfd. in series with the .0001-mfd. differential, as the clearances in the latter are on the small side.

CHOKE-COUPLED OUTPUT FOR THE LOUD SPEAKER



In the right foreground will be seen a large fixed condenser that is joined to the loud-speaker terminal. In conjunction with the adjacent L.F. choke it feeds the loud speaker, but prevents the flow of direct current through it—an arrangement making for both stability and safety.

The "S.T. 300" for Your A.C. Mains!—continued

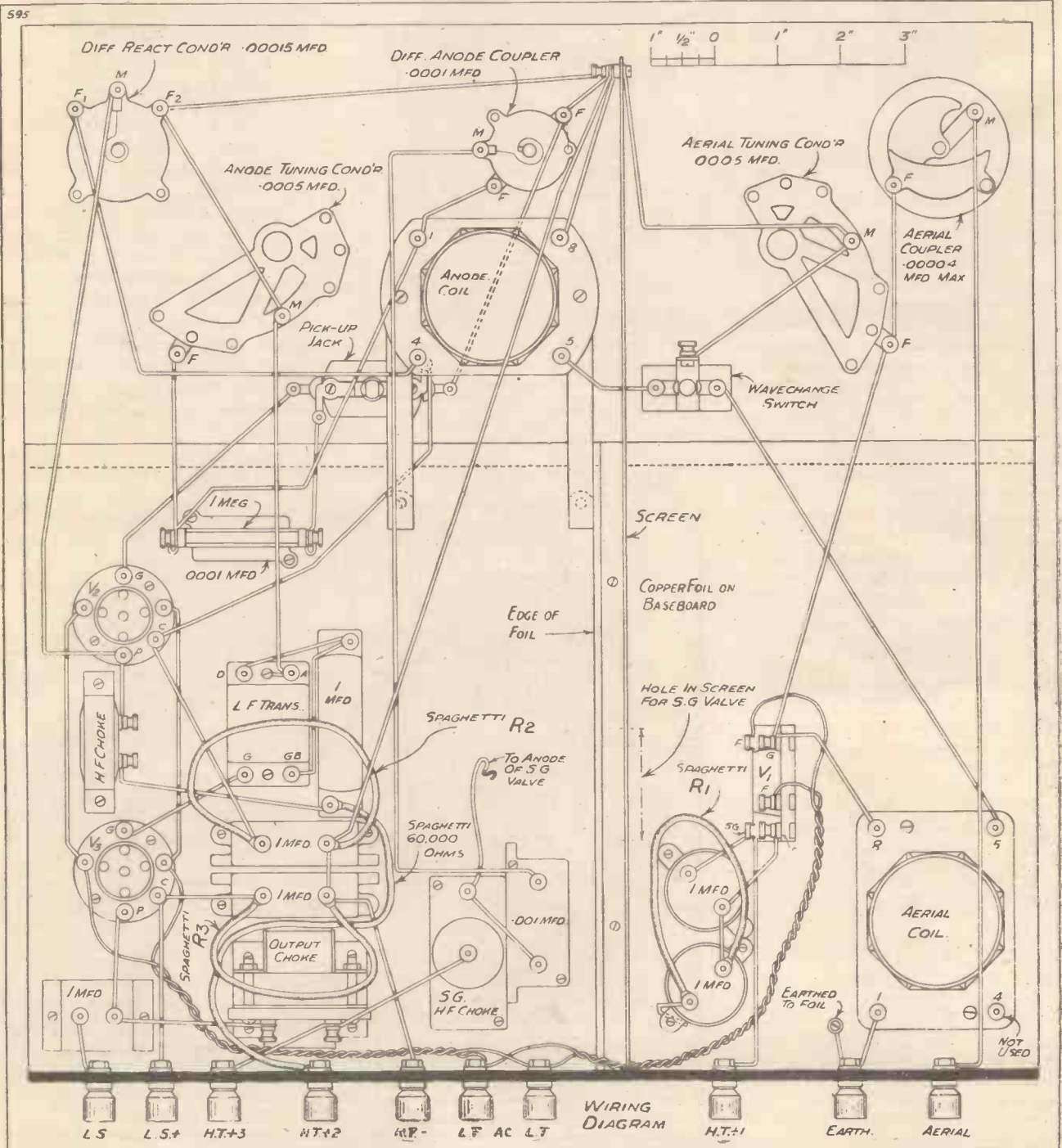
The stability of the whole set is very good. The H.F. side is perfectly satisfactory, but if any departures from the design cause a tendency to oscillate, a small movement of the anode coupler knob to the left will remedy the trouble.

Such tendency to oscillate may occur on the long waves if you use a different push-pull switch than that specified. This applies to battery models as well, and is due to capacity coupling between the circuits. The switches mentioned have a metal third

contact rod which acts as an earthed screen between the other outside contacts.

Please note that if a 1:3 Parafeed or a standard Niclet is used the coupling condenser (nearest to it in the drawing) is preferably of $\frac{1}{2}$ mfd. capacity.

THE DESIGN FOR USING INDIRECTLY-HEATED VALVES



Note the twisted flex leads that are used for connecting the filament terminals of the valve holders to the 1-volt A.C. supply. The anode coil is mounted on the supports supplied with it, exactly as in the original "S.T.300" design.

IS YOUR "S.T.300" QUERY ANSWERED HERE?

By
**JOHN
SCOTT-TAGGART**

Some of the questions most frequently asked in readers' letters about the "S.T.300" are dealt with here. The answers contain many helpful points for those who have built the receiver.

Q. I have built your "S.T.300," but find the condenser readings vary somewhat from those in your list. Why is this, and does it matter?

A. The reason may be (a) different condensers or (b) different coils than those used. The first reason will not affect signal strength or wave-length range, but on some makes you may find a little "crowding" of stations at (usually) the bottom end of the dial. This only affects ease of tuning and logging. The "law" of some variable condensers is not properly thought out in all types. For example, with one condenser across a medium-wave coil I found that a division was equivalent to 32 kilocycles at the bottom end and 8 kilocycles at the top.

Differential's Effect

If the coils are at fault you likewise will not lose signal strength, but stations may "slip off" the dial. Another fault—also manufacturers', not mine!—is due to differential anode couplers of slightly different capacities. The anode coupler provides a small parallel capacity across the tuning condenser. If your anode tuning condenser readings are so low that some station just "slips off," I suggest you move the coupler knob a little to the left or right of vertical (preferably to the right if selectivity permits; a bigger effect is noticeable, however, if the knob is moved a little to the left). The above fault is rare.

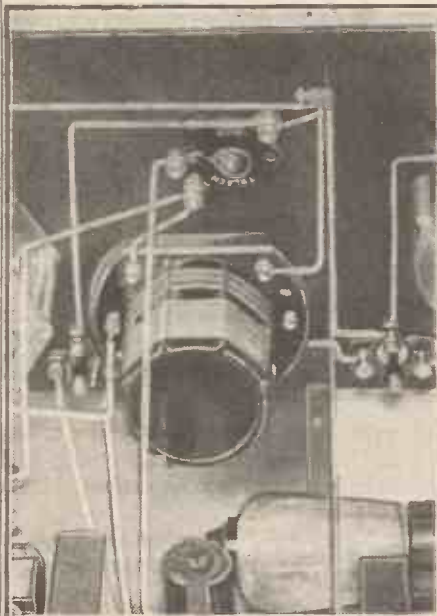
Q. The difference in readings between the two variable condensers in your set increases at the bottom end. Why is this?

A. This is because there is a "ballast" capacity across the anode coil due to the "stepping-stone"

effect in the anode coupler. The discrepancy is lessened when the two couplers are over to the right, and the readings may even cross over. It looks nice to see two columns of figures reading identically, but unless they are *absolutely* the same you gain nothing. If you have to log the readings for sixty stations it is as easy to go back to 51, 54, as to 51, 52! And, technically—provided the stations come on the dials—there is no difference.

Q. I have a .0003-mfd. grid condenser and a 2-megohm leak. Can I use them on the "S.T.300"?

CONDENSER DIAL READINGS



The differences between dial readings are largely governed by the anode coupler seen in the above illustration, and partly by the setting of the aerial coupler. The readings do not have to be the same.

A. Try them, by all means. I believe in readers trying to use their existing components if of high quality. This is an opportunity to vent my views. It's not my job to try and get you to buy new components. All I am concerned about is that you shall get the results I get and which I have demonstrated. But you may easily, by "making do," lose signal strength or range. It is terribly difficult to advise a reader who wants to make all sorts of changes. Each *may* make, say, 5 per cent difference, and you may not mind losing it if the alternative is heavy expenditure. But these 5 per cents in different parts of a set may tot up and make a big difference.

Ferranti Transformers

Several readers, by the way, who have the larger-sized Ferranti transformers want to know if these will work in the "S.T.300." Yes, excellently. A little wangling on the baseboard is necessary, as they take up a little more floor space than the Niolet I used.

Q. We regret to note that in the "S.T.300" you did not use one of our — (grid leaks, spaghetti, condensers, etc.). We shall be interested to know whether in future sets you will be, etc. [This is from about fifteen manufacturers!]

A. Unfortunately, I have as yet never designed a set which pleased all the trade. One cannot use more than one pair of variable condensers in the "S.T.300," any more than one can wear more than one pair of trousers! The fact that I use a component in a set means, of course, that I think it is good; but I wish all readers to understand that my inevitable choice of

Is Your "S.T.300" Query Answered Here?—continued

one make does not preclude there being others just as good, and those others will, as likely as not, be used in future sets.

Having said that, I may add that my concern is for the reader and the reader alone. A wholesome and successful radio component industry will automatically result from that policy. Manufacturers, I know, will agree.

An Important Point

There are, by the way, sometimes curious reasons for giving only one make of component. Take the wave-change switch on the "S.T.300." Note its position very close to the screen. Note that the "plug" is earthed. When receiving long waves, the capacity between the other two contacts is practically nil, because the "plug" acts like a screen between. I made a scrutiny of several other three-point switches, but considered the capacity effects too high for my particular purpose.

oscillate if you have modified the design.

Q. What is a good method of volume control when receiving the local station?

A. The correct method would be to turn the aerial coupler to the left and slightly retune on the left-hand tuning condenser. This, however, is not as simple as turning the anode coupler to the left. But note that when this is done reaction must be at zero.

This method is absolute silent in operation and extremely effective for family use. If there is a tendency for a heterodyne whistle to appear as the anode coupler is turned, alter the setting of the right-hand tuning condenser slightly and use the new reading as the correct one.

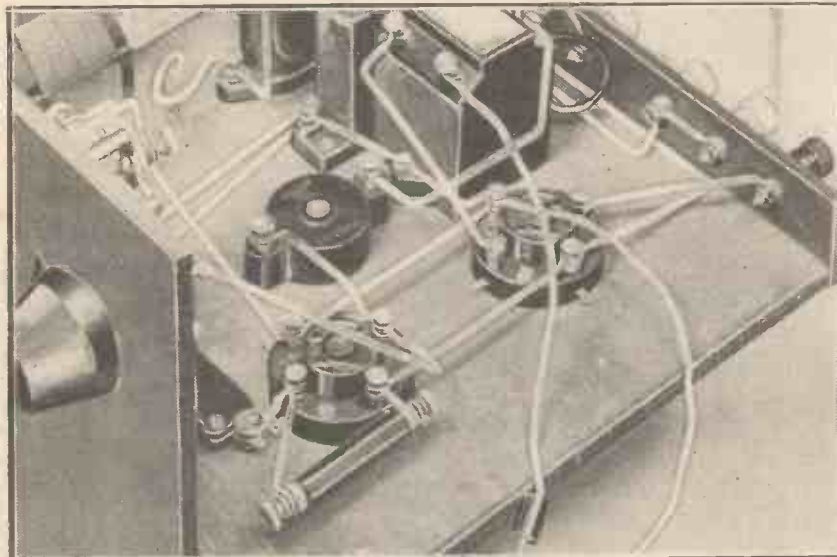
Q. Can I use a pentode with the "S.T.300"?

A. Emphatically, yes. The results are extraordinarily good. A

another valve at the *beginning*, so as to get Timbuckzizlin, Katchvodkoff, and other fascinating but remote stations—or to get more selectivity when very close to a B.B.C. station—I suggest you use another S.G. valve with exactly the same differential anode coupling I invented for the "S.T.300."

Everyone can add another L.F. much more simply, at little extra cost, and without hardly altering the set. A resistance-capacity stage is best added after [the detector. For most people this extra stage is quite unnecessary, but if you are very near a B.B.C. station the selectivity controls may cut down the strength of some of the near-by (in wave-length) foreign stations. The extra kick from a second L.F. stage will give you the extra selectivity. This effect does not apply to 99 out of 100 sets. It is a special advantage derived from the "multiple selectivity" selectivity system.

OBTAINING GREATER L.F. AMPLIFICATION



The L.F. end of the set, seen above, uses one low-frequency stage, which is ample for ordinary purposes. But if extra power is desired, a pentode valve can be used for the output, or another L.F. stage can be added. In the latter case, the best scheme is to fit an R.C. stage after the detector.

You see, the middle points of both coils come to the wave-change switch, so if there is capacity across the switch you will lose all the effect of the screen inside the S.G. valve, and the set may oscillate on the long waves. This can be stopped at once by turning the anode coupler a little to the left.

This, incidentally, is always a cure in the "S.T.300" for a tendency to

oscillate will bring up stations not on my list and also enable very high selectivity settings of the couplers to be used.

There will, in using a pentode, usually be the necessity for tone correction.

Q. Can I add another valve to my "S.T.300"?

Yes, certainly—provided the neighbours don't object. If you want

* **AMPLE VOLUME** *
* **FROM MOSCOW** *

Sir,—As a keen experimenter and constructor of wireless sets, I feel I should like the opportunity of testifying, without fear of contradiction, as to the capabilities of the "S.T.300" circuit, a demonstration of which Mr. Scott-Taggart was kind enough to invite me.

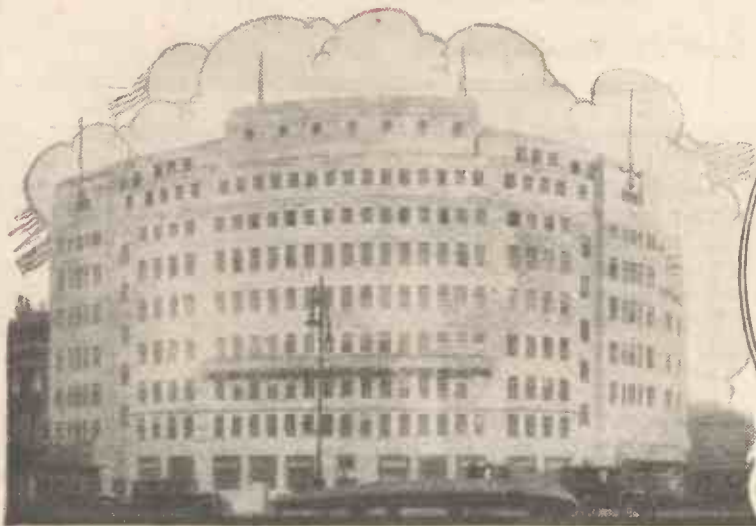
For clarity and strength from foreign stations, together with its unique selectivity, I can safely say I have never met with its equal; and the fact that Moscow could be listened to with ample volume, also the Eiffel Tower could be completely separated from Warsaw, are sufficient examples of both these much-needed advantages; yet the "S.T.300" is simplicity itself to construct and operate, a few hours only being necessary to enable one to become quite used to its manipulation.

When it is borne in mind the number of stations that can be heard with this wonder set, I feel sure that all who construct it will not regret a penny of their expenditure.

Yours faithfully,

E. G. SAURIN.

1a, Ossington Street,
London, W.2.



B.B.C. NEWS

Topical notes regarding British Broadcasting Stations and Programmes.

By Our
Special Correspondent.

Trade Restiveness

THESE are signs of trade restiveness about the B.B.C. This is due in part to the failure to function of the liaison committee set up between the B.B.C. and the wireless trade about two years ago.

According to opinion in the trade, this body has never really functioned and has now been put to sleep by the B.B.C. Another independent "Broadcasting Committee" has been set up by the Radio Manufacturers' Association and it proposes to be much more active.

Basically there is the feeling that the B.B.C. drifts steadily away from an appreciation of the needs of the trade, and that in its new mantle of exclusive highbrowism it forgets its trade origin and primal allegiance.

So strongly is this view held by leaders of the wireless industry that it is contemplated to prepare already for making adequate representations to the Parliamentary Committee on Broadcasting, which will be set up three years hence to review the B.B.C. and recommend the future form of broadcasting in this country.

Simultaneously, strong organisations of advertisers are studying the problem of how to get "on the air" for advertising purposes in some future organisation or organisations.

Big events are shaping themselves and the B.B.C. is in for much fiercer struggles than it has ever encountered before. Sir John Reith loves nothing better than a fight, and this time he will have foemen worthy of his metal.

The Opera Controversy

Once again the controversy between "studio opera" and "O.B. opera" has broken out. The cause this time

is the dissatisfaction of the B.B.C. Music Department with the varying standard of performance of "outside" broadcasts of opera, which although recognised to be satisfactory for public performance is not considered at all suitable for transmission.

Then there is the further point that a growing body of listeners yearn for the old days of studio opera, specially adapted and "cut" to popular requirements. I anticipate that before very long there will be at least a partial reversion to the original policy of studio opera for broadcasting.

This does not mean that the B.B.C. will withdraw its support from the excellent enterprise at Covent Garden.

It does mean, however, that it becomes increasingly urgent to secure a united front among all those interests concerned with the public performance of opera in Great Britain.

Radio Drama in Danger

Although the B.B.C. performance of the thriller "Rope" was recognised as a conspicuous success by the critics, I hear the psychologists have weighed in so heavily at Savoy Hill that there is a danger of fresh restriction on the field of dramatic effort.

It is much to be hoped that any such interference with the logical development of this new art form will be vigorously resisted. Mr. Val

AN INTERESTING RADIO DEMONSTRATION



The Rt. Hon. J. H. Whitley (ex-Speaker of the House of Commons) addressing the audience at a recent demonstration of good and bad radio reception at the London School of Economics. Some of the varied types of loud speakers used for the demonstration can be seen in the foreground.

B.B.C. News—continued

Gielgud, Mr. Harding and Mr. Jack Watt should be given their heads as long as they keep off politics and religion.

Duplication of Music

There has been a good deal of irritation among listeners lately because of the spread of duplication of musical items. It has not been unknown for such pieces as "In a Persian Garden" to be given half a dozen times on the same day.

The difficulty appears to be in co-ordinating the outside broadcast concerts with the studio concerts. I am glad to hear that the Music

By the B.B.C. accepting responsibility, the cause of this anxiety is automatically removed from him.

It will be interesting to see to what extent, if at all, the B.B.C. will tolerate any extension of Sunday programmes for wireless. And then, if they do it for the wireless exchanges, what will be the attitude of the direct listener?

Status of Regional Directors

With the new policy of increased decentralisation and cultivation of local interest, there has come a logical recognition of the improved status of Regional Directors.

Those who study the problem from the angle of the general efficiency of the service are advocating no substitution. They think that a silent period between five and six would not only be very popular in enabling people to listen to the Continent, but also would save money for strengthening the real entertainment periods.

"Reorganisationitis"

People in the B.B.C. tell me that the place is undergoing another attack of "reorganisationitis," the disease which afflicts all such public institutions regularly. The real cause of the present attack is obscure, but it is believed not to be unconnected with the activities of the new Governor, Mr. Harold Brown, who is supposed to have been the nominee of Lord Plender and Mr. Neville Chamberlain.

Daventry Moving

The B.B.C., with the consent of the other wireless services concerned, has decided to move the whole of Daventry to a new site farther west and closer to Birmingham. This will considerably increase the effective range of the transmitters, especially in the West. North Wales also will benefit.

Paying for the Enquiry

The care with which the B.B.C. has explained that the cost of Sir William Beveridge's "Family Life" inquiry falls upon other shoulders is explained by the fact that the money is really derived from the Rockefeller Institute through the London School of Economics.

Presumably, therefore, the scheme is American in origin. It is unlikely that any British organisation, on its own account, would undertake such a strange venture so ill-adapted to national psychology. I have heard of scores of amusing replies that have been sent in; apparently hospital doctors and nurses are having a lot of fun about it all!

A BRITISH AMATEUR WHO BEAT ALL RECORDS!



Mr. H. L. O'Heffernan, a British radio amateur, who won the last International relay competition promoted by the American Relay League. He succeeded in obtaining more than double the number of marks of any other competitor, there being many hundreds of entrants from all over the world.

Department at Savoy Hill is aware of the evil and is trying to deal with it.

Wireless Exchanges

The B.B.C. has practically completed an arrangement which will give it virtual control of the programmes selected by wireless exchanges. This, no doubt, is a triumph for B.B.C. diplomacy, but I wonder if it is realised yet what may be involved in the way of responsibility.

As a manager of a wireless exchange put it to me, one of his chief anxieties has been how to deal with the programme criticisms of subscribers.

This is all to the good, and I hope to hear that those very able and devoted servants of broadcasting who represent the B.B.C. outside London will soon take their places at the headquarters council tables with the same rank as the chiefs of the branches there.

Future of the Children's Hour

Recent changes in the staff of the London and Daventry 5XX Children's Hour have revived the old problem of whether the time has come to discard the Children's Hour as a relic of the pre-mature days of broadcasting.

NEXT MONTH

The May Number of
**"The WIRELESS
 CONSTRUCTOR"**

will be ON SALE April 15th.

USUAL PRICE ORDER NOW



A PRACTICAL MAN'S CORNER

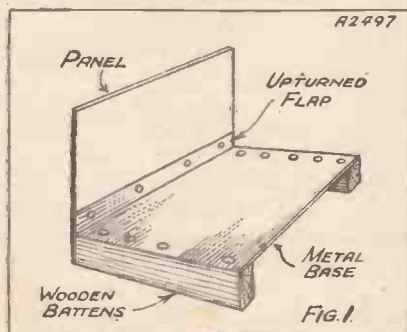
By R. W. HALLOWS, M.A.

In these pages, month by month, our contributor packs a wealth of practical information and advice on constructional work. The regular reader of this "Corner" cannot help picking up a more or less complete training in radio workshop practice, while every month there are wrinkles to read, gadgets to make, or hints to help you.

Chassis Making

WHY not make your own chassis for the building of receiving sets? There are several easy and cheap ways of doing the job. The fundamental idea upon

A NOVEL IDEA



Why not make your sets up in chassis form? For the handy constructor it is a comparatively simple matter, as the above diagram shows.

which are based the methods that I am going to describe are illustrated in Fig. 1.

To the panel are fixed, by means of screws, a couple of wooden battens about $\frac{3}{4}$ in. in thickness, 3 in. in height, and of whatever length may be required. On to these and to the panel itself is bolted a piece of sheet metal.

Fixing to the panel is done by means of bolts passed through holes in an upturned flange in the sheet. The panel may be of wood, ebonite, or metal, according to requirements. Personally, I have rather a fondness for metal panels for two reasons.

In the first place, they completely eliminate hand-capacity effects—this is particularly important in sets designed for short-wave work;

secondly, they reduce the number of connections, since the spindles of variable condensers and the other components mounted on the panel are automatically earthed.

If you like the look of ebonite you can have a panel of that material and make the upturned edge of the base so high that it covers the whole of the back of the panel that is above the wooden battens.

Further Points

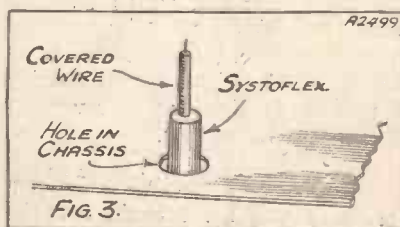
The idea of raising the base 3 in. or so on battens is to allow quite a number of components, such as fixed condensers, resistances, small chokes, and even midget low-frequency transformers, to be mounted on its underside. This saves a great deal of space. The head room required by valves is, including the holders, on the average not more than about 5 in.

If you allow $5\frac{1}{2}$ in. to be on the safe side, the total height of your panel is thus only $8\frac{1}{2}$ in., and you

can bring it down to 8 in. if you make the battens only $2\frac{1}{2}$ in. in height.

A slight variation of the first method of constructing chassis is illustrated in Fig. 2. Here battens are not used, and the metal base is made with two flanges. One of these turns upwards and is bolted to the panel, whilst the other turns downwards and serves as a rear support.

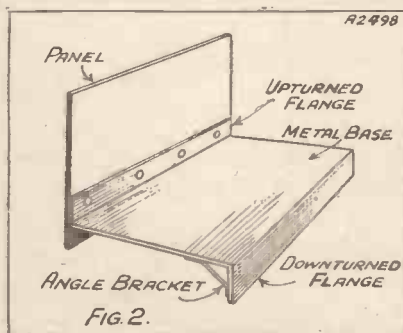
WIRING-UP



Great care is necessary when bringing wires through the metal. This diagram shows how a small length of systoflex can be slipped over the wire for protection.

Unless the metal is fairly stout, small angle-brackets should be used as strengtheners under the back right-angled bend of this kind of chassis.

ANOTHER METHOD



Here is a slightly different method of making a chassis. In this case the base is made completely of metal, a downturned flange at the back providing the necessary support.

Recommended Materials

Before the days of potted coils and of metallising the bulbs of valves the only two metals that could be used for chassis, unless we were to put up with rather serious losses, were copper and aluminium.

Iron would not do, for if it were placed in the fields of unshielded coils the eddy currents set up were, to say the least of it, undesirable. But now that we can our coils in aluminium, and cover the bulbs of H.F. and detector valves with a zinc coating, and place our ganged

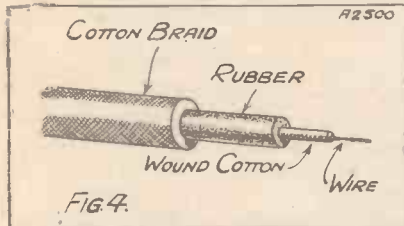
A Practical Man's Corner—continued

variable condensers in neat aluminium boxes, we can use pretty well what we like for the chassis.

Most of those in commercial sets are made of iron or of pressed steel. The advantages are obvious: iron and steel are both cheap and strong. This opens all kinds of possibilities for the amateur maker of receiving set chassis.

The type shown in Fig. 1, for example, can be made from the lid of a biscuit tin. The rim is cut away round three sides with tin shears and

FOR HARD WEAR



An alternative to the systoflex method of protection is the use of heavily braided leads, such as that employed by electricians for house wiring.

the lid is then reduced to the required size. The remaining edge of the rim is left and this forms the required upturned flange. The tin plating of the lid has the advantage of keeping it nice and bright and preventing rust from disfiguring it.

Other Metals

It may well be, though, that the size of the piece that you require is such that a biscuit tin will not do. From a shop which deals in metals you can obtain tinned sheet iron of suitable gauge, and it is not a difficult business from this to make up chassis in either the Fig. 1 or Fig. 2 form.

First of all, mark out on the sheet the size that you require, not forgetting to include the flange or flanges, as the case may be. Cut this out and then scribe deeply along the lines where the flanges are to be bent. Obtain a rectangular piece of wood 3 or 4 in. square in section and use this as a moulding block. The best method of making a flange with the aid of this block is the following:

Drill four or five small holes in a row just inside the scribed line where the bend is to be. Place your flange on the moulded block, arranging it so that the scribed line is exactly coincident with the edge.

Then fix it down with small wood

screws. With a mallet you will have no difficulty in bending your flange exactly at right angles and in flattening it out neatly. This done, the chassis is unscrewed from the moulding block. If there is a second flange to be made the job is done in the same way.

A Useful Material

But we are by no means limited to tinned sheet iron for the material of our chassis. From the metal merchant you can buy something else which is cheap, easily worked, and in other ways exceedingly convenient.

This is perforated zinc of fairly stout gauge with holes about $\frac{3}{16}$ in. in diameter. Shaping is done in the way already described, and the holes will save a very great deal of drilling work.

Since there are so many of them you can pass your wires as you will from one side to the other of the base. They are, too, a loose fit for 4 B.A. bolts, and you will find that with a little manoeuvring you can mount most components without having much drilling to do.

Chassis Wiring

I have come across a surprisingly large number of troubles due to using for metal chassis sets wires whose insulation was designed for the older wooden baseboard and ebonite panel method of construction.

If you care to make a simple experiment you can easily satisfy yourself that wire of this kind is not good enough for a metal chassis. Take a piece of double-cotton-covered wire, or enamelled wire, or of wire with an

inner covering of cotton and an outer covering of glazed material.

Connect one end to a terminal of a voltmeter and join the other terminal of the instrument to, say, the positive pole of an accumulator. By means of a piece of flex connect the other battery terminal to the blade of an ordinary table-knife.

Bend the wire under test into a right-angle at one point. Now apply the back—not the edge—of the table-knife to the right-angled bend with a gentle sawing motion.

It will not be long, I think, until you obtain a reading from the voltmeter which shows that the insulation has broken down and is allowing current to pass.

In Practice

This is precisely what happens in actual practice. All the wires in the receiving set are subject to a certain amount of vibration, and unless the insulating covering is of a very sound kind it rapidly becomes worn through at the point where the wire passes through a hole and comes into contact with a metal edge which is just about as sharp as the back of a table-knife.

Then a short-circuit happens—and you know the rest of the story. One of the first kit sets to use a metal chassis achieved something like a record number of "blow-ups" because unsuitable wire was sent out with the kit of parts. The makers have taken this to heart in this year's model.

The Wire to Use

There are several ways in which you can make your wiring secure with a metal chassis. One is illustrated in Fig. 3. Over each lead which passes through a hole in the chassis slip a piece of systoflex of suitable length.

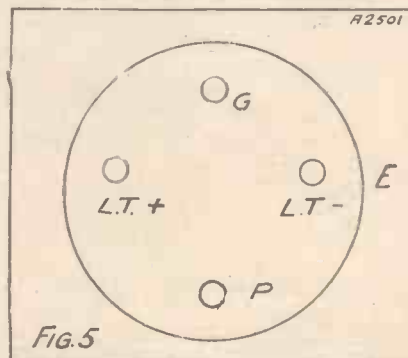
Systoflex is tough stuff and will prevent trouble, especially if the insulation of the wire itself is good. The second method is to make use of the smallest kind of wire that electricians use for domestic wiring.

This is illustrated in Fig. 4. It has an outer covering of coarse braided cotton, inside this is a thick rubber sleeving, between which and the wire itself is a winding of cotton.

This sort of wire will stand any amount of wear without its insulation giving way and it is perfectly safe to use for chassis work.

(Now please turn to page 378.)

METALLISED VALVES



This is a view of a valve holder showing the pin which is usually connected to the metal coating on the valve. Care should always be taken that this is made the earth side of the L.T. battery.

AS WE FIND THEM

NEW APPARATUS TESTED



Under this heading we publish reviews of apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

H.M.V. Model 435

THE H.M.V. Model 435 receiver is an "all mains" design utilising three indirectly-heated valves, the loud speaker being incorporated in the set.

Briefly, the circuit comprises a band-pass aerial tuner followed by a screened-grid H.F. stage coupled to the grid circuit of a power-grid detector by the parallel-feed method.

The rectified output from the detector is passed through a 1-7 ratio shunt-fed L.F. transformer to a pentode output valve capable of supplying approximately $1\frac{1}{2}$ watts of undistorted energy.

The loud speaker is a permanent-magnet moving coil, the coil resistance being 8 ohms, and a step-down transformer is interposed between the pentode and the speaker.

The valves used are a Marconi M.S.S.4 screened-grid, M.H.4 detector, and an M.P.T.4 pentode. The rectifier valve is a U10. The Model 435 receiver is suitable for mains having voltages of 100-160 and 200-250, 40-100 cycles, and the power consumption is stated to be 35 watts (approx.).

Calibrated Scale

The set has been designed to give simple and trouble-free operation, and in order to achieve this the tuning circuits are ganged together to form a single-knob control.

It is interesting to note that the receiver is calibrated in wave-lengths, hence the wave-length of the desired station being known it is only necessary to rotate the tuning control until the pointer is opposite this figure on the scale.

The scale, which is illuminated, is automatically changed from medium to long waves by the action of the complete control switch. In the gramophone position the scale rotates to the word *Gramophone*.

The receiver can be used either with a normal aerial or a mains aerial, and provision is also made for connecting up additional loud speakers external to the set.

A FINE SET



This H.M.V. all-mains receiver is a magnificent engineering job, and has recently been reduced in price to 20 guineas.

Those who wish to employ a gramophone pick-up can quite easily do so by joining this to the pick-up terminals on the receiver, and there is, of course, a special H.M.V. playing desk which is eminently suitable for these listeners.

On test the set gave powerful reception, and both the sensitivity and selectivity were of a very high order.

The calibration scale was accurate and the operation delightfully simple.

At Tallis House, under daylight conditions, the Midland and Northern Regional transmissions were received

at excellent strength, and it seems unnecessary to add that the London National and Regional transmitters were separable with the greatest of ease. On the long waves Radio-Paris came in powerfully and free from 5XX.

At night there was no difficulty in bringing in a large number of continental stations, and the sensitivity of the instrument is such that in many cases the volume control was needed.

With regard to the reproduction, the tone balance was extremely good and speech crisp and clear.

The very fine results achieved, coupled with the attractive cabinet-work and mechanical perfection, place this Model 435 receiver right in the forefront of its class.

"Audirad" Choke

It is a well-known fact that much of the interference in mains-operated (not necessarily "all mains") sets is caused by stray high-frequency currents picked up by the mains themselves.

In D.C. supplies, for instance, it is possible for these H.F. currents to be modulated at low-frequency by the D.C. ripple, and thus produce a hum in the loud speaker.

Receivers employing an H.F. stage are particularly susceptible to the presence of these stray high-frequency currents, but practically any set is liable to the trouble unless certain precautions are taken.

Increasing the smoothing by means of L.F. chokes is ineffective, and the remedy lies in the use of high-frequency chokes in series with the mains supply.

Chokes of this type have to combine the qualities of high impedance to

As We Find Them—continued

H.F. and low self-capacity with the ability to carry the whole of the current flowing through the smoothing circuit, and the question of cost is one which cannot be ignored.

Any simple, inexpensive method of overcoming the problem may be regarded as real progress.

A GOOD PROPOSITION



The new "Audirad" choke is a combined L.F. and H.F. component. In addition to its smoothing and filtering properties, it also functions satisfactorily as a stopper of H.F. interference picked up on the mains.

Messrs. Radio Instruments, Ltd., Purley Way, Croydon, have successfully applied themselves to this task and as a result have produced a compact dual-purpose component which they have named the "Audirad."

The "Audirad" occupies the same amount of space as the orthodox smoothing or filter output choke, in spite of the fact that it is capable of dealing with H.F. as well as L.F.

It has a nominal inductance rating of 25 henries to L.F. currents, a figure which is well maintained over a wide current range. The maximum D.C. current is 50 m.a.

The inductance of the H.F. "stopping" is given as 10,000 microhenries, and a practical test in THE WIRELESS CONSTRUCTOR laboratory revealed the "stopping" properties of the device to be very satisfactory.

The "Audirad" is a very sound proposition, and in view of its extremely moderate price (8s. 9d.) we feel sure that it will achieve a well-merited popularity.

Blue Spot Loud Speaker

The British Blue Spot Company's loud speaker type 44R is among those we have recently tested.

This model employs the well-known 66R Blue Spot unit and is fully adjustable for sensitivity.

The reproduction given by this speaker is very good indeed and is characterised by a crispness and freedom from "boominess" and unpleasant resonances.

Its power-handling ability is ample, while its sensitivity is such that it will work well in conjunction with the smallest receivers. The cabinet-work is excellent, and retailing at 52s. 6d. this speaker is an attractive proposition.

"Kinva" H.F. Choke

An H.F. choke, like other inductances, produces a magnetic field. In consequence some makers wind their chokes astatically in order to eliminate the effects of this external field.

Messrs. Postlethwaite Bros., of Stourbridge, however, have decided that nothing short of complete shielding is good enough.

Hence the "Kinva" choke is surrounded by a detachable metal screen.

The choke winding itself is section-wound in order to ensure low self-capacity and a very large number of turns of wire are employed.

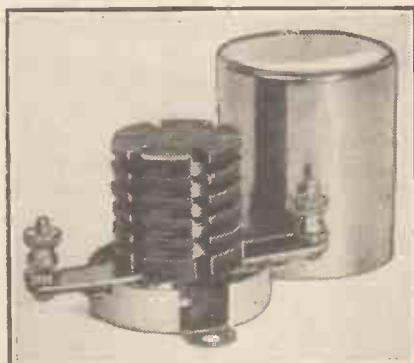
It may occur to the reader that the result of the metal casing would be to reduce the effective inductance of the winding, but doubtless the makers will have allowed for this by increasing the number of turns accordingly.

On test the choke behaved very satisfactorily. Two types are available, viz., for metal chassis and base-board mounting. The price is 2s. 9d.

Atlas Mains Unit

With reference to our report on the D.C.15/25 mains unit in the February issue, Messrs. H. Clarke & Co. (M/cr.),

A SCREENED H.F. CHOKE

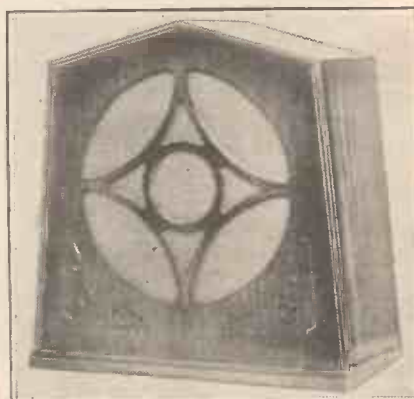


The "Kinva" H.F. choke is completely screened in order to eliminate the effects of its external magnetic field.

Ltd., point out that a condenser is provided for in the earth lead, in which case there is no need to insert a series condenser in the existing earth connection on the set.

When the mains unit is used, the earth lead is removed from the earth terminal on the receiver and transferred to the special terminal on the

A SENSITIVE SPEAKER



This is the attractive Blue Spot 44R loud speaker. The movement is provided by a highly efficient unit.

eliminator in accordance with the makers' instruction pamphlet.

Incidentally, the price of this unit is 39s. 6d.

Aluminium Screen

Messrs. Burne-Jones & Co., Ltd., 296, Borough High Street, London, S.E.1, have sent us an aluminium screen which they have produced for the "S.T.300" circuit.

This screen has an attractive sand-blast finish, and excellent rigidity has been obtained by using sheet of a stout gauge.

A hole for the S.G. valve, together with the necessary slots for leads, are provided. The price is 2s.

Sifam Fuses

The Sifam Electrical Instrument Co., Ltd., of Bush House, Aldwych, W.C.2, have sent us samples of their single and double fuse-holders, containing fuses rated at 5 amp.

The fuses are of the glass tubular enclosed type, and the holders are neatly constructed of a brown insulating material. The contact springs make a firm and secure connection with the metal ends of the fuses. These fuses are of value in mains-operated equipments and retail at 2s. and 1s. respectively in the double and single types.

John Scott - Taggart ASKS —

Is Band-Passing A Craze?

— AND EXPLAINS BRIEFLY WHAT BAND-PASS TUNERS ARE AND WHAT THEY DO



"ARE we," writes a reader to me, "to understand that you are opposed to band-pass circuits?" He has read my articles in the February issue of this magazine and has a suspicion that I am "agin" them. In case there are other readers with the same impression I am glad of this opportunity of correcting it.

Any scheme for giving greater selectivity must be endorsed, or at least sympathetically examined. The word "band-pass" has a magic ring about it which is all to the good, because it has added a great deal of glamour to multiple circuit systems which are bound to give greater selectivity. The average person is none too keen to "go in for" more coils and con-

densers than he can help. The band-pass vogue has done much to give an impetus to the "better selectivity" movement.

With the carrot of special tuning coils in front and the big stick of more and stronger stations behind,

Craze?" because we have rather lost our sense of humour while worshipping this golden calf.

Folly to Criticise

We have sworn allegiance to a faith which even this minute may be tottering. It is, however, folly to criticise band-pass tuning because its adherents over-emphasise its advantages. It is also unfair to blame the system, because in actual operation improper trimming, etc., often defeats the main merits which it possesses.

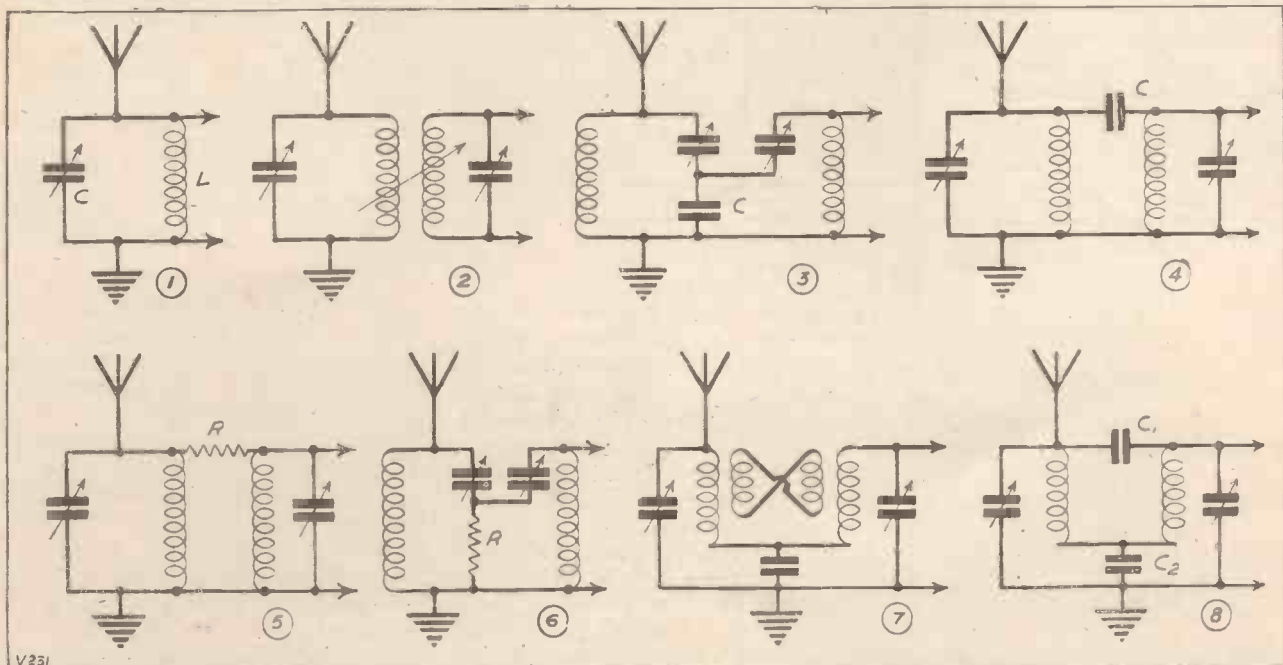
In my opinion, we have sung our praises of "top" (i.e. the top notes) several decibels too loud. We have shaken the rafters; in fact, to such an extent that some of them are dropping on our heads!

You will thoroughly enjoy this outspoken article, in which the author—whose "S.T.300" has already done so much for selective listening—outlines his attitude to band-pass circuits.

we have begun to trot towards the lush fields of "no-jamming," where we hope to browse in peace amongst the broadcast stations of the world. Now and again we kick out as new coils are introduced, but, on the whole, we keep fairly good-tempered.

I ask "Are Band-pass Circuits a

THE FUNDAMENTAL FEATURES OF BAND-PASSING SHOWN IN SKELETON FORM



Here are the eight circuits referred to in the accompanying article, showing the different forms of band-pass circuits, starting with the "grandfather" of them all and ending with the latest types in common use to-day.

Is Band-Passing a Craze?—continued

Word has gone round (it really went round several years ago, but our ears were dumb) that the worship of "Top" may have to cease. Some heretics are crying out in the marketplace: "To — with Top!"

The fact of the matter is that the top notes may be distorted by ultra-selective tuning, and then boosted up in the L.F. circuits. This idea is not new—there has been at least one voice crying in the wilderness—but it may revolutionise reception methods. Numerous research workers—including myself—are prospecting in this new territory.

Meanwhile I repeat that there has

view; tone correction is always possible afterwards, and many a poor L.F. transformer has in past years been used to give good final quality.

How It Started

The grandfather of all band-pass circuits is the simple inductance coil shunted by a variable condenser. This is shown as (1) in the figure. The next step is the "magnetically" coupled two-circuit arrangement; (2) where the two coils are placed close to each other. This simple arrangement gives very much greater selectivity than the single circuit, but a disadvantage is that the selectivity

couples the circuits, and the coupling is independent of frequency. Circuit (6) puts the resistance—which must now be small—so as to be common to both circuits; the arrangement has little practical value at present.

Circuit (7) is a type of mixed filter which, with effective ganging, is intended to pass a constant band over the whole wave-range. The two tuned circuits are now coupled by both magnetic (inductance) coupling and capacity coupling; in some form or another the most successful modern "mixed" band-pass tuners use this or some similar (and sometimes simpler) arrangement.

A CHILLY BROADCAST FROM VIENNA



This is a scene during the running commentary on the Workers' Winter Sports Olympia, held near Vienna. A vivid description of the events was broadcast, on 517 metres, from the microphone shown here at the winning post.

been too much praise of "preserving top" and not enough praise of the common-or-garden selectivity which band-pass tuning gives us. Nothing to my mind is more pathetic than to see a designer employing a band-pass system with the fanatical idea of "preserving top," and then when he comes to a pentode at the end of his circuit to see him introduce a tone-corrector circuit to cut out excessive top!

Real Selectivity

Even if band-pass circuits were not so good at preserving top notes, they would still be very good—better, in fact—from a selectivity point of

varies with the wave-length of the signals desired. Circuit (3) is another method of coupling two-tuned circuits, but here the "band" passed varies with the frequency of the incoming signals. The condenser C (of about 0.02 mfd.) is common to both circuits, but its reactance and "coupling power" will be greater on the longer wave-lengths—with resultant poor selectivity.

Arrangement (4) has the coupling condenser C in a different place; the condenser must be extremely small and the arrangement is far from being satisfactory. Circuit (5) is the Eckersley tuner arrangement. A resistance R of about 100,000 ohms

Double-Humping

Circuit (8) shows how a very small condenser, C_1 , and a large one, C_2 , can be arranged to give reasonably uniform selectivity over a whole wavelength range.

The device normally regarded as a band-pass circuit produces a resonance curve which is double-humped.

These double humps are planned to come close together so that a flat peak effect is obtained; this avoids a sharp resonance peak which, by reducing side-bands, cuts off the top notes. We are, unfortunately, still left with the extra-mural "skirts" of the resonance curve.

Look at any resonance curve of a band-pass tuner and you will find these "skirts"—the portion outside the two vertical lines or "walls" which you should draw $4\frac{1}{2}$ (not 9) kilocycles on each side of the zero point (the 9 kilocycles is between the walls). You are not meant to look at these. But they are skirts you ought to pry at because they represent sheer, unadulterated jamming.

The Honest Fact

The honest fact is that some well-known makes of band-pass tuners at fifteen miles from Brookmans Park will not only not give real 9-kc. separation, but will not completely separate Midland Regional from London Regional—which are ninety kilocycles apart!

But in spite of all its faults, the band-pass tuner properly used has fought a good battle against interference in thousands of sets. Some—and I'm not certain myself—say its funeral is already passing. If so, at least let us take off our hats.

WITH PICK-UP AND SPEAKER



by
A.
JOHNSON-
RANDALL

Using a pick-up with the "Vi-King" Band-Pass Four.

A LARGE number of readers have written to me asking for details of fitting a pick-up to the "Vi-King" Band-Pass Four.

Now, this is not a very difficult task, although a little ingenuity will be required in connection with the mounting of the radio-gram switch and pick-up terminals.

Two New Parts

If you turn to page 282 of the March issue you will notice that the L.T.+ and - terminals are immediately behind the V_2 valve holder and its grid connections.

In consequence, any modifications which involve the use of a switch in this part of the circuit will necessitate a special bracket to hold the ebonite strip for mounting the switch.

However, there are various methods of carrying out this part of the job, and this can be safely left to the constructor.

The alterations to the wiring are simple. A single-pole change-over switch will be needed, together with a couple of terminals. The switch can be of the push-and-pull type, or alternatively of the type requiring a half-turn of the knob for changing over.

This is immaterial so long as it is a single-pole change-over switch.

Wiring Alterations

The first operation after devising a mounting for the switch and two terminals is to remove the lead joining G of the valve holder V_2 to one side of the 2-meg. grid leak and .0003-mfd. grid condenser. This leaves the grid terminal of V_2 blank.

To this terminal connect the arm or spindle of the change-over switch. Join one of the other terminals on the switch to the terminal on the

grid-leak holder which was previously connected to G on V_2 .

Extra G.B. Tap

You will have mounted close to the switch two terminals for the pick-up leads. Connect one of these to the remaining terminal on the change-over switch. Join the second pick-up terminal to an additional G.B. lead, which can be called G.B.—3. This G.B. plug is inserted in the $1\frac{1}{2}$ -volt tapping on the grid-bias battery.

If you work out the connections you will find that when the change-over switch is in one of the two alternative positions the G terminal of V_2 is joined via the switch arm or spindle to the .0003-mfd. grid condenser and 2-meg. grid leak. This is the position for radio.

In the other position of the switch, G of V_2 is connected through the

switch arm to one of the terminals for the pick-up, the pick-up thus being joined between G and G.B.—3.

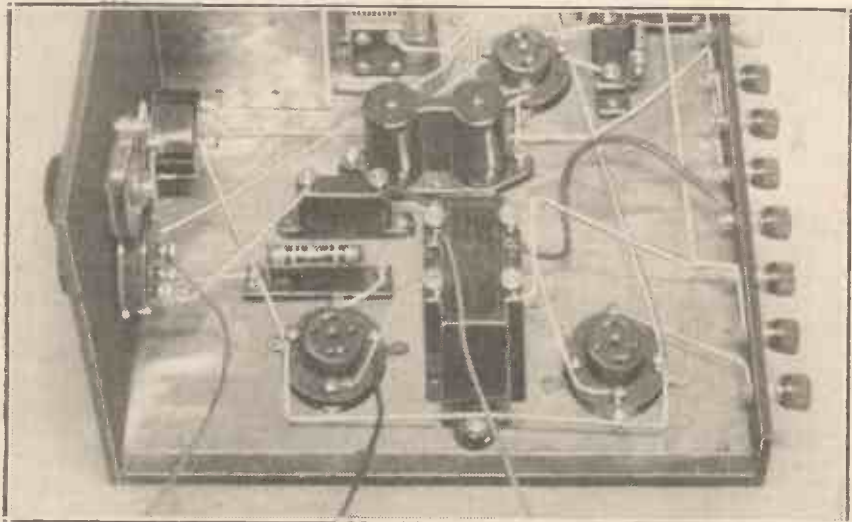
This scheme does not switch out the filament of the S.G. valve, and it is scarcely worth while trying to do this in one operation, since a switch having the additional contacts would be more expensive and, after all, the current taken by the S.G. valve is quite small.

Switching S.G. Valve

Actually the operation of switching out the S.G. filament is carried out by breaking the L.T.+ lead between V_2 and V_1 , and so those who wish to cut the S.G. valve out of circuit will have to arrange to break the L.T.+ lead between the points mentioned.

By the way, it is advisable to keep the reaction condenser at its minimum capacity when the pick-up is in use.

MODIFYING THE "VI-KING" BAND-PASS FOUR



This is the L.F. portion of the "Vi-King" Band-Pass Four, and details of the wiring alterations for fitting a pick-up are given above.



A reader's gadget—Simplified searching—When the fuse blows—L.F. and H.F. differences.

MY remarks the month before last about a special screw-driver which holds the screw during insertion in awkward positions have brought forth an extremely interesting letter from a reader. In it he describes, and gives diagrams, of an ingenious home-made tool which holds the screw very firmly on the end of the screwdriver blade.

Once the screw is started, the holder part is slipped out of the way and the tool used as an ordinary driver. Those readers who are interested in this tool will be pleased to know that the letter is to be published, with diagrams, in due course.

Keeping In Step

Searching on a set that has two tuning dials is easy enough if they keep more or less in step. But if they don't it's not so easy—in fact, it may be quite difficult.

When I come across such a case I get a tiny paintbrush, a little white

paint and proceed as follows. First of all I tune in about ten loud stations well spaced out round the dials (if you cannot find about ten fairly easily, including locals, of course, the set's not much good for distance) and note their readings.

Then on both dials I make white marks at these readings, and thereafter searching is simple. Knowing that the marks must be in step, it is easy to turn the dials so that intermediate points also are all but in step, since the paint marks occur every ten degrees or so.

A Fuse Tip

Here is a simple tip—so simple that perhaps some readers may feel insulted by its being mentioned. But please forgive me if you do, for I am sure there are some who will find it useful and who for some reason or other have not already tumbled on it.

With quite a number of sets a flash-lamp bulb is connected between H.T.— and L.T.— as a fuse. Some-

times such a "fuse is fused" and a spare one is not available and the set is wanted in a hurry for a particular item.

I have known people in such a predicament try to rig up some sort of gadget to short the bulb holder, or else alter the set's wiring to remove the fuse! It's quite unnecessary.

This is what should be done. Just remove the wire from the negative of the H.T. battery to H.T.— terminal, from this terminal, and join it instead direct to L.T.—.

Yes, it's obvious that it can quite easily get overlooked!

H.F. or L.F.?

One is apt to look upon high-frequency and low-frequency oscillations as two entirely different kinds of thing. They are not, though, and there is really no gap between the highest low-frequency oscillations and the lowest high-frequency oscillations.

We think nothing of talking about 10,000 cycles in relation to L.F. circuits, and engineers think nothing of building stations that transmit on 20,000 metres. But 20,000 metres is only 15,000 cycles, so you could almost hear such a station without a rectifier.

No doubt the difference in the type of components used for the H.F. and L.F. "sides" of our broadcast receivers helps to cover up the similarity, but, even so, iron-cored transformers are sometimes used for H.F. amplification as well as for low-

A. S. C.

IT'S a great feeling to be able to commence my notes this month with the news that conditions are at last beginning to show signs of improvement.

My log during the whole of last month has been considerably better than of late, but there is one evening that sticks out above all others, and that was the evening of February 14th, Valentine's Day.

"Radio Maroc"

I have good reason to remember that because when I donned the 'phones at about half-past five in the evening the first thing I heard—and at remarkably good strength, too—was a special Valentine's Day programme from W 2 X A D.

Later on this same night I logged, among other interesting stations, Radio Maroc, on 32.26 metres.

There are two other noteworthy entries in my log this month. One is

* THE MONTH ON *
* SHORT WAVES *

Bandoeng (P L E), on 31.86 metres, whose signals were excellent (on Tuesday afternoon) from about 2 to 3.30, and the other is Zeesen, on 31.38.

Zeesen's Strength

This latter station I am not concerned so much with getting, for that is almost always possible. But what struck me particularly was the remarkably good quality and strength at which his signals came over on the loud speaker.

By the way, there is one other station that has been coming over particularly well of late, and that is CT 1 A A at Lisbon. He is on the air every Friday commencing at

10 p.m., and the programme is always well worth listening to. I wonder how many of you heard him calling to THE WIRELESS CONSTRUCTOR, London, on February 19th?

Listen for CT 1 A A

CT 1 A A is an old friend of ours, and those readers who date back to April of last year will no doubt remember that he played an active part in THE WIRELESS CONSTRUCTOR'S special programme from Nairobi.

It is interesting to note that CT 1 A A is doing a special programme for our companion journal, "Popular Wireless," on Friday, March 18th, when, among many other interesting items, the voice of Captain P. P. Eckersley is to be heard over the air. I strongly recommend you to listen to this special programme, and I shall be interested to hear how you get on.

G. T. K.

GRAMOPHONE MUSIC ON YOUR "S.T.300"

HOW TO ADD A PICK-UP

IN designing the "S.T.300" I had in mind the probability that many readers would like to provide the set with a means of reproducing gramophone music. You will find that the simplest way to effect the change is to observe the steps in my rapid construction guide which I give below. All you need is a Lotus No. 5 jack and a plug of the same make. The cost is five shillings for the two.

Automatically "Outed"

I have arranged that when you plug-in, the filament current of the S.G. valve is automatically switched off, thereby saving current and valve "wear and tear," as well as preventing amplified radio signals "drifting over" while using a gramophone.

The Lotus jack has two terminals sticking out at one end. The jack (one-hole fixing) is mounted so that—looking at it from the terminal strip of the set—these terminals are on the left.

The terminal that sticks out horizontally is connected by a straight wire to the detector valve grid; the terminal that points downwards is connected straight to the nearest terminal of the grid condenser.

At the other end of the jack the vertical terminal is joined to the L.T.+ terminal of the set, its path being a vertical drop to the baseboard, then a run along the baseboard parallel to the panel and half an inch from it; when it gets to the edge of the screen it turns at right angles and follows the edge till it gets to the L.T.+ terminal.

Easy Change-over

The wire to the next terminal down on the jack drops vertically to the baseboard, and running along in corner formed by baseboard and panel, passes through a notch filed in the bottom corner of the screen; the wire immediately after emerging from the screen goes in a bee-line to the nearest filament terminal on the S.G. valve holder.

By JOHN SCOTT-TAGGART

Who gives you full details for making this very desirable modification to a magnificent set. The few alterations to existing wiring are remarkably simple, and the gear required costs but a few shillings, which will be amply repaid by the additional enjoyment obtained from the set.

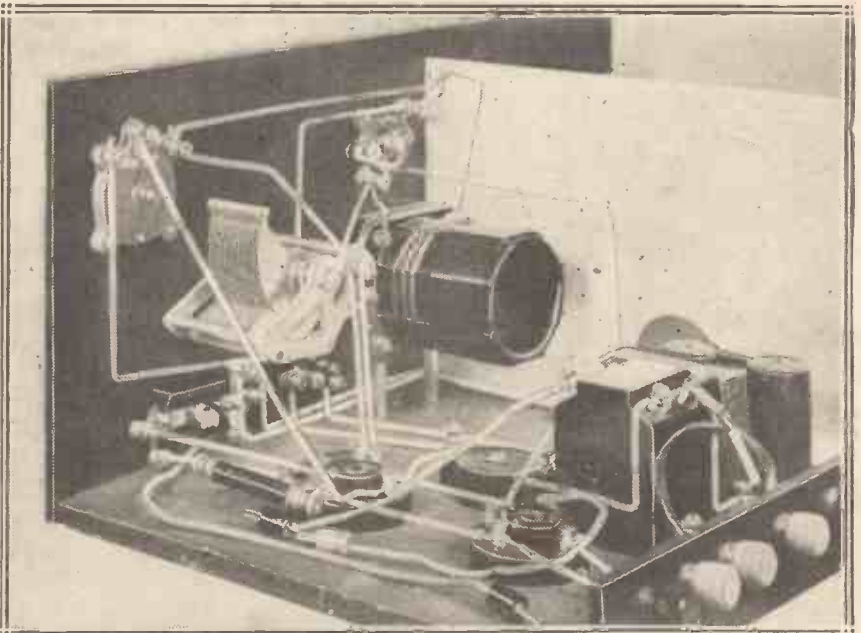
To the next terminal on the jack (i.e. the terminal which sticks straight out) is connected a flexible rubber-covered lead which ends in a plug; this lead passes under the bottom jack terminal (unused) and runs along the baseboard at 45° to the panel; it may be stapled down to prevent it touching the grid wires; the plug is inserted in the grid-bias battery so that 1½ volts is applied to the grid (when the pick-up plug is inserted). Note that the wires on the drawing do not adhere to actual shape. The

shape is as given in the February issue, or as described here.

RAPID CONSTRUCTION GUIDE

- (a) Take terminal out of screen and remove screen.
- (b) Remove wires 5, 14, 15, 37 (see Feb. CONSTRUCTOR for identification). Remove on-off switch.
- (c) Remove wires 31, 32, 39 and 40 from anode tuning condenser. Remove anode tuning condenser.
- (d) Drill hole for Lotus No. 5 jack.
- (e) Attach a G.B. flexible lead to jack (see above for details) and fix jack in position.
- (f) Connect S.G. valve-holder filament + to jack, keeping wire in corner of baseboard and panel (see above).
- (g) Jack to L.T.+ terminal (see above).
- (h) Jack to grid condenser (see above). Grid condenser to grid leak (straight line).

READY TO REPRODUCE THOSE RECORDS



Here you see the L.F. end of the receiver after adding the pick-up jack. It can be seen mounted on the front panel a little to the left of the tuning condenser.

GRAMOPHONE MUSIC ON YOUR "S.T.300"—continued.

- (i) Grid of detector valve to jack (see above).
- (j) Replace wire 37. Replace anode

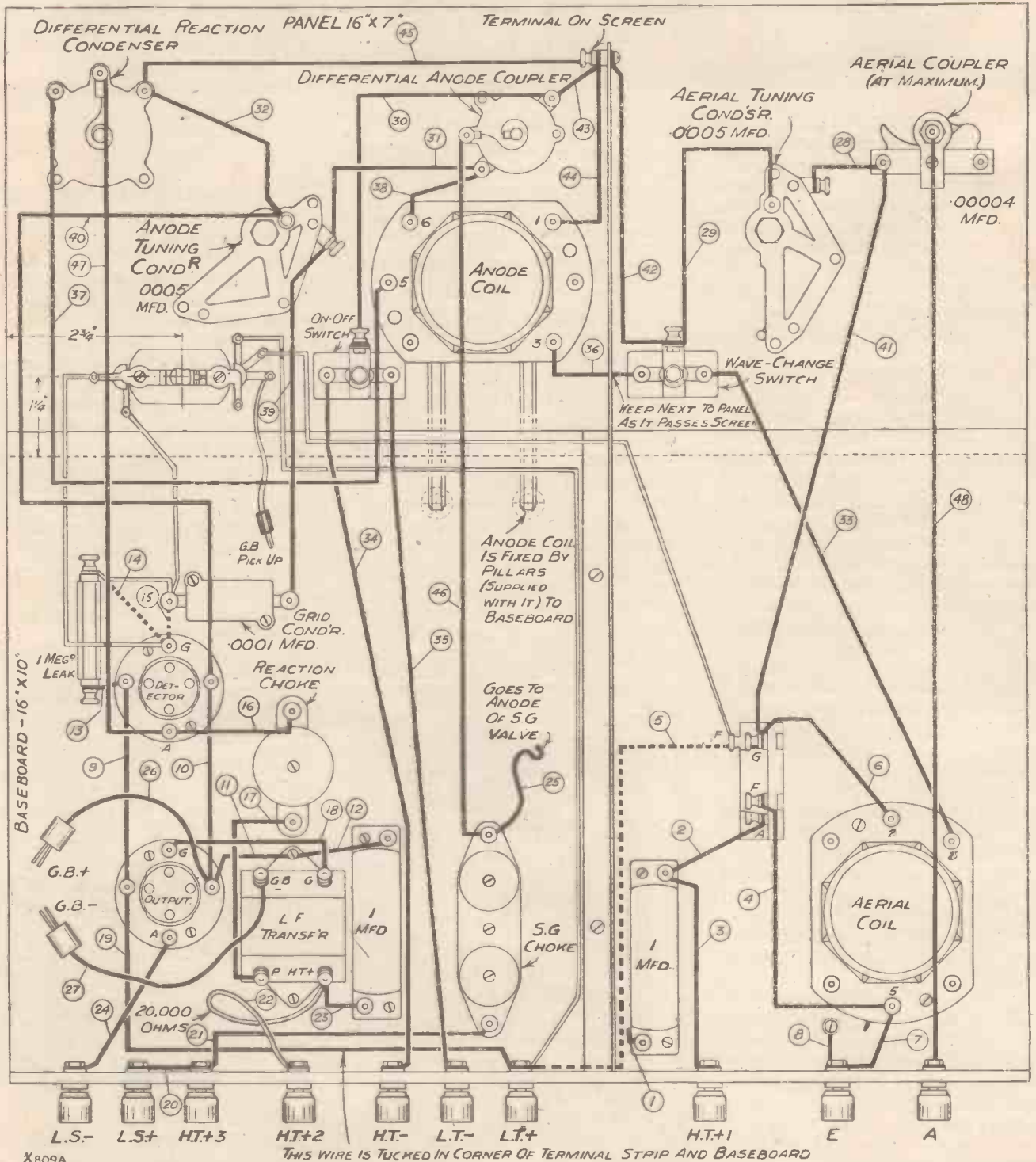
tuning condenser at new angle as shown. (Wire 37 should be shortened to run $\frac{3}{4}$ in. below condenser.)

- (k) Replace wires 31, 39, 32 and 40. (Wire 32 now projects straight out from reaction condenser, then goes to tuning condenser.)

- (l) Prepare notch in bottom corner of screen which comes next panel. Replace screen. Replace terminal on screen.
- (m) Connect wires to screen.
- (n) Plug-in pick-up and try your new records!

J. S.T.

HOW THE ALTERATIONS FOR PICK-UP WORKING ARE MADE.



The dotted lines show the original wires which are removed altogether, and the double lines show the new wires. The actual "run" of the wires cannot be shown in plan, so it is described fully in the article.



DECIBELS AND THINGS

By Wayfarer

FOR SALE

IF there is one thing that rouses my angry passions more than another it is to have to spend an evening with a fellow who has just entered the ranks of fatherhood for the first time. Chappies who want to demonstrate their first home-made wireless sets are bad enough, but they are as nothing beside the young father gloating over his first-born.

"What would you do?" asked Gubbworthy, after giving me for the umpteenth time a list of his small daughter's charms, "if you had just become the father of a sweet little girl?"

Goop's Idea

"Fit her with a silencer," I replied promptly.

The Professor, who was smoking with us, leapt to his feet with an excited cry.

"A magnificent idea!" he yelled. "The Goop Baby Silencer shall re-establish my shattered finances. Or don't you think that a volume control might be even better?"

He produced an old envelope and a stump of pencil from his pocket, and promptly became immersed in calculations and drawings.

"If you'll just be serious, my dear chap," said Gubbworthy, "I rather badly want your help."

"So long as it is nothing financial," I murmured, "you can count on your Wayfarer."

"Cuckoospit" and "Bindweed"

"Well, I rather want to give my dear little daughter one of those beautiful wild-flower names. I know that you won prizes at school for nature study. Do please suggest some of the loveliest."

This was rather a poser. I closed my eyes and thought for a while. Somehow my repertoire of wild-flower names seemed to be limited. At last, though, I thought of one.

"Toadflax!" I yelled in triumph. Gubbworthy didn't quite like that, and suggested that I might try again.

"Cuckoospit?" I ventured.

"No, no!"

"Bindweed?"
 "Wouldn't do at all."
 "I've got it—Puffball. Most descriptive, I'm sure."
 "I want something beautiful," snorted Gubbworthy. "Now do pull up your socks and find me a really nice wild-flower name."
 "There is only one more that I know," I said at last.
 "What's that?"
 "Stinkwort."

"LOUD-SPEAKER" LESSONS!



"—the young father gloating over his first-born."

I gathered from Gubbworthy's subsequent remarks that I wasn't to be asked to enact the part of god-father. What he had to say, though, was luckily cut short by the Professor, who sprang between us, brandishing a fistful of old envelopes.

"An epoch-making invention this time," he roared. "The silencer must wait until I have developed my crocodile terminal."

"You mean crocodile clip, don't you? Anyhow, they were invented long ago."

"No, I don't, I mean a crocodile terminal. It is specially designed for home-constructors."

"Well, what does it do?"

"The Snap Action"

"It is furnished with an ingenious little mechanism which automatically eliminates the possibility of making wrong connections. Provided with a neat combination of an acceptor circuit, a rejector circuit, and a relay operating a pair of hacksaw blades, it snaps at you every time you try to fix a wrong wire to it—but one moment. The idea for that silencer is coming to me. It is all a matter of decibels."

"Why call poor girl babies by that awful name?" I asked.

"What awful name?"

"Why, Jezebel."

"Decibel, you idiot—d-e-c-i-b-e-l—and I don't suppose for a moment that you know what a decibel is."

What is a Decibel?

"It sounds rather like a decimal with a cold in its head," I suggested. "But why underrate my intelligence?"

"No one could possibly do that. Tell me, now, what is a decibel?"

"Must be the tenth of a bell," I said, after a little thought. "I see now. It's the unit of tintinabulation. A door bell is a bel and a school-bell sort of thing is a kilobel, and Big Ben's a megabel. Yes, a splendid idea. May I suggest that Gubbworthy pushes the millibel and asks for a little more coal for this fire?"

The Professor looked rather pained.

"Anyone," he said, "who professes to be a student of wireless ought to know what a decibel is. The name, of course, commemorates the great Bell."

"What, Big Ben?"

"No, you ass. Bell, the inventor of the telephone, just as ohm was named after George Ohm and the volt after Volta—"

A USEFUL GADGET!



"—It snaps at you every time you try and fix a wrong wire to it."

"And the kilocycle after the chap who invented the bicycle."

"Shut up! Scientists have decided that the unit of sound energy shall be called the bel."

"Did Bell give them an inch?"

"What on earth do you mean?"

"Well, why have they taken his 'L'? He had two of them, hadn't he?"

In Lighter Vein—continued

"Do you, or do you not, want me to explain just what a decibel is?"

"No," I cried; "most emphatically *no*; and if Gubbworthy says that he does he will get such a whack on the jaw that he will be decibelled—I mean disabled—for a week."

TELLING THE TALE



"—who announced that his aerial mast was bending something 'orrid.'"

Any little unpleasantness that might have followed was prevented by the sudden entry of Gubbworthy's hand-maiden, who announced that his aerial mast was bending something 'orrid' before the gale that was raging outside, that she was frightened out of her wits and would we please come and do something at once. Always men of action, we sank our differences and hurried to the scene.

The report was not exaggerated. The tall pole was rocking to and fro in the most alarming manner.

"It's that stay," yelled Gubbworthy, "that's slackened off. Next time she heels over, grip it and hold on tight."

Nautical Aid

As the mast reeled and the offending stay formed a downward loop, the Professor leapt for it like a man. Next instant the mast swayed in the opposite direction, suddenly tightening the stay and shooting the Professor neatly over the garden wall, like a projectile from a catapult. We gathered from the horrid crash that he had landed in Captain Buckett's cucumber frame. With great presence of mind I called to him to collect the old seadog, for he was obviously just the man for such a job as this.

Still picking out bits of glass from here and there, and looking rather as if he had been pulled slowly through a barbed-wire entanglement, the Professor arrived in a minute or two with the Captain.

"What she wants," he roared, "is a running bobstay with a baffle knot and a couple of garbord strakes."

I think that is what he said. Anyhow, it was something like that. He

sent Gubbworthy running round to fetch a rope from his garden shed, and directed us to push hard against the pole on the leeward side. As neither the Professor nor I was quite sure what leeward was, we found ourselves next moment pushing hard on opposite sides.

"You flat-footed, lop-eared, knock-kneed lubbers!" bellowed the captain. "Don't you know leeward from windward?"

A Little Misunderstanding

The Professor and I both seemed to feel simultaneously that we must have made a mistake. He started to rush to my side just as I got under way to go to his. We both chose the same way round the pole, and met in full career with what must have been a sickening thud.

It was at that moment that the halyards at the house end gave way. Down came the aerial wire, writhing like a cartload of snakes. In less than two ticks the Professor and I were so neatly and tightly bound together by its coils that we could not move hand or foot. Fortunately, though, my right knee was resting upon the Professor's lower chest, so that I was able to get a really good purchase for some he-man heaves.

"LOW RESISTANCE!"



"—he had landed in Captain Buckett's cucumber frame."

By this time Captain Buckett and Gubbworthy had got what the mariner called a Turk's head or a spinnaker or something round the mast, and were pulling like anything on the rope, when there was an appalling crack, and down came the mast right on top of them.

"Well, well," I said, after pulling them out from beneath it and reviving them as well as I could, "you've had your bit of clean fun, but I'm all in favour of frames after this."

"Not cucumber frames," sighed the Professor, picking out an extra large splinter of glass.

THE "VIKING" SHORT-WAVER

An appreciation from a regular reader.

Sir,—I should like to express my thanks for the specification of the "Viking" short-waver. As I have constructed the set, I can vouch for its many good qualities, notably its freedom from hand-capacity effects. This is my first serious short-wave set after trying my hand at one or two others with but scant success. Almost as soon as it was completed I obtained a transmission from Chicago, and on Friday evening sat down to tune-in Lisbon, and was amazed at the strength with which it came over.

Strong and Clear

I tuned the station in at 22.17, during a musical selection, and the announcement of the station's identity in various languages followed.

A piano selection was the next item, and it was really like a piano, as the quality was excellent and the fading very slight.

Acknowledgments to listeners followed and a request for reports; then music again and a further list of acknowledgments and thanks to the WIRELESS CONSTRUCTOR for their reference to the station.

At 11.15 there was a reading on Faraday in English, and so clear and distinct was the transmission that I could have taken it down verbatim.

The Old Thrill Again

But, seriously, short-wave working has recaptured the thrill (which I thought had been lost for ever) that I experienced when I first constructed that thirty-five-shilling crystal receiver in the early days of "P.W."

I have been a continuous reader of "P.W." and the CONSTRUCTOR from No. 1, and have made up dozens of sets from them with never a failure, though, of course, some have been better than others.

Thanking you for the valuable assistance I have derived from your paper.

Yours faithfully,

WILLIAM G. GREEN.

Fulham, S.W.6.

S.T.300

Battery Model

READY RADIO

KITS make the S.T.300 a world-beater!

S.T.300

Battery Model

	£	s.	d.
1 Polished oak cabinet, 16 in. X 7 in. X 10 in., with baseboard	18	6	
1 Ebonite panel, 16 in. X 7 in., drilled to specifications	5	0	
2 Ormond '0005 slow-motion condensers, No. 6	13	0	
1 J.B. Midget '00004 condenser	4	0	
1 ReadiRad '00015 differential condenser	2	6	
1 Telsen binocular choke	5	0	
1 Differential condenser, '0001	2	0	
2 Colvern S.T.300 coils	12	0	
1 W.B. horizontal valve holder	1	0	
2 Valve holders	1	0	
1 Lewcos H.F. choke, type M.C.	2	6	
2 ReadiRad 3-point switches	3	0	
1 Varley Niclet L.F. transformer, 3'5-1	7	6	
1 T.C.C. '0001 fixed condenser, type S	1	3	
1 Graham Farish 1-meg. Ohmite	1	6	
2 T.C.C. 1-mfd. fixed condensers, type 50	5	8	
1 Lewcos 20,000-ohm spaghetti	1	6	
1 Terminal strip, 16 in. X 1 1/2 in., drilled to specification	1	3	
1 Screen, 10 in. X 6 in. (with notches)	2	0	
1 Sheet copper foil, 10 in. X 7 in.	1	0	
1 Packet Jiffilix	2	6	
3 Valves as specified	1	19	0
2 Belling-Lee wander plugs	4		
10 Belling-Lee terminals, type R	2	6	
Flex, screws, etc.	6		
£6 16 0			

Every claim made by the designer of the S.T.300 is justified when you use a Ready Radio Kit. Every Ready Radio S.T.300 Kit consists of specially chosen components which are matched in order to extract the utmost efficiency from the circuit.

The S.T.300 is the set you MUST build for really good Radio reception. You MUST build it with a Ready Radio Kit in order to get the results the designer claims for it.

Send off the Coupon on page 351 now.

Official Blue Print FREE with every Kit!

KIT "A" (less valves and cabinet) **£3:18:6**

OR BY EASY PAYMENTS

7/3 down, and 11 monthly payments of 7/3.

KIT "B" (with valves less cabinet) **£5:17:6**

OR BY EASY PAYMENTS

10/9 down, and 11 monthly payments of 10/9.

KIT "C" (with valves and cabinet) **£6:16:0**

OR BY EASY PAYMENTS

12/6 down, and 11 monthly payments of 12/6.

BATTERY EQUIPMENT

1 Pertrix 120-volt Standard High-tension Battery	15	6
1 Pertrix 9-volt Grid-bias Battery	1	3
1 R. & A. Speaker Unit (Type 40)	15	6
1 Pertrix Accumulator, P.A.C.3	11	0
£2 3 3		

The **READY RADIO A.C. ELIMINATOR** with trickle charger Type B.S. is especially suitable for this receiver.

Please state voltage when ordering.

Price - - - **£5 : 17 ; 6**

See page 351 for details of the **A.C. S.T.300, Radio-gramophone equipment,** etc.

READY RADIO

Head Office and Works: EASTNOR HOUSE, BLACKHEATH, S.E.3.

'Phone: Lee Green 5678.
'Grams: Readirad, Blackvil.

Showrooms: 159, Borough High Street,

London Bridge, S.E.1.

'Phone: Hop 3000.



MAKING RADIO READ-ABLE

By HERBERT K. SIMPSON

In this, our contributor's second article of the series, he goes a step farther in his explanation of the why and wherefore of radio, and we feel sure that our readers will find it a most enjoyable article.

WHAT a fine world this would be if everything that we disturbed from its proper place wanted to get back again, and proceeded to do so! And yet this is actually the spirit which animates electrons and electricity. We can, in fact, regard electric currents as "tidying-up" processes.

Most of us have read or heard something about atoms and descriptions of their extremely small size; our imaginations have been strained by such feats as trying to visualise an atom as being the size of an orange if an orange were enlarged to the size of the world.

"Not Divided"

I am not going to worry you with anything on those lines; all I want you to remember is that atoms are very small and that you and I and all our belongings are made up of enormous numbers of them.

The name atom comes from the Greek words meaning "not divided," but this did not prevent science from probing still further and finding that no atom is "the same all the way through." Each atom consists of one or more electrons, which are tiny charges of negative electricity, clustered round a central core. This core is composed of one or more "protons" or charges of positive electricity.

Those Fussy Atoms

Now atoms are very fussy about always having the right number of electrons, and if one were removed the atom would try to attract any electron near at hand until the vacancy was filled.

Suppose that by some means we remove electrons from one end of a wire and supply them to the other end. In the wire there will be a general endeavour to restore the original conditions, and this is achieved by a flow of electrons towards the end where there is a shortage of them. It should be noted that an atom would have a very slim chance of ever getting exactly the same electrons back again.

"GETTING A MOVE ON!"



A go-ahead radio engineer who has just gone out to Czechoslovakia on important radio business takes advantage of the speed and efficiency of air transport. Here is here seen beside his machine at Essen, Germany, en route for Prague.

If this removal process were maintained we should get a continuous stream of electrons from atom to atom along the wire, or, in more usual terms, a "direct current" of electricity.

The Direction of Flow

To distinguish between the conditions at the two ends of the wire, the end short of electrons is called

positive and the other end is said to be at negative potential.

It will be noticed that the electrons travel from negative to positive, which is the reverse of the old conventional current direction which many of us were taught at school.

At first sight it might seem that the electrons were being very obliging in keeping to the wire, but if we look into the matter we find that they merely take the path of least resistance.

Atomic Attachment

It is most fortunate that the electrons in many substances are so attached to their atoms that it is extremely difficult to make them carry any electron traffic. These substances are known as non-conductors, or insulating materials, and have a multitude of obvious uses.

D.C. and A.C.

So far I have only dealt with direct current (D.C.), but we will now get on to that awesome alternating current (A.C.). It really isn't awesome at all, and in some respects I

think it is easier to understand than D.C. To put it briefly, A.C. is a repetition of movements of electrons first in one direction along a conductor and then in the other.

That is not quite the whole story, because alternating currents can differ widely in the number of their movements per second, and this governs what is known as their frequency.

(Please turn to page 378.)

S.T. 300 A.C.

KIT "A" (less valves and cabinet) **£5:11:6**

OR BY EASY PAYMENTS

10/6 down and 11 monthly payments of 10/6.

KIT "B" (with valves less cabinet) **£8:6:6**

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HEAYBERD MAINS UNIT, TYPE M.1.
as specified - - - **£6:7:6**

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11/9 down and 11 monthly payments of 11/9.

If purchased by Easy Payments with either of the above Kits, add 11/9 to the monthly Kit price.

Ready Radio Radiogram Cabinet

With this beautiful cabinet you can convert your present set to a Radiogram of the most modern and artistic design. This cabinet is of highly polished walnut with lift-up lid, automatic support and a needle cup. Overall size, 3' 3" x 22" x 17". Suitable for any receiver having a panel not exceeding 12" x 7" and a baseboard 16" x 10".

Price £3:7:6

or deposit of 15/- and 6 monthly payments of 10/-.

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Readirad Pick-up

An entirely new design possessing many unique features. Compensated spring-balanced tone-arm to reduce record wear. Swivel head to facilitate needle changing. Extreme sensitivity and marvellously lifelike reproduction. Correct tracking. Extremely handsome appearance. Never needs adjustment.

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Please dispatch to me at once the following goods

Please dispatch to me the following goods

for which (a) I enclose
(b) I will pay on delivery (Cross out line not applicable) £

for which I enclose first deposit of £

Name
Address

Name
Address

W.C.4/32

W.C.4/32



PICK-UP HINTS AND TIPS

Some interesting notes on various practical aspects of radio-gram reproduction.

By A. BOSWELL

Checking Distortion—How to Test—Converting Portables.

Checking amplifier distortion is fairly simple if you happen to have a milliammeter.

Perhaps you may think that milliammeters are expensive. Well, so they are, if you want an accurate dead-beat instrument.

But for distortion checking a dead-beat meter isn't required, nor is it necessary for it to be very accurate, provided you are not using it for current measurements.

A Kick-Meter

What you really want is a cheap milliammeter to employ as a "kick-meter." That is to say, the magnitude of the needle kicks give you some idea of the amount of distortion present.

You connect your milliammeter in series between H.T. + and the filter choke or output transformer primary terminal, which normally goes to H.T. +.

Thus the current to the anode of the output valve passes through the meter.

The range of the milliammeter should be chosen so as to bring the needle about half-way round the scale at the normal anode current taken by the valve.

For example, in the case of a super-power valve a 0-25 m.a. scale would be about right.

Keep the Needle Steady

If the amplifier is working well within itself the needle will remain steady, but directly the grid swing reaches a point where grid current commences to flow or rectification occurs the needle will kick violently.

A certain amount of kicking can be tolerated, because the distortion may not be enough to be audible. But when the movement amounts to anything greater than, say, 10 per cent of the steady reading it is time to cut down the volume until the valve is working within the limits of

linearity decided by the anode voltage and grid bias.

Believe me, a milliammeter of this type is a very useful instrument.

I am often asked whether it is worth while to purchase a complete pick-up, carrier-arm, turntable and motor. Now, the answer depends solely upon individual circumstances.

HEARD THESE ?

RECORDS WORTH HEARING.

Orchestral.
Prelude to Act 3 of "Lohengrin"
Chicago Symphony Orchestra
H.M.V. (D.B.1557)
Bolero
New Light Symphony Orchestra
H.M.V. (B.4046)

Vocal.
That's Why Darkies Were Born.
Paul Robeson . . . H.M.V. (B.4053)
Cuban Love Song.
Lawrence Tibbett . . . H.M.V. (D.A.1251)
Cast Thy Burden.
Master Graham Payne Zonophone (6033)
Bonnie Mary of Argyll.
Heddle Nash . . . Columbia (D.B.720)

Organ.
Wedding March.
Edouard Comfette . . . Columbia (D.X.320)
On Wings of Song.
Edward O'Henry . . . Broadcast (3147)

Dance.
Cuban Love Song.
Savoy Hotel Orpheans Columbia (C.B.405)
Carry On.
Orpheus Dance Band Zonophone (6037)
Mona Lisa.
Ambrose and his Orchestra
H.M.V. (B.6125)

Vaudeville.
Hold My Hand.
Les Allin . . . Zonophone (6025)
Hang Out the Stars in Indiana.
Florence Oldham . . . Columbia (D.B.724)
Beat the Retreat on Thy Drum.
Stanley Holloway . . . Columbia (DX.321)

Piano.
Honeysuckle.
Billy Mayerl . . . Columbia (D.B.723)

For instance, there are many listeners who have excellent portable gramophones which they use chiefly outdoors in the summer, and perhaps occasionally indoors at other times.

These listeners would prefer to avail themselves of the advantages of electrical reproduction, but, having a perfectly good turntable and motor

already, naturally they do not want to buy another especially for the pick-up.

Easily Converted

Well, these enthusiasts are catered for by those makers who supply pick-ups suitable for attachment to the existing tone-arm in place of the sound-box.

The conversion thus costs only a small sum, and the portable can be readily used as an ordinary acoustic gramophone when required.

Then we have the listener who does not already possess a gramophone. In this case he will obviously purchase a playing desk or assemble his own turntable and pick-up complete with carrier-arm.

Of course, there are some fortunate people who can afford both a portable gramophone and a powerful radio-gram receiver, but they scarcely enter into the question. I am only considering the average listener who has to go about it in the most economical way.

Incidentally, some of these pick-ups designed for use with existing tone-arms are extremely good. There is, for instance, the H.M.V. version, which for sensitivity and tone takes a lot of beating. The makers supply a combined volume and tone control for this pick-up, and the amount of scratch can easily be adjusted by experimenting with clip-in resistances of various values. This is a useful refinement, because it enables the listener to suit the pick-up to his amplifier.

An Interesting Pick-Up

By the way, the Loewe Radio Co. have sent me some interesting details of a new pick-up which they placed on the market during the Radio Exhibition.

The pick-up has several interesting features. For instance, the needle fixing is automatic. It isn't held by a screw, but you just place it in its holder and it "stays put."

Moreover, the usual rubber buffer on the armature bearing has been done away with, and in consequence there can be no trouble due to perishing.

The volume control is built into the tone-arm pillar and the resistance chosen is 40,000 ohms.

The Loewe people state that the price of the pick-up is 33s. 6d. (including the tone-arm and volume control).

I hope to have an opportunity of trying one of these pick-ups in the near future.



I AM writing this in a deep, cosy armchair, with 15 ft. of ether and 2 ft. of brick wall between me and the nearest piece of wireless apparatus. In other words, I'm having a rest!

The idea of this article was mine. I wanted somewhere in this magazine where every month I could just talk— not of some special subject, but on any topic that might interest both of us. Perhaps I ought to explain first my own position on this paper.

I am simply an independent contributor. THE WIRELESS CONSTRUCTOR has its own excellent staff and research laboratory. It is quite possible that our views on technical matters may clash. If all of us agreed there would be precious little progress in radio, so I almost hope we do differ sometimes!

Being "outside" the paper gives me several advantages. In the first place, I am privileged to say exactly what I like, and, secondly, I am freer to move about, to get to know readers' difficulties in various parts of the country. My opinions may at times be pungent and unpalatable to "vested interests," but I hope and believe that my consideration for the wireless constructor—and the wireless constructor *alone*—will benefit not only him but the radio industry itself.

That Was Exceptional

But the last thing I want is to become a one-man band. I know that a great deal of space has been devoted to my first set and articles, but cir-

cumstances were exceptional. Only if I feel that I have got something really startlingly better than the "S.T.300" will I ask for such a lavish display again.

Breaking Records

Well, first of all let me thank you all for the reception of my "S.T.300." It has simply amazed me. I knew I had something good, but I never dreamt that such a vast number of readers would start building the set at once. The Editor tells me that one firm of coil manufacturers is

It's good to rest here for a bit with my feet on the mantelpiece. In a laboratory across the passage is a pair of "S.T.300" coils, submitted by a new firm who have failed to keep to my specification. I shall not pass them until a new and satisfactory pair have been submitted.

To-morrow I shall also be finally testing two forms of A.C. versions of the "S.T.300" which I have developed. They are out there in one of the two laboratory huts in my garden. The final choice will appear in the same issue as these notes.

Now about these letters you have written. I've read them all, but it would really take me weeks to reply to each individually. They range from one marked "strictly personal" (he wants me to tell him "strictly between ourselves" whether the "S.T.300" really does all I claim), and one which demands full layout details of an "S.T.300," but using two S.G. valves, push-pull output, A.C. valves—and this is all to go into a radio-gram cabinet of such and such dimensions.

Blackpool and Bonzo

Requests for demonstrations have streamed in. I have had picture postcards of Blackpool sands (complete with donkeys), a family group (taken about 1890), Bonzo powdering his nose, another seaside postcard (of an indelicate character—it ought to be sent to the local Watch Committee!) and a beautiful coloured portrait of a

JOHN SCOTT-TAGGART TALKS TO YOU—

This article is really just a talk—discursive and intimate, like a chat between old friends.

In it the designer of the "S.T.300" speaks to you of radio in general and of particular topics that interest him. He is delightfully informal and informative.

Settle yourself in your own armchair, and read and enjoy what "S.T." says from his!

turning out a thousand pairs of coils a day, that another sold forty thousand in a week, that other manufacturers are feverishly attempting to keep pace with demands for the components required for the "S.T.300." The "kit" people are reporting a growing rush for orders. And, finally, I am told the circulation of THE WIRELESS CONSTRUCTOR has broken records.

All this is extremely gratifying, but I have been too busy to get swelled-headed! Demonstrations to give, alternative makes of coils to test, suitcases full of letters to read, aerial couplers to try out.

From My Armchair—continued

bowl of apples with a couple of bananas lolling on their backs beside it.

I want to assure readers that I don't mind their using up old stocks. Their *interest* is what I want. I want to liven things up. Keep on writing to me. That is the best way for you to let me know your troubles, your complaints, and your needs.

Those Demonstrations

Many queries I can deal with in articles, but the ordinary sort are dealt with by a special department with which I am constantly in touch. But, apart from queries, there must be expressions of opinion on conditions, sets, methods of presentation which—even if I cannot reply to all of them individually—interest me keenly.

super-hets, and one with a 6-valve super-het. Nearly all had had over eight years' experience of "home-construction," making up different sets as they came out; one of the letters is from a reader with 20 years' experience of wireless!

Having given these demonstrations, I know exactly how Daniel felt in the den of lions, but I seem to have survived! I have a grouse, though. I said I wanted to "get into some of your homes." But while thousands have asked for demonstrations, only six readers indicate their willingness to offer me an aerial and shelter for an 8 p.m. to 10 p.m. test! If you feel you wouldn't mind me trying a set undergoing tests on your aerial for one evening, write me a postcard. I

Brighton Aquarium has been received in an aeroplane flying upside down." There must be still some things that television can do for the first time.

But this is by the way. What I wanted to say was that I believe highly successful television has been accomplished with a perfectly amazing width of side-bands giving a really detailed picture. No, the scheme is not British, but American. The H.M.V. people, however, are handling the matter on this side.

An American Advance

In some articles last spring I said that I only agreed with the television pessimists in so far as present methods are concerned. Scanning discs, Neon tubes and the wave-lengths used have always been regarded by me as useless except to amuse. The American step forward involves a cathode-ray tube and waves of the order of seven metres.

We all know work on these lines has been progressing, especially in the U.S.A. and Germany. Now something approaching real success is in sight. My advice is to watch the H.M.V. people and the B.B.C. The latter's 7-metre station should teach us what these waves can do; e.g. to what extent they can go through or round buildings.

Reaction and Tone Control

There is likely to be a good deal more heard about reaction and tone control in the near future. I have said something in an article on band-pass tuning about the subject. The idea, of course, is to sharpen tuning by means of reaction.

This, if carried to extreme limits, cuts off—or, rather, tapers off—the side-bands. Every note in speech or music (and even the "doomp" interval signal) produces fluctuations in the wave-lengths produced by the transmitter. These are essential, and we like to keep them in full strength in our receivers.

"Side-bands" and Selectivity

We can, however, get greater selectivity by reducing the strength of these fluctuations (or "side-bands") and boosting their effect up in the L.F. circuits. Dr. Robinson, at last, is getting some credit given to him and—as usual in such cases!—is getting some withheld.

But I see my allotted space is up. Next month I want to deal with rather more technical topics. J.S.-T.

RAIL-ROAD RADIO IN GERMANY



Many trains in Germany are equipped with radio receivers for entertaining the passengers. This photograph shows an engineer linking up a couple of carriages.

Now about demonstrations. I have devoted a lot of time to these, but I have only got through a fraction of the requests. My idea of these demonstrations was to show publicly what the "S.T.300" could do and to meet readers.

Incidentally, I was surprised at the types who attended. I had thought they would probably be 2-valve or 3-valve users who were looking for a suitable set. Nothing of the sort!

Daniel in the Den!

Not a single "demonstratee" had less than three valves. I made a note of the sets they used, and of the writers of letters published only one was an inexperienced constructor, but he was using a 2 S.G. four-valve set! The others include two readers with 5-valve

have several "test-stations," but I want a really large number all over the country. Perhaps some keen readers could oblige me. I would ask for an appointment and show my passport.

* * *

When television was "inaugurated" about six years ago, everyone realised that it was a promising development. But none of us quite expected the vast amount of promising that was to be forthcoming. Unfortunately all the epoch-making things in television have been accomplished, including, now, television in a train.

This makes it very hard for the epoch-makers to make new epochs. Perhaps readers could send me suggestions to pass on to them, e.g. "this is the first time television of conger-eels in

Colvern Coils
exclusively specified
for the S.T. 300
Now chosen for
the A.C.
model.

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chosen for the A.C.
Model of the S.T.300—
1 pair Colvern Coils,
Type S.T.300,

12/- pair.

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Specified for WIRELESS CONSTRUCTOR S.T.300 A.C. Model



"Parafeed" has been selected for the "S.T.300" because it represents the most advanced development of Radio Research in its class—an essential qualification in this receiver, where every component must give utmost efficiency.

PARAFEED L.F. TRANSFORMER

Special 6 to 1 Ratio

The R.I. "Parafeed"—the outstanding transformer for parallel feed—has been specified by Mr. Scott-Taggart for the S.T.300 because it gives the practically straight-line amplification that is vitally necessary in this type of receiver. N.P.L. test curves show high and uniform amplification between 25 and 8,000 cycles. The inductance of the "Parafeed" is no less than 80 up to 100 henries.

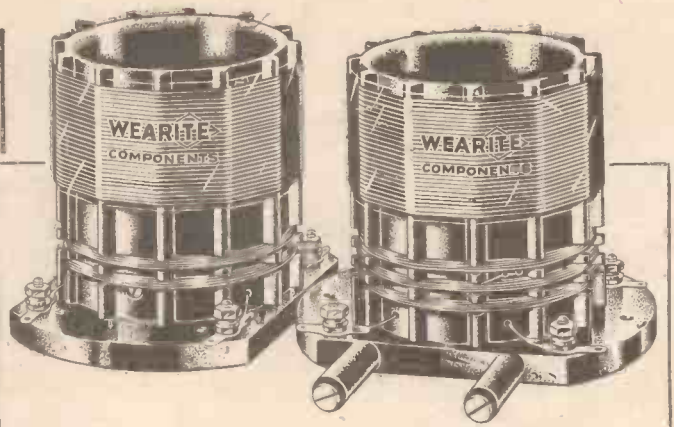
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8/6



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T.A.



These are the coils for your A.C. "S.T.300"

Look through the designer's recommendations—be consistent in your choice—use WEARITE. Remember Wearite are the first component makers in Radio. Ask for leaflets dealing with Wearite Valve Holders, Chokes, Switches, etc.

When you decide on Wearite Coils for your A.C. "S.T.300" you are certain that its tuning circuits will function just as intended by the designer. Wearite coils are definitely to author's specification—and are tested by a specially designed H.F. Oscillator—only Wearite Coils are subjected to such test.

PRICE 12/6 per pair.

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FITTING A PENTODE



How to make a unit which enables you to employ a pentode valve to its best advantage with practically any receiver.

HAVE you ever thought that you would like to try a pentode valve in your set? Perhaps you have. Perhaps you have even gone so far as to try one and have taken it out again because it did not bring about the improvement in results that you were expecting.

THE ONLY PARTS YOU REQUIRE FOR THIS SIMPLE UNIT ARE:

- 1 Tapped pentode output choke (R.I. Pentamite, or Tunewell).
- 1 2-mfd. condenser (T.C.C., or Telsen, Dubilier, Peto-Scott, Sovereign, Helsby, Hydra, Ferranti, Lissen).
- 1 2-mfd. condenser (Dubilier non-inductive type, or see above).
- 1 .01-mfd. fixed condenser (Lissen, or Dubilier, Telsen, T.C.C., Graham Farish, Sovereign).
- 6 Engraved-type terminals (Belling & Lee type R, or Clix, Igranic, Eelex).
- 2 Strips of ebonite, one 4 in. x 1 1/2 in., and one 5 in. x 1 1/2 in.
- 1 Spaghetti resistance, 15,000 ohms (Leweos, or Bulgin, Telsen, Graham Farish, Varley, Igranic, Ready Radio, Peto-Scott, Sovereign, Tunewell, Magnum).
- 1 Spaghetti resistance, 5,000 ohms (Bulgin, etc.).
- Piece of 3/8-in. plywood, 5 in. x 4 in.
- Glazite, Lacoline, Jiffilix, Quickwyre for wiring.
- Flex, screws, etc.

The fact of the matter is that a pentode, like most other valves in the set, requires a certain amount of special treatment, and it is not much good to hope for the best results by substituting the last valve in your set with a pentode unless you also make the necessary alterations to the output circuit.

Improvement in Results

Used correctly, a pentode output stage can make quite a considerable improvement in results, and, in certain cases, it might even act as a distortion remover.

Take the case of a set in which the present output valve has a low amplification factor. It is quite

possible that in order to get adequate volume it is necessary to load each valve with much stronger signals than it is intended to handle.

That means to say, of course, that distortion is bound to result, and, amplified in each successive stage, the final results that reach your ears are likely to be—well, to put it bluntly, too awful for words!

Volume to Spare

But supposing a pentode valve, or, rather, a correctly designed pentode output stage, were to be fitted to a set of this description.

It is quite within the realms of possibility that it would then be

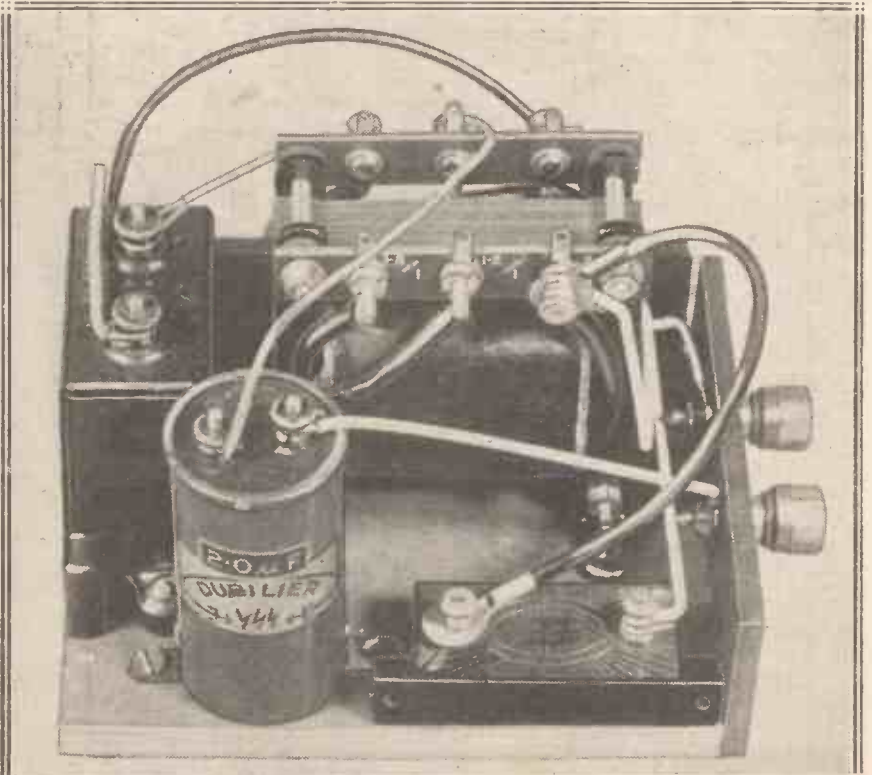
possible to obtain more than adequate volume without the slightest trace of overloading distortion.

Distortion Eliminated

What would actually happen is that, on account of the high degree of amplification given by the pentode valve itself, it would probably only be necessary to apply quite a modest well-within-the-limit signal to the grids of the preceding valves, and thus, although you would still be getting adequate volume, the distortion due to valve-overloading would be eliminated.

But its application as a "distortion-eliminator" is not, of course,

AN OUTPUT FILTER IS INCORPORATED



The unit is also, of course, a complete loud-speaker filter, making it possible to run long loud-speaker leads, etc.

Fitting a Pentode—continued

the primary function of a pentode valve.

The real use of a pentode valve is that it enables you to get just that little bit extra out of a set without going to the extent of another L.F. stage.

That Extra "Kick"

For that reason it is a particularly useful type of output valve for H.F.-Det.-L.F. sets where the addition of a second L.F. stage is either impractical or unwarranted. The same thing applies to the popular Det.-L.F. arrangement, although as a general rule it is not wise to fit a pentode to sets employing two L.F. stages unless the L.F. stages are of the very low magnification type.

In any case, with sets employing two powerful L.F. stages a pentode valve is not necessary.

But for those of you who are using sets of the type mentioned above,

and who feel that they would like just a bit more kick out of them—well, why not try fitting a pentode?

With the number of "semi-low" consumption pentodes that are now available it is not necessary to concern yourselves too much with the question of H.T. consumption, because several of the medium-sized pentodes take very few more milliamps than a "respectable" power valve.

Concerning H.T. Current

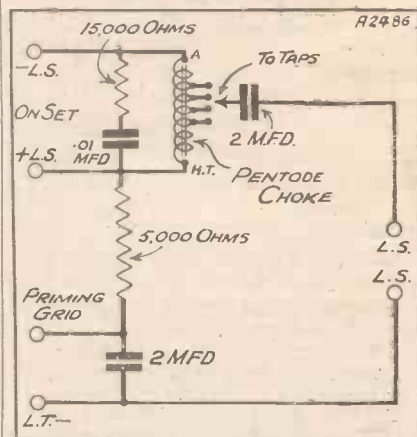
These remarks are intended to apply particularly to sets of the battery-operated types, for it is in cases such as this that the question of H.T. consumption is of necessity a vital consideration.

In the case of sets worked from H.T. mains units—well, there are very few commercial mains units that have an output of less than twenty milliamperes, and that should be adequate for a correctly-biased medium-

sized pentode, even allowing for the detector and S.G. valves in a three-valve arrangement.

So that with modern valves the question of H.T. consumption is not all that important, and for what you get in return for the few extra milliamps it is, in our opinion, quite a well-worth-while investment.

THE RIGHT H.T.



The correct H.T. for the priming grid is automatically arranged for by the provision of a "dropping" resistance.

For those of you who are interested in the pentode proposition, and bearing in mind our earlier remarks about special treatment, we have designed an efficient little output unit which will enable you to fit a pentode to almost any set that falls into the category outlined above.

It is quite a simple little unit which constitutes a pentode filter output circuit. But it is rather more than a straightforward output filter arrangement, for it also includes decoupling components for the priming grid of the pentode and a tone-correcting scheme to obviate the over-accentuation of high notes which tends to result from the use of a pentode valve.

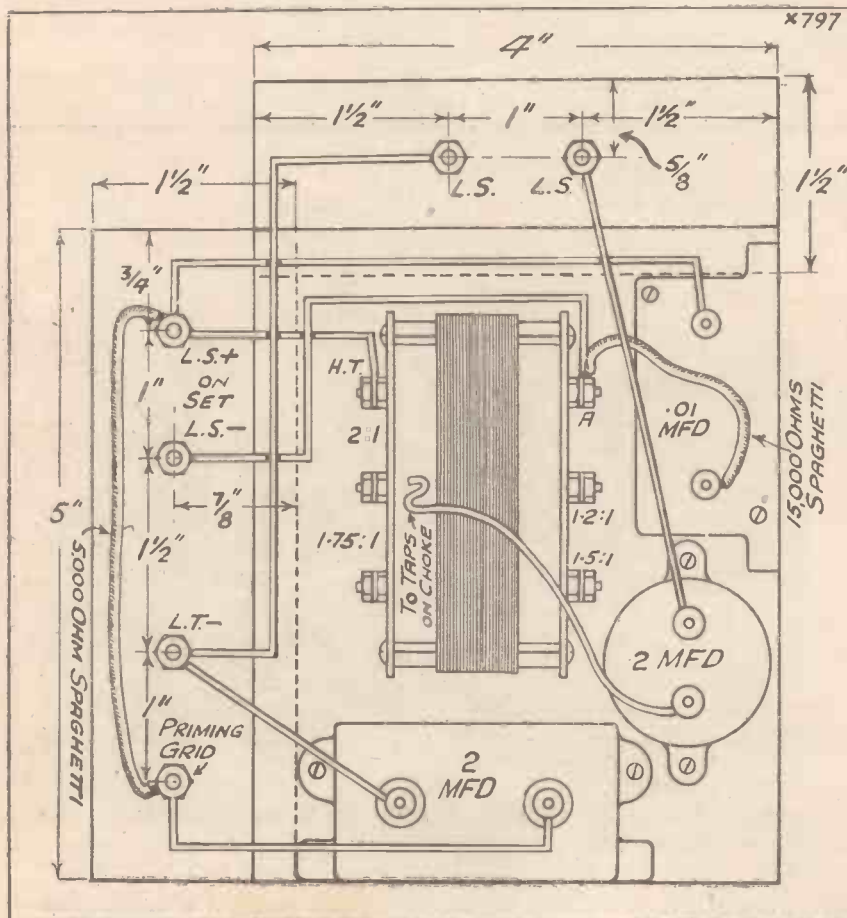
Adjustable Choke

The pentode output choke is of the tapped variety, so that by experimenting with different tapping points you will be able to adjust the unit for best results in your circumstances.

A list of the few parts that are required is given elsewhere in the article, and in view of the extremely simple nature of the unit, coupled with the fact that every possible

(Please turn to page 380)

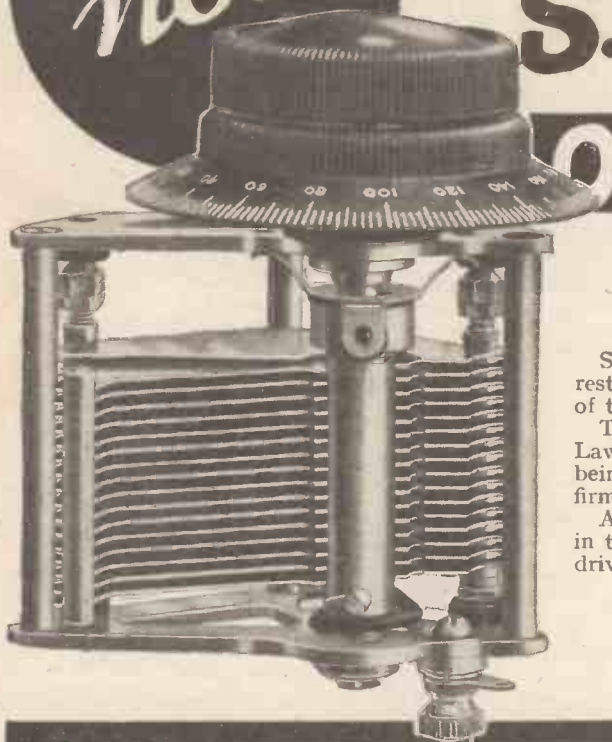
VERY EASY TO CONSTRUCT



A pentode choke, three fixed condensers, and two of those inexpensive spaghetti resistances are all the components that the unit necessitates.

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·0005	6/6

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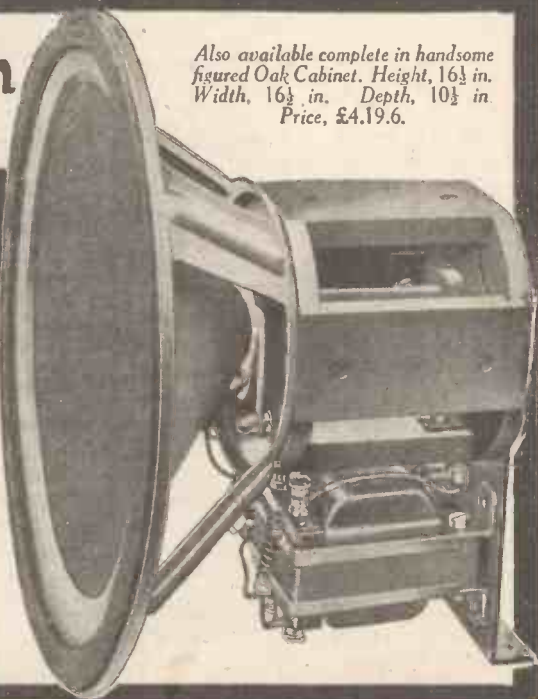
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CHOOSING A LOUD SPEAKER

By VICTOR KING.

Here are some helpful home truths about the various choices open to you when settling the important question of selecting a new speaker. Our contributor characteristically says exactly what he thinks about the different types now available, and the reproduction you may expect from them.

It of ten happens that a new set makes a man dissatisfied with his loud speaker. Perhaps he realises that the accessory is not as good as it might be, and he begins to hear it in its true acoustic colours.

On the other hand, the new set may be giving more power, and the loud speaker's inefficiency is too self-evident to be in question at all!

Are Your Ears Drugged?

But however good the reports may be of a certain make and type of loud speaker, and however excellent it sounds in the shop, there is always a serious possibility that its first try-out at home will cause bitter disappointment.

Many a "new" loud speaker has been relegated to the kitchen, or even a top shelf, and many an "old" favourite has been reinstated with broadcasting honours.

There are two main causes. The one is that the listener has actually got to like the form of distortion dished out by the old loud speaker, and his ears are drugged, as it were.

He hears a good rendering of high notes as "squeakiness," and hates it!

The other possible cause is that the new loud speaker, by being more efficient, is bringing out distorting noises that were unable to get through the mellow sogginess of the older instrument.

Watch for Woofiness!

Don't forget that a lot of the most irritating distortion is heard in the "upper register"—high-pitched gratings and rattles which are smoothed into inaudibility (together with re-

spectable high notes) by the general "woofiness" of the less efficient speaker.

You will hear this kind of distortion very plainly with a good moving-coil or inductor instrument. It is mainly due to valve overloading, and the overloading can occur in the "earlier" valves quite as easily as in the power valve.

However, you mustn't give way to distortion. A good set deserves a good speaker, and a good speaker demands a pure input!

OUTPUT POINTERS

- (1) A loud speaker must be "matched" with the output valve for best results. Many speakers now include tapped transformers in their construction which enables this to be done.
- (2) However, the average "high-resistance" speaker will match up quite well with the average output valve.
- (3) You cannot have bass without power—always go for the "biggest" power valve you possibly can if you want good bass.

But despite the indisputable merits of a good moving-coil speaker, do not take it for granted that every moving-coil speaker is good. There are plenty of not-so-good speakers of this class.

In any case, there is a lot to be said for a good electro-magnetic cone. The moving-coil comes into its own on the bass notes, but you must have power for bass.

And to reproduce a goodly proportion of bass you must be prepared for a fairly hefty volume.

If you won't have "loudness" at

any price, and must have "quiet listening," then I fancy you will find yourself fully satisfied by a high-class loud speaker of the electro-magnetic variety—which will probably be quite a bit cheaper.

But don't forget a moving-coil can be just as sensitive as one of these, and that it is not true to say it cannot give results equal to a balanced-armature on small inputs.

You can operate a moving-coil very well indeed with a two-valve set, providing the speaker is one of those modern sensitive varieties and the set is able to deliver moderate volume.

The inductor type stands between the balanced-armature and the moving-coil. That is my opinion. I consider that a good inductor is better than an average "small" moving-coil, and that it is definitely superior to a balanced-armature speaker of a moderately efficient character.

Don't Fall for a Fetish

But don't subscribe to fetishes or fashions. After all, you are the one who has to listen to the loud speaker you buy, and if you are satisfied with it and your friends consider the results are good (without being told what the instrument is), then you are adequately equipped.

There are all too many people who are prejudiced against anything that don't happen to fall into the "what is done nowadays" class!

Nevertheless, it is a fact that the best performances are put up by moving-coils of high quality working under proper conditions. If you are not convinced that you can or want to achieve those conditions, then use a balanced-armature, and don't feel ashamed of doing it.

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latter—the Exide Gel-Cel—is the first really satisfactory battery of this type to be produced. The majority of leading portable set makers now fit Exide Batteries, and when next you have to replace the battery in your own set you will find it an economy to do the same.

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A new scheme claimed to possess advantages over all other existing methods.

By J. C. JEVONS

A LONG chain of development stretches between the early diode valve—or the simple crystal—and the modern push-pull rectifier which is now being advocated for high-quality reproduction.

Changing Fashions

From ordinary "grid-leak" the fashion passed to "anode-bend" rectification, though there are still many supporters of the merits of each. More advanced practice favours the "power" grid detector to either, whilst the new push-pull combination claims certain features of advantage over all its other rivals.

In anode-bend rectification the valve is biased to work on a bend of the plate characteristic curve. Here rectification takes place after the signals have passed through the valve, so that it is equivalent to the combination of a high-frequency amplifier plus a detector.

Anode-bend is less sensitive than grid-leak rectification, and is therefore not so suitable for receiving weak signals. Because of the negative bias on the grid the internal resistance of the valve is very high, so that it does not reduce selectivity by damping the tuned circuits.

"Power Grid" Rectification

On the other hand, the high impedance of the valve limits the choice of coupling circuit which can be used, since the intervalve coupling should always "match" the valve impedance as nearly as possible.

In "power" grid rectification a higher voltage is applied to the plate of the valve and the normal values of grid-leak resistance and condenser are reduced so as to avoid distortion. For instance, in the ordinary grid-leak rectifier, unless the value of the leak resistance is low compared with the impedance of the grid condenser, the higher-note frequencies will leak

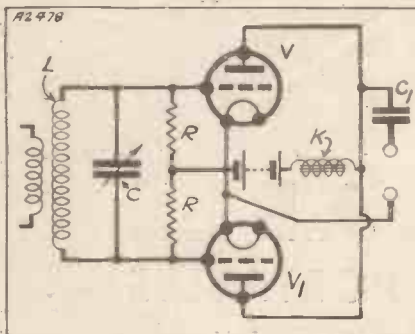
away through the latter, and so will be lost.

The "power" grid rectifier is designed to prevent this loss by reducing the normal value of leak resistance and increasing the reactance of the grid condenser, but since this necessarily increases the flow of grid current, there is still a damping action on the preceding tuned circuit, with a corresponding falling-off in selectivity.

The use of a detector comprising two valves arranged in push-pull has the following advantages over its predecessors.

The high-frequency signals are applied to the grids in phase-opposition, and they therefore mutually cancel each other in the output circuit. This effectively prevents any

AUTOMATICALLY NEUTRODYNED



The H.F. signals are applied to the grids in phase-opposition so they mutually cancel each other in the output circuit.

transfer of H.F. energy into the L.F. circuits, and so avoids any undesired reaction likely to give rise to instability and parasitic "noises."

Further, since the push-pull pair of valves are automatically neutrodyned, there is no anti-reaction feedback—or "referred load"—between the output and input circuits, and therefore no tendency to damp the preceding tuned circuits.

No grid condensers are used, the

connections from the input transformer being taken directly to the grids. This allows a high value of grid resistance to be used, without producing frequency distortion.

Finally, a choke or transformer coupling can be used between the push-pull detector and the first stage of L.F. amplification.

The circuit arrangement is shown in the figure. It will be seen that the output coil K is in parallel with the plates of both valves V, V₁, which are connected together, a coupling condenser C₁ for the first L.F. stage being taken from the common lead.

The New Scheme

On the other hand, the input coil L is arranged in push-pull across the two grids, and is tuned by a condenser C. There is no grid condenser in either lead, but two leak resistances R are connected across each grid to the common filament.

Detection takes place between the grid and filament, each valve handling one-half of the wave. Take first the upper valve V. Positive impulses on the grid are at once transferred by the electron stream directly to the filament. Negative impulses cannot pass through the valve in this way, and so build up a voltage across the leak R.

Since the input coil L has no effective impedance to low-frequency components, any L.F. voltage existing on the grid of the upper valve passes at once across the coil L to the grid of the lower valve V₁.

In the same way the lower valve V₁ wipes out the positive cycles of the incoming wave, but accumulates negative cycles on its grid. These grow into a L.F. voltage which is simultaneously applied to the upper valve V, across the coil L. The low-frequency components are therefore applied to the two grids in phase, causing the plate currents through the output coil L to rise and fall together.

Improved Quality

On the other hand, the incoming high-frequency impulses are applied in "push-pull" to the two grids, across the high radio-frequency impedance of the input coil, so that when one grid is thrown positive the other is negative. This gives rise to opposite variations in the output current which mutually cancel out, thus preventing any transfer of energy to the L.F. circuits.

It may be argued that "push-pull" detection requires the use of two valves instead of one. The reply is that it is always worth while paying a little extra for better quality.



A GLIMPSE OF GLOUCESTER

A Special Correspondent, who has visited the Gloucester S.B. Headquarters of the B.B.C., explains how the land-line links join up all the stations from Plymouth to Aberdeen.

I HAVE been in a little-known B.B.C. centre and heard an engineer at the control-panel talking with London, Aberdeen and Plymouth stations, just as though they were only a few miles away!

Linking the Stations

This B.B.C. centre is at Gloucester. Several months ago I was advised by a friend at Broadcasting House to see the Gloucester repeater station when I happened to be down that way, because, although not one listener in a million knows of its existence now, it will assume increasing importance as the Regional scheme grows.

I made good friends at Gloucester, and an official there showed me the intricacies of the complicated switch-board and relays which are the starting points of the lines running out to all stations.

Gloucester is the hub of the B.B.C. lines which are hired from the Post Office, and are specially balanced so that they can carry broadcast speech and music with a minimum of distortion.

How the Lines Run

In the engineer's office I was shown a map—the key to the land-line links all over the country. Lines go out to Swansea, Plymouth and Birmingham. The Birmingham line is in connection with one coming up from London and carrying on through Stoke to Manchester, Leeds and Moorside Edge.

Leeds, I was told, is another centre very much like Gloucester, and while Gloucester is the control point for all lines taking mainly the London programme, Leeds is the starting-point for the North Regional lines. From Leeds lines go to Sheffield and Hull, up to Newcastle and down to London.

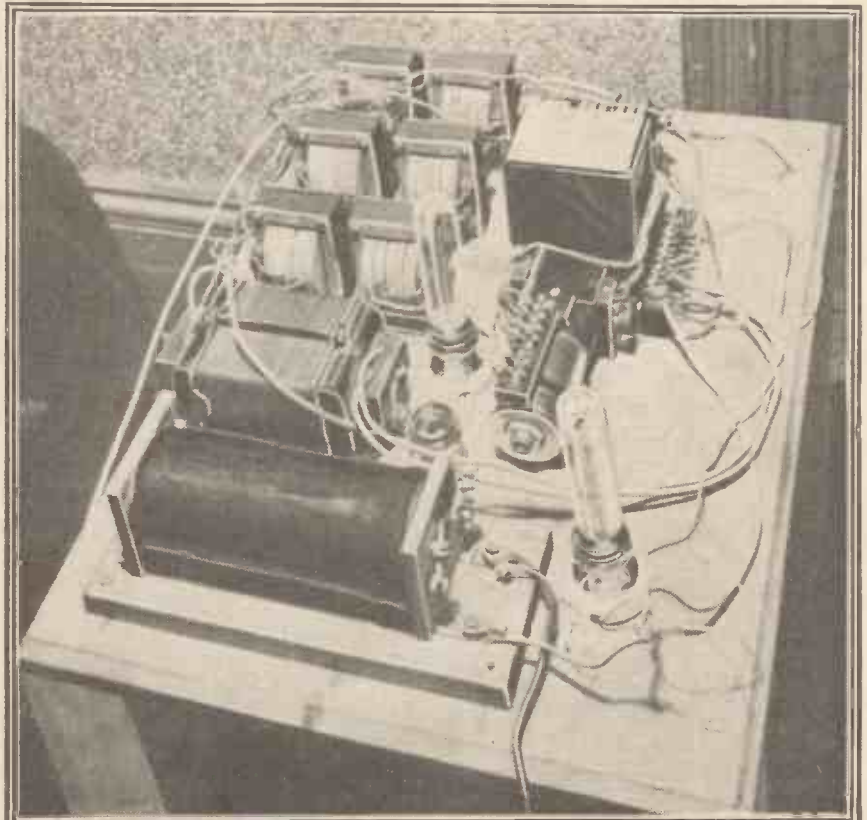
There is a special line to Glasgow, from which junction points run off to the Edinburgh, Aberdeen and Dundee stations. On this map I saw the alterations which are being carried out.

There will be new lines from Newcastle to Edinburgh and Edinburgh to Glasgow, from London to Leeds, London to Bournemouth and Manchester and a submarine cable to Belfast.

I confess it is difficult, just looking at a map on a wall, to realise what these land-line connections between the stations really mean. It is convincing, though, when the engineer merely pushes in a 'phone plug and within a minute or two is talking to the control-room at a station three hundred miles away.

In the evening, too, when the S.B. system is working at full pressure, the engineer at Gloucester can tap

"RINGING UP" THE REGIONALS



This interesting piece of apparatus is installed at the Gloucester repeater station. It is used for calling up the different B.B.C. stations and is commonly known as "The Ringing Machine."

A Glimpse of Gloucester—continued

into any line and hear how the London programme is going out to any of the West Country stations.

Overhead and Underground

Lines, lines, lines! I dare say you are wondering just what these B.B.C. lines are. As you go in a car along many of the main "A" roads you see the overhead long-distance 'phone lines which connect the Post Office trunk exchanges.

Some of these lines are humming

with business and private 'phone calls. Others are carrying the B.B.C. programme to some distant station! At present many of the lines which the B.B.C. uses are overhead, but the Post Office has an ambitious scheme on hand whereby all lines in the next few years will be carried underground.

That will be the end of scare reports in the daily papers on the morning after a bluster that 'phone communication between important towns (and incidentally between B.B.C. stations)

is impossible because some of the 'phone lines have been blown down.

In the old days underground cables were useless for broadcasting, because they had a bad "cut-off." Intelligible speech was all very well, because the lack of frequencies was not very noticeable; but they were hopeless for music.

Correcting the Tone

With all the new underground cables there is a repeater station every 40 or 50 miles. There is a rather complicated network of condensers, chokes and resistances in a filter circuit, which keep the tone right.

The general idea is that if a line can only handle high notes well, then at the beginning of the line, from one B.B.C. station to another, there is an equaliser, which shifts up the tone, and at the other control-room end a corrector which brings it down to normal. The line thus carries a greater proportion of higher frequency, and so when the corrector is brought into circuit at the control-room at the end of the line there is no loss of bass.

The Gloucester engineer told me that the short lines running out from the station work well from 50 cycles up to 8,000 cycles, and even on the long cross-country lines the top cut-off is in the neighbourhood of 7,000 cycles.

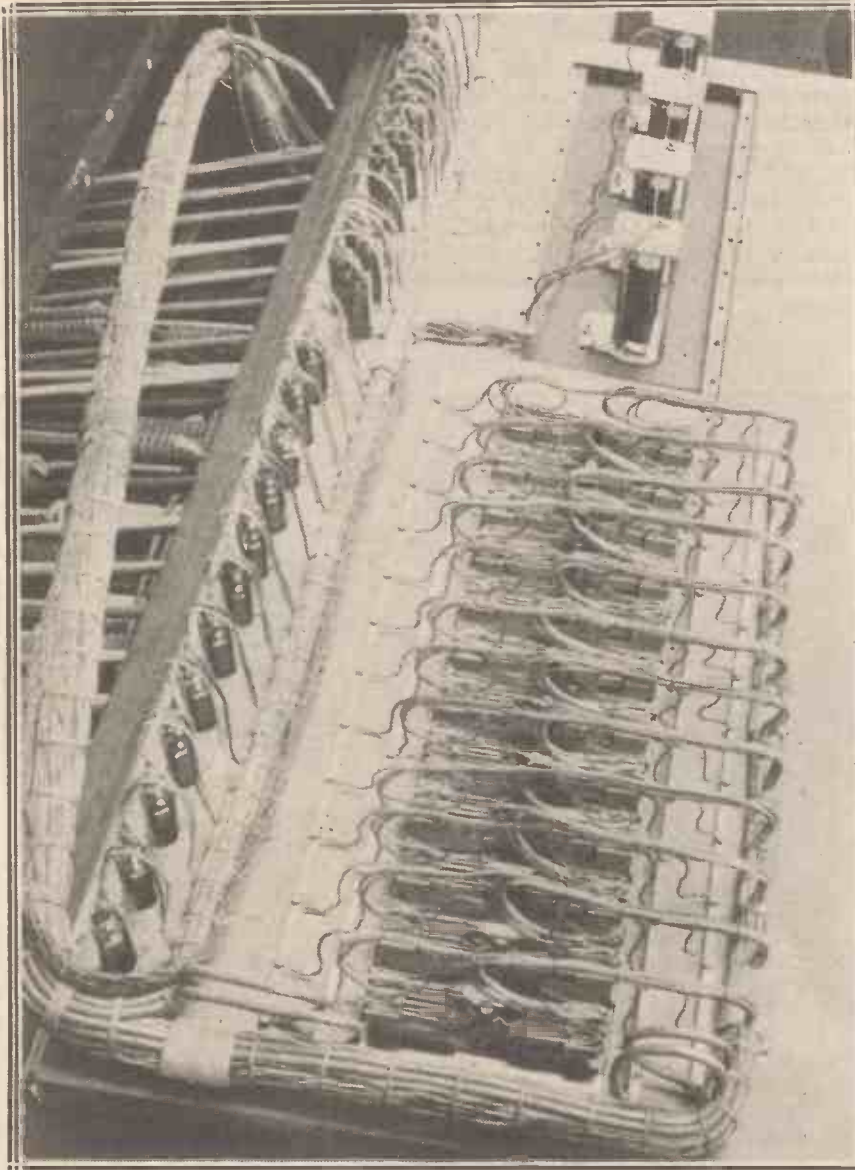
Many New Lines

Within the next few years the Post Office hopes to carry all cables underground, and the B.B.C. will take over some of these lines. Many new lines will be put down, such as one going under the Severn to the West Regional transmitter at Washford Cross, which will, of course, be underground.

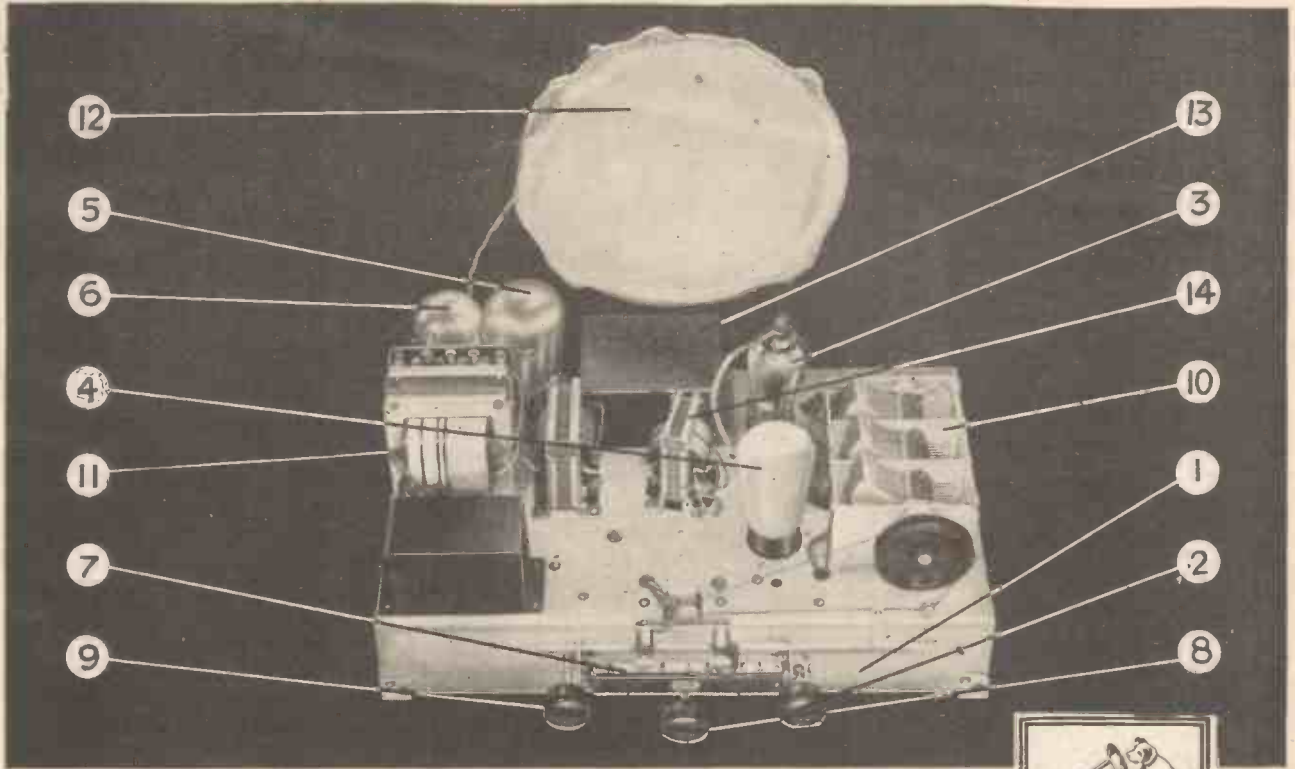
Sometimes, the Gloucester engineer explained, there must be a group of lines for a single station, and the reason for this is that ordinary amplifiers are used at certain repeater points. The amplifiers are just like those in an ordinary wireless set and are transformer coupled. The signals come in from one line at the grid end and go out at the anode output end. Obviously this system will not work in reverse.

Two-way repeaters—special speech amplifiers which can work in reverse—on the B.B.C. lines are used at certain repeater stations, but they are no good for music.

NOT WIRED WHILE YOU WAIT!



Inside the S.B. desk at Gloucester. The engineer in charge, sitting at his desk, is in full control of all the S.B. programmes originating from London, and he is able to tap in on any single one at will. As the reader can no doubt imagine, the connecting up of a complicated switchboard such as this required a great deal of patience and no small amount of skill.



Precision Engineering — not at one point— but at every point!

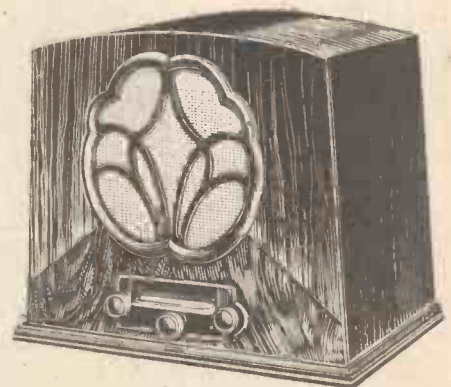
The above photograph of the chassis and loudspeaker removed from the walnut cabinet of the "His Master's Voice" Model 435 shows the clean layout and sturdy construction of the radio-receiver that has been described in the technical press as "one of the most outstanding triumphs of the British Radio Industry."

- (1) Cadmium plated chassis.
- (2) Combined "On — Off" and wavelength switch, automatically presenting appropriate scale.
- (3) Screened-grid high frequency valve making all worth-while stations audible.
- (4) Leaky-grid detector valve, ensuring superb quality of reproduction.
- (5) Super power pentode output valve.
- (6) Rectifier valve enabling receiver to be operated direct from electricity mains —no batteries.
- (7) Four separate illuminated scales showing "off," "medium waves," "long waves" and "gramophone."
- (8) Single tuning knob moving pointer across wavelength scale.
- (9) Combined volume control for radio and gramophone pick-up.
- (10) Three ganged condenser and band-pass filter circuits provide knife-edged tuning from a single knob.
- (11) Specially designed mains transformer enables instrument to operate from different voltage ranges by a single plug and socket system.
- (12) New type permanent magnet moving-coil loudspeaker, housed in a dust-proof cover to keep fine gap clear of dust.
- (13) Additional loudspeaker, remote volume control and gramophone pick-up sockets.
- (14) Intervalve transformer may be swivelled into position, securing the minimum of hum.

"His Master's Voice," Model 435, three-valve radio-receiver — Band-pass tuning — single dial control — incorporating moving-coil loudspeaker. 1½ to 2 watts output. Mains aerial in A.C. Model.

Voltage ranges and consumption — A.C. : 95-164, 190-260 volts, 50-100 cycles; 35 watts. D.C. : 190-250 volts; 60 watts.

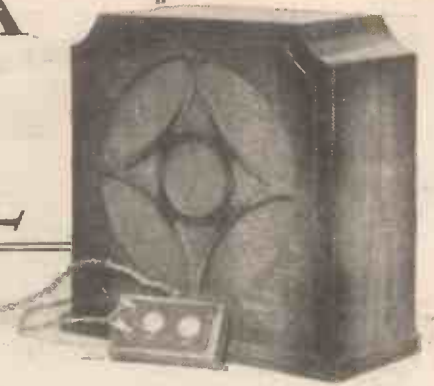
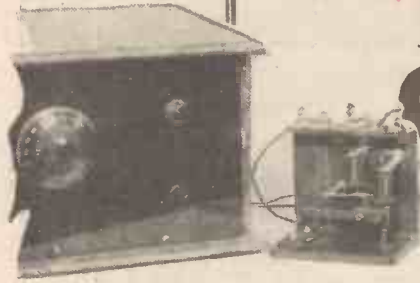
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The Gramophone Co. Ltd. London, W.1.

His Master's Voice

MAKING A REMOTE CONTROL



ARE you familiar with the purpose of a remote control unit? Do you realise that for a very little cost you can construct a unit which will enable you to switch your radio programme on or off without having to go near the actual set to do it?

Easy to Make

In other words, if you wish to use your loud speaker in a room away from the set, with a remote control unit in circuit you can still select just that part of the programme you want to hear without having to "endure" the unwanted items.

The remote control unit described in this article is not really difficult to construct, although the mechanical details require to be carried out with

This inexpensive little unit will enable you to turn your set on and off from any point in the house no matter where the receiver is situated. It does not take any extra current from the set's batteries and will work for months and months on an ordinary flashlamp refill.

By A. KIRK

some care if an efficient unit is to be produced.

The backboard (A) should first be screwed along one edge to the baseboard (B). Next obtain two pieces of 2 B.A. or 4 B.A. tapped rod, each piece 2½ in. long, and secure them by means of nuts to the backboard in the positions marked C and D.

The pivoted beam (E), full details of which can be obtained from the diagram provided, is made from three suitably shaped pieces of ebonite.

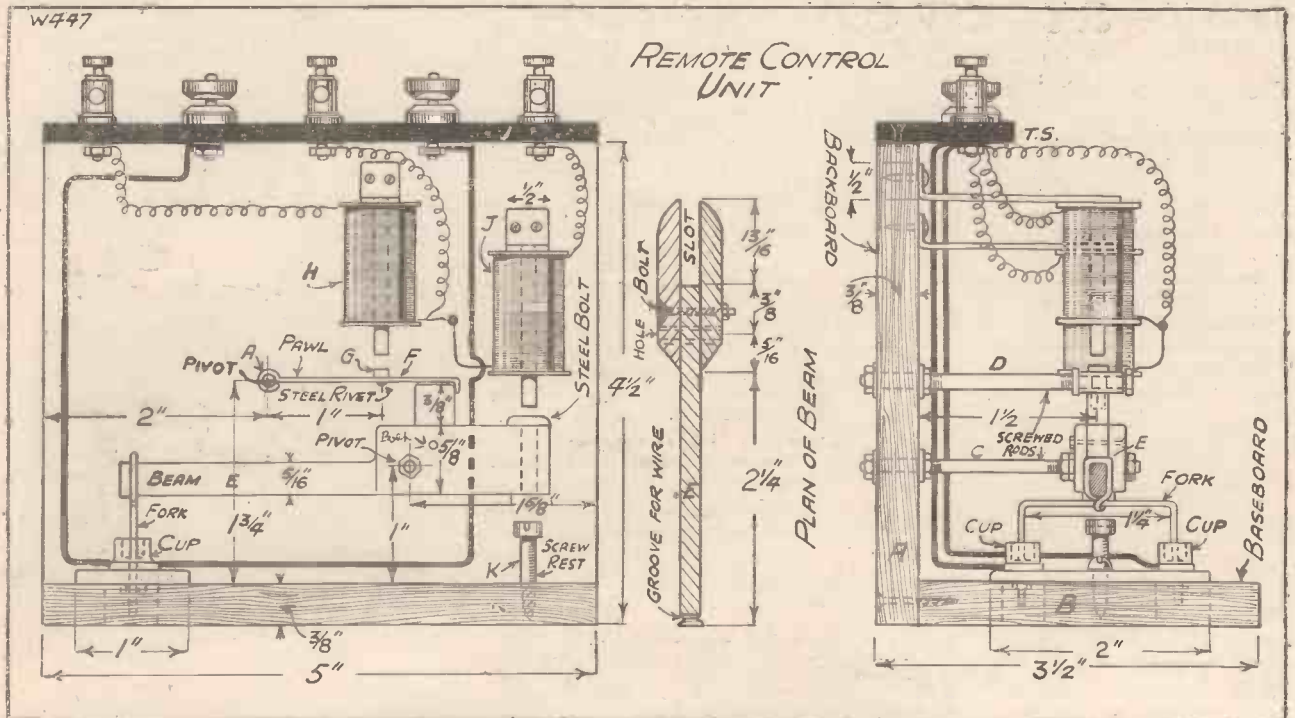
At the thin end of the beam a groove should next be cut, and a piece of No. 18 S.W.G. wire should be twisted lightly round the groove. The ends of this piece of wire should be bent into a fork shape, as shown in the side-elevation drawing of the completed unit.

Balancing the Beam

At the slotted end of this beam a fairly heavy nut and bolt should be fitted in such a way that when the beam is pivoted in position the nut and bolt end is just sufficiently heavy to bring the other end up.

The cups (subsequently to be filled with mercury) into which the prongs of the "fork" dip are made from pillar-type terminals cut to a

AN ELECTRICAL "ROBOT" THAT WILL TURN YOUR SET ON AND OFF!



The constructional work is much simpler than these comprehensively dimensioned diagrams might at first convey. No tools other than those needed to assemble receivers in the ordinary way are required.

here it is...!

All-British—
Naturally!

A 3-VALVE KIT FOR ONLY



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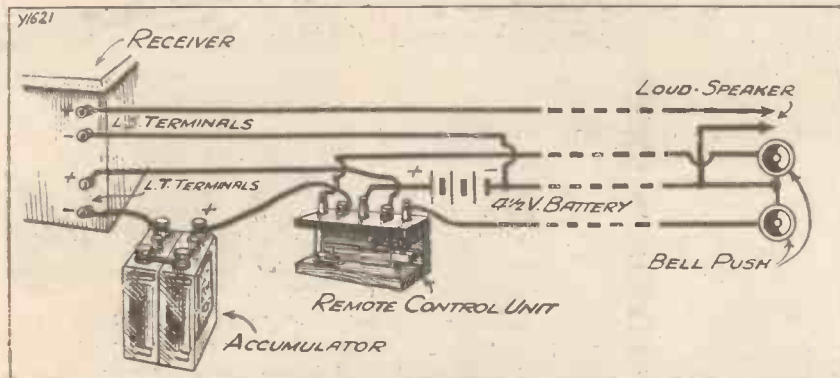
Making a Remote Control—continued

suitable size. The hole in each cup should be made with a $\frac{1}{4}$ -in. drill to a depth of $\frac{3}{16}$ in.

appropriate position on the base-board (B).

The armature, or control arm (F),

ONLY FOUR WIRES ARE NEEDED

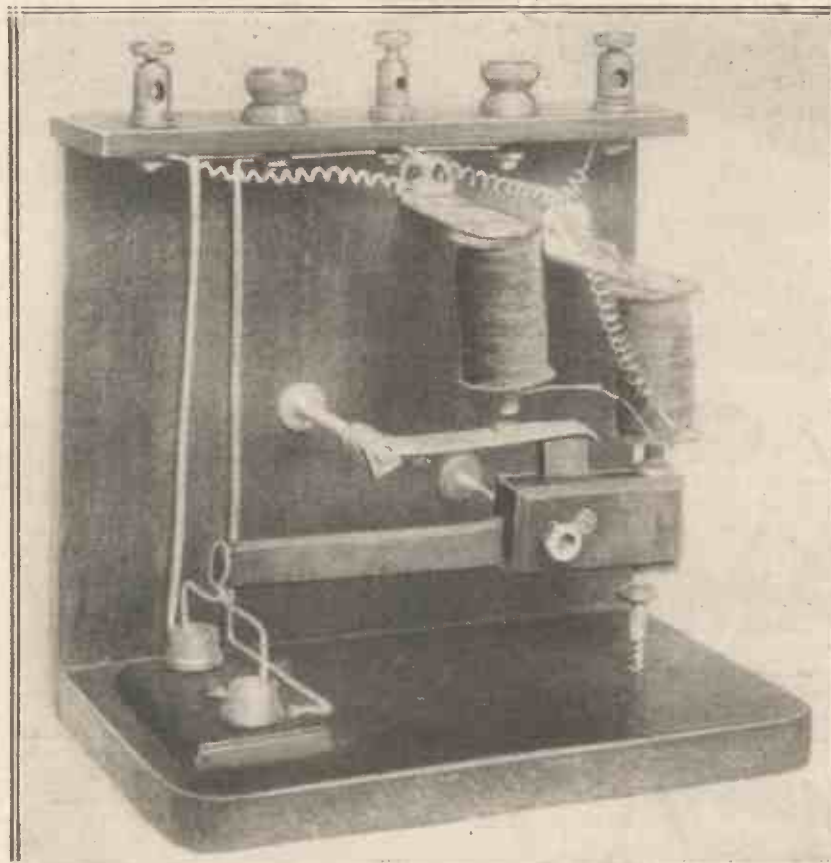


One of the loud-speaker extension wires is also employed as one of the remote control connections. The control thus necessitates the use of only two extra wires which may conveniently take the form of a length of twin bell-wire.

Next mount these cups on a strip of ebonite with the centres $1\frac{1}{2}$ in. apart (see elevation diagram), and mount the ebonite strip in the

is the next thing to prepare, and this can be made from a strip of aluminium or brass $\frac{3}{8}$ in. wide. At one end the strip should be bent round so that

MERCURY-CONTAINING CONTACT CUPS

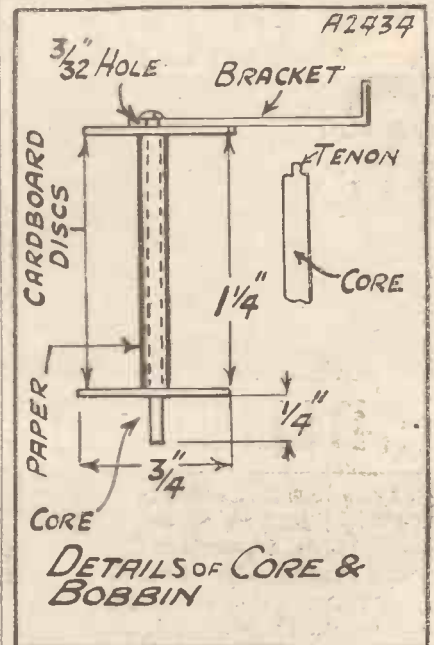


In the bottom left-hand corner of this photo can be seen the two little cups which are filled with mercury and into which dip the two ends of the wire above, L.T. thus being switched on.

it will swivel on the tapped rod D.

The other end of this strip should be bent down to an angle of 90 degrees for about $\frac{1}{16}$ in. The construction of the armature is completed by the fixing of a steel rivet (G), the position of which can be determined from the front-elevation of the finished unit. The

BOBBIN AND CORE



Two electro-magnets are used, and the bobbins for holding the wire are built up on the cores themselves.

“block” round the edge of which this armature fits is part of the centre piece of ebonite of the beam.

When you have reached this stage in the construction you will begin to get an idea of the way in which the unit works.

Mercury Contacts

When the beam is held in a horizontal position by means of the armature the two mercury cups are joined together electrically by the fork-shaped piece of wire, and the circuit is complete.

If a current is now passed momentarily through the bobbin (H), the armature is attracted, and owing to the weight of the steel bolt the wire prongs are raised clear of the mercury cups and the circuit is broken.

If the beam fails to fall on to the screw rest, or if it falls too heavily (Please turn to page 379.)

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"S.T.300"

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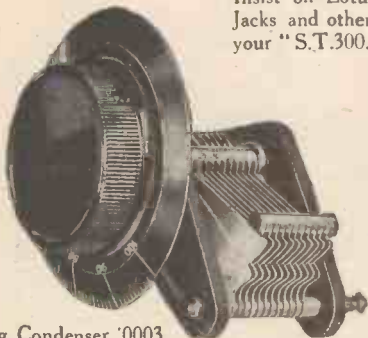


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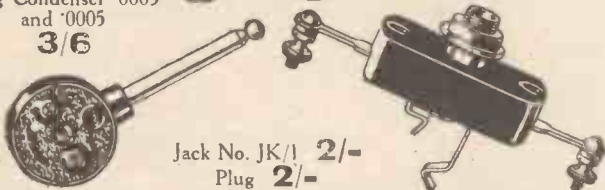
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The Types to use
in the
A.C. "S.T.300"

The types shown are the Special Non-inductive Type 9200, of which the 1 mfd. capacity costs 2/9, and the Moulded Mica Type 670, in which series the .001 mfd. costs 1/-. All good dealers stock them.



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CONDENSER Co. (1925) LTD.

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THE fundamental technical problems of television would be very much simplified if we had at our disposal a wide band of frequencies; unfortunately this is impracticable for several reasons, not the least of which is the already overcrowded state of the ether.

If the picture is televised as a whole—that is, in a single unit—it is obvious that all the points or scanning spots of the picture must be transmitted successively, whilst the picture itself, as has been found by experience, must be repeated at least $12\frac{1}{2}$ times per second.

It is obvious that if we could subdivide the picture into several parts, and have a separate wave-length or wave-band devoted to each section, it would be much easier, since the number of scanning spots to be dealt with in each section would be proportionately reduced.

Using Several Channels

This idea has, of course, long been known and a great deal of work has been done upon it. It is doubtful if the necessary multiplicity of radio channels will ever be available, particularly in view of the ever-increasing requirements for radio channels for telephony and broadcast transmissions.

Nevertheless, there may be an important field for television by line transmission, and here the number of channels may—subject only to the usual economic considerations—be multiplied at will.

I have before me a Paper by Mr. C. O. Browne, read before the Institution of Electrical Engineers, and entitled "Multi-Channel Television." This Paper describes some most interesting experiments upon land-line television, using five channels simultaneously. The primary object

A descriptive article in which our contributor explains the working of a new system of television. This method employs a frequency range of approximately 117 kilocycles, but in order to overcome certain difficulties this is divided up into five separate bands, or channels, each having a width of about 23 kilocycles.

of the experiments was not so much to simplify the transmission of an ordinary picture as to increase the available number of scanning spots, and so to improve the detail in the received picture.

In these experiments the received picture was projected upon a screen measuring 24 in. by 16 in., scanned at the rate of $12\frac{1}{2}$ times per second, and

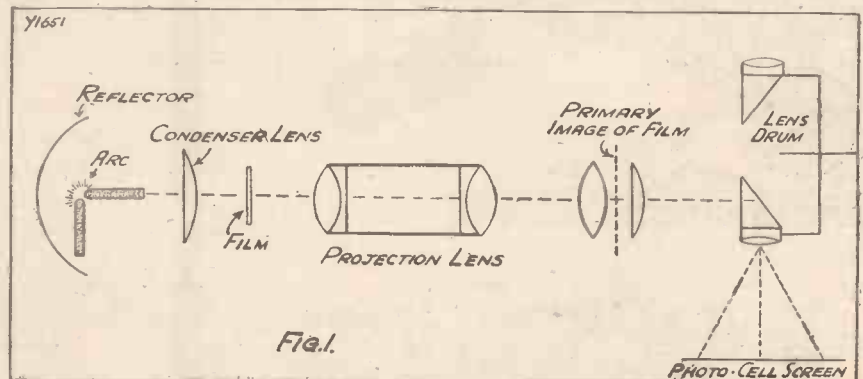
The speed of $12\frac{1}{2}$ pictures per second was chosen because 50-cycle A.C. mains could then be used without awkward gear ratios. The transmitting and receiving apparatus were synchronised by synchronous-motor drives operated from the same A.C. source.

Frequency-Range Required

It is interesting to note that the frequency range necessary for transmission on the foregoing basis is $12\frac{1}{2}$ multiplied by 15,000 multiplied by $\frac{1}{2}$ —that is, 93,750 cycles per second. The explanation of the factor of $\frac{1}{2}$ is that one cycle comprises two (light and dark) picture elements.

In practice the above figure has to be multiplied by another factor, which turns out to be about $\frac{1}{4}$ ths and rep-

AT THE TRANSMITTING END



Showing the arrangement of the apparatus for the five-channel television transmitter, a lens drum being used for scanning.

composed of 15,000 elements or scanning spots. The pictures received were comparatively good, and showed details of a moderately pronounced character as contained on an average cinematograph film, which was used as the object to be televised.

The sub-titles on the film were resolvable, although some smaller details were definitely rather obscure.

resents the ratio of the duration of the total picture-cycle to the time the picture is stationary whilst being scanned. This brings the figure to 117,000 cycles per second approximately.

The picture was divided into five equal parts and the total frequency range was divided into five equal bands, each of which was transmitted

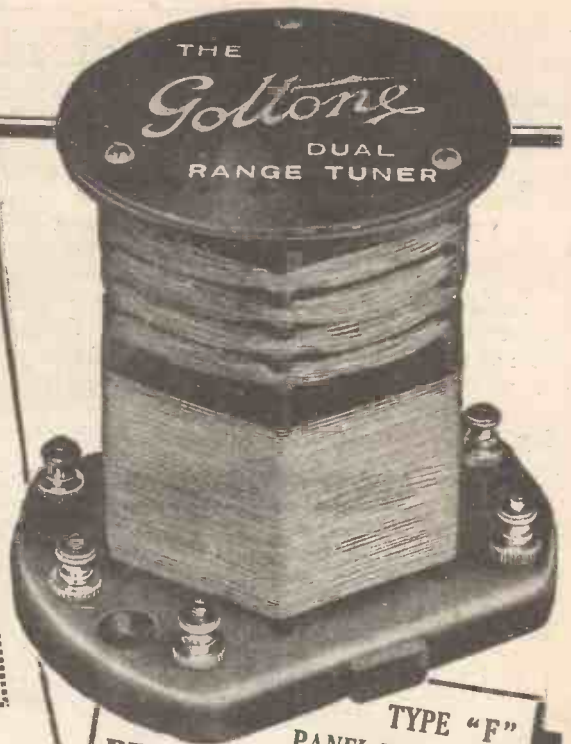
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Five-Channel Television—continued

separately and simultaneously. Dividing the 117,000 cycles per second by 5 (the number of channels) gave 23,400 cycles per second for each channel.

A Practical Limit

Incidentally, it is desirable to limit the cycles per second in each channel to not more than 25,000 per second in view of the practical difficulties involved both in the amplifiers working from photo-electric cells and in

of picture elements with respect to the boundaries of the received image; non-linear electrical distortion, due to working over the non-linear portions of the characteristics of components such as the valves or the Kerr cells.

Chromatic distortion, which is associated with the electrical distortion, and which shows up as areas of red light which are noticeable on the grey-green background produced by the

particularly important to introduce mechanical filtering systems, and in addition a good deal of experimental work was carried out by the author on various damped spring-coupling arrangements. Eventually, however, these mechanical filters were made quite satisfactory and a perfectly steady picture was obtained.

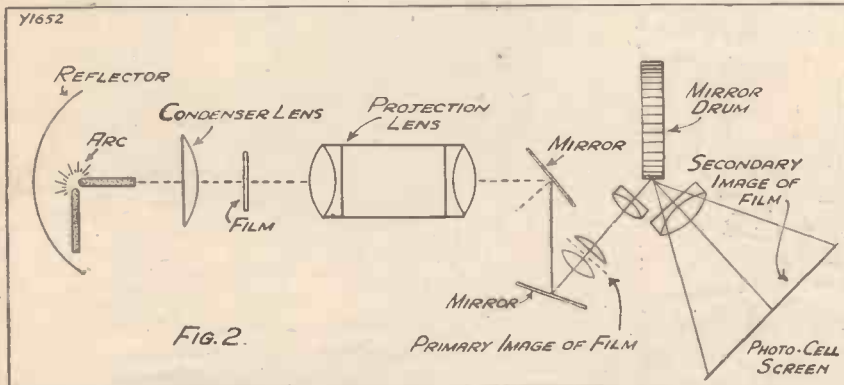
Results of the Experiments

These experiments have shown that quite a fair television picture can be composed, of the size mentioned, using 15,000 points—that is, about 36 points to the square inch. The picture can, of course, be enlarged, but with corresponding decrease in the brilliancy of the received image and with no greater definition. The scanning speed of $12\frac{1}{2}$ pictures per second was found to be insufficient, and with the relatively large received picture the effect of the flicker at this speed was noticeably augmented.

Reasonable-Size Picture

The use of 15,000 scanning spots would, of course, be a very serious problem if only a single radio channel were available. Nevertheless, these experiments have shown definitely that for land-line transmission, with at least five channels available, it is possible to get a reasonable-size picture with fair definition; indeed, something which is in the realm of practical politics. It remains to translate these very excellent results from land-line television into terms of radio television!

ANOTHER METHOD OF TRANSMISSION



The system illustrated here is the same as in Fig. 1, but a mirror drum is used instead of a lens drum for scanning purposes. The photo-cell screen in both cases is a frame carrying the fine cells, one for each channel which carries a fifth of the complete picture.

the use of Kerr cells. I have not the space in this short article to deal with the details of the transmitting and receiving systems, but it is interesting to note that a vacuum caesium photo-electric cell was used at the transmitter owing to the excessive attenuation which is introduced at the higher frequencies by gas-filled cells.

The voltage-swing required to operate the Kerr cells used at the receiver is of the order of 600 volts double amplitude, so that the total amplification required between the photo-cells and the Kerr cells is 3×10^5 , or 110 decibels. Actually the amplifiers were designed for a total magnification of 10^6 , or 130 decibels.

Various Types of Distortion

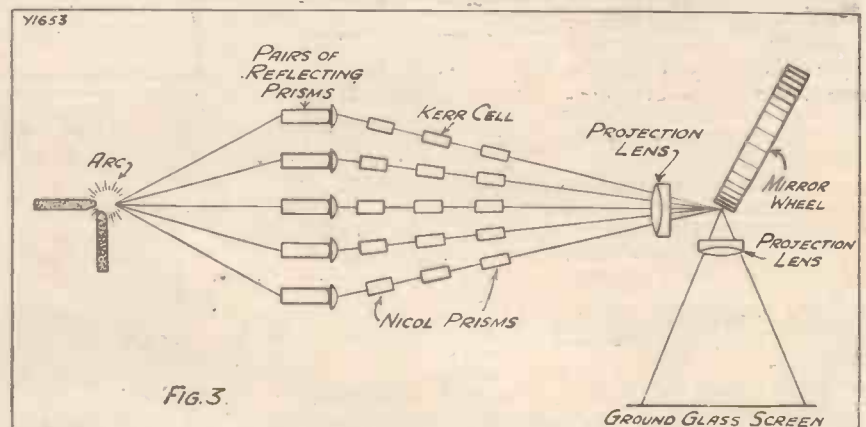
The transmitter amplifiers were divided into two sections, each section being fed from its own batteries, partly to prevent feed-back and partly for portability.

The Paper deals in considerable detail with various important practical points, such as geometric distortion, due to defects in the transmitter and receiver optical systems, which give rise to erroneous positions

colour of the nitro-benzene in which the Kerr cells are immersed; frequency distortion, which produces either deficient or accentuated definition at particular spots of the picture and may introduce non-linear distortion; and phase distortion, which gives rise to fictitious positions of picture-elements upon the receiver screen.

In order to overcome unsteadiness in the received picture it was par-

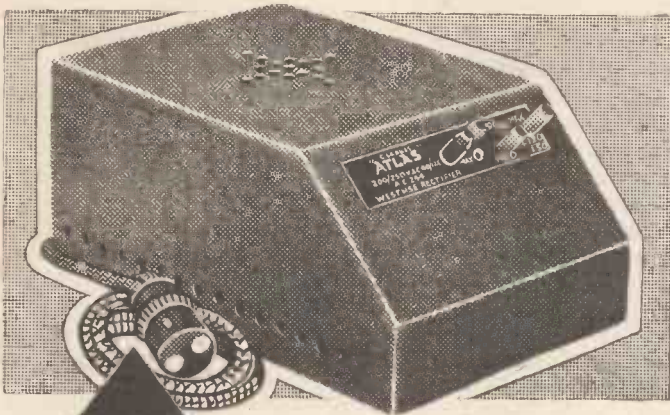
THE "MULTI-CHANNEL" RECEIVER



In this diagram the television receiver is shown. The five separate channels all feed via their Kerr cells on to the one mirror drum which is running synchronously with the scanning drum at the transmitting end and which projects the complete picture on a ground glass screen.

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OUR NEWS BULLETIN

That "Titanic" Play

The B.B.C. came in for a good deal of adverse criticism when it was announced the other day that it was proposed to broadcast a play based on the disaster to the "Titanic" in 1912. Captain Sir Arthur Henry Rostron, Commander of the liner "Carpathia," which rescued 711 people from the "Titanic" when she sank after striking an iceberg on her maiden voyage, expressed his dislike of the B.B.C.'s proposed play very strongly. He thought the idea should be dropped immediately.

"Tell the B.B.C.," he is reported to have said, "to think of the feelings of those relatives of the drowned, who will remember the day that followed that terrible April night till they die. Some of the scenes during the rescue by the "Carpathia" will haunt me for ever. They still haunt others. My plea is that the B.B.C. should be merciful to them."

Logical Reasoning

Practically every newspaper was against the idea of this "Titanic" play, which, we understand, was conceived by Mr. Filson Young. The idea of broadcasting the play has now been dropped.

We are inclined to agree that this is all to the good, but, on the other hand, it is a little illogical that a play about the "Titanic" should be dropped on the grounds that it would cause distress to the relatives of those who were drowned.

If this argument is to be logically maintained, then the B.B.C. should never broadcast any play which has any bearing on the fighting during the Great War. Surely a play like "The White Chateau" may be said to have caused more distress to many, many more people than a play based on the "Titanic" would be likely to cause?

A Question of Power

A daily newspaper has pointed out that the recent activities of the B.B.C. have made the terms of its original Charter of Incorporation and Licence from the Postmaster-General

(Continued on page 375.)

Batteries Hold Their Own

IT is reported that at least £10,000,000 was spent on radio batteries during 1931, and in the same year nearly 1,000,000 wireless sets were also sold to the public. The battery figures are interesting in view of statements which have been recently made that mains-operated sets are on a fair way to oust battery-operated sets.

Where the H.T. Goes

Other figures about radio in 1931 are now available. Here are some outstanding points: It is reckoned that there are nearly 12,000,000 homes in this country, and the Electrical Development Association states that only 3,000,000 are equipped with electric lighting supply.

It is estimated that at the time of writing something like 4,000,000 battery-operated sets are in use in Great Britain, and if we take three new H.T. batteries a year as an average, this means a sale of 12,000,000 of these batteries a year.

More Optimism

According to G. A. Atkinson, the well-known film critic, television for general entertainment purposes will probably begin on a large scale with the broadcasting of films, because it is cheaper to televise a film of an event than the event itself. He points out that the American Entertainment Trust estimates the potential users of a National television service in America at 26,000,000 people, and preparations are now being made to put on the market a television set costing a few pounds.

There is also news of the possible construction of a new television station in America, which will be so powerful that it will be able to televise films from New York direct to Europe.

Mr. Atkinson is a first-class film authority, but we venture to think he is being a little too optimistic when he writes in such glowing terms of television.

OUR NEWS BULLETIN

—continued from page 374

a matter of considerable public importance, and the question which naturally arises is: What power, if any, the Government retains over the expenditure by the B.B.C. of public money on programmes and objects to which the vast majority of its subscribers take strong exception.

Greater Control Needed

Although public protest, as reflected by the newspapers, has stopped the "Titanic" broadcast, it failed to prevent the B.B.C. from spending public money on the stupid census of listeners for the benefit of the London School of Economics. Consequently, it is felt in certain authoritative quarters that it would not be surprising if steps are soon taken to ensure greater Government control of the B.B.C.

Mr. Scott-Taggart's Novel

"The First Commandment." Hutchinson, 7s. 6d.)

Many readers have no doubt seen prominent advertisements of Messrs. Hutchinson (publishers) announcing a novel by John Scott-Taggart, which is described as "a vivid novel of the newspaper world in which the author probes into the hearts of men and women with a skill and sympathy which excites admiration."

We had always pictured Mr. Scott-Taggart as probing into the hearts of wireless sets, so we were intrigued by this bombshell. But we have long since ceased to be very much surprised at what he does; his career, quite apart from the technicalities of radio, has been very eventful. A distinguished war career beginning at seventeen years of age, wide travels, the successful building up of a publishing business, the ownership of five aeroplanes in succession which he has piloted himself (he has had three crashes—one involving a broken rib, and the other a near escape from drowning in the Channel in wintry

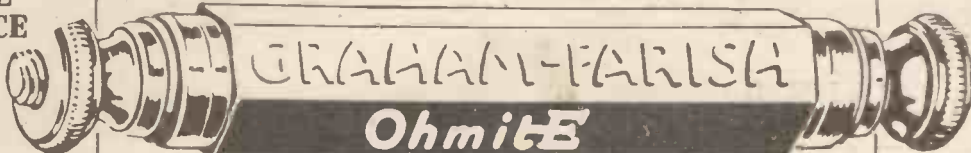
(Continued on page 376.)

PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

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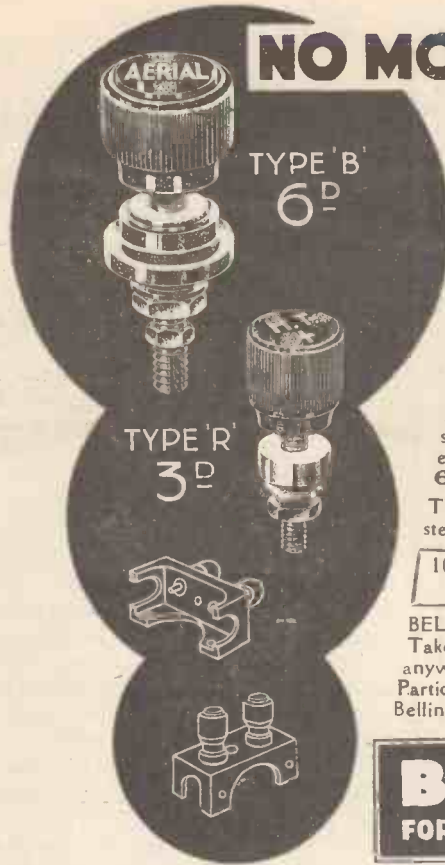
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—continued from page 375

seas), are incidents which alone have brought him into contact with the realities of life.

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This is a rattling good story, and we could not put the book down till it was finished. We gather that story-writing is, for Mr. Scott-Taggart, a relaxation from wireless; we only hope the success this novel deserves does not wean him from radio!

We can wholeheartedly recommend our readers—or their wives—to buy this story, or put it on their library lists. They will find it absorbing.

(We note that a novel of very similar title has, by a coincidence, been published simultaneously, so get the title right!—Ed.)

Concerning Public Money

The B.B.C. is always getting lime-light, and the limelight reveals facts which ought to be well known to-day, but which are constantly escaping public attention. For instance, the sale of wireless licences last year brought them in more than a million pounds, and this year, owing to the increase in the number of licences—there are practically four and a quarter million—much more than a million pounds will be received by the B.B.C.

In fact, the B.B.C. was so prosperous in 1931 that its income exceeded its expenditure by £186,000, and it is quite likely that by the end of this year it will have half a million pounds in reserve.

With these huge sums of public money involved it is only right that the public's Parliamentary representatives should have a good deal to say in the matter of the distribution of the money subscribed by listeners for the maintenance of the B.B.C.

The Empire Station

It was announced in the House of Commons recently that it was hoped to provide a regular service from the new Empire broadcasting station before the end of the year. Work on the construction of the station has already been commenced. The scheme

is being financed out of the B.B.C.'s revenue, and there will be no question of overseas contributions until the new Empire service has been started

Site Near Daventry

The site for the new station will be very close to the present Daventry 5 X X. In all there will be seventeen aerials, eleven of which will be directional, and two transmitters to enable distinct programmes to be sent out simultaneously.

Dividing the Empire

The whole of the British Empire has been divided into five zones for the purpose of this British

**THE "S.T.300" FOR YOUR
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RECOMMENDED ACCESSORIES

Loud Speakers—Blue Spot, W.B., Amplion, Celestion, Epoch, H.M.V., B.T.-H., R. & A., Graham Farish, Marconiphone.

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Detector: Mazda A.C.2/H.L., Cossor 41M.H., Mullard 354V., Marconi and Osram M.H.4, Six-Sixty 4G.P.A.C., Tungfram A.R.4101.

L.F.: Mazda A.C./P., Cossor 41M.P., Mullard 104V., Marconi and Osram M.L.4, Six-Sixty 4P.A.C., Tungfram A.P.495.

NOTE.—Where valves other than those mentioned in the text are used care must be taken that the right value of bias resistance is used in each case.

Mains Unit.—This should be able to supply a heater current of 3 amps. at 4 volts, and an H.T. supply of 200 volts at 30 milliamps. If larger units are used (giving more than 30 milliamps.) it may be advisable to load the output by means of a resistance to ensure that at the anode current (total) taken by the valves employed the voltage does not rise above 200. Heayberd (M.W.1), Atlas, Regentone, Formo, Ekco, R.I., Tunewell, Lotus.

Empire broadcasting service. Roughly speaking, these will include the principal Colonies and Dominions as follows

1. Canada, British Guiana, Trinidad, the West Indian and certain Pacific Dependencies.
2. Australia, New Zealand, Tasmania, Borneo, and the East Indian Dependencies.
3. India, Burma, the Malay States and adjoining Dependencies.
4. South Africa, Mesopotamia, Egypt, Somaliland, East Africa.
5. West Africa, with the Gold Coast, St. Helena and Ascension Island.

VALVES AND BIAS FOR THE A.C. "S.T.300"

THE grid biases for the S.G. valve, the output valve and the detector valve (when the latter is used as the first L.F. amplifier of gramophone currents) depend upon the types of A.C. indirectly-heated valves you use. Three Spaghettis (or other resistances if you can fit them in) are necessary (R₁, R₂ and R₃), and their values and my recommendations of valves are given below. (The first valve, of course, is the S.G. valve.)

MAZDA RANGE :
A.C./S.G., 1,000 ohms; A.C.2/H.L., 600 ohms; A.C./P., 1,000 ohms.
Total current = 19 milliamps. An A.C./H.L. may be used instead of A.C.2/H.L., and no change of spaghetti is necessary.

MARCONI AND OSRAM RANGE :
M.S.4B., 750 ohms; M.H.4, 750 ohms; M.L.4, 300 ohms.
Total current = 25 milliamps.

COSSOR RANGE :
M.S.G.—L.A., 300 ohms; 41M.H., 750 ohms; 41M.P., 300 ohms.
Total current = 27.5 milliamps.

MULLARD RANGE :
S.4V.B., 200 ohms; 354V., 1,000 ohms; 104V., 1,000 ohms.

Total current = 19.5 milliamps. (Note that 300 ohms will do instead of 200 ohms, which some "Spaghetti" makers do not produce.)

The above current values were obtained with an H.T. of very close to 200 volts in each case with unit in operation. If your own mains unit gives more than the above the set will work perfectly, e.g. a unit rated at "50 m.a. at 200 volts" will mean that using those valves the H.T. may rise to 300 volts, but the valve-makers object to this as affecting valve-life, etc.

Using a Larger Unit

If you wish to use a larger unit than the 30-millamp. one necessary for maintaining a steady 200 volts, an outside resistance can be put across the unit to keep the H.T. down. Unit manufacturers are only too pleased to advise on all matters relating to "eliminators." But note that for these valves you do not need a unit bigger than will give the total currents I mention. In fact, almost indistinguishable results are obtainable by cutting the H.T. down to 150 volts. The Mazda and Mullard valves then take a total of 15 m.a.; Cossor's take 17.7; and Osram and Marconi 17.8 m.a. So that a 20-m.a. unit would really do if it gives 150 volts with this current withdrawal. The values of self-bias resistances given above are not altered.

Some of the types of valve given above are obtainable in metallised form. All my tests are done with both types, but the metallised form is theoretically better, and I advise the type; in the "S.T.300" itself there is no apparent advantage, however. It is essential if a metallised S.G. valve is used to wrap insulating tape around the glass where the metal coating would touch the screen, or to leave a slight air-space all round, otherwise the grid-bias resistance is likely to be shorted; this is no calamity and no damage can be done, but obviously one doesn't do it intentionally. The order of makes of valve in my list has no special significance.

J.S.T.

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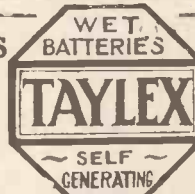
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 * THE GRAHAM FARISH *
 * "AMAZING THREE" *
 * Some details of a new kit set *
 * that has made its appearance on *
 * the market. *

WE have recently had the opportunity of examining and trying out one of the new Graham Farish kit sets, which this firm is marketing at the exceedingly moderate price of 38s. 6d.

Messrs. Graham Farish assume that the purchaser is not equipped with tools, and so to make his task easier they supply a combined screwdriver and spanner, which, with the aid of a pair of scissors to cut the systoflex, should be all the constructor requires to carry out the job.

In appearance the completed set is most attractive. Bakelite mouldings have been used throughout, and the clever positioning of the parts to achieve compactness without loss of efficiency is a credit to the designers.

Extremely Useful

Everywhere there is ample evidence that Messrs. Graham Farish have spared no pains to ensure the utmost simplicity in both construction and operation.

The circuit itself comprises an anode rectifier followed by one choke and one parallel-feed transformer-coupled stage of L.F. magnification, and the tuning coil has two alternative tapings giving different degrees of selectivity.

We tested the set at Tallis House, using $1\frac{1}{2}$ volts negative grid bias on the anode rectifier and 84 volts H.T. on the H.T. +1 tapping, 120 volts H.T. being employed for the two L.F. valves.

With the aerial connected to the tapping on the coil giving the higher degree of selectivity, the two Brookmans Park transmissions were brought in at full loud-speaker strength and were just separable. The North and Midland Regionals were receivable on the loud speaker in daylight. On the long waves [Radio-Paris could be received at good strength on the loud speaker without interference from Daventry.

The set gave very good volume and the reproduction lacked nothing in clarity or balance.

It is remarkably good value for money, and should afford many pleasant hours of listening in return for the very modest outlay required.

MAKING RADIO READABLE

—continued from page 350

Frequency is usually measured in cycles per second, and so it is necessary to know what is meant by a cycle. There is nothing mysterious about it, it is just a complete set of movements—first in one direction, back past the starting place and along in the other direction and back again.

When you switch on your set, a variety of alternating currents and direct currents spring into activity.

Expressing Frequency

From your aerial you get high-frequency (H.F.) currents, which will have a frequency of about a million cycles per second if you are working on the medium wave-band. To avoid using such large figures the H.F. frequencies are usually given in kilocycles—i.e. thousands of cycles.

The alternating currents which work your loud speaker vary, as I mentioned last month, from about 50 to 5,000 cycles per second, these being known as low-frequency (L.F.) currents. They are also called the audio-frequencies, because the corresponding pulsations of the air which they produce in the loud speaker are audible to us as sound.

I am afraid that we have been talking about rather elementary matters, but I hope to get on to some more interesting stuff next month.

A PRACTICAL MAN'S CORNER

—continued from page 338.

If you use perforated zinc with $\frac{3}{16}$ -in. holes, not a bad idea is to obtain a length of ebonite tubing with an outside diameter of $\frac{3}{16}$ in. Cut this into little pieces each about half an inch long. Then whenever you want to pass a wire through the base, first of all put a piece of tubing into the hole selected.

The tubing fits tightly, and with it in place there is not the least fear of a short between a positive high- or low-tension lead and the chassis taking place.

Metallised Valves

Most valves intended for use on the high-frequency side of the set can now be obtained in metallised form; that is, with the outsides of the bulbs covered with a coating of fine particles

of metal held in place by a gummy base.

These are exceedingly useful, especially in sets with a high stage-gain in the H.F. circuits, since they minimise unwanted couplings and therefore make for stability. The metallic coating is connected to one of the filament pins, and it is very important that the low-tension wiring of the set should be such that this pin is the negative.

It won't make a great deal of difference to results if the valve is so arranged that the coating is connected to filament positive, but it will open vast unpleasant possibilities in the matter of low-tension shorts.

You have, for example, the screens of all kinds of components connected to low-tension negative, and if the set is chassis-built there is a large area of metal also at low-tension negative and earth potential.

Let the bulb of a metallised valve connected up in the wrong way touch a screen and there you are, or perhaps I should say there you aren't. Fig. 5 gives a bird's-eye view of the proper connections of the valve holder of a metallised valve. It will be seen that looking from the plate towards the grid leg of the holder the low-tension negative terminal is the right-hand one.

Should you contemplate changing over to metallised valves in an existing set—and in many cases it will be well worth your while to do so—I would strongly recommend you first of all to see that the wiring of the filament circuits is as in Fig. 5. If it is not, the necessary alterations are not difficult to make.

Increasing Selectivity

One advantage of the metallised valve will be appreciated by those who live almost on the doorstep of a super-power station. It is not always realised that an unmetallised valve is itself by no means a bad collector of powerful wireless impulses, which means that at short range the valve may be to some extent responsible for direct pick-up from a high-power transmitter.

Metallised valves definitely increase selectivity in such cases, as I have proved by actual tests. I live at no great distance from Brookmans Park, in a locality where the field strength of both the London stations is very great. Another very important point about the metallised valve is that by minimising interaction effects it helps appreciably to make reaction control smooth.

MAKING A REMOTE CONTROL

—continued from page 368

when the armature is released, the desired balance can be obtained by sliding the steel bolt one way or the other along the slot.

With regard to the magnets, the cores are made from soft iron. The variety used by electric welders for welding is very suitable, being about $\frac{3}{8}$ in. in diameter.

A piece of this iron $1\frac{1}{8}$ in. long is tenoned down at one end to $\frac{3}{8}$ in. and riveted into a brass or aluminium bracket. Two discs of cardboard are fitted tightly on the core, one against the bracket and the other $\frac{1}{4}$ in. up from the bottom. Between these discs is wound a piece of paper a few times round the core, and the whole dipped in thin glue. The actual winding is put on between these two cardboard discs.

The Magnet Windings

Wind as neatly as possible with No. 32 D.S.C. wire until the winding is about $\frac{5}{8}$ in. diameter; 5 in. being left at beginning and end for connection to terminals. Both magnets are similar in construction.

The magnets are fitted to the backboard in such a manner that when the beam is "on" or horizontal, the steel bolt in the slot is just clear of the core of the magnet above it, and when the beam is "off" the rivet in the armature is just clear of the other magnet core.

The terminal-strip is the next thing to be fitted, and when this has been done the cups and the ends of the magnet windings should be wired to their respective terminals. The cups are now filled with mercury, and the unit is ready for use.

To put it into operation, connect up as shown in the diagrammatic circuit. The actual unit remains at the set end, but at the loud-speaker end of the extension leads you will require two ordinary bell-pushes. One of these bell-pushes enables you to switch the set on, and the other comes into use when it is desired to switch the set off.

"ATLAS" Mains Unit for "S.T.300" Set

Owing to numerous enquiries for an "ATLAS" mains H.T. unit suitable for the "S.T.300" set, Messrs. H. Clarke & Co. (M./cr.), Ltd., have produced a special unit for this set. This unit is Model A.C.244ST, and provides three tapplings—First tapping gives 60/80 volts with minimum and maximum positions; second tapping gives 50/90 volts with minimum, medium and maximum positions; and the third 120/150 volts. Output gives 20 m.a. at 120 volts. Cash price, £2 19s. 6d.

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FITTING A PENTODE

—continued from page 358

constructional detail is given in the wiring diagram, it seems hardly necessary to dwell upon the construction in the text.

But for the benefit of new readers, perhaps a word or two concerning the order in which the various jobs should be undertaken would not be amiss.

Cutting the Baseboard

The first thing is to cut out the baseboard, and in doing this it is desirable to keep the edges as square as possible, for otherwise when you come to screw the terminal strips on the sides you will find they have the appearance of being drunk!

So that squarely-cut baseboard edges is the first-important point.

Your next job should be to cut out and drill the two terminal strips, and, in this connection, before you mount them to the baseboard you will find it best to fix the terminals on them.

When the two strips are mounted you can then proceed to fix the components to the baseboard, after which, with the wiring diagram shown elsewhere in the article to guide you, the wiring procedure should not take you very long.

Now, by way of conclusion, may we say a word or two concerning the way in which the unit, when finished, should be fitted to your set?

First of all connect the plus and minus loud-speaker terminals on your present set to the correspondingly-marked terminals on the unit. These two terminals, which are on the four-terminal strip, should not be confused with the two terminals marked L.S. on the other strip. The

two latter terminals are, as a matter of fact, joined direct to your loud-speaker.

The terminal marked L.T. negative on the four-terminal strip should next be connected to the L.T. negative terminal of your set, and you should then be left with only one further terminal to connect. This one, which is marked "priming grid," should be joined direct to the terminal on the side of the pentode valve.

By the way, if your present set employs a standard type of filter

NEXT MONTH

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output circuit it should be disconnected when this pentode arrangement is in use.

The Alterations

To put it out of circuit, disconnect the wire which is at present joined to the anode terminal of the last valve holder in your set (if more than one wire is joined to this terminal, they should all be disconnected), and join this anode terminal instead by means of a piece of flex wire to the terminal on the unit marked "L.S.—"

The L.S. plus terminal on the unit in this case should be joined to the maximum H.T. plus terminal on your set. The wire at present going from this latter terminal to the H.T. battery should, of course, be left undisturbed.

THE "UNI-AMP"

—continued from page 327

One end of the secondary of this transformer goes to G.B.—1 and the other end to the grid of the "detector" valve in the set via the flex lead and the plug.

The Filament Supply

The plate of this valve is joined up in the usual way to the output valve. The filament supply for the amplifier is obtained via the two flex leads from the filament pins of the adaptor plug.

When using the "Uni-Amp" after a detector valve the method of connecting up will be as follows: Put the switch over to the opposite position from that in which it was set for the scheme just described, namely, over to the B position, the B plug now coming into use.

In this case the plug is placed in the detector valve holder as before, and the detector valve is replaced. In the amplifier a small power valve should be inserted.

Changing Over

Grid bias—1 is not now used and —2 is connected to a tap on a grid-bias battery suitable for the power valve in use.

The loud speaker is connected across the output terminals and H.T.+1 is connected up to the same voltage as that applied to the detector valve when the set is used in the normal manner.

H.T.+2 is connected to the maximum voltage available, and the pick-up terminals naturally are not connected up at all. That completes the connections.

INDEX TO ADVERTISERS

Britannia Batteries, Ltd.	PAGE 320
Belling & Lee, Ltd.	375
Bird, Sydney S., & Sons, Ltd.	377
British Blue Spot Co., Ltd.	Cover iii
Burne-Jones & Co., Ltd.	317
Bulgin, A. F., & Co., Ltd.	377
British Hard Rubber Co., Ltd.	377
British Institute of Eng. Technology	375
Carrington Mfg. Co., Ltd.	371
Colvern, Ltd.	355
Clarke, H., & Co. (M/cr.), Ltd.	373
Day, Will, Ltd.	379
Dubilier Condenser Co. (1925), Ltd.	369
Edison Swan Electric Co., Ltd.	Cover iv
Exide Batteries	361

Ferranti, Ltd.	PAGE 373
Formo Co.	356
"Film Pictorial"	Cover iii
Gilbert, J. C. (Cabinets)	376
Graham Farish, Ltd.	367 & 375
Gramophone Co., Ltd.	365
Hayberd, F. C., & Co.	376
Jackson Bros.	318
Lotus Radio, Ltd.	369
Milton Mfg. Co.	376
Munday, A., Ltd.	356
Ormond Eng. Co., Ltd.	359
Peto-Scott Co., Ltd.	319
Pickett's Cabinets	377
"Popular Gardening Annual"	318
Radio Instruments, Ltd.	356

Ready Radio, Ltd.	PAGE 349 & 351
Reproducers & Amplifiers, Ltd.	318
Taylor, C.	377
Telsen Electric Co., Ltd.	Cover ii
Turner & Co.	374
Varley Products	379
Ward & Goldstone, Ltd.	371
Westinghouse Brake & Saxby Signal Co., Ltd.	379
Whiteley Electrical Radio Co., Ltd.	371
Woodcrafts Co.	375
Woodworkers Supplies	375
Wright & Weaire, Ltd.	356

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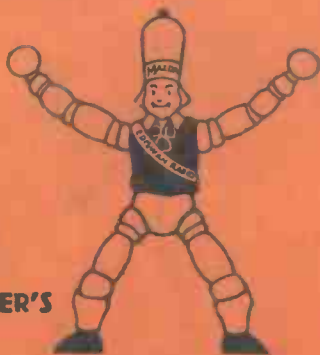
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