

P.A. AND THE PRE-AMPLIFIER (SEE PAGE 133)

Popular Wireless & TELEVISION TIMES

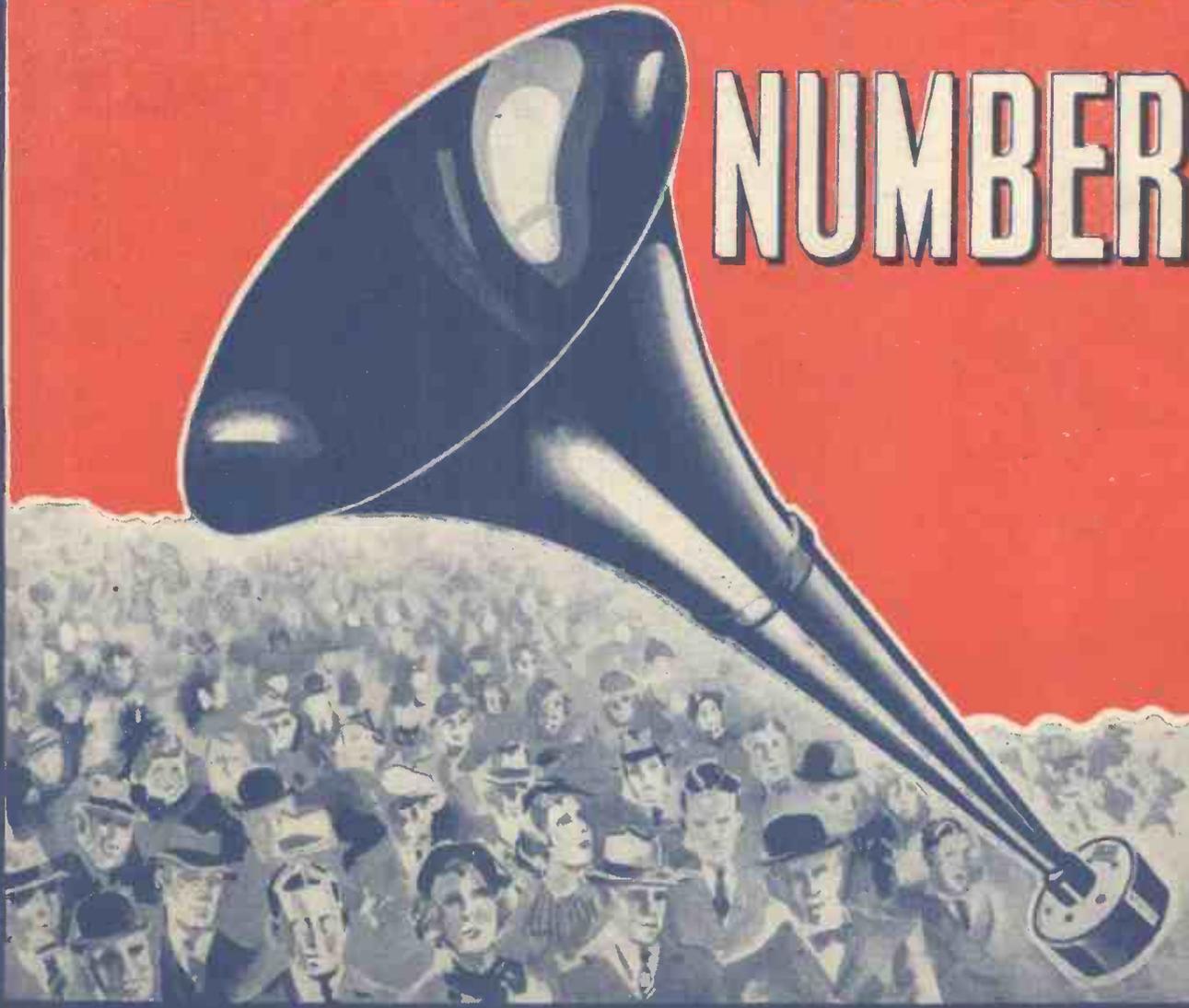
P.A. INSTALLATION
TIPS

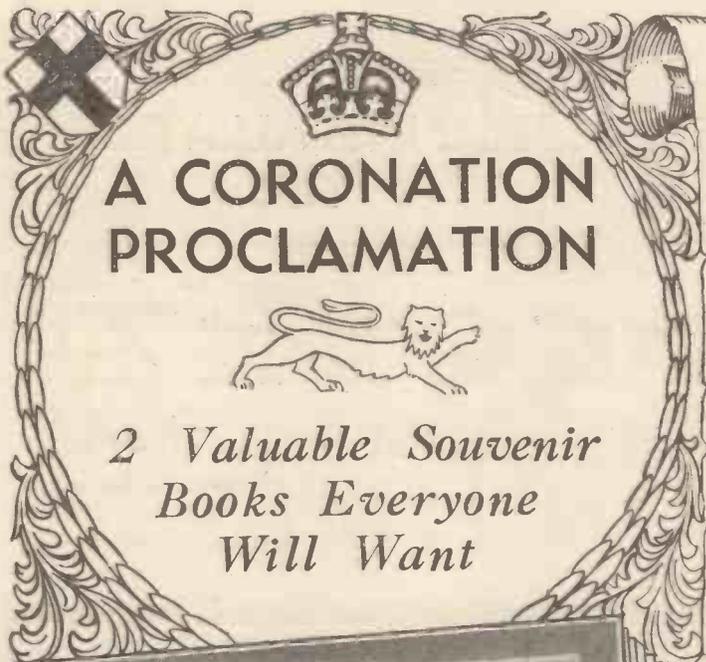
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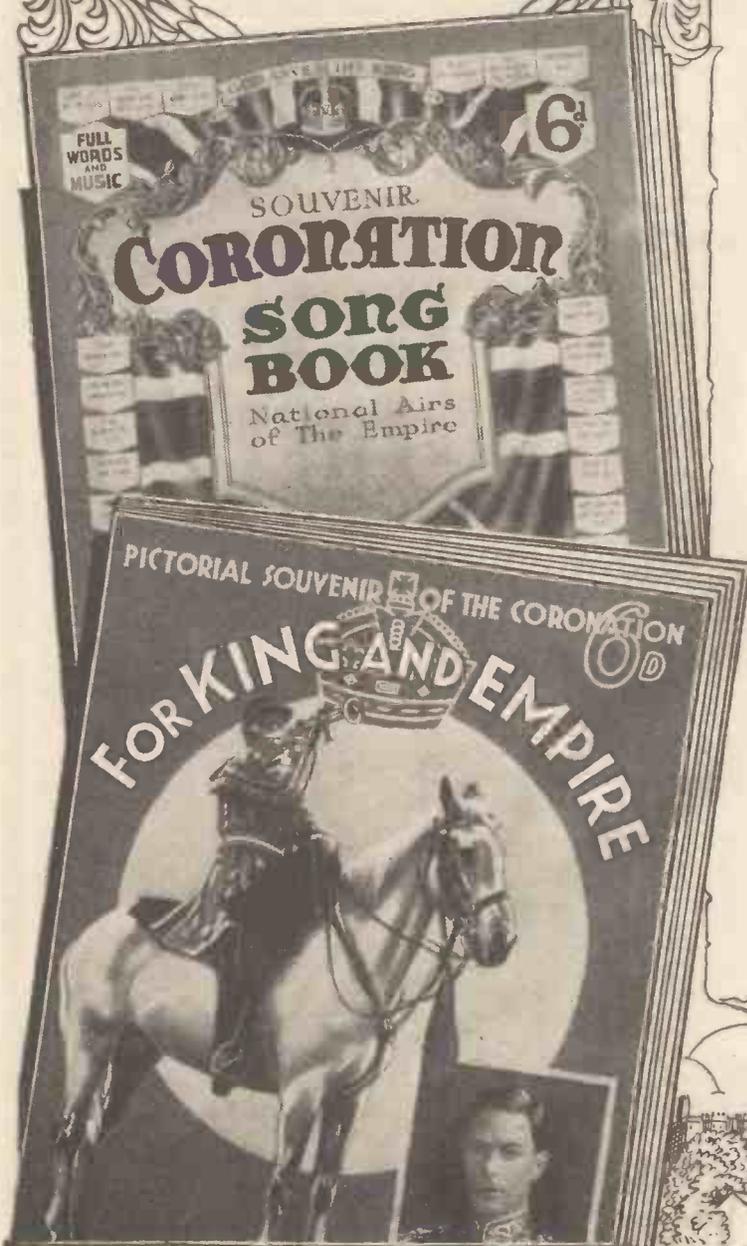




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Editor: G. V. Dowding

Asst. Editors: A. Johnson-Randall, A. S. Clark

MORE MONEY
TELEVISION
RUST ON ROSES

RADIO NOTES & NEWS

WORDS FAIL ME
MICK AND MIN
THEY SAID IT

Nasty Threat

IN one respect the B.B.C. is exactly like you and me—it *wants more money*.

The recently issued tenth annual report was as gloomy a document as I have perused since my horrified optic beheld the total shown at the foot of my last Income Tax form. This B.B.C. annual report stakes out a claim for a bigger share of the licence money. "It is clear," says the report, "that unless the contribution from the Treasury recommended by the Broadcasting Committee is available, the anticipated requirements of television, both for capital and revenue expenditure, cannot be met without severe detriment to sound broadcasting."

The sting is in the last five words. Our programmes won't stand any detrimting.

Radio in the Commons

THE Secretary of State for Foreign Affairs was recently asked by Mr.

Pilkington (Widnes) whether his attention had been called to the recent Italian broadcasts alleging the use of poison gas by British bombing aeroplanes on tribes near Aden; and what action he proposed to take. Mr. Eden replied: "Yes, sir, my attention has been called to the Italian broadcasts in question. The allegations regarding the use of poison gas are entirely unfounded. With regard to the second part of my hon. friend's question, his Majesty's Government considers that the publication of the facts of this case constitutes sufficient action." Mr. Pilkington: "Cannot the right hon. gentleman ask the Italian broadcasting agency to deny these allegations?" Mr. Eden: "No, sir. I do not think it worth while."

Look You

EVERY owner of a television set should make a point of staggering along to Olympia before April 24th. Marconi-E.M.I. Television, with the help of the B.B.C., are staging a sideshow at the Ideal Home Exhibition, and the result is that the looking public have a unique opportunity of seeing the production side of the television programmes.

A number of home-type receivers pick up the programmes from Alexandra Palace, and between times the film "Television

Comes to London" is shown in the viewing theatre. On the other side of the gangway is a replica of a B.B.C. television studio, wherein gaudily painted artists do their

MY WORD By THE EDITOR

PUBLIC ADDRESS

The Coronation, and all of the thousands of open-air and indoor festivities which will be associated with it, will create the greatest need and most widespread use of Public Address that have ever existed.

That is the ample justification for the devotion of this special number of "Popular Wireless" to the subject. The tens of thousands of organisers and officials of national and local functions have brought before them details of the apparatus available and hints from experts on how to install and use it.

And constructors and experimenters and those who just listen are introduced to one of the most important and fascinating uses of the thermionic valve and loud-speaker.

But here we deal in tens of watts of power as against the two or three comprising the output of even the average mains set. Yet, fundamentally, much of the apparatus and the circuits employed are the same as those that figure in the "L.F. end" of an ordinary radio receiver.

I would urge our younger readers to read the articles in this issue carefully, for "P.A." work holds at least as many opportunities as any other branch of the electrical and radio industries, and it is varied and interesting into the bargain.

turns under the glaring lights, while an Emitron camera keeps its eye on them.

The Exhibition runs daily from 10 a.m. to 10 p.m., admission 2s. 4d., or half-price after 6 p.m.

Points From Letters

"WHY do they call it Chamber music?" asks T. W., of Sidecup.

They've got to call it something, T.W., and as it is not intended for a full-sized orchestra such as needs a big hall, but for a few players who might easily be accommodated in my lady's chamber, they chose a very suitable name for it.

"What did you mean by saying that the Brighton Police radio sets are in the Feline Slumberwear class?" asks A. C. S. of Ringwood. "What is the Feline Slumberwear class?"

Cat's pyjamas, boy, cat's pyjamas!

"Do you know who A. J. Alan is? Really and truly?" says Miss C., of London, W.I. I do, moddom, really and truly, *I do*. But I found out only by the most astonishing sleuthing, and I promised faithfully not to divulge the name. (Had I known what a dog's life Arieline was going to lead me about the secret I should not have Sherlocked so determinedly!)

Rusty Postscript

THE nodding daffodil, the repetitive cuckoo, or the favourite suit at the cleaners, are not more infallible signs of Spring than the postscripts to letters from gardening friends.

J. W. M. of Canterbury writes me a long screed about superhet second-channels—a heart-breaking, channel-crossing sort of letter—and at the end he adds this postscript: "How do you cure rust on roses?"

It takes all the Spring out of my step just to think about rust on roses. My roses rust faster than a box of nails left out all April. What makes it worse is that I could easily ask the Editor of "Popular Gardening"—but I'm afraid to get him to wipe away my troubles with a word, for do you know what he might say?

He might say that he wanted to ask *me* something—something about superhet second-channels, and all that! I think I'll chance the rose rust, after all.

(Continued overleaf.)

NEXT WEEK: HOW TO MAKE A 5-WATT UNIVERSAL AMPLIFIER

BOUNDBROOK'S WHITE AND ORANGE AERIAL MAST

Germany's Sir John

BBROADCASTING administration and control have been completely reorganised in Germany.

A national manager has been named, who is also Chairman of the Reich Broadcasting Company. The appointment has gone to Dr. Glasmeier, who was manager of the Cologne station.

Pray silent sympathy for Dr. Glasmeier, who has to please eight and a half million German listeners, including Herr Hitler!

By comparison, our own Sir John is lying at ease in a bed of roses, on velvet, with soft lights and sweet music.

"A Marriage Has Been Arranged"

AN instance has recently come to light of a dusky African maiden—together with her complete trousseau of seven anklets and a couple of ear-rings—having been exchanged by her loving father for a wireless set.



She was the acknowledged belle of the village. Her ears were set far wider apart than any other maiden's, and every time she smiled they were

dazzlingly united by a double row of dental perfection.

Her father obstinately refused all offers for her hand until a chief of the Wily Willy tribe brought out a small box, flicked on a switch, and smote the silence of the jungle with "Ol' Man River."

As the music died away the visitor pointed to the set and said, "You lika?" while with the other hand he indicated the maiden and murmured "Me catcha?"

Swept away by a spirit of scientific curiosity, all paternal prejudice evaporated in a hearty, "O.K. Chief!"

"THE LITTLE SHOW"

"The Little Show," designed by Bryan Michie as a radio cabaret attraction for presentation round about 10 o'clock in the evening, returns to the microphone in the National programme on April 27th. The Coronation season in London will attract to the "floor shows" of the luxury hotels the greatest cabaret artists of the world. Many caravansera have already announced the engagement of famous artists.

Michie has allotted himself time for surveying all the cabaret entertainments of London, and will produce these famous acts in a series of "Little Shows." The B.B.C. Variety Orchestra, conducted by Charles Shadwell, and the new combination within that orchestra called "The Variety Swingers," will support the cabaret stars.

Words Fail Me

WORDS," said the nigger, "is about the fondest thing I is of." Judging by the way some of you sharks swoop down on me if, peradventure, my pen should slip, you, too, are lovers of words. Allow me, therefore, to commend to your notice this new series of talks which the B.B.C. has put on under the title "Words Fail Me." Begun on Thursday, April 8th, this series promises to be good.

Incidentally, the Postmaster-General recently told the House of Commons that the B.B.C.'s weekly output of words was over 400,000. Had I been asked to guess the figure I should have placed it much higher than 400,000 for the "I Love You's," and "Feeling Blues" must run into the hundred-thousands some weeks!

Mick and Min

MINNIE, recently hailed in America as the world's only singing mouse, had hardly become accustomed to the honours showering thick upon her when up jumped Mickey, of Devonport, Eng.



At his first test in the B.B.C. studio at Plymouth Mickey showed the artistic temperament, and spent five minutes in poshing up his whiskers in complete silence. Just

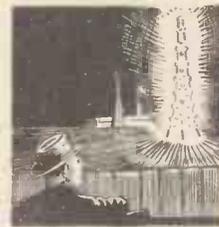
as his audience were getting restive he changed his mind, lifted up his voice, and rang the welkin several times in succession.

His finale—*vibrato pizzicato*, with just a hint of *whadda-ya-know-about-that*—created a near-riot, and was admitted by the critics to have placed Mickey in the Queen's Hall class.

Whether Mickey and Minnie will entertain audiences in this country is unsettled at the time of writing; but one thing is certain—between them they have definitely debunked that old gag about being "as quiet as a mouse."

For Fly-by-Nights

THAT new aerial tower erected not long ago at Boundbrook, N.J., for station WJZ, is not one of your self-effacing kind, hiding its light under a bushel.



No, sir. It reaches up to a height of 640 feet, and so that even the unobservant passer-by shall not overlook its presence it has been painted in alternate stripes of white and vivid orange.

When darkness falls, a high-power, occulting, blind-everybody beacon comes into action right at the top of the mast. And fifteen separate and powerful marking lights are arranged up the mast's length, to guide the inattentive eye to the topmost illuminations.

Theoretically, of course, all this ostentatious display is for aeronautical purposes. But how ecstatically the publicity boys must have entered into the spirit of it!

They Said It

OUR B.B.C. has been accused of melodramatising the Fen floods... It's the tone that matters. 'Aspects of Judgment Day' would, we feel, be announced from Portland Place as though

the end of the world were a lullaby in the Children's Hour."—"Daily Mirror."

"I do not think it is either helpful or stimulating in the public life of this country at the present moment to make any sort of provocative attack on the great work in which the B.B.C. is engaged."—Sir Patrick Hannon, M.P. (ex-Chairman Listeners' League).

"IN A GONDOLA"

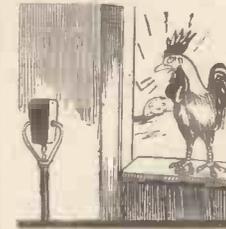
The Light Entertainment Department of the B.B.C. is replacing the popular feature "The Table Under the Tree" with one to be called "In a Gondola," which will start in June.

This programme might be described as an outside broadcast, as the artists are to journey along the Venetian canals in a mythical gondola.

Wilfrid Rooke Ley will write the book for the new series. The idea of touring round Venice in a gondola offers fruitful opportunities for the introduction of light and varied Italian music. The party may land at St. Mark's, visit the Opera, see the street festivals and carnivals, and tour the picture galleries.

Transatlantic Towsers

THE wide publicity recently given to the transmission by amateur radio across the Atlantic of a dog's bark, and the resultant waking of a New York dog by an Alsatian in Sussex, reminds me of the first instance of the kind.



This occurred when the Dutch telephony service to the East Indies was settling down to business, and the microphone in Java happened to be

"alive" near an open window. It was getting light in the East Indies, but was pitch black in Holland where the reception was being tested; so when a Javanese cockerel unexpectedly looked over the radio station's window-ledge and cock-a-doodle-do-ed at the microphone, the loudspeaker in Holland crowed in the dead of night.

Several Dutch cockerels within hearing of the loudspeaker thought they had overslept themselves, so they threw in the clutch and accelerated, waking up all the hens in Hilversum and Huizen!

A B.B.C. Resignation

MANY listeners will learn with regret that Mr. E. R. Appleton will resign his appointment as West of England Regional Director, as from June 30th, 1937.

Mr. Appleton, whose name is best known in connection with the Silent Fellowship and the Joan and Betty broadcasts, joined the B.B.C. in 1924 as Director of the Cardiff station. On the further development of the Regional Scheme he became Director of the West Region, and when this was divided into two regions last October he became West of England Director.

I understand that Mr. Appleton will devote his energies to a new movement among the youth of the English-speaking peoples.

ARIEL.

PUBLIC ADDRESS

ITS APPLICATIONS AND LATEST DEVELOPMENTS

THE growth of public address in this country during the last few years has been extraordinarily rapid. The day when the platform speaker had to shout in order that his words might carry to the audience has gone. No longer does the after-dinner speaker have difficulty in reaching those sitting at the far end of the banquetting hall. To the aid of these



The Coulphone 12-watt P.A. amplifier. It has a push-pull output stage and costs £12.

has come the modern public address system which, with its microphone into which the speaker can talk in an ordinary conversational tone, and its amplifier to magnify his words to any desired volume, has made public speaking the easiest thing in the world.

But this is only one of the many uses to which public address may be put. P.A. apparatus is employed in theatres, at greyhound racing tracks, on football grounds, at swimming pools, club dances, and, in fact, in a host of ways too numerous to mention.

Apart from its great value in amplifying speech, its use for relaying music is of extreme importance. The entertaining of



One of the G.E.C. moving-coil microphones. It weighs 3½ lbs. and is finished in antique bronze. The price is £5 10s.

spectators at football matches and at other outdoor sports and pastimes by means of gramophone records has been found to provide an increased revenue by those who have been enterprising enough to install the necessary equipment. Many a club social evening or dance can be run economically and be made a great success with the aid of a portable P.A. amplifier.

Here, then, is a profitable field for radio dealers who might see fit to purchase the necessary equipment with a view to hiring it out, and, of course, looking after the installation on occasions such as these.

Everybody will agree that great outdoor functions, such as the Hendon Air Pageant, are rendered vastly more interesting by the running commentary broadcast to the spectators by way of the P.A. projectors.

This year is a memorable one, and never will P.A. apparatus have been in greater demand than during Coronation week. May 12th will be a splendid opportunity for dealers all over the country to enhance their local prestige and do good service to the public by utilising P.A. equipment

for relaying the B.B.C. commentary on the ceremony to those who are unable to listen in their own homes or who are without radio sets.

Waiving of Copyright

On that day the B.B.C. will waive its copyright, and those who wish may relay the historic broadcast to the public at large.

P.A. equipment in general comes into two categories: (1) Apparatus intended for permanent installation, such as in theatres, public halls, on football grounds, etc, and (2) portable apparatus including mobile equipment installed in motor vans.

Generally speaking the portable P.A. equipment is relatively inexpensive, and those who invest in one of the good makes of apparatus are likely to find such an investment a profitable one, bearing in mind the numerous occasions upon which the apparatus can be installed for a reasonable fee.

In every town and village during the summer there are open-air galas and other events where the promoters will, we feel sure, readily agree that the provision of music and the ability to address the crowd in comfort is well worth a small fee. In the winter the apparatus can be used to take the place of orchestras or dance bands at local gatherings with some considerable saving in cost to the various bodies who run

this type of social evening. The majority of fixed installations are built up on the rack system, examples of which are illustrated in these pages. This method has several advantages, among which are its elasticity, since additional panels can be added as and when required, the whole being assembled vertically so that all controls, etc., are conveniently placed for



A 60-watt Correx portable amplifier priced at 70 guineas. Provision is made for two microphones, gramophone, pre-amplifier or radio unit.

operating, and the various units accessible for adjustment or servicing purposes.

With the rack system you can have your amplifier, mixer and tone control panels, gramophone turntable, and, if desired, a testing panel, built into a single compact assembly, taking up the minimum of space, while yet providing the maximum efficiency.

In reviewing the different types of equipment available at the present time we have decided to take the various firms in alphabetical sequence, and it will be appreciated that no importance whatever attaches to this particular order.

Many of the firms dealt with in these pages market both portable and permanent equipment.

(Continued overleaf.)



The Benjamin "Two-inch" Projection Speaker for P.A. work. It has a power-handling capacity of 25-30 watts and is priced at £15.

PUBLIC ADDRESS

(Continued from previous page.)

First on our alphabetical list we have Arden Acoustic Laboratories, who we note have many ambitious installations to their credit, one of them being the sound amplification and relay scheme which Arden engineers installed for the Southport Municipal Corporation. The apparatus installed has to supply an area of nearly one square mile, with diffused music relayed from different bandstands.

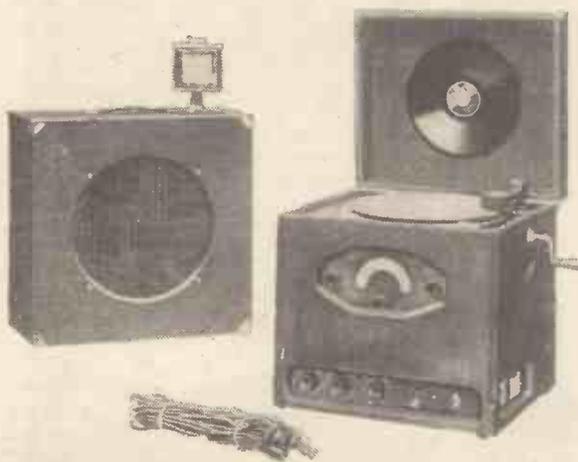
This firm includes in its range an amplifier rack, incorporating a turntable mixing unit and two 20-watt amplifiers giving a total



A Celestion Universal A.C./D.C. Amplifier costing 19 guineas.

undistorted power output of 40 watts. The unit principle of construction is used, and, should a fault occur in one unit the other will continue to give service at reduced volume. The amplifier will operate from eight to twelve heavy-duty loudspeakers at full volume.

A portable P.A. unit is available at 50 guineas, and this price includes a moving-coil microphone with a folding stand, an amplifier, and two moving-coil speakers in walnut cabinets.



Here is one of the outfits supplied by Gramplan Reproducers. It is a mobile 10-watt unit fitted with a radio input panel. Price, 43 guineas.

For mobile work, such as electioneering and propaganda, there are amplifiers which will work from a 6-volt battery; one of these amplifiers is capable of giving 4 watts undistorted output and the other 12 to 14 watts. The prices are 40 and 60 guineas respectively.

The P.A. engineer will be the first to admit that the best amplifier made cannot give good results unless the final output, namely the loudspeakers, is specially designed for the job and, moreover, designed by those who have had wide experience of moving-coil units capable of handling large inputs without distortion.

Among the firms who specialise in loudspeakers are Bakers Selhurst Radio and Benjamin Electric Limited.

The Baker Super Quality triple speaker can handle up to 20 watts without distress, and consists of a combination of two speakers, one being designed to cover the low and middle frequencies, and the other the upper frequencies extending to 14,000 cycles per second. This particular model costs £7 7s. and £8 15s. for its D.C. and A.C. versions respectively.

In the Benjamin range there are a number of well-designed units to choose from. One, which is illustrated in these pages, is the 2-in. Projection speaker, and this is particularly suitable for public address work where a directional effect is required. It can be used either indoors or outdoors, and is finished in black cellulose, while the spun aluminium horn is in two parts to facilitate carriage. A carrying case is provided to give adequate protection in transit.

The name "Two-inch Projection" model is intended to convey that the speaker unit incorporates a 2-in. diameter voice coil, which will carry three times as much audio current as the usual 1-in. size. The power-handling capacity is 25 to 30 watts. These figures leave a margin of safety. The price is £15, and a special field supply kit for energising the field coil for A.C. mains is available for £2 extra.

Amplifiers for battery, universal and A.C. operation are marketed by Birmingham Sound Reproducers Limited. The 45- and 30-watt A.C. amplifiers are built in two units—the main amplifier and the power pack chassis. There are three precision milliameters mounted on the chassis for valve checking



A compact 8-watt A.C./D.C. general purpose amplifier marketed by Francis Day and Hunter. Note the microphone and stand inside the hinged front of the case. This equipment costs 16 guineas.

purposes. A microphone transformer is incorporated, with a dual-purpose winding for carbon and dynamic microphones, and there are two faders for microphone and gramophone use, together with a tone control.

The 12- and 20-watt A.C. amplifiers are built on a single chassis, and these also are provided with faders and a tone control.

In the universal range there are a 16-watt amplifier, having a triode push-pull output stage, and an 8-watt

output, also with a triode push-pull output stage, for dance band purposes. The 12-volt battery or mains amplifier has an output of 12 watts, and operates either from a 12-volt battery or from A.C. mains, the change-over being effected by the simple movement of a switch.

High Power

The British Thomson-Houston Company specialise in the larger type of public address installation, necessitating large power outputs and intricate control arrangements.

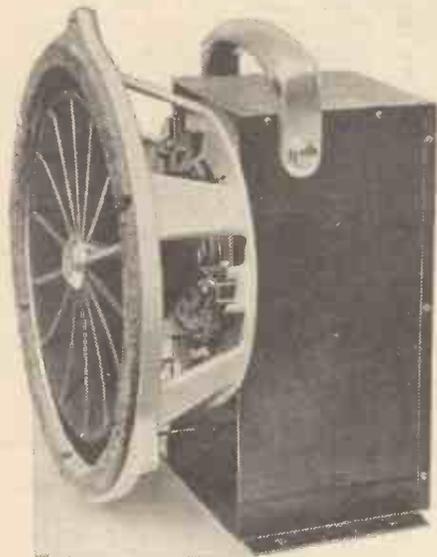
A section of this company's extensive research laboratories is devoted to the improvements in equipment in cinemas and P.A. installations generally. The latest B.T.H. achievement is the production of a 120-watt amplifier. This output is obtained in return for a mains input of only 500 watts.

Rack and panel construction is employed, and the circuit of the amplifier



One of the B.T.H. Rack and Panel type equipments. This firm specialises in the larger types of P.A. installations.

incorporates Class A/B amplification. A further B.T.H. development is a metal diaphragm speaker unit, which it is claimed gives greater efficiency than the moving-coil type speaker, while at the same time



The Sound Sales "Super-Auditorium" Speaker, priced at £12, complete with output transformer. This speaker can handle 15 watts when mounted on a 4-ft. baffle.

being suitable for dealing with 10 to 15 watts output.

The portable aspect has not been neglected by B.T.H., and there are available a 10- and a 30-watt unit suitable for use with gramophone, microphone, or radio inputs.

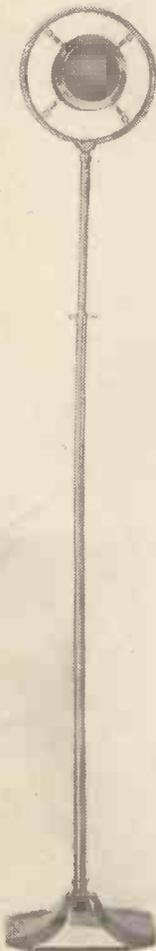
One of the most interesting pieces of P.A. apparatus in the Celestion range is the universal portable amplifier. Priced at 19 guineas, the amplifier, together with its microphone with stand and leads, and a 9-in. permanent magnet moving-coil speaker, are all contained in a carrying case measuring only 17 in. by 16 in. by 9 in. The microphone, which is a new patented moving-coil type, is sold separately, complete with telescopic chromium-plated floor stand, at 6 guineas. The amplifier is fitted with microphone and gramophone pick-up inputs, as well as volume and tone controls, and has illuminated telephone type dials to facilitate operation in the dark.

Consider Power Required

Portable amplifiers are designed to have various outputs, and those who are considering the purchase of this type of P.A. equipment should give careful thought to the uses to which the amplifier is likely to be put before deciding what particular output is the most suitable in their particular case. In some cases 20 watts may be adequate, while in others 50 or 60 would be needed.

In the Correx range there is a portable amplifier capable of giving an output of 60 watts, and it is

One of the moving-coil microphones in the Radio Development Company's range. In its standard form it costs 6 guineas



priced at 70 guineas. There are input arrangements for two "mikes," a gramophone pick-up and radio, and the equipment includes a mixing and fading control panel enabling any two of four inputs to be faded or superimposed. There is also provision for a pre-amplifier. Class A/B amplification is employed.

Correx Amplifiers also manufacture transformers and chokes of all descriptions, and those who are designing their own P.A. equipment will find that this firm is prepared to build transformers or chokes to specification.

A Small-Power Outfit

Both large and small amplifiers are included in the Coulphone range, the smallest unit being a 3½-watt output model, priced at £5 for the amplifier alone, or £8 including motor, pick-up, loudspeaker and oak portable case.

There is a 6-watt model with a push-pull triode output stage priced at £12 (or £8 for the amplifier alone), as well as a 12 to 14-watt model, which also has a push-pull output stage. This costs £18 complete, or £12 for the amplifier only.

Thirty and seventy-watt models are available at £25 and £60 respectively, these prices being for the amplifier by itself. British Tungram valves are used throughout and each unit is guaranteed for twelve months.

Those who are considering the purchase of a mobile unit will be interested in the Easco P.A. equipment, photographs of which appear on another page. The gear is fitted in a Commer 8-cwt. van, which, finished in priming colours, costs £145, or in dual colours, £8 10s. extra. Black and silver lettering is obtainable for an additional £6 10s.

The P.A. gear includes a detachable rack assembly, bolted through the roof with four butterfly nuts and bolts, carrying two Magnavox projection speakers that can be swivelled. The amplifier itself has a 32-watt output and incorporates a twin playing desk with mixer panel.

Easily-Removed Equipment

The necessary microphone, rotary converter, batteries and switch-board are included. The van is permanently wired, but all equipment is easily removable in ten minutes so that it can be used for deliveries. The price of the P.A. equipment is £99 15s.

Film Industries Limited offer an extensive range of all types of P.A. equipment. There are some interesting types of portable gear, one being known as the "Baby," which consists of a self-contained



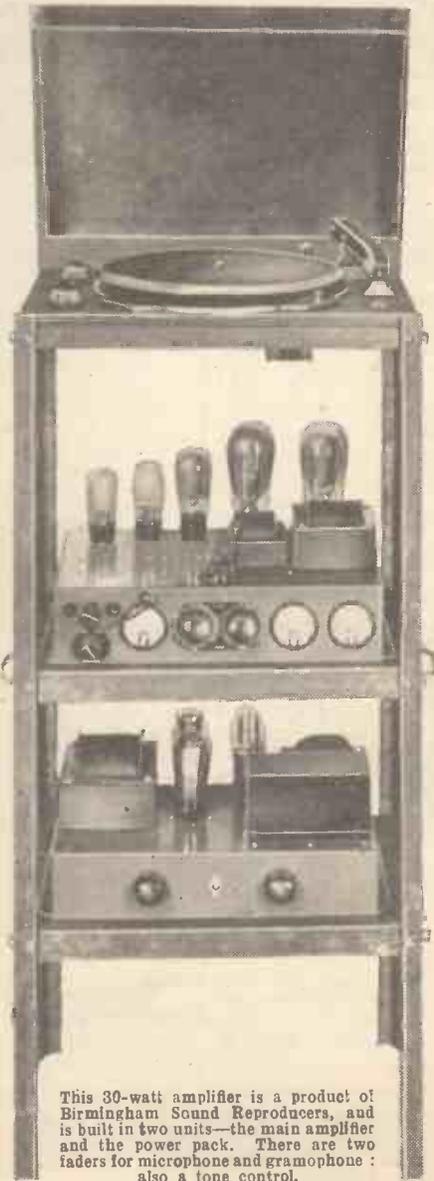
Reslo Sound Equipments make this P.A. speaker unit and horn. The unit is of the moving-coil type and is 7 guineas, while the horn costs 4 guineas in black stove enamel.

battery-driven amplifier with Class B output and two preliminary amplification stages. Two types of loudspeaker are available with this model, one a 40-in. all-metal horn type and the other a folded horn type suitable for indoor use. The price of the model with the 40-in. horn is £32, while the other is £30.

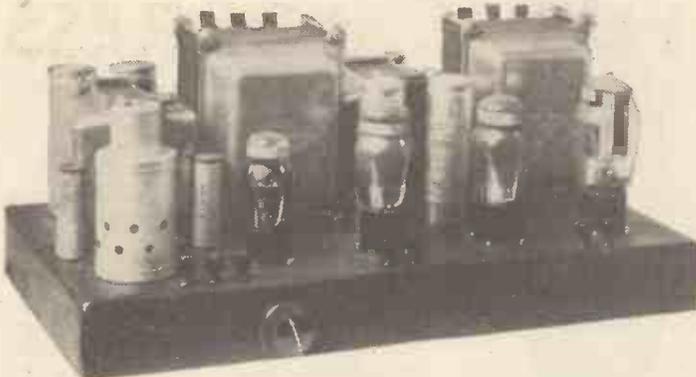
A portable gramophone attachment is available for this unit, and is priced at £6.

Another Film Industries model is a 12-watt universal A.C./D.C. amplifier priced at £36 10s. This also is portable and supplied with two cone speakers, or

(Continued overleaf.)



This 30-watt amplifier is a product of Birmingham Sound Reproducers, and is built in two units—the main amplifier and the power pack. There are two faders for microphone and gramophone: also a tone control.



One of the Vortexion amplifiers. Having an output of 15-20 watts, it is supplied complete with valves for £15.

(Continued from previous page.)

alternatively with a 40-in. metal horn speaker for outdoors for an additional 30s.

There is also a special mobile unit costing £50 for fitting to cars, the speaker of which is of the exponential horn type, fitting under the bonnet of the car with the opening pointing so as to project the sound forward through the radiator. The power is obtained from a rotary converter worked from the car battery.

A Portable Outfit

Sixteen guineas is the price of a compact 8-watt universal portable unit marketed by Francis Day & Hunter. This price includes a microphone with a chrome collapsible stand and 10-in. moving-coil speaker. The amplifier has an input for two microphones and an output for two speakers. The amplifier, speaker and microphones are all self-contained in one case.



The Baker "Super-Quality Triple" speaker is a combination of two units, one designed to cover the low and middle frequencies and the other for the upper registers. The A.C. model is £8 15s. and the D.C. version 7 guineas.



The Voigt speaker unit with "Tractrix" horn. The unit can be obtained with a diaphragm to handle up to 8 watts, or a double power diaphragm handling up to 12 watts.

output still can obtain a 25-watt unit for 60 guineas.

Sound reproducers of every description—permanent and portable—are manufactured by the G.E.C. From the most modern rack-mounted equipment down to quite small portable amplifiers, there is a wide choice of models.

Moving-coil Mike

Those who require mobile units are equally well provided for. The range is too extensive for us to cover fully in this brief review, but we may say that there is no aspect of P.A. work that hasn't received the attention of this well-known firm.

There are several interesting microphones in the G.E.C. range, one being a moving-coil model costing £5 10s.

Among the special advantages claimed are absence of background noise; no polarising current is needed; and the extremely wide frequency range covered with a sensibly linear characteristic. This microphone possesses considerable directional properties, so that the ratio of direct to reverberant sound is improved, and the difficulties of acoustic feed-back largely avoided.

Among the smaller amplifiers is an all-purpose 6-watt chassis for A.C. operation costing £19 16s. Triode valves are used throughout.

Grampian Reproducers have produced a special model to meet the Coronation demand. Priced at 43 guineas, this amplifier is a mobile unit and is housed in a cabinet complete with Garrard spring motor, pick-up, rotary converter, a moving-coil microphone and a heavy duty exten-

Other models are a 10-watt A.C. amplifier, which is sold complete with playing desk and pick-up for 30 guineas, and a 12-18-watt universal amplifier, which with a gramophone playing desk costs 38 guineas, and a 15-watt A.C. model priced at 45 guineas.

Those who require a bigger

sion speaker. A radio input panel is fitted so that the broadcast commentary can be relayed through the amplifier. An interesting feature about this model is that it is suitable for battery, A.C. or D.C. supply.

Those who handle P.A. gear are called upon to carry out various tests during installation or when making adjustments. In testing for clarity of reproduction in halls or in the open air, it is a good plan to confine the speech tests to certain words, which, by reason of their characteristics, quickly reveal any shortcomings in the apparatus. In connection with such intelligibility tests it is interesting to note that a series of words, printed on small patience playing cards with instructions for testing announcing systems, are available from A. Hinderlich.

Every type of transformer for "P.A." work is manufactured by N. Partridge, whose speciality is high-fidelity transformers for audio-frequency work.

Direct-Coupled Amplifiers

Bi-phase direct-coupled amplifiers are a speciality of Magnaphone Limited. One unit in this firm's range has an output of 21 watts, this being obtained with a total last-stage anode dissipation of only 50 watts. The hand microphone supplied with the equipment is automatically energised when plugged into the amplifiers.

Twin turntables and pick-ups are fitted and the whole is housed in a solid oak cabinet with chromium front. The price is £50. This model is for A.C. working, but it can be operated from D.C. through a converter.

There is also a universal portable outfit which is contained in two cases, one for the speaker and the other for the amplifier. The amplifier incorporates a two-stage circuit, with push-pull output giving 9 watts. The price is £27 10s.

Universal Mains Amplifier

Outstanding in the M.R. Supplies range is a portable P.A. amplifier which is suitable for use on A.C. or D.C. mains. The complete equipment, which includes amplifier, speaker, and microphone, costs 12 guineas.

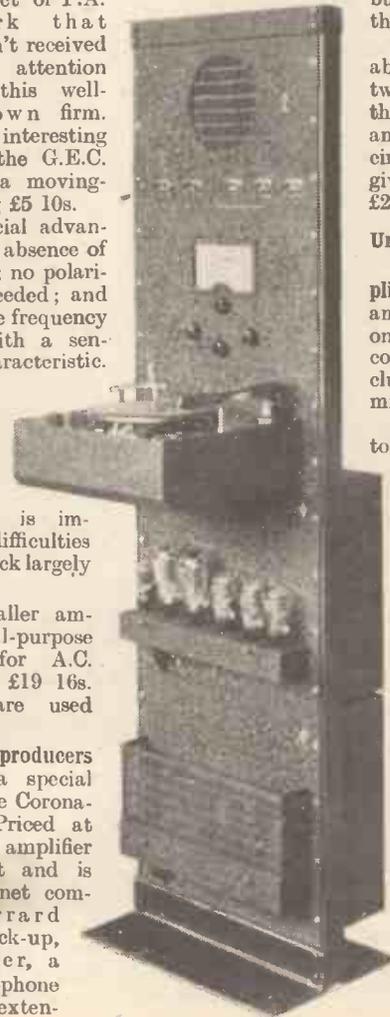
The circuit utilises two pentodes in push-pull in the output stage, and the combination is capable of giving a full 7 watts of undistorted power. Volume and tone controls are provided, these being mounted on the front of the amplifier unit.

This firm also manufactures a Piezo-crystal microphone for which a substantially level response of 25-10,000 cycles is claimed. Other features of this instrument are absence of background noise, and the fact that no energising current or transformer is required. It is priced at £5 10s.

Moving-coil microphones and projectors for P.A. work

(Please turn to page 144.)

One of the large amplifiers made by Bryan Savage which incorporates a radio receiver, automatic record-changer and two 30-watt amplifiers.



PROBLEMS OF PUBLIC ADDRESS

By C. LYNTON HARRIS

SOME OF THE DIFFICULTIES WHICH BESET THE P.A. ENGINEER



Marconiphone Photo] A portion of the great new stand at the Arsenal Football Club's ground at Highbury, showing one of the P.A. projectors (indicated by arrow).

considerably and if after the best position for each speaker is found, there is still a very slow "build-up" the engineer leaves it at that, for he knows that when the room is full of people the cumulative "damping" effect of their clothes and bodies is sufficient to kill the remaining resonance. The sketch shows the ideal layout for mike and speakers at a banquet, when A is the Chairman's mike and B, C and D three horn-type projector loudspeakers. It will be noticed that no loudspeakers face the microphone.

It can be said that the P.A. engineer's biggest worry is time. Jobs will come in thick and fast and take every man's full time to carry out, and then there will be a lull during which field engineers are looking for something to occupy them.

The time problem was never more graphically illustrated than when his late Majesty King George V opened the Mersey Tunnel on July 18th, 1934. Actually, on the two

by declaring the Mersey Tunnel open, all in 48 hours.

Now if this was strenuous for his Majesty, what must it have been like for the P.A. engineers? The resources of the department were strained to the utmost. Not a man, not a loudspeaker, hardly a valve was left, every available piece of apparatus was on the job. The organiser, realising that he was up against one of the biggest snags of his career, worked out an itinerary for his men which provided for every possible contingency. It was a case of one job finished, strip gear, pack up, and away to the next and be rigged well before his Majesty arrived. This, of course, applied only to the Royal Microphone and local amplifiers, etc., the main rigging having been carried out well beforehand. On that occasion the Marconiphone engineers can be said to have beaten Father Time well and truly.

Dealing With Echo

In the section of this article dealing with "howl-back," we saw how echo could seriously affect P.A. systems in one respect. Echo pure and simple can ruin a P.A. job completely, unless special precautions are taken to deal with it.

Take the case of the newly completed installation in the new £100,000 stand at the Arsenal Football Club at Highbury. This is a permanent outfit and is without doubt one of the finest installations in the country.

On being tested for echo (as every prospective situation is) it was found that the Arsenal Stadium is very nearly a whispering gallery as far as echo is concerned. Every note put out by the loudspeakers was tossed about from side to side of the arena, causing a confused bellowing instead of giving crisp, clear reproduction. It was ultimately found that the new stand acted as a perfect reflector of sound, even when the damping effect of crowds was taken into consideration. Experiments proved that the only way to overcome this difficulty was to adjust carefully the position of the loudspeakers and to increase their number by 100 per cent.

When the "Queen Mary" was Launched

This may sound surprising, but actually the loudspeakers are all run at about half volume, thus reducing the force of the sound waves and making the distribution more even. Those who have been to the Arsenal ground are struck with the efficiency of the apparatus and the ease with which every word can be heard and understood.

We come now to one of the most important P.A. jobs ever undertaken—this incidentally was carried out by Marconiphone Limited and was the launching of the giant Cunarder "534" (Queen Mary), after being christened by her Majesty Queen Mary.

(Continued overleaf.)

FEW gatherings of people of any magnitude these days are complete without their attendant groups of loudspeakers, familiarly known to thousands as "P.A." The art of public speaking as practised by orators of all kinds, from such exalted personages as the Prime Minister down to the humble fair-ground salesman, has been completely revolutionised by the adaptability and efficiency of the modern public address outfit.

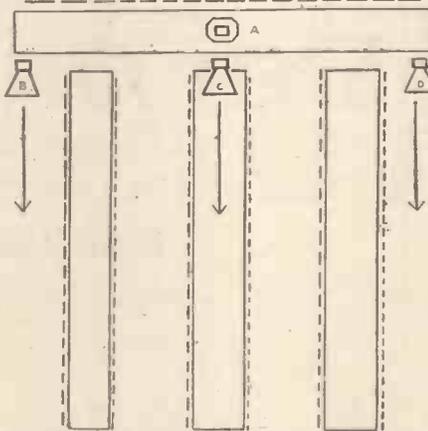
One large and important firm in the radio industry, the Marconiphone Company, Ltd., has a section devoted entirely to work of this nature, and is dealing continually with important official ceremonies for the Government, and has catered for most of the functions attended by his late Majesty King George V.

A Common Difficulty

It is not our purpose here to describe any specific P.A. job in detail in so far as the actual arrangements are concerned, but to consider the snags, difficulties and problems of P.A. which present a most interesting picture of how brains and initiative can convert failure into success.

The first lesson that a P.A. engineer learns is "keep the mike behind the speakers." This is to avoid any trace of "howl-back," that most distressing symptom of an ill-balanced installation. It applies chiefly to indoor work, although outdoor jobs are prone to howl in certain circumstances. It is all due, of course, to the microphone being included in the field covered by the loudspeakers and a vicious circle being set up by interaction. Sometimes, "keeping the mike behind the speakers" effects only a partial cure; this may occur in a large lofty room with very little panelling to break up the sound waves: consequently echo produces the same results. In this case the engineer tackles the problem by turning each of his loudspeakers through a few degrees of arc at a time and testing after each movement: this generally reduces the trouble

AVOIDING "HOWL-BACK"



The ideal layout for "mike" and speakers at a banquet. A is the chairman's "mike," and B, C, and D are horn-type projectors.

days, July 17th and 18th, his Majesty attended six public functions and spoke at each over Marconiphone P.A. systems.

On the 17th the King laid the foundation stone of the Town Hall extension in Manchester; he opened the new Central Library in the same town, and presented a set of silver drums to a regiment quartered in Lancashire at the time.

On the 18th he opened the East Lancashire Arterial Road; he opened Walton Hall Park; and crowned his busy period

PROBLEMS OF PUBLIC ADDRESS

(Continued from previous page.)

Both their Majesties spoke on this occasion, and had it not been for the helpfulness and presence of mind of King George V, the public address arrangements might have been a failure.

"Microphone-Minded"

It is important to realise that at this juncture King George was becoming "microphone-minded," which is a very different thing from "microphone-conscious." He had by this time used his microphone on dozens of different occasions and was thoroughly versed in its use. At the launching of the vessel the authorities decided to have a special cabin built to accommodate the King and Queen, as the weather did not look at all promising. Accordingly a shelter was erected which was roofed with corrugated iron and had a glass front. As will be remembered it poured with rain during the whole of the ceremony and for a few moments it seemed as though the noise created by the rain pelting on the iron roof would drown the voices of their Majesties as they spoke. King George was seen to raise his eyes to the roof as he commenced to speak, and without a moment's hesitation he leaned forward and pulled his microphone towards him. He spoke in a level tone of voice at ordinary conversational level, but his mouth was only a few inches from the microphone during his speech; engineers were therefore able to turn their volume controls back, thus reducing the noise level and leaving his Majesty's voice clear and strong.

One big problem the P.A. engineers have which seems to be insoluble concerns the matter of costing more than anything else, but it is nevertheless a difficulty which has to be surmounted. The problem is wastage. Take the forthcoming Coronation celebrations as a typical example. When that little job is over it is estimated by the engineers that there will be over ten miles of wire left over for which no useful purpose can be found. Think of it, ten miles of wire in lengths of a few feet which will have to be thrown away—nobody wants it!

When there is No Mains Supply

The engineer's nightmare is the rotary converter, not that rotary converters are not extremely useful and reliable pieces of apparatus, but their indispensability does not prevent them from being an unmitigated nuisance. Times without number Marconiphone engineers have been called upon to do a job in the "Welsh mountains," or the "Scottish Highlands," or some similarly remote spot where the possibility of obtaining mains supply is negligible, and in these instances accumulators and rotary converters must be carried, as all Marconiphone P.A. gear is constructed to work from mains supply. If the job is a really big one the number of accumulators and converters used will be considerable, and if their central position is on a hillside all the gear will have to be carried up by hand, adding 50 per cent. to the work involved.

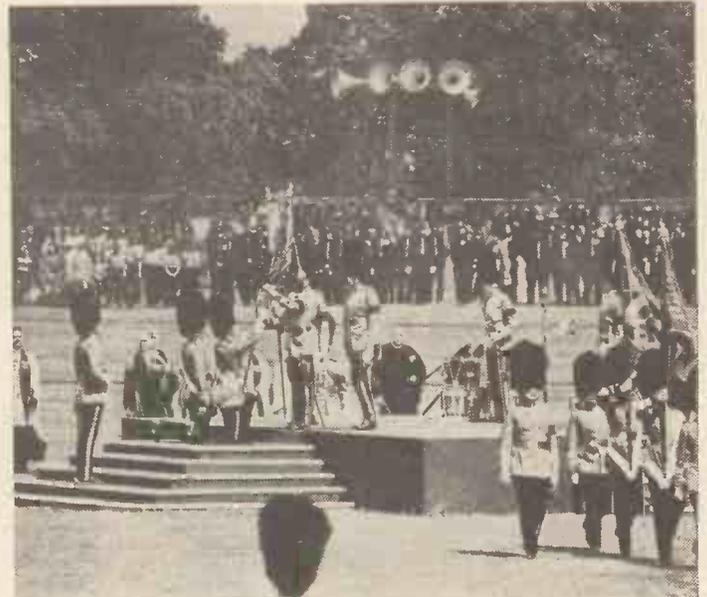
Thus far we have dealt with difficulties connected with installation, and while

these can be sufficiently worrying, not the least amongst the snags is the breakdown. These are happily rare, the ever-growing reliability of modern P.A. apparatus contributing largely to their comparative infrequency, but when they do happen the very efficiency and reliability of the gear militates against a quick diagnosis unless special precautions are taken. Wind and weather all combine to spoil a relay, to say nothing of damage by ignorance on the part of people outside the P.A.

crew. Speedy diagnosis is accomplished by sectionalising the system and equipping each section with its meter or meters. When a breakdown occurs the alarm bells ring and the section engineers begin a quick run over the meters, the fault is located, and "stand by" apparatus switched in.

One is tempted to take time by the forelock and imagine a P.A. squad handling a television job! Shall we see large sized screens each with its attendant loudspeaker? And shall we connect up each screen with a central control panel as we do now with speakers? Or will each television screen

and speaker have its own receiver and amplifier and receive its signals direct from the broadcasting station? Nothing is too fantastic these days it seems, but in the meantime "P.A." is necessary, and it provides work for thousands, and the difficulties experienced are all in the day's work. They are met with and vanquished, every difficulty adds to the general store of knowledge possessed by these engineers. They have never fallen down on a job yet and they say that they never will. If experience counts for anything their statement can be relied upon.



[Marconiphone Photo.]

P.A. equipment is invaluable on occasions such as this, when thousands of interested spectators are eager to hear as well as see the proceedings. The scene depicted shows King Edward VIII presenting Colours to the Guards in Hyde Park last July.

SEEN ON THE AIR

NEWS AND VIEWS ON THE TELEVISION PROGRAMMES,
BY OUR SPECIAL RADIO-SCREEN CORRESPONDENT,

L. MARSLAND GANDER

UNKIND Fate decrees that once I have said something flattering about the B.B.C. lest they should lay that unction to their souls, I immediately have to take it all back.

The B.B.C. deserved the warmest congratulation on a marked improvement in the programmes. That improvement has not been maintained. I know that the cry is "More money, we can do nothing without more money!" But I cannot believe that cash shortage explains everything which I saw during the week under review.

What a rollicking choice of programme for Saturday was "Venus and Adonis," Dr. Blow's masque for King Charles II, presented by the Oxford University Opera Players! This occupied 50 minutes out of the two hours of programmes. Really, Mr. Cock!

Even Homer nods, and Mr. Cecil Madden, whose ability as a producer I esteem highly, almost nodded his head off with the Crazy Cabaret for April 1. Had a schoolboy

been let loose in the studio I should have expected just the sort of programme which was served out. As for the compère in the bath who persistently announced "Songs at the Piano," if he was meant to be exasperating he certainly succeeded. But I must make a reservation in favour of the stage mule, who said more with his eyes and ears than most of us can with mouths and faces.

"Masks Through the Ages"

I fully realise that there is a fine distinction between what is funny and what is not, and that there was any amount of work and there were plenty of ideas in this programme. I also note that one of my colleagues takes an entirely different view of its entertainment value. So be it. I have said my say and my conscience is clear.

"Masks Through the Ages" was a good idea which went wrong. Mr. Duncan
(Please turn to page 142.)

P.A. INSTALLATION TIPS

No matter how good your amplifier and other gear may be, your reputation can stand or fall by the skill with which installation is carried out. Valuable hints, the outcome of practical experience, are given in this article

By A. S. CLARK

NO matter how good your amplifier and associated equipment may be, the results can be completely spoilt by inefficient installation.

The installation of modern gear is distinctly easy, but one must guard against a careless outlook if only for this very reason. There are certain fundamental rules which obviously must be obeyed, but there are also finer points which can make a world of difference to the final results.

It is so easy when a small point of imperfection crops up to say, "Oh, we notice things too easily; the public won't know the difference," or words to that effect. Probably they will not—consciously, but this is not the attitude which ensures repeat orders at some later date.

Aim at perfection, and then you will probably overhear remarks such as, "I thought there was a real orchestra there at first," or "I've never heard such clear loud-speakers before; it was easy to hear every word." Get people talking about the fine quality of your installations and you will not need to canvass for P.A. jobs. People will approach you instead.

In themselves, and in print, some of the points mentioned in this article may seem

We all know that plenty of top is a criterion due to the absorption effects of people and buildings, but music must also have its oceans of bass. But what about speech? Overdoing the top from a music point of view will turn up trumps for speech alone, resulting in an unusual clarity. And a group of speakers rather than distributed ones will avoid a double, or echo, effect in most places.

In The Orchestra Pit

Out-of-doors speakers with horns are a necessity to direct the sound, but they can spoil the effect in a hall. Quite a common use for P.A. work is to provide music in place of an orchestra for stage work.

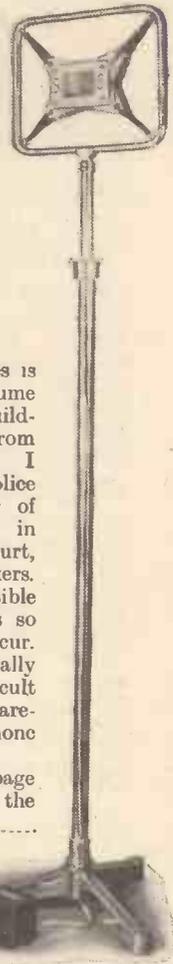
Here a couple of speakers on large baffles will distribute the sound best. Arrange them so that they are turned slightly towards one another. The sound will then appear to come from the space between them, in this case the orchestra pit.

Look at the sketch on this page. See how the speakers are also sloping well back? This gives the sound waves a free passage right up to the top of the building, with the result that the largest amount of air is set in motion, and the sound will be nearly as

nection with microphones is to obtain ample volume without risk of a howl building up due to feedback from speaker to microphone. I remember one case in a police court where a number of microphones were used in different parts of the court, all feeding the same speakers. It was practically impossible to arrange all the mikes so that feedback did not occur.

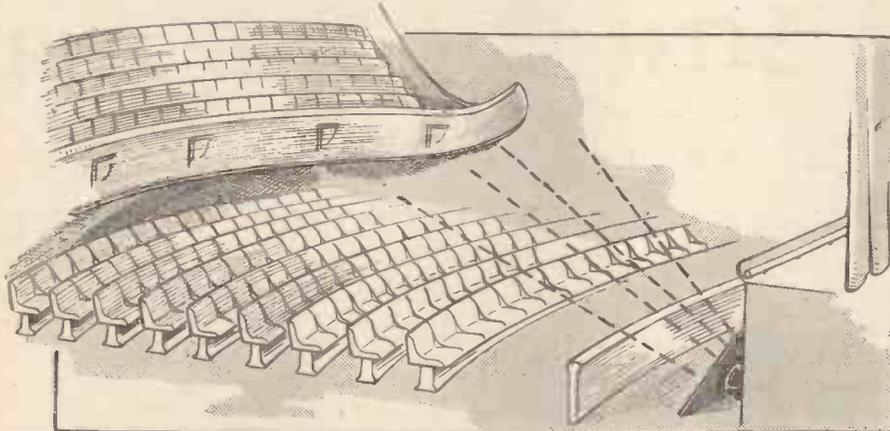
But one is not normally faced with quite so difficult a proposition. Usually careful placing of the microphone will do the trick.

The sketch on the next page of this article illustrates the



The stand on which this Sound Sales transverse-current microphone is mounted is so constructed that the height of the microphone can be adjusted simply by pulling or pushing the telescoping tubes, which automatically lock themselves in any position.

GET THE AIR MOVING IN BULK



In a theatre or hall, loudspeakers should be pointed so that there is no immediate obstacle in the path of the sound waves. Thus the biggest amount of air will be set in motion and the best results obtained.

trivial, but believe me they are not. I have personally proved this in all instances from first-hand experience.

Take the following simple case of suiting the speaker to the particular job for a kick-off. Some P.A. installation engineers use the same type of speakers for outdoor events, the reproduction of records in lieu of an orchestra, and for the amplification of speeches. No wonder we hear so much of the "plum-in-the-mouth" announcements which cause people to turn to their neighbours with the remark, "What did he say?"

loud at the back of the theatre as in the orchestra stalls.

Tip the speakers into a more vertical position and the "orchestra stalls" will be deafened, while those at the back of the pit will not be able to appreciate the music. And that's an exact quotation straight from practice for a start.

The positioning of the microphone is no less important than that of the loud-speakers. Don't just dump it in front of the speaker's table and hope for the best.

The chief thing one is up against in con-

chief point to bear in mind—get the mike directly in line with the general direction of the speaker's voice. In this way the sound of the voice will produce the biggest effect on the microphone when compared with the sound picked up from the speakers. You can thus work with less amplification for a given volume, or obtain greater volume before "ringing" sets in.

Keep The Gear Hidden

Where difficulty is experienced in spite of careful positioning, the possibilities accruing from the use of a more directional type of microphone should be considered. But try to keep the microphone as obscure as possible. Very often flowers can be used to hide it completely, and there are many other dodges that will occur to one.

And while talking about hiding, don't forget the amplifiers, and turntable if one is used. Find an out-of-the-way place for these, as it looks very amateurish if they are in full view of the people listening to the speakers. If you need to take a cue for some purpose or the other, it is easy to arrange a signal light à la the orchestra light in a theatre. Then the operator can be in an ante-room if necessary.

Should you have to arrange the turntable where it will be near some of the audience, say behind a screen, it is advisable to provide a cover. Otherwise it is possible for pick-up chatter to mar reproduction

(Continued overleaf.)

P.A. INSTALLATION TIPS

(Continued from previous page.)

from the point of view of those near by, particularly if they also happen to be a fair way from the loudspeakers.

Don't leave the volume control turned up to its normal setting when putting a fresh record on. The slight clonk as the needle is placed on the record, and the period of hiss before playing commences, will spoil the effect. Similarly, the volume control should be turned smartly to zero as the last note of the record is completed. But be sure it is the last note—particularly with classical stuff—or you may offend the ear of some musical high-brow.

The best procedure for starting a record is to have the volume control at zero when the needle is placed in its groove. Then turn up the volume slightly so that you will hear the first note as soon as it commences, and, immediately you do, turn the control smoothly and fairly rapidly up to the pre-determined setting, which must be clearly marked to avoid mistakes.

Duplicating Apparatus

When the function is of particular importance, it is wise to duplicate some of the apparatus in case of an unexpected breakdown—which does occur occasionally. Pick-up and amplifier are the most likely to give trouble, so two turntables with their own mikes and two amplifiers side by side are a sound precaution.

Loudspeakers are less likely to prove troublesome, but when more than one is used it is a good idea to feed them via entirely separate lines. Then if one breaks down it is easy to leave it out of circuit, and a short in its leads will not put the others out of action as well.

To facilitate change-overs a little switching panel may be rigged up. Then either pick-up can feed either amplifier which can be connected to any of the loudspeakers. If you have trouble then—well, you must be under a hoodoo!

Try to get the loudspeakers hum-free. Nothing spoils things so much as a slight hum which makes itself heard as a back-

ground during silent moments in speech or music.

Which side of the mains is earthed can have a big bearing on the question of hum. I remember one case when we were working from D.C. mains with the aid of a converter, and tests the previous night had proved no hum whatever to be present.

On checking over on the night of the show, prior to the arrival of the audience, we were greeted with a distinctly nasty hum. A hasty checkover failed to reveal anything wrong.

Something had to be done, so we quickly rigged up an earthing lead for the amplifier



A MOBILE OUTFIT

Supplied by Easco Broadcast Services of Brixton Road, London, this Commer van contains a 32-watt amplifier, mike, and twin turntable. The gear is so fitted that it can be removed in ten minutes when the van is required for the delivery of goods.

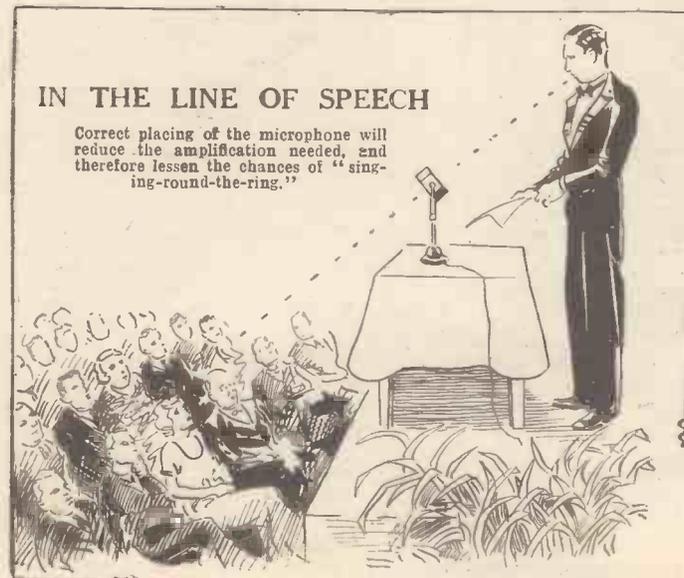


to the electric-wiring conduit. Everything was O.K. again. But just then the theatre electrician strolled up to tell us he had put us back on to the other side of the three-wire mains input. Someone had switched us over so that we had a positive supply line earthed.

When you use, say, two moving-coil speakers, it is quite a good scheme not to use two of identical type. Any faults or peaks in one will then tend to be overcome by the other. It is useful if one is good on top and one on bass.

You may, however, have to compensate for slight differences in sensitivity, but this is not a difficult task.

There are many other points I could deal with, but I think the more important have been covered. Don't consider they are rather insignificant unless you have had practical experience of P.A. work—and then I know you won't. Attention to detail, after all, is essential when competition is keen.



IN THE LINE OF SPEECH

Correct placing of the microphone will reduce the amplification needed, and therefore lessen the chances of "sing-ing-round-the-ring."



Up-to-date news concerning the radio industry

AS the result of intensive research into the wireless needs of India's villagers, the Research Department of All-India Radio have produced a receiver embodying an automatic time switch.

Every now and again sets in villages have failed because the man in charge has forgotten to switch off, with disastrous effects on the battery. With this new set the time switch will bring it into action at just the right moment and automatically switch off again when the village programme ends. The switch will only need winding up once a fortnight.

In designing this special set to meet the needs of the villagers the engineers were faced with several difficulties. For example, costs had to be kept down, and the possibility of careless handling provided against. Moreover, there were such things as wet weather and animals to be considered. Hence robust construction is a feature of these receivers.

Already a number of these sets have been built by the All-India Research Department for one of the Provincial Governments, and every encouragement is given to private manufacturers to build these sets. No patent is being applied for and there will consequently be no question of royalties. It is the policy of the Research Department to give the manufacturers every assistance and guidance possible.

RADIO ON HOLIDAY

Now that Spring is here once again, our thoughts naturally turn to the country and the sea. Soon there will be trips to the sea-side and on the river, and excursions far afield into the heart of the country.

On these occasions a really lightweight portable is a great boon. We are reminded once again of this class of receiver by the news that Pye Radio have produced a compact little portable which they call the "Baby Q." Although small in so far as its physical dimensions are concerned, it is, nevertheless, provided with a four-valve circuit, a built-in frame aerial and a light-weight moving coil loudspeaker.

(Please turn to cover iii.)

TELEVISION TOPICS

Collected by A. S. Clark

"TELEFRAMES"

Items of general interest

WHAT is claimed to be the largest number of television receivers being run from a single aerial is achieved by the Marconiphone Company at the Ideal Home Exhibition at Olympia.

Twenty receivers are worked simultaneously from one aerial. With so much electrical gear being demonstrated at the show, the wonder is that they are able to work a single receiver. Much credit reflects on the engineers who have managed to suppress the interference.

"ALLY PALLY" ON A CRYSTAL

We have received an interesting letter from a reader residing close to the Alexandra Palace, who gets this station on a crystal set. He suggests that those keen on short waves should find interest, if they live near Alexandra Palace, in building an ultra-short-wave crystal set.

An interesting idea which certainly combines the old with the new in radio. (We hope to publish the letter next week in the "From Our Readers" page.)

TELEVISION FROM PARIS

The new television station in Paris at the Eiffel Tower is due to start, or be ready to start, on July 1st, at reduced power. It

Personalities, technicalities, and the latest news from all parts of the world go to make this the most popular and valuable television feature published in any periodical. It enables readers to keep right up to date in all aspects of television.

should be ready for full-power operation by some time in October, namely, with 30 kilowatts.

There seems little doubt that the transmissions should be picked up well in this country, but no specific details of the transmission technicalities are yet to hand.

It is unlikely that they will be identical with the Alexandra Palace transmissions, and therefore the home constructor of television gear, who can easily modify it, should be in a better position than the user of a normal set so far as the Paris transmissions are concerned.

LEAVE THEM ALONE

Unless you are certain of what you are doing, it is most unwise to alter the pre-set controls of a television receiver. It is so easy to get a wrong combination of these which give pictures, but pictures which are not quite right in some way.

For instance, it is sometimes possible for a

picture to be obtained without interlacing of the lines taking place. In each frame of 202½ lines, the lines fall exactly in the same place instead of alternately between one another. The effect on the picture is simply to reduce the definition.

ILLUSTRATING TUNING

H.M.V. have been quick to appreciate how much easier it is to explain the operation of a television receiver on paper than to do the same with a normal sound receiver. Illustrations of maladjustments are used in their literature explaining how to work their television receivers.

Thus it is the simplest matter to indicate which control to turn to change a faulty picture into a satisfactory one. Pictures of the sound of incorrect adjustment on an ordinary set cannot be given—and words are not nearly so good. The only thing with a sound receiver would be to send out a record!

SHORTING SCANNING COILS

One of the snags previously met with in magnetic scanning has been the inductive effect of the coil causing the fly-back time to become lengthened. As all readers know, it is desirable for this to be as rapid as possible.

An ingenious way to overcome the trouble is to arrange for the scanning coil to be short-circuited during the fly-back period, and a recent Marconi patent provides a circuit for achieving this automatically.

TELEVISION FOR BEGINNERS

G. Stevens explains how a magnetic field focuses the beam.

LAST week we saw how the beam in the tube can be deflected by a magnetic field because it behaves as a conductor carrying a current. The same laws which govern its deflection will apply to its focusing, but we have a slightly different arrangement of coil. To focus the beam the coil is mounted round the neck of the tube, just above the anode (which, you will remember, serves to accelerate the electrons towards the screen).

The electrons leaving the hole in the anode are rather in the form of a spray, some certainly proceeding along the axis of the tube, but the majority going off at an angle to the axis towards the walls. As they move away from the anode they come into the field of the coil which is outside the tube, and here we must see exactly what the field of the coil is like. The sketch of Fig. 1 shows the field due to an air-cored coil carrying a current, and you will see that it is very like an ordinary bar-magnet in effect.

The Lines of Force

At the centre of the coil the lines of force are practically straight, but they curl off at the edges, returning round the back of the coil, although this is not shown in the figure. In practice the coil would have an iron core which would serve to concentrate the field, but it does not affect the principle.

Now imagine an electron entering a field like the one shown,

moving from left to right across the page. If it is travelling along the axis of the coil it will be running parallel with the lines of force all the way through the coil. In the principles of the interaction between magnetic fields and conductors one of the essential things is that the conductor must move at right angles to the lines of force, across the field. If it moves parallel with the lines there will be no force exerted on it.

So all the electrons travelling parallel with the lines of force will not be affected by the field at all, and will go on up the tube as if it didn't exist. This is what we want, because electrons moving along the axis of the tube are in their right path and will reach the centre of the screen.

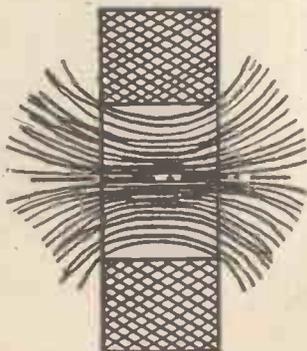


Fig. 1. The field at the centre of the focusing coil.

Now take the case of an electron which has wandered from the straight and narrow path through the centre of the coil. It will be travelling at an angle to the axis, and in so doing will cut across the lines of force of the coil. As soon as it does this, it will be deflected by the field and will try to go round in a circle like a tiny motor armature.

This may be difficult to see at once, so we may think of it very crudely like this: A conductor carrying a current is pushed by a magnetic field into a region where there is no longer any force on it, i.e. it always tries to move out of the field. Now the field of the coil is all round the path of the electron, and as it starts to move in one direction or the other so does it find a fresh part of the field ahead of it.

As a result, the poor little thing will run round and round like a squirrel in a cage, trying to get out of the field!

A Spiral Movement

Now there is a second factor to take into account. The electron started off from the anode with considerable speed towards the screen, and as it enters the coil it will be moving fairly fast in an axial direction. The rotary motion given to it by the field will thus be super-imposed on its own motion along the axis, and if you can visualise the two movements you will see what will be the result.

Describe a circular movement with the tip of your finger and at the same time move your arm away from you—you draw a spiral. And that is exactly what the electron does. It commences to twist about the axis until it arrives on the other side of the coil in line with all the well-behaved electrons that have gone through in a straight line.

A very curious thing, which can be proved by a mathematical calculation, is that all the electrons arrive at the same point on the axis after they have been through the coil, no matter at what angle they entered. Sometimes they make only part of a spiral path, and other times they do two or three turns, but however they twist, they always finish up neatly at the same point and go on to the screen to form a sharp little spot. The drawing of Fig. 2 tries to show the paths of the electrons.

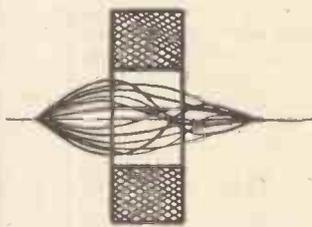


Fig. 2. The paths of the electrons through the coil.

It is a little difficult to draw, because it ought to be in perspective, but you can see that some electrons have only made a curve while others have spun round the axis before settling down. The path is largely governed by the angle at which they enter.

The charm about magnetic focusing is that it is so simple. All you require is a coil and some amperes—and the rest is a matter of adjusting the position of it and the value of the current until the beam focuses sharply. That is why the magnetic focused tube is gaining in popularity. The internals of the tube are easier for the maker and there is less risk from the high voltage.

RANDOM RADIO REFLECTIONS

By VICTOR KING

MORE BALANCE NEEDED IN VARIETY PROGRAMMES :: MUSICAL EXPERTS AND REPRODUCTION ::
THE CHILDREN'S HOUR :: A TOKIO READER TAKES OUR CONTRIBUTOR TOO SERIOUSLY

PLEA FOR BALLADS

I MUST confess that until Bruce Sievier recently drew my attention to the fact, it had completely escaped me that the B.B.C. Variety and Music Hall programmes do not nowadays usually include ballad singers.

Is this the reason why so many people are saying that B.B.C. variety has deteriorated? It might be, you know. The "comics" and other variety artists are still as good, if not better, than they have been in the past. Yet their programmes fail to "get over" with their one-time punch.

Now have you noticed how well received is a Nosmo King monologue, such as "Loyalty," and a sketch by Tod Slaughter?

That gives you a clue?

Balance.

There's no balance in a bill containing little else but wise-crackers and crooners.

That's where the ballad comes in—or ought to come in. It would add stability. Sentiment? Yes, why be afraid of that?

No one has ever "brought down a house" like Dame Clara Butt singing "Home, Sweet Home."

A different kind of sentiment that, from the sentimentality of the singers of "Swamp Music" with their fantastic moonlight chapels and crapulent Capris and of those whining "Skat" singers who mouth animal noises.

The appeal of a good ballad well rendered is universal. Highbrows, middlebrows and lowbrows can all obtain pleasure from it.

Oh, yes, the B.B.C. gives us ballads. Squashed in between afternoon band concerts!

They should run Percy Manchester or Marie Burke in a variety show with an audience and register the effect of the turns with an "Applause Meter." I think they'd find a "Trees" and a "Hills of Devon" would get as big an ovation as the next best act.

And there might be less criticism of "Variety" in general. "Variety"! No wonder they don't use this word much these days at the Big House!

TONE TOPICS

THE quality of radio sets is improving despite the listening public. That is my considered opinion. In my view there is no popular demand at all for good reproduction. Give the average listener a

set which has an output of a watt or two, free from harsh resonances and with plenty of pseudo bass, and he'll think it's grand.

"Tone" as opposed to fidelity still rules the ether waves.

And do musical experts as a tribe shiver when they listen to a smooth 100-3,000 and talk scathingly about the "absence of top," "smudginess," "loss of characteristic

casting their ordinary programmes on ultra-short waves in order to be able to give them a nice wide spectrum.

Or is this merely a rumour based on the fact that television programmes are going out on ordinary wavelengths now and then?

Still, if the majority are easily satisfied there is undoubtedly a minority which welcomes every step forward in sound reproduction. Naturally, all my readers belong to this minority. Or do they?

SHAKING HANDS WITH HIMSELF!



STANLEY HOLLOWAY, the well-known radio artist, plays a dual rôle—that of blacksmith and his son—in the "Song of the Forge," a Butcher film now in production at the Cricklewood studios. This is Stanley Holloway's first dramatic rôle of his career.

timbre," and what not? Not on your life; only radio engineers mouth such expressions.

It has frequently been my task to demonstrate radio to bulge-brows of the musical world. I find most of them more gullible than ordinary folk and always ready to eulogise any passable loudspeaking outfit.

Eight years ago I took a portable set to the house of a titled conductor and composer. What a row that portable made! I rehearsed all kinds of red herrings in order to cover up this deficiency. Of course, I could blather about the miracle of radio, I said to myself, and I could keep the volume down and speak loudly. And never stay on the programme more than a minute or two.

But I needn't have worried.

This well-known musical expert was absolutely entranced and actually declared he thought the "tone" was most pleasing.

Again, I say, it's only radio engineers who worry about fidelity.

That's why I am mystified that the B.B.C. should be toying with the idea of broad-

A FALLACY

ALL this Children's Hour controversy amuses me mightily. Why? Because I don't believe, and never have believed, that as many children listen to the feature as do grown-ups. Have you ever met a child who will gravely sit and absorb an hour's children's broadcast?

I haven't, and if I did I'd expect to find a solemn little owl not given to normal child-like pursuits.

The height of fatuousness is reached in the inclusion of musical programmes in the Children's Hour. Good heavens, I see they are still doing it! Half an hour of the B.B.C. Northern Orch', "Slavonic Dance in G Minor by Dvorak" and an overture by Mendelssohn.

Would it be natural for a youngster to WANT to sit down and listen for half an hour to that?

But maybe the offspring of B.B.C. programme arrangers are made that way!

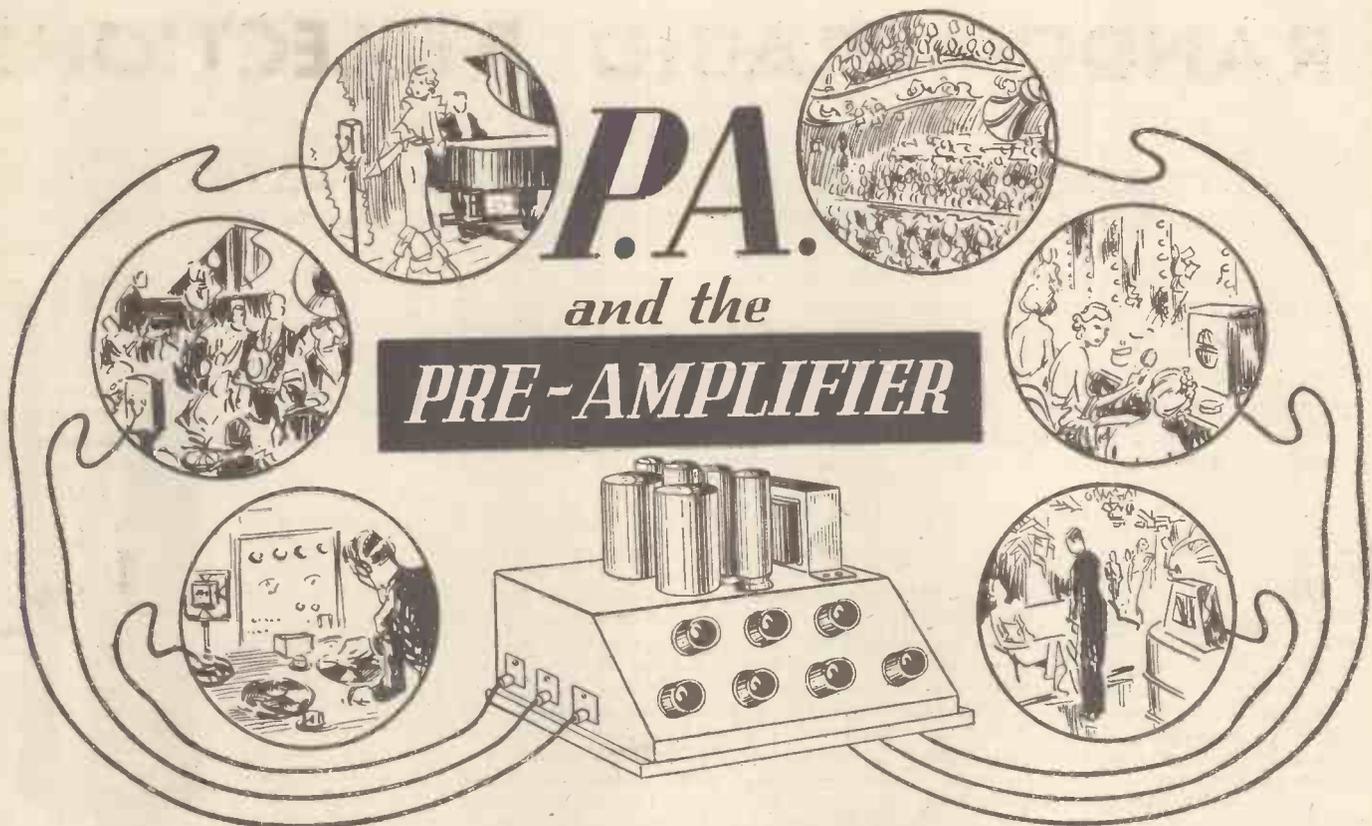
FROM JAPAN

I HAVE before me as I type, a sheet of very thin paper, and it has come all the way from Tokio. I'd have replied direct, but I can't decipher either the writer's name or his address. It looks as though he has shed a tear over them, as well he might. Such depths of philosophy as he treads in might well produce a tear.

Mr. "Sat-something" has taken one of my little slices of writing far too seriously. Do you remember that bit where I lightly pushed forward from a B.B.C. commentator's assertion that "nobody knows what electricity is" to the ultimate mysteries of matter?

Mr. Sat—or it might be Sutu—(let's call him Mr. X) weighs in with a terrifying rival to the electron theory. He would have us believe that we—you and I and Uncle Henry Hall and all—are each nothing but "an aggregation of vibrations comprising a directive mind force."

(Please turn to page 143.)



PART 1.

A PRE-AMPLIFIER may be employed for one of two reasons: (a) because its use is a technical necessity, or (b) because of the practical advantages to be derived from its inclusion in the equipment.

The condenser microphone affords an example of the former class. Sensitivity and a silent background cannot be obtained unless this type of microphone is fed straight on to the grid of a valve; even a short length of lead is detrimental to its performance. Fig. 1 shows how the problem is tackled in practice. The case beneath the microphone contains a three-stage pre-amplifier that, after amplifying the signal from the microphone, feeds into a low impedance line. The design of such an amplifier is interesting from a purely technical point of view, but the practical value to the average reader of a detailed analysis would be small. These notes will therefore be confined to the uses of the pre-amplifier under heading (b).

A Popular Form of Output Stage

To obtain a clear view of the obstacles encountered in the construction and operation of P.A. apparatus it is necessary to refer first of all to the main amplifier.

One of the most popular forms of output stage for general P.A. work is that known as "Low-Loading Push-Pull." This was introduced by the G.E.C. Fig. 2 shows an amplifier circuit designed by the author that utilises two P.X25a valves in low-loading push-pull, and delivers 30 watts undistorted output. The input required to the grid of the first valve fully to load the output stage is of the order of 1v. This circuit will be taken as a basis for discussion, and reference to it can easily be modified by the reader to apply equally to any other amplifier requiring an input

of up to .25v., whether it be of the low-loading variety or not.

Assuming the components to have been connected properly, no difficulty is experienced in obtaining an absolutely silent background with the volume control turned

★.....★

A pre-amplifier has many advantages, the chief being the ability to increase the overall amplification of the P.A. equipment without the need for adding to the main amplifier—a risky procedure in many instances—as well as the ease with which mixing and tone control can be carried out.

This week we commence the description of an efficient pre-amplifier unit designed

By N. Partridge, B.Sc. (Eng.), A.M.I.E.E.

★.....★

down and the chassis earthed. When the volume control is turned fully up some premature disappointment may be felt, but a little experimentation usually succeeds in reducing the background to a very slight hiss accompanied by the merest trace of hum. So far, so good; gramophone records are an immediate success and hope is in the ascendant. However, when a microphone is connected to the amplifier real trouble starts. All attempts to mount the microphone transformer on or near the amplifier chassis prove abortive owing to pick-up from the mains transformer. This interference can be reduced by the suitable orientation of the transformer, but the most silent position is invariably with the transformer balanced at a quite fantastic angle and even then the hum level is far above a reasonable limit.

The next step is to remove the transformer to a distance of several yards, this cures the trouble in part, but a loose transformer dangling at the end of several yards of flex is highly inconvenient if not

undignified when it comes to professional P.A. work.

Greater discouragement has yet to come; the available amplification proves just not sufficient and another stage of amplification is desirable. The experiences of the adventurous ones attempting to build an additional stage on to the main amplifier chassis are altogether too harrowing for comment. To be serious, the position is anything but satisfactory, and to persist in the attempt to combine the whole outfit on one chassis will almost certainly result in a very amateurish equipment. It is possible, but not within the scope of the average constructor.

Nerve Centre of the Outfit

The pre-amplifier opens up a clear way out of the whole difficulty. At the first suggestion, a separate unit seems an inconvenient and expensive addition. It is completely the reverse and the extra expenditure may be regarded as a single premium insurance against the above-mentioned troubles.

Having reached the decision to adopt the plan it will be profitable to review all the possibilities and to enumerate the desirable features. The pre-amplifier need not be limited to the provision of additional amplification, but can become the nerve centre of the equipment.

The mixing of microphones and/or pick-ups is a necessity that needs very careful attention. Provision can be made for the independent control and mixing of two microphones and two pick-ups without cross-talk or interference arising between these four incoming channels. The microphone transformers should, of course, be housed within the pre-amplifier.

Tone control can be included. The chief object of this will be to compensate

(Continued overleaf.)

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partially for the acoustics of the place in which the amplifier is operating. Rooms, halls, etc., display reverberation characteristics that vary in all manners of ways with frequency. Hence, the exact shape of the tone-control frequency curve is not important, it can at best improve existing conditions in a general way and not in detail. This type of tone control should not be confused with that calculated to correct the defects of recording, nor with the tone-compensated volume control. Both of these devices demand the exact shaping of the frequency response, and if considered beneficial should be employed in addition to the other corrections.

The Question of Magnification

The gain needed from the pre-amplifier is unity on the pick-ups and about 10 times (20 db.) on the microphones. Although no amplification is needed for the pick-ups, a single stage will be necessary to permit of tone control and to make up for the loss of signal strength in the mixing circuits.

The pre-amplifier should be capable of feeding several amplifiers if required. The length of the line between the pre- and main amplifiers need not be great, say 10 to 60 yards, but the need for a line transformer at the main amplifier end must be obviated. To include a transformer at this point would re-introduce one of the original difficulties.

The H.T. and L.T. should be drawn from the main amplifier.

The pre-amplifier must be absolutely stable and the noise-to-signal ratio must be low. This requires a little explanation. An absolutely silent background with the pre- and main amplifier controls turned fully up is a physical impossibility owing

will not be fully up and the background noise will fall in proportion to the speech output. Hence, if the ratio between noise and signal is low, the amplifier can be used satisfactorily for all purposes.

How the Circuit is Arranged

The controls must be arranged on a suitable control desk to ensure easy operation, and, since the pre-amplifier is essentially an adjunct to professional equipment and not a luxury item, the cost must be low to make it a practical proposition.

Many possible schemes were drawn up by the author, and a number were put to a practical test. The final choice is shown in the circuit diagram of Fig. 3, and the complete unit in the photograph of Fig. 4.

T₁ and T₂ are the two microphone transformers which are housed within the chassis, and thus effectively electrostatically screened. T₁ is of the normal type, while T₂ is designed for a push-pull carbon microphone. R₁ and R₂ are the respective volume controls. The theory of the mixing circuit will be given detailed attention later. After being amplified by V₁, an M.H.4, the microphone signals are mixed with the two pick-up channels, R₉, R₁₂ and R₁₅ being the volume controls. R₉ is a master control for the two microphones, and it is important to understand its correct use. When R₉ is fully up the background noises and microphonic disturbances arising in V₁ are all passed on to the main amplifier, irrespective of the setting of R₁ and R₂. It is obvious, therefore, that R₉ should always be turned as low as the occasion will allow, and the signal strength maintained by turning up R₁ and R₂. Attention to this rule will ensure that the background is always low compared with the speech signal.

DELIVERS 30 WATTS OUTPUT

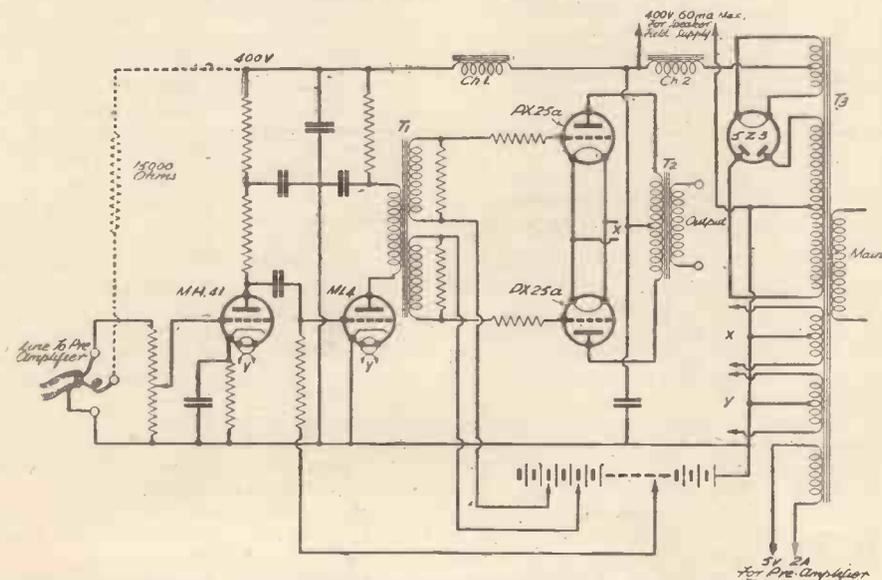
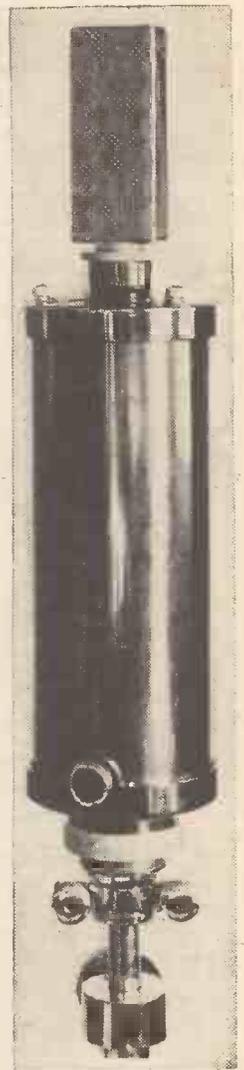


Fig. 2: An amplifier designed by the author, utilising two P.X.25a valves in low-loading push-pull. It delivers 30 watts undistorted output.

to the high gain. Valve hiss alone would prevent this ideal being attained. The important factor is the ratio between the speech output and the noise level. It is essential that when the controls are fully up the noise level should be negligible compared with the full output of the amplifier. When the equipment is required to deliver only a small output, the controls

In effect R₉ controls the gain of the first stage, and this should not be made higher than is necessary. The four channels can be operated quite independently, and one can be employed without the necessity of connecting microphones or pick-up to the others. Turning the controls of the channels not in use has no audible effect on those in operation.

Fig. 1: The Midgley Condenser Microphone and Three-Stage Amplifier. Designed for film recording and studio use, it has an overall gain of 65 decibels. The weight is 8½ lbs.; overall height, 17 ins.; and diameter 3¼ ins.



The combined signals are amplified by V₂, an M.H.41, and a special transformer, T₃, is used to obtain the required output impedance. T₃ has a step-down ratio of 2 to 1, and the primary inductance is 100 H. at 5 m/a.; the frequency response of this component must, of course, be good. To the secondary of T₃ is connected a tone control circuit. Whatever the setting of the tone control switches, the impedance across T₃ never falls below 5,000 ohms at any frequency, and the impedance across the line never rises above 5,000 ohms; these conditions are essential for successful operation.

S₁ (a single-pole five-way switch obtainable from Messrs. Wright & Weaire, Ltd.) reduces the treble in two steps when rotated to the left. The remaining three positions apply a correction for the line capacity for lengths of 10 to 20 yards, 25 to 35 yards and 40 to 60 yards. It was not found possible to incorporate a top boost for reasons to become apparent later, but this is no great disadvantage, and the fact that the first form of tone control to become popular was a "top cut" will go far to confirm this contention.

Reducing the Bass

S₂ is connected to a double-wound choke, and reduces the bass in two steps or increases it in two steps when rotated to the left and right respectively. In the central position a small base correction is applied to maintain a level or slightly rising-response for normal use.

The line itself consists of screened flex. The outer screen serves as the earth line and as a common return for the H.T. and speech current. One of the inner wires is used as the positive speech line, and the other as the H.T. positive.

It has been mentioned that turning up the main amplifier volume control sometimes causes background noise to become audible; the more the control is turned up, the more apparent becomes the noise. The

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pre-amplifier terminates the line with 5,000 ohms, and when this is connected across the main amplifier input it will be found that the volume control can be turned fully up without the usual accompaniment of noise. This arrangement not only avoids a host of difficulties, but actually cures an existing embarrassment. A further advantage is that the impedance of the amplifier volume control is in no way critical; anything from 25,000 to 5 megohms will prove equally satisfactory. From this it follows that any number of amplifiers can be fed in parallel from the one pre-amplifier, providing the combined impedance does not fall below about 25,000 ohms.

The L.T. Supply

The L.T. supply of 4 v. 2 a. presents a slight difficulty. A 4v. accumulator is excellent but cumbersome, while to fit a mains transformer on the pre-amplifier chassis would frustrate the object of building it. The remaining possibility is to draw the current from the main amplifier. The L.T. supply must not be earthed at the main amplifier end, and, to compensate for the inevitable voltage drop along the line, the transformer voltage must be higher than 4v. A 5v. 2a. winding (not C.T.) on the main transformer, or a small separate 5v. 2a. transformer on the main amplifier chassis, answers the purpose.

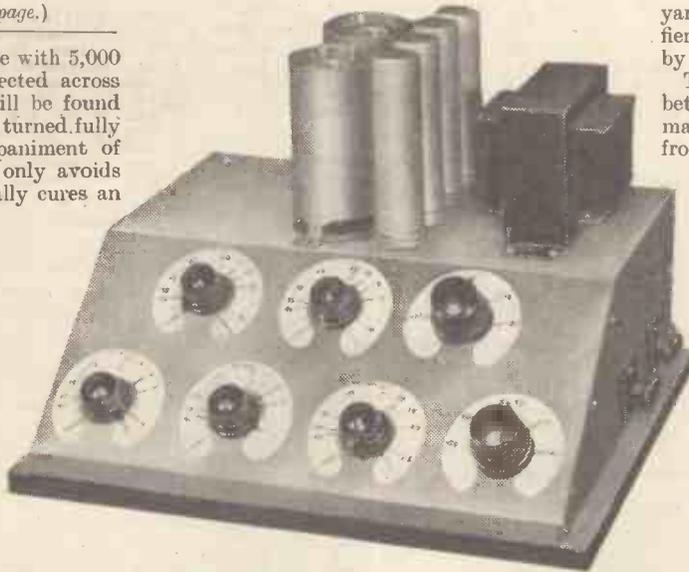


Fig. 4: The completed pre-amplifier unit. The two plugs seen on the right are joined in parallel, so that two amplifiers may be fed from the same unit if desired.

A 10-yard length of 23-0076 standard 3a. lighting flex, a 20-yard length of 40-0076 standard 5-amp. lighting flex, or a 50-yard length of 110-0076 standard 15a. power flex will give the correct drop of 1v. when passing 2 amps.

Excess Cable Is Coiled Up

Having obtained 10, 20 or 50 yards of the appropriate flex, the full length must always be in circuit. Naturally, the pre-amplifier need not be exactly 10, 20 or 50

yards distant from the main amplifier; excess cable can be disposed of by the simple process of coiling it up.

The H.T. required is anything between 250 v. and 300 v. at approximately 7 m.a. This may be tapped from the main amplifier H.T. supply by the aid of a suitable voltage dropping resistance. It is wise to keep this resistance at the main amplifier end of the line, as illustrated in Fig. 2. When this is done an accidental short circuit on the line will not cause any damage to the apparatus owing to the limited current that can pass through the resistance even when the full H.T. is applied across its terminals.

Points to Note

The output stage illustrated in Fig. 2, being operated in low loading push-pull (Class A-B), requires a different technique from the usual push-pull (Class A) arrangement and the following points should be observed:

- (1) No reservoir condenser is used across the rectifier.
- (2) Automatic grid bias cannot be applied to the output valves.
- (3) The components Ch₂, T₁ and T₂ are of very special design, and the author will be pleased to give further information concerning suitable components for the amplifier to any reader contemplating the construction of same.

[Mr. Partridge's concluding article will appear next week.]

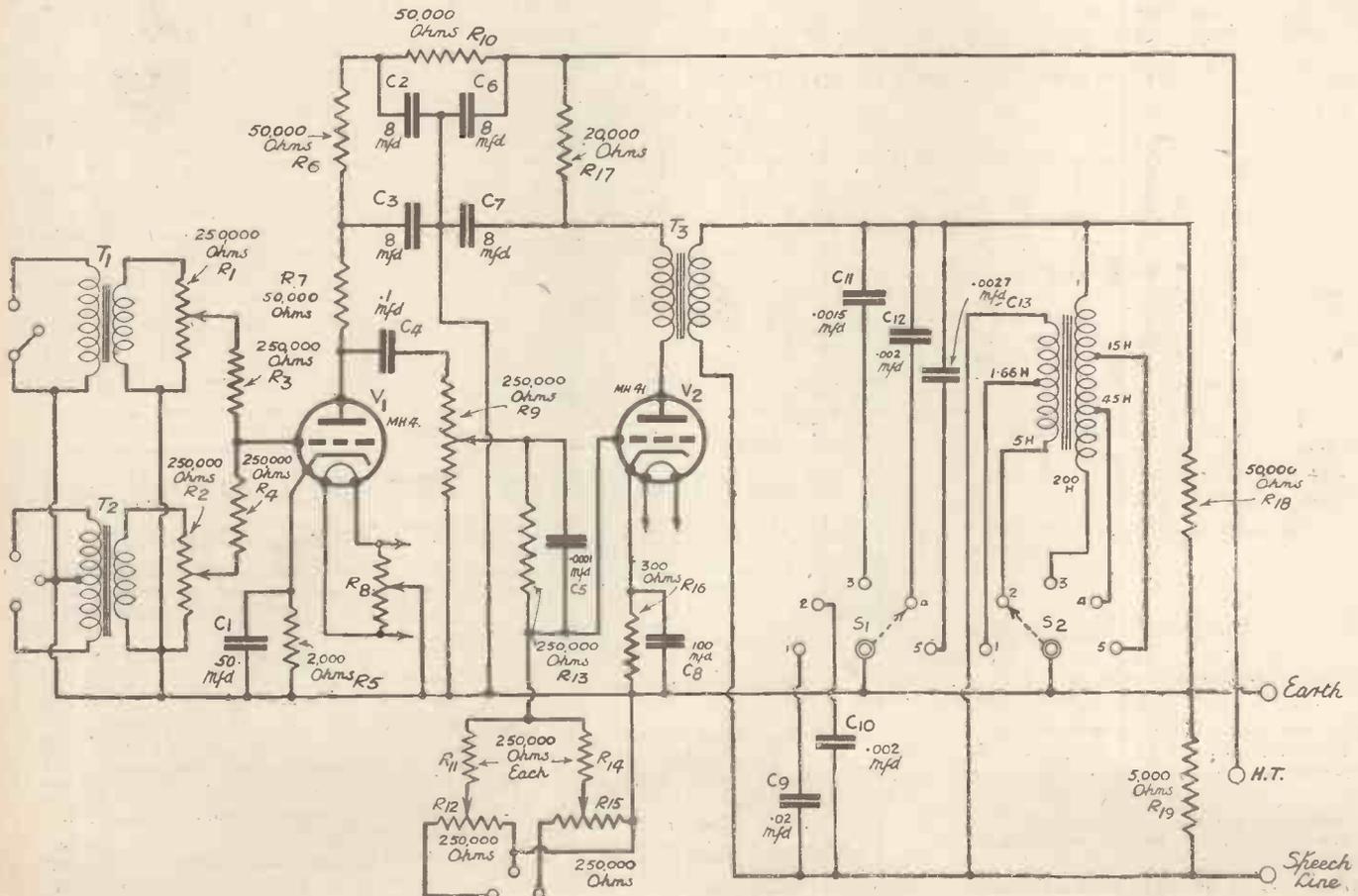


Fig. 3: The author's final choice of pre-amplifier circuit. The functions of the various components are fully described in this article.

QUESTIONS AND ANSWERS

By K. D. ROGERS

WEAK RECEPTION ON AN S.G. THREE

R. W. (Newbury).—*I have built a three-valve set using a screen-grid valve, and though it gives plenty of stations I find that they are all weak and I have to use phones. Would it be better to use a screen pentode valve instead of the S.G.?*

Probably not. The trouble is not due to the fact that you are using an S.G. valve, but to something radically wrong either with the circuit or the coils, or else with the ganging.

Is the ganging properly carried out? Make sure of that because it is most important. Try the set, using separate tuning condensers to make sure that the two circuits are properly tuned-in. Also make sure that reaction is operating properly.

As you get plenty of stations, though at weak strength, are you getting the proper amplification from the L.F. side of the set?

I notice from your rough sketch that you are using band-pass tuning. Cut out the first stage altogether and put the aerial through a small condenser on to the grid of the first valve or on to the primary winding of the second coil unit (No. 4 in your case). Then you will be using two tuned circuits instead of three. If the strength is still weak try the aerial on the No. 4 of the third coil—that is, the anode coil. Take the screen-grid out of its socket and try to tune-in stations using the reaction and the tuning condenser in the usual way. You will then have a detector and L.F. set, and it will give you an idea if the set is working properly on the two last valves. You should get Droitwich quite loud on the loudspeaker, and the Midland Regional. If you do not I should suspect either the detector circuit or the L.F. circuit.

In your diagram you have omitted the reaction H.F. choke. Is that how you have the set? If so, the reaction will be pretty poor. You must have an H.F. choke between the anode of the detector and the L.F. transformer, and the reaction condenser must be connected to the anode direct as you show it.

Put that reaction right and see how the set goes. It will be quite useless without that reaction choke.

SOS

Will some reader please get in touch with Mr. M. Williams, 3, Albermarle Street, Clerkenwell, London, E.C.1, with a view to lending him a blue print and details of the S.T.500? Thanks.

"EXCHANGE IS NO ROBBERY"

Mr. L. Brown, 3, Harkers Cottages, Langwith Junction, Mansfield, Notts, has over 100 old copies of "P.W." from Nov. 1934 to Dec. 1936. He is anxious to exchange them for anything useful in the way of radio gear, short-wave components preferred. So any offers among readers?

THANK YOU, EVERYONE

I quote a letter from Mr. G. Bowman, Newcastle-on-Tyne: "I wish to thank you for inserting on my behalf an SOS for issues of 'P.W.' Nov. 3rd, 10th and 17th, 1934, in your number of Feb. 27th.

"The requisite copies have all been forthcoming (actually about sevenfold) and promises to forward on receipt of instructions number about three dozen. Rather belated efforts to do one a good turn are, in fact, still arriving, two coming this morning (mid-March) and inquiring if I was still in need.

"Although all correspondence has been answered I wish to thank you and your readers for the valuable assistance in an emergency."

And thank you, Mr. Bowman, for writing. I am glad you have found such a good response; I knew you would—but it is good to hear from you.

LOSS OF INDUCTANCE

T. W. P. (Llandudno).—*Can you tell me why a coil should lose inductance when a piece of metal comes near it?*

I can and I will, though it may take a long time. So those not interested can turn over and go to sleep—or read something else.

I am first going to explain what inductance is. That you understand that when an alternating current flows through a coil it sets up a magnetic field round the coil which is constantly rising and falling, reversing in polarity in the same way as the current reverses in direction.

Now you must remember this fact. When a magnetic field cuts a coil of wire—that is, when the lines of force during their building up or their fall cut across the wire forming the coil—they induce in that wire a voltage. That voltage is in such a direction that it causes a current to flow in such a way that it opposes any change in the current already flowing in the coil.

A mouthful, but it boils down to this:

Suppose, for the sake of argument, that you have a length of wire. Put it down on the table in front of you and coil it up.

Let the end of the coil towards your left hand

be A and the other end be B.

Now send a current from A to B. As the current builds up the lines of force round the wire rise up, and in doing so they cut the turns of wire. This cutting causes a voltage to be induced in the wire, in opposition to the voltage which is causing the current to flow. Now switch off the current. The current will die down and as it does so the lines of force round the coil will collapse, cutting the wire turns as they do so. That cutting will induce in the coil a voltage in the other direction, tending to cause a current to flow in the same direction as the current that has been flowing.

In other words, each time the lines of force cut the wire they give rise to a voltage which opposes any change in the current that is already flowing.

Thus, when you switch on, the induced voltage tries to stop any current flowing, and when you switch off, the induced voltage tries to keep the current flowing and not allow it to die away.

With A.C., where the current is changing direction and rising and falling all the time, you can see that the lines of force will be constantly giving rise to opposition currents which tend to oppose any change in the main current passing through the coil. That opposition is called inductance.

Now when you put a piece of metal near a coil in which current is flowing you upset the action of the lines of force. They cut the metal and give rise to currents (called eddy currents) in the metal. These currents in turn give rise to a magnetic field and this field also cuts the coil. So we get the coil's own field cutting through it, and also the field from the currents in the metal.

But the field from the metal induces currents in the coil in the reverse way to those which are induced by the field of the coil. In other words, they are in the opposite direction to the currents caused by inductance effect. That means that the effect of the field from the metal is to reduce the effect of the field due to the coil. Taking it a step further, we may say that the effect is to reduce the inductance of the coil.

It sounds all very complicated, but that is what happens.

ANOTHER SOS

This time for S.T.1-5 details in "Wireless Constructor." The writer of the SOS has had an accident with his accumulator and spill acid on the blue prints, etc., ruining the lot. Those ready to help please write to E. Thomas, 320, Barry Road, Barry, Glamorgan. Incidentally, Mr. Thomas sticks up for "P.W." readers and says that he has helped others on several occasions and has always received thanks and acknowledgments. I am glad to hear it. It confirms my belief that the gentle "kick in the pants" that I have had to give "P.W." readers on the matter of acknowledgments of SOS assistance was due to isolated cases.

CATHODE-RAY TUBES

P. G. D. (Birmingham).—*If a cathode-ray tube burns out, what happens? Can it be mended?*

The "burning out" of a cathode-ray tube (which nowadays is of the indirectly heated variety) usually means that the spot cathode, or more accurately the emissive spot on the cathode, disintegrates and will not give off any more electrons. It is rarely that the tube heater burns out as happens in the case of the indirectly heated valve.

Such an occurrence is possible, of course, but it is usually the cathode emission that "goes west." This can be mended (as can the filament or heater), but it is not every manufacturer of cathode-ray tubes that carries out a repair service. Ediswan do so, I believe, and charge half the price of a new tube, but I do not think that such "mending" is carried on by every cathode-tube inker.

The effect is to provide a completely new tube, both in regard to its efficiency (except for the wear that has taken place on the screen), and also in regard to its characteristics. I have had such tubes repaired in this way, and have found them completely satisfactory.

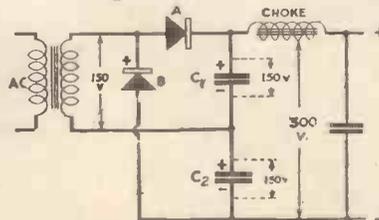
(Please turn to page 143.)

TECHNICALITIES EXPLAINED—No. 48

Voltage Doubling

A method of operating rectifiers (usually dry) so that the voltage of the D.C. output is twice that of the A.C. input.

The two rectified outputs of two rectifiers are used to operate in series as it were. The circuit is as shown here. "A" passes current during one half-cycle of 150 volts A.C. from the transformer secondary. It charges up the condenser C1 with 150 volts D.C. across it.



On the second half cycle "A" does not pass current, but "B" does, charging up the condenser C2 with 150 volts potential across it.

Now as regards the output circuit it will be noticed that C1 and C2 are in series across it. Therefore, across the two condensers are 300 volts, for the polarity of the circuit is so arranged that the upper plates (in diagram) of C1 and C2 are positive. Thus, across the circuit we have 300 volts. That voltage supplies current to the H.T. smoothing unit and to the receiver.

Note that the two rectifier units or sections of one unit operate on alternate half cycles, so that the condensers are charged in turn, and the result is full-wave rectification.

ON THE

SHORT

WAVES



"RANDOM RADIATIONS"

By W.L.S.

NO, this title is *not* an impolite reference to amateur transmissions, although I confess that much of this page will be given up to that subject. I am clearing off a number of old grievances—some of them my own and some coming from readers.

Many of the latter would like to see this page devoted entirely to the amateurs; but, after all, short-waves mean so much more than the amateur bands alone. There is no doubt, though, that the amateurs are more interesting to the average reader than anything else in the spectrum—possibly because they have a kind of natural affinity with him, since he is an amateur himself.

First, let me deal with one particular letter. A gentleman from Bristol, who wishes to remain nameless, writes: "Why is it that one can sometimes hear one amateur talking to another, and then hear him say 'over,' or some such expression; and sometimes one can hear what sounds like one end of a telephone conversation, with no replies audible; and, yet again, one can sometimes hear a complete conversation, with the second man's voice coming in in the background?"

Three Categories

In a nutshell, the three categories are these: (a) Ordinary two-way conversation—alternately transmitting and receiving; (b) duplex telephony, with the man who is speaking probably listening to the other chap on headphones; and (c) duplex telephony, with the "other man" being received on a loudspeaker, and therefore getting through to the first man's microphone, so that a listener can hear both ends of the conversation.

Duplex work, of course, cannot be carried out unless *both* stations are suitably equipped. And "suitably equipped" means "possessing a receiver which will still get the other man when one's own transmitter is switched on."

In other words, G6— talks to G8—, and even when his own transmitter (next door to the receiver, perhaps) is switched on, he can still hear G8— if he wants to butt in.

Nearly any amateur with a good superhet can work duplex—but the difficulty is generally in finding *another* station that can return the compliment.

This same Bristol gentleman has a minor

moan about some of the funny expressions that are taking the place of the once universal "over"! That, of course, was a natural contraction of "changing over" from transmission to reception—and didn't mean, as some funny people imagine, that the transmission was "all over."

Now, instead of "over," we hear "come in, please!" (don't knock!); "turning it back to you" (turning *what* back?); "pulling switches"; and a motley collection of American expressions that demand the services of an experienced interpreter.

Still, times change; and I suppose "over" has had a fair run for its money.

Next comes a complaint from a whole

reduce power and change wavelength and still be certain of finding him.

The next point concerns something entirely different—that of getting superhets down to 5 metres. Several of my readers seem to have had great difficulty in this respect; but I dragged my own down there with such ease that it seems to be worth a few words.

The chief point is—leave the oscillator on 10 metres, and just make a 5-metre aerial coil. Then the second harmonic of the oscillator will beat with the signal—and you know that it oscillates on 10 metres, and you know where 10 metres is on the dial.

All that you have to do, therefore, is to wind a coil that you imagine will cover 5 metres, and tune round the band until you hear that increase in "mush," motor-car ignition noise, and so forth, that tells you everything is in tune.

My superhet now covers 4 to 550 metres without a break, and I find the range from 4 to 12 metres easily the most interesting.

Strong A.P. Reception

The strength of the London television station on it has to be heard to be believed. Some of the 5-metre amateurs with frequency-stabilised transmissions are also exceedingly strong. Some of those with old self-excited gear and lots of frequency modulation, however, can hardly be picked out at all. They sound just like odd bits of raw A.C. wandering about.

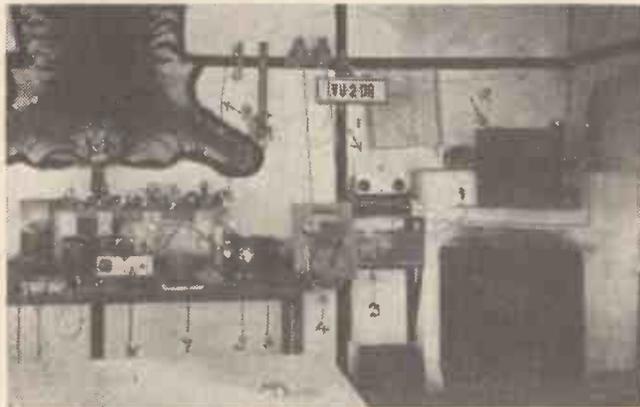
The illustration on this page should be of interest to amateur transmitting enthusiasts. It shows the station of VU2DR in Assam, India. Built entirely from receiving components, and using a Mullard 104V as the last valve, this transmitter has worked all continents with a power of 8 watts.

A small generator and a Milnes H.T. unit supply the power, and the operator attributes his success to the beam aerial.

As an example of what can be done with home-made gear, low-priced components and low power, VU2DR stands out a considerable distance above some of the stations of British amateurs who can buy their components "just around the corner."

"W. A. C." on 8 watts must be harder now (in spite of the good conditions) than it was ten years ago, as interference from higher-powered stations and crowding has greatly increased.

AN EFFICIENT INSTALLATION



This photograph comes from VU2DR, a short-wave enthusiast at Assam, India. Most of the gear is home made—(1) is the broadcast set and (2) the loudspeaker; (3) is the charging gear; (4) the beam rotating apparatus; (5) a clock giving G.M.T.; (6) two accumulators for driving the transmitting generator; (7) the 8-watt generator; (8) a three-valve receiver and (9) the aerial lead-in.

batch of readers—heartily backed up by myself—about the way some amateurs will use the "DX bands" and high power for making local contacts which could be better handled with 5 watts or so on 160 metres. Too often we hear stations with 100 watts or more on 20 metres, completely hashing up the DX while they converse with another British station only a few miles away.

Superhets on 5 Metres

One reader complains about "two well-known London stations" carrying on a phone conversation on 10 metres, both using fairly high power. He's right, I know—one of the stations was my own! The only excuse I can offer is that it was imperative that I should have a word with the other fellow, and it was impossible to

ON THE SHORT WAVES—Page 2.

POINTS from the POST-BAG

W. L. S. Replies to Correspondents

T. W. M. (Exeter), to whom I alluded a few weeks back, has completely knocked out all other claimants for the "P.W." DX Certificate by sending in complete sets of eleven verifications for each continent! It's Australasia that has held him at the figure of 11. Of course, I know that many readers would be able to send me 100 veri's for North America and perhaps 50 for South America; but T. W. M. is the only one, so far, to send in more than four for every continent.

While we're on this "veri" racket I might mention that I have been looking over some of my own cards—which concern two-way contacts, of course, and not reception reports. I find South America is the shortest continent, with 54 cards. Australasia comes next with 156; North America is well into four figures! Some of the hams who spend far more time on the air than I do must be able to produce incredible quantities of complete W.A.C.'s.

Concerning Coil Data

C. S. D. (Harrow), who recently appealed for the address of A. W. (Banbury), has received several letters from readers who seem to be under the impression that he has got the circuit he wanted from A.W. Actually, he hasn't yet heard from A. W. at all—so if this should catch the latter's eye will he please make himself known to me? I will then put him in touch with C. S. D.

There are so many queries running about on the question of coils for the "Simplex" Two that we shall simply have to publish the data again. Look for it in the issue of May 1st. This paragraph may be taken as the answer to about eighteen letters.

P. A. S. (Ilford) wants someone to identify an unknown station for him. Here is his description of it: "It is on about 22 metres, and comes through in short bursts, very distorted, with the appearance of musical accompaniment to speech. There is a plop every time it starts." Sounds to me like an amateur in trouble, but perhaps someone else happens to know more about it.

P. A. S. also inquires about the shipping wavelengths. He will find most of the interesting stuff in the regions of 24, 36 and 60 metres. I hear most of my ship-to-shore telephony on roughly 24 and 36 metres.

W. G. M. (Southampton) comes back to the fold after a long absence. He has polished up his OVI and has been listening to long-distance phone on it, just to satisfy himself that the small set isn't essentially an affair for C.W.

He logged several W5's, W6's, VK's, and other "oddmments," such as C O, V P 3, P K 2, V O, P Y and V E 4—so he doesn't seem to be doing so badly.

As he says, "On 10 metres some of the

W8's and W9's nearly knock the phones off your head at times." I know! I've been listening to them with headphones and seven valves recently, and my eardrums haven't settled down to normal yet.

More Countries for "Tiny"

R. W. (Workshop) sends in a long list of DX stations—C.W. this time—and tells me that he still uses the famous OVI which started such a lot of rivalry a little while back; but his aerial now consists of six feet of wire lying on the floor behind his bed. The interesting thing about his list of DX, by the way, is that it was all logged on 40 metres, that home of local phone and near-phone. It includes six K6's (Hawaii), one K7 (Alaska)—all heard between 8 and 9 a.m.—and two Venezuelans heard late at night.

His famous "Tiny" now has 114 countries to its credit.

H. J. B. (Manchester) comments on the

S.W. ENTHUSIAST'S BEAM AERIAL



VU2DR, of Assam, India, attributes much of his success to his beam aerial, which he can rotate without moving from his seat at his operating bench. Quite a professional-looking affair, isn't it?

good Australian signals to be heard on 10 metres at about mid-day. He finds VK 2GU among the best of them, as most of us have done during the past few weeks. He has also logged a lot of West Coast American stuff on phone.

T. M. (Dublin) wants a few further details on the three-stage converter that I mentioned in the article entitled "Converter or Adaptor," some time back. I'm hoping to be able to give full details of one quite shortly.

Readers are reminded herewith that they have not many days left, if they want their copy of the "P.W." DX Certificate. None will be issued after April 30th. All you have to do is to send in two phone veri's from each of the six continents. For each additional set of 12 veri's you will receive a gold seal to place in the space provided.

The new certificate is going to be more difficult to gain than the present one.

Short-Wave News

THE season of contests is over at last—and some of us are very glad about it.

The amateur bands are incredibly rowdy stretches of territory while the various contests are in progress, and many hundreds of "hams" seem to come on the air for the tests and disappear for another year. They'll none of them be missed—even if they haven't got themselves on the list.

National Field Day, of course, is different, and has an atmosphere of its own, which I, for one, rather like. I think it is a great pity that low-powered portables are not given more of a showing during the year.

Five-Metre Field Day

On July 4th a National Five-metre Field Day will take place. This should be an extremely interesting event, and one in which every keen listener can play his part. Portable stations will be in action all over the country on that day, and it should give a better chance of 5-metre reception over long distances than has been available since our Crystal Palace tests in 1933.

All the stations taking active part will be portables, and they will be installed at fixed points in the open air. You may safely bet that the people who run such stations will choose good, high sites for them.

A full list of call-signs and locations will be available some time before the actual date, and I will see to it that this is published in "P.W." in plenty of time for every reader to make his plans and get his receiver out in a good spot somewhere.

Those who have to stay at home, however, should have quite a good time of it; there won't be many parts of the country in which some, at least, of the portables do not make their presence felt.

Crystal-Controlled Stations

Incidentally, there will be none of the old frequency-modulated, "wobulated" transmissions. They will all be stabilised, and many of them will be crystal-controlled. In other words, straight receivers will probably be better for the job than super-regenerators.

I recently spent a week-end at the coast. My host was a "ham," but we didn't do any "ham radio" at all. We listened for several fairly short periods, however, on a commercial all-wave receiver, which gave me a chance of comparing conditions in Sussex with conditions at home.

The best broadcast from the States came, as usual, from W 2 X A D. W 8 X K on 19 metres was a little more than half his strength. The set was fitted with a tuning indicator which really gave one an accurate idea of carrier strengths; W 2 X A D bumped it up to an amplitude comparable with that of Droitwich. W. L. S.

FROM OUR READERS

THE SHIPPING BANDS FOR THRILLS

The Editor, "Popular Wireless."

Dear Sir,—I have often seen letters published in the "Readers' Page" about the reception of broadcast stations and amateurs, but I have never seen any letters about signals heard on the shipping bands.

I consider that the 18, 24, 27 and 36-metre bands are the most interesting of the whole range, that is to anyone who can read Morse.

One of my first thrills was when I heard the Graf Zeppelin, (DENNE) at the time it was passing over the Equator during one of its flights to South America. I have also heard the "Hindenburg" (DEKKA) and have followed it to both North and South America.

One of my treasured possessions is a letter from the wireless operator of the Royal Research Ship Discovery II (VPSJ), thanking me for my letter, which I sent him containing a log of his signals. The Discovery II, it will be remembered, rescued the Ellsworth brothers from the Antarctic, in January, 1936.

To anyone who cares to listen on the 27-metre band, numerous aeroplanes can be heard. A short while ago I received a QSL from the Zephyr (D-A GAV), a German aeroplane which was in the news a short while ago as being one of the first aeroplanes to operate on the mail service to New York.

To anyone who wishes to listen to ships, if they listen on the 36-metre band during the morning between 06.00 and 08.00 they will hear signals from all over the world. During four years, listening on the shipping bands I have heard signals from nearly every part of the world. One thing that I have noticed is the absence of "conditions." There is always plenty of DX and perhaps the chance of hearing something out of the ordinary.

Yes, sir, for the person who wants plenty of DX, plenty of thrills (and who is there who can listen to signals from ships out in the "Seven Seas" without being thrilled), give me the shipping bands every time.

Yours faithfully,

J. EDWARDS.

8, Welton Grove, Leeds 6

"SIMPLEX TWO" BLUE PRINTS

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose herewith a blue print of the "Simplex Two," from a tracing I have made from the small diagram published in POPULAR WIRELESS a few weeks ago. I constructed this set, and in order to facilitate the marking-out of the aluminium chassis I made a full-size drawing of the set. While thus engaged it occurred to me that a little extra care in drawing might be well worth while, as there must be many readers who would like a full size print to aid their construction, and the enclosed is the result. I trust I have not infringed any copyright, and you will observe that I have acknowledged the origin of the design. I am prepared to let readers have a copy of this print for 9d., this covering the cost of printing and postage.

Perhaps you would be good enough to draw the attention of your readers to this matter in an early issue.

The following story may be of some interest to you: A scientifically-minded uncle of mine, an amateur of many years' experience, has hitherto expressed strong condemnation of the entertainment value of short waves, although he has heard one or two commercial all-wave sets. I constructed the "Simplex Two," and took it down to his house one week-end, with a view to reversing his opinion. When I showed him the outfit he was rather amused at the simplicity of the lay-out, and obviously had little interest in the set. I connected the batteries and accumulator, etc., and began to tune-in.

Within forty minutes I had logged W 2 X A D, W 8 X K, O L R 2 A, about three unknown Latin transmitters, an Empire station which we held at R6 for three-quarters of an hour at surprisingly good quality, Eindhoven, and quite a number of amateurs. My uncle was like a child with a new toy: he could scarcely eat his meals without leaving the table to try his hand at tuning. We stayed up till 1.30 a.m. listening to the American amateurs on the 20-metre band, and on the Sunday morning we had a tour of the British amateurs on 40 metres.

That is just one of the opinions expressed on this page—which is your page. It is written entirely by readers for readers. Have you something you would like to tell readers? Then drop us a line. And remember your letter may win for you the guinea prize which is awarded each week to the sender of the best letter in the opinion of the Editor. This week it goes to Mr. J. Edwards

My uncle begged me to leave the set with him for a week, so that he could show a friend with a commercial all-wave what a real short-wave set could do, and expressed his intention of making one himself.

This praise from an experienced radio constructor with a bias against short waves is praise indeed, and should be proof enough to the unconverted that there really is something in it.

I should be glad to hear whether you approve my idea of supplying readers with these blueprints, and in conclusion wish your paper the success it strongly deserves.

All good wishes to yourself and staff.

Yours faithfully,

WM. ROSS.

41, Curtis Road, Heaton Mersey, Manchester.
[EDITORIAL NOTE.—The "Simplex Two" blue print which Mr. Ross has prepared is a first-class piece of work, and we freely extend our permission to him to sell copies of it.]

It should be noted that without this permission having been granted our copyright would most certainly be infringed.

The "Simplex Two" was originally described by W. L. S., in POPULAR WIRELESS, July 6th, 1935, but this issue is now out of print, due to the set's popularity. Brief details with diagrams were given again in the February 27th issue this year.]

THE IMPORTANCE OF SPANISH

The Editor, "Popular Wireless."

Dear Sir,—I noticed in your issue of March 13th that you are going to start another "Through Your Radio" series some time in the future. Your French course was wonderful, and I am writing this to let you know how much I should like another language lesson. Although French is a most useful and a rather essential language I am not very fond of it, as it is not a very sweet-sounding tongue. Also, it is very difficult to pronounce French words à la Française.

I therefore suggest, and I hope that many of your readers will agree with me, that a Spanish course would be just the thing to publish next in "Popular Wireless." Spanish is, I think, a much easier

are lucky enough to take a holiday there)." But have those readers forgotten the short waves? At the present time those waves are dotted with Spanish speaking stations from all over the world. It is only when we make a tour of the short waves that we discover how important Spanish is. The 49-metre band is a regular jumble of Latin Americans. At present most of the U.S.A. stations give special Spanish programmes for their South American listeners. They often give their usual announcements in Spanish as well as in English.

I am sure that most DX'ers would like to know a little Spanish, so I send you this letter as a vote in favour of the next "Through Your Radio" being a Spanish course.

Hoping that my letter, along with others, may be the cause of weighing the scales in favour of a Spanish lesson.

Yours faithfully,

DIARMUID DOYLE.

The Abbey, Ballaghaderene,
Co. Roscommon, Ireland.

MAKING THE DIALS REVOLVE

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a few lines in appreciation of your latest feature, Leslie Orton's, "The Dial Revolves."

As a beginner on the short waves I have found the articles most helpful and interesting. I did not know my set was capable of bringing in so many stations until I was shown how, by your expert contributor, whose clear and concise language has trebled the pleasure of listening and added the thrill of distance.

Looking forward to your next issue.

Yours truly,

C. WELCH.

240, Millbrook Road,
Freemantle, Southampton.

NOT WANTED

The Editor, "Popular Wireless."

Dear Sir,—As one of the listening public, it is with surprise that one learns that the B.B.C. has no real power to deal with competing broadcasts from foreign stations. During the past few weeks I have heard programmes received by British sets from Germany, Italy, Russia and Portugal, with propaganda forming the chief item, and our own B.B.C. has failed to prevent this air piracy.

In theory there is an international broadcasting agreement by which the different broadcasting nations should refrain from intruding on each other's territory, but it is plainly evident that this treaty has been broken. It is high time the British Government stepped in, if they have the power, to prevent this alien propaganda which is definitely the basis of many harsh criticisms among radio fans, and is unwanted by the majority of licence-holders who pay to be entertained.

"LISTENER."

Batley, Yorks.

MR. ALLAN REPLIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having read with great interest the letter of Mr. Chadwick, on his experiences as a radio reporter for twelve years, he gives us a list of cards sent and received which shows after twelve years of reporting a heartbreak to look at. He also goes on to say that any recipient of a card from 2 B I C will confirm that it is the good detailed report that I prescribed. By the list he gives us, very few confirmed have it as yet. Surely, Mr. Chadwick, if you had been reporting to any of the countries you mention ten or twelve years ago, I think, and so will others, that you would have had a much better fate than has been your lot up till now.

I ask Mr. Chadwick if he can honestly say that he can give a full report on his card? If he can. "It sure must be a mighty good one." I don't rely on my card to carry my report, I always give all available information I can gather about the transmission I intend to report on. With twelve years of radio reporting I thought Mr. Chadwick would have learned that a card would not hold everything to be put in a report. A Q S L-card passed between two stations isn't a report. I think I am right in saying that it only verifies the Q S O that has taken place.

(Continued on next page.)

AT RADIO NORMANDIE



This is the elaborate playing desk used at the Fécamp station. It has six turn-tables and the announcer sits in a chair in the centre.

language to learn than French, and at the present time a very useful one. Now some readers may say "Why is Spanish more important than, say, Italian or German?" Well, let us look at the map of the world!

We see that Spain (of course), the West Indies, all the Central and South American Republics, except Brazil (which speaks Portuguese), Rio de Oro, the Canaries and many other islands, speak Spanish. Now if we combine all these countries we find that they make up quite a large percentage of the land on the Earth's surface. But even then some of your readers may say, "But what have South and Central America to do with us? They are too far away and we shall never visit them (except those readers who

FROM OUR READERS

(Continued from previous page.)

And now, Mr. Chadwick, I will answer your questions:

(a) My analyses cover the whole period of my reporting venture two years past—March 3rd, 1937.

(b) Yes, my percentage of cards is still being received. Two cards just received are from W 8 J K. This confirms your report on the reception of my 14-mc. fone signals on Feb. 2nd, 1937. Many thanks. No coupon was sent. This station put out 500 watts, has worked all continents; 73 countries on fone and code, and he appreciated my report. W 9 C L Q sent me the following: "I plan to work ten-metre fone as much as possible in future and would appreciate a further report from you, should you hear me. Let me hear from you again, February 28th, 1937."

(c) Yes, I count "circular letters" verifications, if they state they are to verify my report. Fortunately I have only one V Q 7 L O, and V K 2 M E, P M N, etc. supplied me with a card.

And now, Mr. Chadwick, if you don't count "circular letter" verification, what do you look for. Some gay coloured cards so that you may adorn the walls of your shack, so that some novice who may visit it will go all green with envy?

As I have already said, I do not attach much importance in my card for my success. Surely, Mr. Chadwick has seen far better results than mine. For instance, Mr. Everard, Mr. Diarmuid Doyle (whose list was published in "P.W." March 20th), and also Mr. Bigley (B S W L 122), and "Onda Corta" (in "P.W." March 13th).

And now may I give a few extracts taken at random from my cards. Brazil—"Many thanks for your report and the most useful information you gave me." Argentina—"Many thanks for your very kind letter and card of the 12th July, 1936, I appreciate immensely your valuable information on my 20-metre fone. Should you happen to hear me again I should very much appreciate hearing from you. With renewed thanks. N. America (W 3).—"Tnx fer ur nice letter and report O.M. Hope to hear from you again some time and know how I am coming in over there 23 es Gud Luk." W 4.—"Tnx, O.M., fer crd es report. Hope to get your way some time again. Return postage guaranteed. W 6.—"Tnx fer your f.b. report and letter, O.M. Appreciate it very much." W 8.—"Thank you for your very fine report, O.M." Cuba—"Thanks for your nice correct report." W 9.—"Tnx a lot fer the f.b. report. I am sure glad I am getting over to you in fine shape, lots of luck. Again, thanks for report."

And, finally, three from the Continent. Portugal.—"Very interesting your reports. Many thanks, dear O.M." France—"Vy Tnx fer f.b. report es hope a new report soon." Switzerland—"Mni tnx fer ur card, dear O.M. Please watch my transmitting."

I could also give G.'s who have appreciated my reports and asked for more.

Surely, Mr. Chadwick, those few extracts speak for the quality of my reports, and I would "veri" (excuse me, Mr. Chadwick, if I use that horrid word) much appreciate anything you may have to say on this reply. Having been a radio listener since 1923, I won't say that I haven't anything to learn yet. So, Mr. Chadwick, what about it.

Yours faithfully,
T. T. ALLAN
(B.S.W.L. 563, B.L.D.L.C. 2971).
133, High Street, Newburgh, Fife, Scotland.

SUPERB COLOURED FLOWER STUDY GIVEN FREE

A BEAUTIFUL Natural-Colour Flower Study, full postcard size, of the Eschschoczia Cherry Ripe is presented with the Grand Coronation Number of POPULAR GARDENING, now on sale, price 2d.

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Complete Kit of Components exactly as FIRST specified and used by Mr. J. Scott-Taggart, with Konectakit (Gratis with Complete Kit) but less wanders plugs accumulator connectors, valves Extractor Kit, Cabinet and Speaker.

IMMEDIATE DELIVERY-CASH-C.O.D. or H.P.

KIT "B." As Kit "A" but with 4 FIRST specified valves only, less cabinet and speaker, etc. Cash or C.O.D. Carriage Paid £4/16/6, or 9/- down and 11 monthly payments of 8/10.
KIT "CT." As Kit "A" but with valves and Peto-Scott S.T.800 Table Cabinet, net only, less speaker, etc. Cash or C.O.D. Carr. Paid £5/14/0, or 12 monthly payments of 10/6.
KIT "CC." As Kit "A" but with valves and Peto-Scott S.T.800 Console Cabinet only, with speaker, baffle and battery shelf, less speaker, etc. Cash or C.O.D. Carr. Paid £6/11/6, or 12/3 down and 11 monthly payments of 12/1.
KIT "CLL." As Kit "A" but with valves and Peto-Scott S.T.800 Console Cabinet, Type "L", only, with lift-up lid, and speaker baffle, less speaker, etc. Cash or C.O.D. Carr. Paid £6/14/0, or 12/3 down and 11 monthly payments of 12/3.
*S.T.800 EXTRA KIT: A kit of parts or ready-built kit, £4/4/0, or add 2/3 to deposit and each monthly payment. Please state which is required when ordering.
*If the above Kits are required complete with 8 wanders plugs and 2 accumulator connectors, as specified, ADD 1/9 to Cash or C.O.D. prices or 1/9 to the deposit.

S.T.700 to S.T.800 CONVERSION KIT

COMPLETE SET of parts necessary to convert your S.T.700 to the all-wave S.T.800 exactly as recommended by Mr. Scott-Taggart on page 247 of "Popular Wireless," dated Nov. 7, 1936.

Comprising: B.T.S. Quadwave Tuner, aerial balancer condenser, turret switch, B.T.S. H.F. choke, 54-watt resistors, 5,000 Ohms, and 2 1-megohm, 2 mica fixed condensers, .0001 and .0005-mfd. Cash or C.O.D. Carr. Pd. 36/-, or 2/6 down and 9 monthly payments of 4/3.

2/6 DOWN

FINISHED INSTRUMENTS-CONSOLETTES



Battery Version. Complete with FIRST SPECIFIED valves. Peto-Scott Type 101 matched speaker and walnut Consolette cabinet with Australian walnut-veneered front and wings (illustrated). Dimensions: 20" wide, 24" high, 12 1/2" deep. Less batteries. Cash or C.O.D. Carr. Paid £9/2/0, or 16/9 down and 13 monthly payments of 16/8.

16/9 DOWN

A.C. S.T.800 KIT "A" Comprises complete kit of components as FIRST SPECIFIED and used by Mr. J. Scott-Taggart, including Peto-Scott ready-drilled and polished walnut plywood panel, ready-drilled terminal strips, aluminium brackets, mains lead, nuts and bolts, less valves, cabinet, speaker and Extractor Kit. Cash or C.O.D. Carriage Paid £9/19/0, or 18/3 down and 11 monthly payments of 18/3.

SUPER CENTURION KIT "A" £2:18:9 for 5/- DOWN

Complete Kit of components exactly as specified by Mr. John Scott-Taggart, with ready-drilled panel and Esabilt cabinet parts, but less valves, cabinet and extractor. Cash or C.O.D. Carriage Paid £2/18/9.

Or 5/- down and 11 monthly payments of 5/6. KIT "B." CASH or C.O.D. Carr. Paid £3/19/0, or 7/3 down and 11 monthly payments of 7/3. KIT "CT." CASH or C.O.D. Carr. Paid £4/16/6, or 8/9 down and 11 monthly payments of 8/9. KIT "CC." CASH or C.O.D. Carr. Paid £5/14/0, or 10/6 down and 11 monthly payments of 10/6.

Enjoy the Wonderful Quality of TELEVISION SOUND PROGRAMMES on your A.C. MAINS SET with the Peto-Scott 6-9 METRE CONVERTER KIT



Converts your present A.O. mains set to receive the sound section of the television broadcasts from Alexandra Palace. The advanced acoustical design and general proficiency of the amplifiers employed on these broadcasts produces a quality of tone and musical rendition which has become famous. Enjoy this 100 per cent. natural reproduction, obtainable only on the ultra-short wavelengths, on your present set with the Peto-Scott Converter.

Only 4 simple connections and no alterations to your A.C. set

KIT "A" 30/- Comprises all necessary high efficiency components, including 100.1 slow-motion dial, and is complete with instructions and wiring diagram. Yours for 2/6 down and 8 monthly payments of 3/9.
KIT "B" As Kit "A" but with Hexode Valve, £2/10/0, or 5/- down and 10 monthly payments 5/-.

2/6 DOWN

Peto-Scott SHORT WAVE 4 KIT COVER 7 TO 77 METRES



Entirely new design in Battery Short and Ultra S.W. Kits. Just what the keen DX fan has been waiting for. Provides for the reception of all Short-Wave Stations, and also covers the Television sound channel. Stove enamelled steel chassis and screens. With eight 6-pin coils.

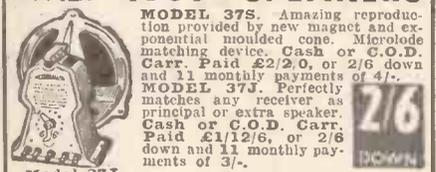
4 Valves Pentode Output. Dual Ratio S.M. Airplane Dial. Low Loss Components. Slow Motion Reaction Condenser. Combined Volume Contrl. & Switch

Cash or C.O.D. Carr. Paid, or 5/- down and 11 monthly payments of 5/9. Complete Kit of components, less valves and cabinet. Kit "B." as Kit "A." but with 4 British valves. Cash or C.O.D. £4/11/6, or 7/6 down and 11 monthly payments of 8/6.

KIT "CS." As Kit "A." but including 4 specified valves, Peto-Scott Classic Cabinet, and Peto-Scott Model 101 Permanent Magnet Motor-coil speaker. Cash or C.O.D. Carr. Pd. £6/13/6, or 12/3 down and 11 monthly payments of 12/3.

5/- DOWN

W.B. 1937 SPEAKERS



MODEL 37S. Amazing reproduction provided by new magnet and exponential moulded cone. Microloade matching device. Cash or C.O.D. Carr. Paid £2/2/0, or 2/6 down and 11 monthly payments of 4/-.
MODEL 37J. Perfectly matches any receiver as principal or extra speaker. Cash or C.O.D. Carr. Paid £1/12/6, or 2/6 down and 11 monthly payments of 3/-.

2/6 DOWN



MODEL 37SC. A cabinet instrument giving superb reproduction, with power handling capacity of up to 5 watts undistorted. The turn of a switch adjusts it to match any set made. With volume control. Cash or C.O.D. Carriage Paid £3/3/0, or 5/- down and 11 monthly payments of 5/9.

5/- DOWN

NEW AND DIFFERENT! PETO-SCOTT 1937 SHORT-WAVE ADAPTOR-CONVERTER KIT



Convert your existing Battery or A.C. set for operation on the short waves with this up-to-the-minute unit. No alterations to your set whatsoever. Two hours to build—a lifetime of world-wide entertainment.

No coil changing. Drilled steel chassis. Drilled steel panel.
KIT "A" Cash or C.O.D. 29/6 Carriage Paid 2/6 down and 10 monthly payments of 3/-. All parts for building with diagram, assembly, and operating instructions, less cabinet.

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62 (P.W. 26) HIGH HOLBORN, LONDON, W.C.1. Holborn 3248
EST. 1919



Cried Smithson,
"What's this that
I've got!
Is it Mars, or Aus-
tralia, or what?"
But his pal merely
said,
"You've got crackle,
instead,
Of the Fluxite your
wiring did not!"

See that **FLUXITE** is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

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ADVERTISERS. THANKS!

SEEN ON THE AIR

(Continued from page 128.)

Melvin knows his stuff, but at present is lacking in confidence before the camera. Many of the native masks which he showed were black and could not be viewed properly on my screen. Nevertheless, I learned with interest the origin of some of Mr. Epstein's inspirations.

What promised to be the best programme of the week also went slightly awry. I refer to the Scott epic "To the South Pole," in memory of the 25th anniversary of the death of Captain Scott and his gallant comrades in the Antarctic. It was thrilling to see in the flesh some of Scott's companions on the expedition, to hear the story from their own lips. Unfortunately far too much was taken for granted, and the narrative lost coherence. Film was effectively used for the purposes of illustration. I, for one, cannot hear this great story too often; it was a pity to drop a few of the essential connecting links.

Interviewing the A.P. Ghost

Reverting for a moment to the question of April fooling, the best bit was in "Picture Page" when the Alexandra Palace ghost was superimposed on the screen and interviewed by Leslie Mitchell. Mr. Mitchell himself presented a ghastly sight as a "negative" when the camera leads were reversed, and he made Frankenstein gestures in the guise of a grizzled black man.

Having disposed of my programme grouse I come now to another important matter. Television sets are selling more rapidly; I know of one firm which is definitely having difficulty in keeping pace with orders. Perhaps the prospect of televising the Coronation procession is responsible for this accelerated demand, but whatever the reason, it is essential that there should be no falling off in the quality of programmes. It is also essential that hours of transmission should be lengthened.

The B.B.C., on the old plea of money shortage, declare that the only possible way to increase programme time is by an hour's transmission of film in the mornings.

Below the Standard

I fervently hope that this decision will be reconsidered. Televised film is definitely below the standard of televised "reality." It will be no advertisement for television to show make-weight film in dealers' shops morning after morning. It will be slipping back to the experimental period when, speaking quite brutally, "any old rubbish" was pushed in to fill up.

I hear that Mr. Cock proposes to make a film as a sequel to "Television Comes to London," carrying on the television story to the present day and showing a number of the highlights of television programmes which have been transmitted.

This sounds likely to be a great deal more entertaining than "Television Comes to London." But it will not bear the endless repetition with which we are threatened.

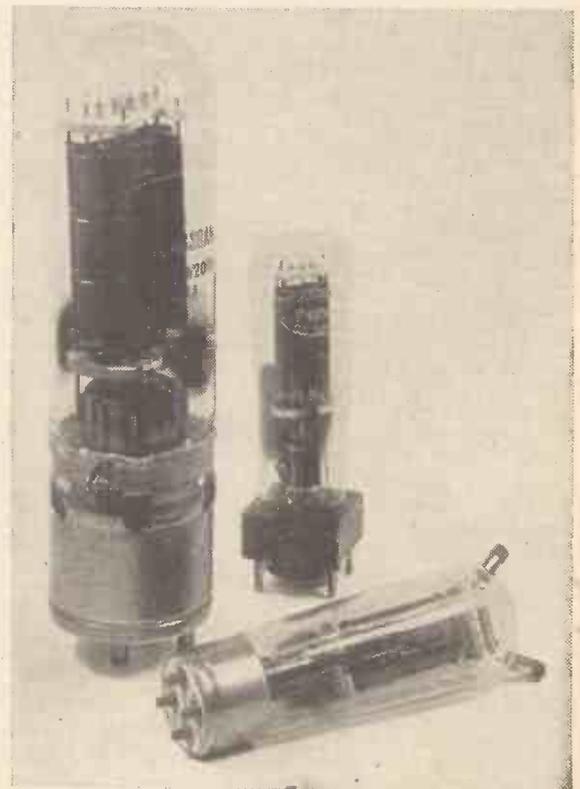
The Licence Fee Question

I attach no importance to the rumour that the licence fee is to be increased to 12s. 6d. to pay for television. No Government will court the unpopularity invited by such a decision. Moreover, first a substantial offer must be made to the B.B.C. out of the £1,000,000 which the Treasury retains from licence revenue.

If, as reported, the Government has offered the B.B.C. £150,000 for this year's contribution to television, it will be about half what the B.B.C. expect to spend on it.

It will be pleasant to conclude this article on a more contented note, and the B.B.C., with the last programme which I have seen, have provided me with the reason.

I found Bob Gregory's demonstration of weaponless self-defence by ju-jitsu instructive and in a mildly sadistic way amusing. Normally, it would not be in the least funny to see a seventeen-stone man flung about like a sack of coals; but I imagine that King Curtis, despite his mountainous bulk, was an expert at falling and took no harm. I laughed idiotically at the rough-and-tumble which Mr. Gregory's two assistants had in ineffectual attempts to emulate the master. Yet I suppose this was the most artless piece of humour of the whole week. Such is the lot of the television producer. His most concentrated efforts fail, and then the audience is convulsed because somebody slips on a banana skin!



Valves of every type are made by Tangrams. Whether for P.A. work, transmitting or ordinary broadcast reception, there is a suitable type in this firm's range. Those illustrated here are representative of some of the larger Tangram valves. On the left is the O 240/2000—a low-frequency amplifier giving 45 watts output. Next to it is the P 60/500, which has an output of 15 watts, and on its side, one of the Tangram S.W. oscillators, the OQ 70/1000.

RANDOM RADIO

REFLECTIONS

(Continued from page 132.)

And that all these little chunks of "aggregation" (that's you and me) "project imaginative constructions" which form our bodies, the earth we propel them about on, and the things, such as houses and what-not, that poke up from that earth.

I suppose if another "aggregation of vibrations" takes offence and lands you a fourpenny one on the fifth octave, that's just another "imaginative projection" working inwards instead of outwards?

Well, Mr. X, Fournier d'Albe advanced the same kind of theory some half a century ago, but that hasn't stopped them chasing electrons in the Cavendish Laboratory and elsewhere. And, anyway, I can't see my tailor having his bills dismissed as "imaginative projections." So what?

THOSE AMERICAN PROGRAMMES

SIX letters in my postbag this week take me to task for praising American programmes. Well, by the time the writers of these pugnacious screeds see this paragraph, they'll have read my recent apologia for the B.B.C. wherein I rather lined up with Sir John Reith and his colleagues. On the end of the line, of course, because my school played "He" on asphalt, and thought "Squash-Racket" had something to do with crime and "Fives" referred to boots.

Now you anti-American radioites have probably forgotten to consult your world clocks. I think you may make a common mistake and compare our evening radio with American afternoon radio.

The U.S. is five hours behind G.M.T. You have to stay up till one o'clock a.m. in order to get their equivalent to our eight o'clock features. Their evening programmes run from 12 midnight to 5 a.m.

And it is during those hours that you get most of the thousand-dollar items. Yes, *thousand dollars*—two hundred pounds. Our B.B.C. reckons to get a star dance orchestra for a whole hour for fifty pounds or so.

N.B.C. of America will often have a score or more artists in one evening, each taking anything from twice that sum upwards.

And their listeners pay no licence fees!

No, I'm not going to start in on a pro-sponsored-programmes argument. I've got a better suggestion than that. Be thankful for our own non-commercial B.B.C., and get a short-wave set and milk the U.S. a trifle now and then for some of their stuff.

You'll find some good listening quite early in the evening. Now and then you might sit up a bit late and tune-in to, say, W8XK on the 25-metre band 12.30 Saturday nights, and hear something quite different from anything you can pick up in Europe. A "Question Bee." Half an hour of unrehearsed fun and excitement with six bold members of the U.S. public on a platform before an audience, picking questions out of a hat and trying to answer them in a contest for twenty-five dollars.

Or on a Sunday evening you might have

a shot at an hour's Spelling Bee from 6.30 to 7.30 that is to be picked up on the 31-metre band.

Then straight on with a Thatcher Colt Mystery play from W2XAD in the 19-metre band.

After which you can switch over to the B.B.C. for the evening service, if you feel so inclined.

NEAT LITTLE IDEA

I SEE that someone claims to have invented a three-dimension television picture receiver. Apparently the idea is to have a bank of photo-electric cells connected to a bank of magnetically-operated rods. Shine the television picture on the cells and it—the picture—stands up moulded in relief by the rods.

In this way, it is claimed, blind people could "read" television pictures with their hands like they do Braille.

Grand idea—in theory. But, as I see it, even for a picture equal to the old, crude 30-line definition, you'd have to have about a thousand of those rods, each with its appropriate photo-electric cell and electro-magnetic actuating mechanism.

QUESTIONS & ANSWERS

(Continued from page 136.)

THANKS A MILLION

Thomas Boyle, 1947, Tollcross Road, Tollcross, Glasgow, E.2, has a whole stock of radio journals to lend. Not only "P.W.," but others. He has "P.W." from October 21st, 1933, to June 15th, 1935, and others from March 23rd, 1933, to January 19th, 1935. In addition, he has "dozens of blue prints."

Think of that, all you set-builders! Mr. Boyle will be glad to lend any of his books to readers who want them, but he adds one most important note to his letter—and I don't blame him. He says, "Remind them that it takes money to send them." It does, too—so don't forget postage when you finally clinch a deal with Mr. Boyle.

THAT VOLT-AMP.

I am grateful to E. H. C.-Y. (Wimborne) for pointing out what might be a rather confusing implication in my *Technicalities Explained* paragraph the other week, when I discussed the Volt-amp.

I will quote this letter, which is self-explanatory, merely thanking him for pointing the matter out.

"In the first paragraph you seem to imply that the volt-amp. is the same thing as the watt. Admittedly in D.C. circuits it is, but in A.C. it may be very different. In this case the current and voltage are out of phase.

"Thus in A.C. the R.M.S. voltage multiplied by the R.M.S. current does not equal the wattage, since the peak voltage and the peak current do not occur at the same instant. Thus the power in volt-amps. will be greater than the power in watts, since the one does not take into account phase displacement and the other does.

"To take an extreme example, take the case of an inductance whose resistance is negligible, placed across the source of A.C. Here the current will be 90 degrees out of phase with the voltage and no power will be consumed. None the less the current through the inductance may be quite high while the voltage will be that of the A.C. supply.

"Hence the value of the volt-amp. will be quite high while the wattage will be negligible."

I am glad my correspondent has pointed that out for, owing to the attempt to get the explanation into a few words, there was evidently some misunderstanding caused by the paragraph.

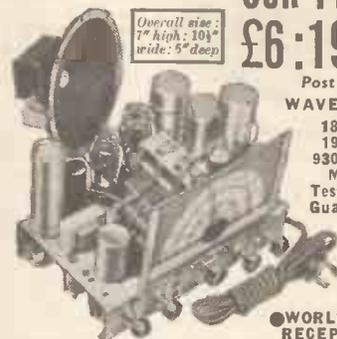
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6 valve ALL-WAVE
ALL-MAINS SUPERHET CHASSIS
with Valves and Field-Energised Speaker
LIST PRICE £10:17:6 **OUR PRICE**

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18.5-50
190-560
930-2,100
Metres.
Tested and
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Overall size:
7" High, 10 1/2"
Wide, 5" Deep

WORLD-WIDE RECEPTION:

18.5-50, 190-560, 930-2,100 metres. ● Illuminated station named wide vision dial. ● Latest 6-valve All-wave Superhet circuit, comprising, Variable Mu Frequency Changer, Variable Mu I.F. Amplifier, Double Diode Triode, Output Pentode, half-wave rectifier and Clarostat mains stabiliser valves. ● Separate tone and volume controls. ● Automatic volume control. ● Simple to tune. ● Complete with 6 valves, Field-energised moving-coil speaker, all knobs, leads and plug. ● Ready to play. ● For A.C. or D.C. Mains 100-260 volts.

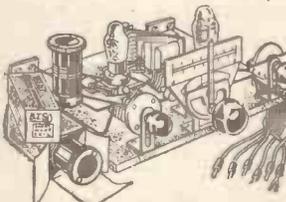
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10/- down secures, balance in 12 monthly payments of 12/-.

10/- DOWN

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27/6

Cash or C.O.D.



Kit comprises all components. Metal sprayed baseboard. 3 variable

condensers, on/off switch, L.F. transformer, 3 four-pin holders, short-wave H.F. choke, 2 terminal mounts, 4 terminals, 5 fixed condensers, slow-motion drive, grid leak, connecting wire, 3 4-pin short-wave coils, 12/26, 22/47, 41/94 metres, 2 brackets and wiring diagram. Cash or C.O.D. Carriage Paid 27/6, or 2/6 down and 11 monthly payments of 2/6.

2/6 DOWN

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Complete with 3 Valves.

This wonderful chassis will bring you a wide choice of English and foreign programmes with amazing purity of tone and remarkable volume. Available at this astonishing bargain price only from N.T.S. 2/6 down secures; balance in 12 monthly payments of 4/-.

Also available with 3 Cosor Valves at 45/-, or 3/- down and 12 monthly payments of 4/3.

2/6 DOWN

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EST. 1924



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YOU**
trace faults
accurately
?

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0-120 "
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0-12 volts
0-120 volts
0-240 volts
0-300 volts
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0-10,000 ohms
0-60,000 ohms
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YES!—if you have a D.C. AvoMinor! With this accurate combination meter it's easy to diagnose all defects in valves, circuits, components, batteries and power units, etc. It is 13 meters in one—gives direct readings of current, voltage and resistance. A precision meter made by the makers of the renowned Avometer! Complete in case with leads, crocodile clips, testing prods and Instruction Booklet.

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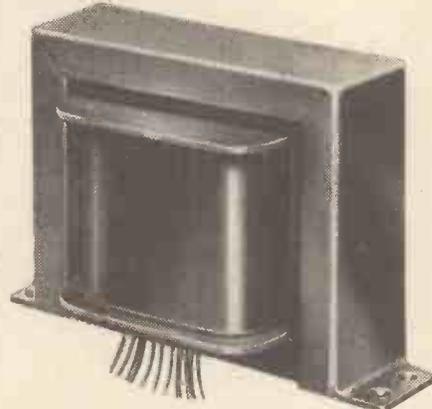
PUBLIC ADDRESS

(Continued from page 126.)

are available from the Radio Development Company.

The "Epoch" model 55 moving-coil microphone made by this firm has a frequency response extending from 70 to 5,000 cycles, and the output is sufficient when coupled to a reasonably designed three-stage amplifier, to fully load the output of the amplifier. This microphone costs 6 guineas with the standard floor stand, or 5 guineas with a table stand.

Reslo Sound Equipment is another concern specialising in microphones and loud-speaker units. There is a moving-coil horn unit designed particularly for P.A. work at



Transformers of all types for P.A. work are available from N. Partridge.

6 guineas, and a further model with a high acoustic output at 7 guineas.

Among the microphones marketed by Reslo are two moving-coil models, one priced at £3 15s. and another at 6 guineas.

For those who prefer a carbon "mike" there is a model at 2 guineas, and another at 37s. 6d. (complete with table stand).

Sound Sales is yet another firm who number among their many designs speakers and microphones.

The "Super Auditorium" speaker, made by Sound Sales, is designed for an input up to 15 watts and possesses high sensitivity. The standard model, costing £12 complete with output transformer, has a permanent magnet, but power energised models can also be supplied. A transverse current microphone is available for £2 10s., and the makers state that its sensitivity is such that it will fully load their 30-watt amplifier without using any pre-amplification.

A 14-watt amplifier, incorporating a fade-over volume control, enabling microphone or pick-up to be brought into operation at will, and also independent tone control, is one of the P.A. outfits in the Sound Sales range. Meters are included for checking the anode current and a substantially straight characteristic from 20 to

10,000 cycles is claimed. The price of this amplifier is £22 10s., and it is intended for operation on A.C. mains.

Bryan Savage Limited have recently been concentrating on amplifiers of the larger type suitable for hospitals, large stores, public buildings, etc. We illustrate in these pages their model K.C.15, incorporating a radio receiver, automatic record-changer and two 30-watt amplifiers. Constructors will be specially interested to learn that Bryan Savage amplifiers can be supplied in constructional kit form if required.

Among these amplifiers are 8- and 15-watt models which are built in chassis form, an impedance adjusting strip being fitted to the front of the chassis allowing any one of four output impedances to be instantaneously selected without disturbing the loudspeaker connections. A frequency response of 30 to 12,000 cycles (plus or minus two decibels) is claimed. The prices range from 11 guineas upwards, according to the particular type of amplifier chosen.

Lock-up Turntable Lids

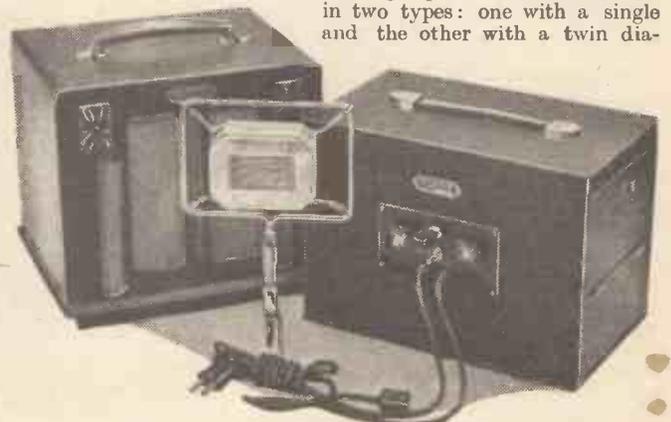
There are also several portable outfits from approximately £25 upwards. In these the amplifier is housed in a strong oak-faced ply cabinet, the top of which is a lock-up lid covering the turntable and pick-up.

Tannoy. This firm markets several portable equipments as well as a mobile amplifier for operation from a 12-volt car battery. This particular outfit has an output of 10 to 15 watts, and can be operated from A.C. or D.C. mains without alteration. Provision is made for the use of two microphones, or one microphone and a gramophone pick-up, and there is a mixing device permitting microphone and gramophone inputs to be superimposed.

The Tannoy moving-coil microphone has a substantial level frequency response from below 100 to 10,000 cycles. No pre-amplifier is needed for this "mike," and robust construction is a feature.

One of the first large diaphragm type loudspeakers designed expressly for use in conjunction with a wide front horn was the Voigt.

Voigt speaker units are made in two types: one with a single and the other with a twin dia-



A 7-watt portable output made by M.R. Supplies. It is suitable for A.C. or D.C. operation.

phragm. The patented magnetic system used produces an exceptionally dense magnetic flux, and an interesting feature is the use of aluminium wire for the speech coil, thus keeping the inertia of the moving parts extremely low. The standard diaphragm responds efficiently up to above

(Continued on next page.)

PUBLIC ADDRESS

(Continued from previous page.)

4,000 cycles when used with a 4-ft. "Trac-trix" horn.

The twin diaphragm unit is slightly different from the standard, and in particular is provided with a second truncated cone which deals with the frequencies above 4,000 cycles.

The handling capacity of the normal type diaphragm is up to 8 watts, and where greater inputs are required a special double power type diaphragm may be used. This will handle up to 12 watts. For permanent outdoor installation the wooden horn is replaced by a 3-ft. mouth metal horn, with a totally enclosed unit.

Fifteen to twenty watts output is available from the £15 P.A. amplifier marketed by Vortexion Limited. The circuit is of the direct-coupled type. For those who require a portable unit there is a 15-watt model weighing 25 lbs., costing 8½ guineas, or with a triple input 10 guineas.

THE RADIO BULLETIN

(Continued from page 130.)

The price of this set with a 90-volt H.T. battery and 2-volt accumulator is 8 guineas.

BRITISH MECHANICAL PRODUCTIONS

The businesses of British Mechanical Productions, Limited and Lectrolinx, Limited, which have for some time past been carried on in close collaboration, have been transferred to a new company named the British Mechanical Productions, Limited, which will continue to carry on the same businesses with a substantially similar management as before, without change or interruption. The new company has a paid-up share capital of £125,000.

NEW RANGE OF CONDENSERS

A range of fixed condensers under the trade name "Ceramicons" is the latest product of Erie Resistor, Limited. These new condensers are available in capacities ranging from 4 micro-microfarads to 500 micro-microfarads, and can be supplied in all tolerances from plus or minus one per cent to plus or minus 10 per cent.

They are exceptionally small in size and are fully insulated, the ends being sealed with an injected cement. Contact to the silver on the Ceramic dielectric is through the medium of a copper sprayed band similar to that which is used on the standard Erie resistors, a method which has proved to give a noiseless and stable conducting path. Wire ends are provided to facilitate connection to components. Other features are low power factor, and low humidity and temperature co-efficient.

LATEST MURPHY CONSOLE

A new addition to the Murphy 1937 range is the Model A38C Console. This is an A.C. mains superhet priced at £17 10s. Od. It incorporates the latest Murphy alphabetical tuning scale and a cathode-ray tuning indicator. Three degrees of selectivity are provided by a three-position switch.

The method of cabinet construction has also been altered, special stiffening bars being fitted giving greater freedom from cabinet resonance effects than the former celotex lining.

The loudspeaker has been entirely redesigned and a curved cone is used to provide an extended frequency range in the treble register. A flexible surround lowers the bass resonance and extends the response in this region.

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REGENTONE ELIMINATORS A.C., 200/250 volts, type W.5a, with trickle charger, 37/6.

SOUTHERN RADIO. Branches at 271-275, High Road, Willesden Green, N.W.10; 46, Lisle Street, London, W.C.2. All mail orders to 323, Euston Road, London, N.W.1.

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CRYSTAL SETS. Burne-Jones. Complete. Guaranteed. 5/6. Ditto, double circuit, 8/-. Sensitive permanent detectors, 1/6. Crystal detectors, complete parts, 1/-; Crystal with whisker, 6d. Postage 1½d. Post Radio, 183, Caledonian Road, London, N.1.

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This list contains the more important European medium and long-wave stations which are likely to be received in this country. There are some relay stations working on very low power and sharing common wavelengths. These have been omitted because their programmes are usually too weak or badly interfered with to be of value to British listeners.

WAVE-LENGTH.	STATION. MEDIUM WAVEBAND.	COUNTRY.	POWER KW.	WAVE-LENGTH.	STATION. MEDIUM WAVEBAND.	COUNTRY.	POWER KW.
203.5	Plymouth	Gt. Britain ..	0.3	356.7	Berlin	Germany ..	100
203.5	Bournemouth	"	1	360.6	Kiev	U.S.S.R. ..	35
206	Eiffel Tower (Paris) ..	France	5	364.5	Bucharest	Rumania ..	12
215.4	Radio-Lyons	"	25	368.6	Milan (No. 1) ..	Italy	50
233.5	Aberdeen	Gt. Britain ..	1	373.1	West Regional ..	Gt. Britain ..	70
236.8	Nürnberg	Germany	2		Penmon	"	5
238.5	Riga	Latvia	10	377.4	Lwów	Poland	50
240.2	Saarbrücken	Germany	17	382.2	Leipzig	Germany ..	120
242.9	Cork	Irish Free State	1	386.6	Toulouse (P T T) ..	France	120
243.7	Gleiwitz	Germany	5	391.1	Scottish Regional	Gt. Britain ..	70
245.5	Radio Marconi (Bologna)	Italy	50	400.5	Burghead	"	60
247.3	Lille (Radio P T T Nord)	France	60	405.4	Marseilles (P T T) ..	France	120
251	Frankfurt	Germany	25	410.4	Munich	Germany ..	100
253.2	Nice-Corse	France	60	414.4	Tallinn	Estonia	20
255.1	Copenhagen	Denmark	10	415.4	Kharkov (No. 1) ..	U.S.S.R. ..	10
257.1	Monte Ceneri	Switzerland ..	15	420.8	Rome (No. 1)	Italy	50
259.1	Kosice	Czechoslovakia	10	426.1	Stockholm	Sweden	55
	(West National ..	Gt. Britain ..	20	426.1	Paris (P T T)	France	120
261.1	North National ..	"	20	431.7	Sottens	Switzerland ..	100
	London National ..	"	20	443.1	North Regional ..	Gt. Britain ..	70
263.2	Trieste	Italy	10	449.1	Cologne	Germany ..	100
265.3	Hörby	Sweden	10	455.9	Lyons (P T T)	France	100
267.4	Newcastle	Gt. Britain ..	1	463	Prague (No. 1) ..	Czechoslovakia	120
269.5	Radio Normandie (Fécamp)	France	10	470.2	Lisbon	Portugal ..	15
269.5	Moravska-Ostrava ..	Czechoslovakia	11.2	476.9	Trondelag	Norway	20
271.7	Kuldiga	Latvia	50	483.9	Brussels (No. 1) ..	Belgium	15
274	Vinnitsa	U.S.S.R.	10	491.8	Florence	Italy	20
278.6	Bordeaux-Lafayette ..	France	12	499.2	Sundsvall	Sweden	10
283.3	Bari (No. 1)	Italy	20	499.2	Rabat	Morocco	25
285.7	Scottish National ..	Gt. Britain ..	50	506.8	Vienna	Austria	100
288.5	Rennes-Bretagne	France	120	514.6	Madona	Latvia	50
291	Königsberg (No. 1) ..	Germany	100	522.6	Stuttgart	Germany ..	100
296.2	Midland Regional ..	Gt. Britain ..	70	531	Athlone	Irish Free State	100
298.8	Bratislava	Czechoslovakia	13.5	539.6	Beromunster	Switzerland ..	100
301.5	Hilversum (No. 2) ..	Holland	60	549.5	Budapest (No. 1) ..	Hungary	120
304.3	Torun	Poland	24	559.7	Wilno	Poland	50
304.3	Genoa	Italy	10	569.3	Viipuri	Finland	10
307.1	Northern Ireland Regional	Northern Ireland	100				
312.8	Poste Parisien	France	60	1107	Moscow (No. 2) ..	U.S.S.R. ..	100
315.8	Breslau	Germany	100	1153.8	Oslo	Norway	60
318.8	Coteborg	Sweden	10	1250	Kalundborg	Denmark	60
321.9	Brussels (No. 2) ..	Belgium	15	1293	Luxembourg	Luxembourg ..	150
325.4	Brno	Czechoslovakia	32	1339	Warsaw (No. 1) ..	Poland	120
328.6	Toulouse	France	60	1379	Novosibirsk	U.S.S.R. ..	100
331.9	Hamburg	Germany	100	1389	Motala	Sweden	150
335.2	Helsinki	Finland	10	1500	Droitwich	Gt. Britain ..	150
338.6	Linz	Austria	15	1571	Deutschlandsender	Germany	60
342.1	London Regional ..	Gt. Britain ..	70	1648	Radio-Paris	France	80
345.6	Poznan	Poland	16	1744	Moscow (No. 1) ..	U.S.S.R. ..	500
349.2	Strasbourg	France	100	1807	Lahti	Finland	150
				1875	Radio-Rumania ..	Rumania	150
				1875	Hilversum (No. 1) ..	Holland	150