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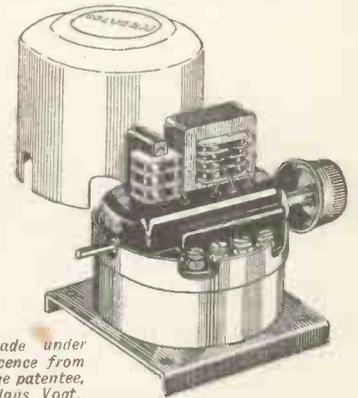
SPECIAL SECTION, "THE WORLD'S PROGRAMMES," PAGES 27-42
(See page 27 for Contents).

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

Edited by **NORMAN EDWARDS.**
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“I’ll do without a radio-gramophone until I can afford one that ‘stands on its own legs’ . . . and gives the finest reproduction possible!”

Thousands of people have said it. But—for those whose price-limit was 30 guineas—such a radio-gramophone didn’t and couldn’t exist until this summer. But now here it is—the Superhet Five Radiogram Model 512—29 guineas, and by “His Master’s Voice.”

To combine the latest type of superhet wireless with an electrically reproducing gramophone, in an instrument which is a self-contained piece of furniture yet costs less than 30 guineas, is a new achievement. But there is something even more remarkable about the Superhet Five.

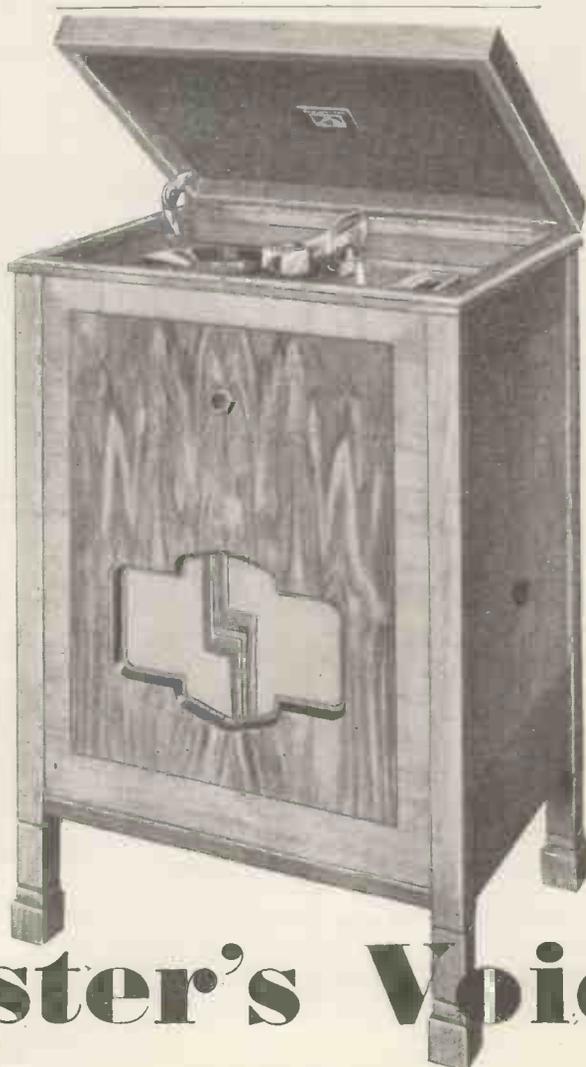
Until now, such utterly life-like tone, such even balance right through the scale, could be found only in the most expensive radio-gramophones. But “His Master’s Voice” have brought the climax of thirty years’ research—acoustic designing applied to the highly selective superhet—down to a new level of cost. And the result is a 29 guinea radiogram whose tone demands one test only. *Ask any “His Master’s Voice” dealer to let you hear it, and listen as critically as you possibly can!*

Notice the simplicity of control, whether for radio or records. Notice the absence of overlap, “images,” “hum” or “heterodyne whistle.” There is only one way to choose a radio-gramophone which is to satisfy you always. *Listen to the tone and judge for yourself.*

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Modern Wireless

Vol. XX. No. 79

BRITAIN'S LEADING RADIO MAGAZINE

JULY, 1933

A Summary of Progress—Our Special Supplement—First-Class Portable Set Design—Unit for A.C. Mains—Programmes from Canada and U.S.A.

THE last few months have seen such tremendous strides in the science of radio reception, that we feel our readers will welcome the special eight-page supplement which we include in this issue of MODERN WIRELESS under the title "Progress."

It offers a complete review of modern component and accessory development during the last few months, and if this review does nothing else, it will certainly save our readers from mistakes in purchasing new components—and don't forget that such mistakes often cost a good deal of money—because the supplement will tell you all about the new apparatus which has come on to the market, in many cases as a direct result of important new technical developments.

Confounding the Prophets

SENSITIVITY and selectivity of receiving sets goes on increasing. A year ago we all expected a certain amount of development, but he would have been a bold prophet who forecast the shower of developments which have fallen upon us since the last Radio Exhibition at Olympia.

Our special supplement has been prepared with a view to enable readers to take full advantage of the latest ideas in reception technique, and to ensure that the great progress recently made will reflect, in their homes and in their sets, the achievements of experimentalists and radio scientists. "Class B," Ferrocart coils, the Westector "cold valve," new pentodes, "Catkin" valves—all are dealt with in concentrated form.

The "Classic" Portable

THE chief of our Radio Research Department (Mr. K. D. Rogers) describes in this issue details for building the "Classic" Portable.

"Classic" is the right term—at least, as regards the use of the word "classic" to-day. If we may diverge for a moment from the subject in hand, it might interest readers to remember that "classic" was really a term used in the days of the Roman Empire to denote a certain class of income-tax payer! The "classics" were those in the first class and who paid the classic form of income-tax. However, let's get away from income-tax.

But in the sense that "classic" means first class, the "Classic" Portable lives up to its name. It contains its own compact loudspeaker, housed in a home-made cabinet.

For Taking on a Tour

THIS set makes an ideal touring companion for, on test, it was found to have a remarkably wide range of reception and first-class strength.

The coming of "Class B" amplification has vastly enhanced the possibilities of portable sets, and if you examine the layout of this receiver and compare it with, say, a portable set described last year, you will see for yourself its outstanding merit and its innumerable classic points.

Power from the Mains

WE have often been asked to give a design of a safe-lag mains unit. Well, there is one in this issue. It has been designed to give an H.T. output of 50 milliamps.

It is an efficient, trouble-free unit, particularly suitable for use with all-mains A.C. receivers employing up to four valves. The special vacuum delay switch incorporated in the set automatically connects the apparatus directly the heaters reach their working temperature. This is another product of the "M.W." Research Department.

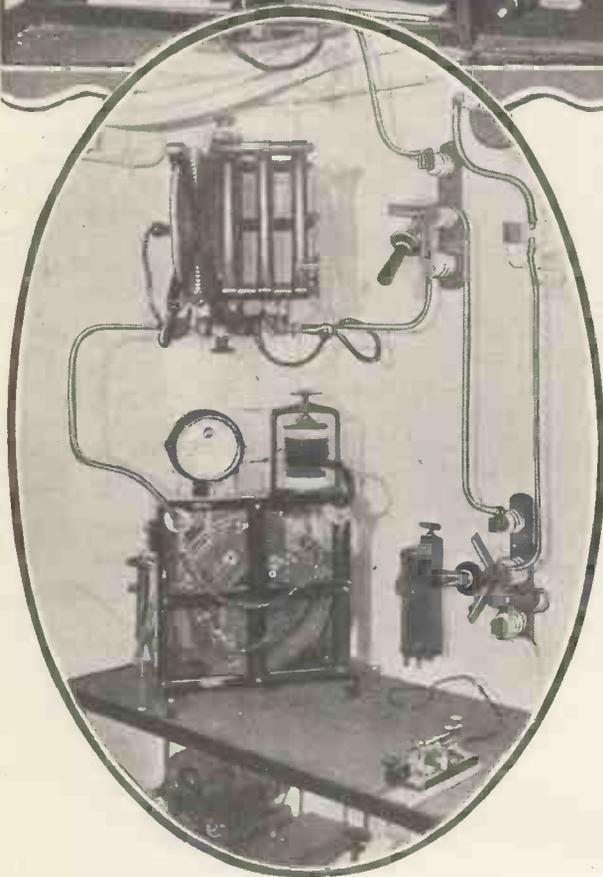
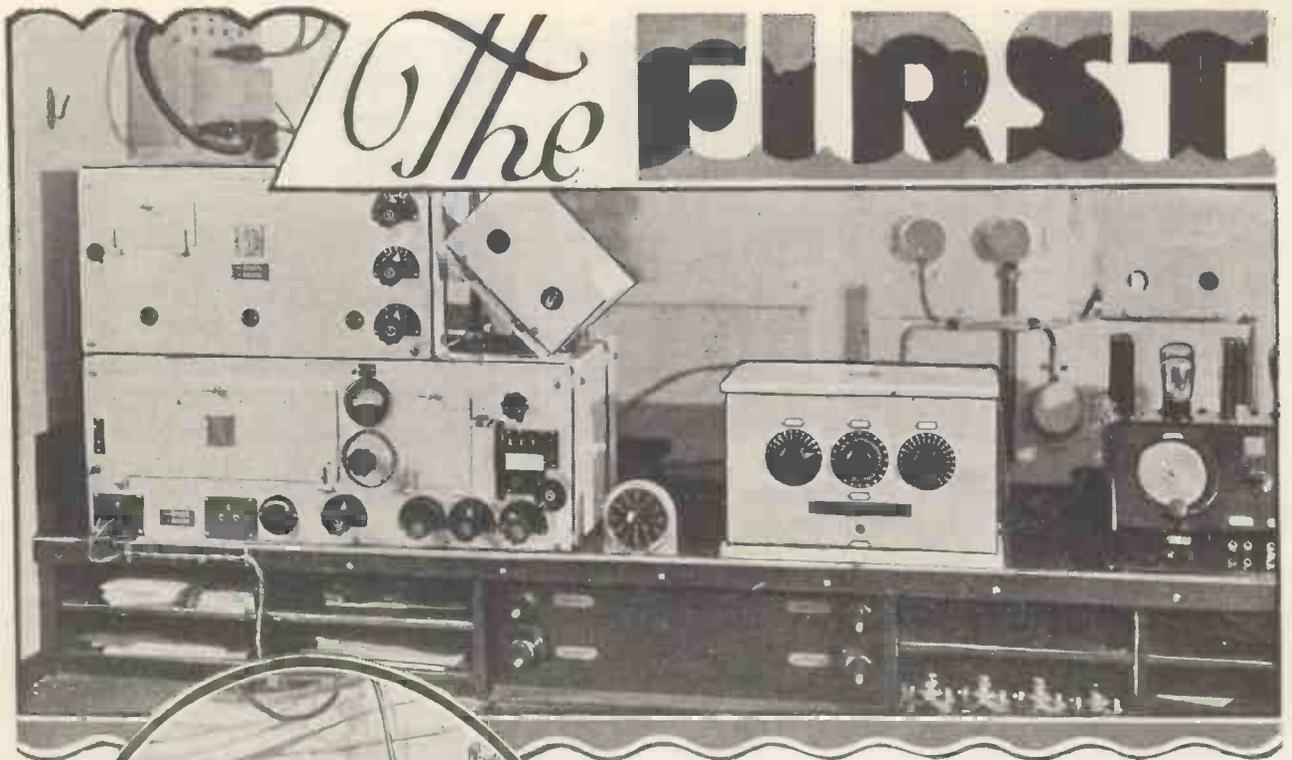
Exchanging Programmes with America

MORE American and Canadian programmes are likely to be broadcast in this country shortly, according to Major W. E. Gladstone Murray, the B.B.C. Director of Public Relations. He has just returned to London from a three months' visit to Canada and the United States.

He has been able to make a new working arrangement between the Americans and Canadians for an exchange of programmes, and believes there will be a development in the near future for an extended exchange between the North American continent and ourselves.

Major Murray does not think there is any good purpose to be served by exchanging musical programmes; but where he believes we can profit from American methods is to put some of their cheerfulness and snap into our broadcasts.





FOR EMERGENCY USE

Part of the emergency transmitter on the Telefunken system, which is installed on the converted cargo boat "Westfalen." Above is a general view of the receiving plant which will be used for ordinary telegraphic work as well as for keeping in touch with aeroplanes approaching the base.

THE S.S. "Westfalen," formerly a freight steamer of the North German Lloyd in the North American service, has been chartered by the *Deutsche Luft Hansa* and converted into a floating aerial base, intended

A floating seaplane base in the middle of the Atlantic has now been brought from the realms of fantastic theory into actual fact.

The details of the new German aerial base, together with a description of the all-important radio equipment, are here given to MODERN WIRELESS readers

By Our German Correspondent.

to serve as an intermediate landing station in connection with a regular South Atlantic air service.

Her naval crew has been supplemented by the Luft Hansa's expert staff and comprises about 40 men. There are both a meteorological and an oceanographic station aboard the vessel.

How the Planes are Landed

In order to enable seaplanes on the open sea to be taken aboard, there has been provided a *landing sail* according to patents by Herr Hein. This, as the plane is landing, will be flooded by the vessel slowing down. When the plane is in position, the ship accelerates, thus stiffening the landing sail and lifting the plane slightly out of the water.

This process secures a firm connection between the vessel and plane, thus enabling the latter to be taken aboard in perfect safety even in a rough sea. A crane 44 feet above deck with a maximum capacity of 15 tons has been provided to effect this.

The starting of the seaplanes taken aboard is effected by a powerful catapult designed by the Heinkel Aeroplane Works. This will shoot a flying weight of 14 tons at a starting speed of 95 miles per hour, the maximum acceleration being 3.5 times the acceleration of gravity, and the duration of acceleration 1.52 seconds. The total weight of the catapult is 58 tons.

A fortnightly service by flying boats of the Dornier-Wal

FLOATING AERIAL BASE

type—similar to that used by Herr von Gronau on his flight around the world—will be started shortly between Cadiz and South America, the voyage between Germany and Cadiz being done by aeroplanes, possibly in conjunction with the Spanish air traffic.

Half Way Between Africa and America

The second stage of the flight is from Cadiz to the Canary Islands, and the third from the latter to British Gambia on the West Coast of Africa.

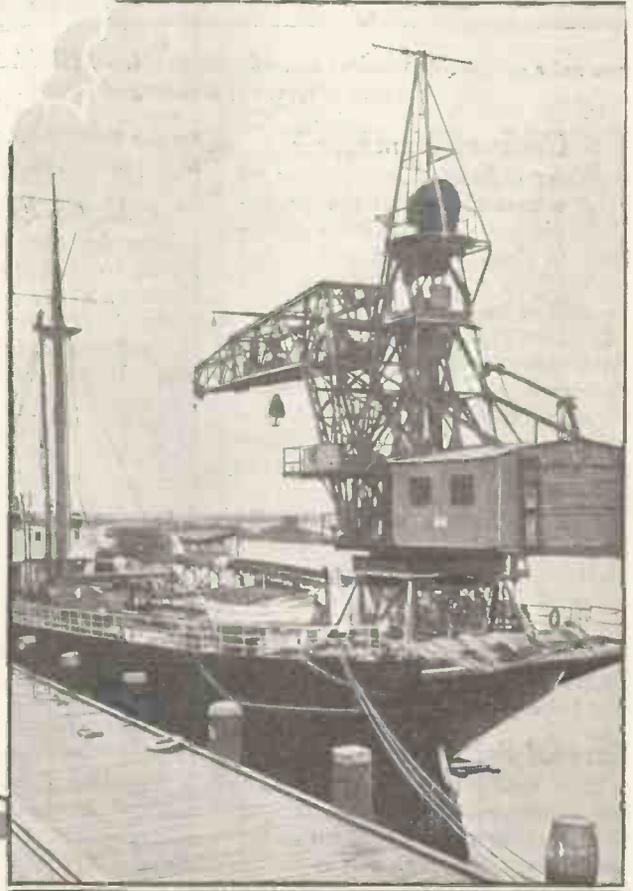
The distance between British Gambia and the South American coast is about 1,900 miles and the "Westfalen" is to be stationed midway, so that a distance of only 950 miles will have to be covered between each coast and the floating base.

Because of the very important rôle incumbent upon the "Westfalen," she had, of course, to be equipped with the very latest resources of wireless communication, to warrant in all cases and under all conditions a perfect connection between the seaplanes and the floating base.

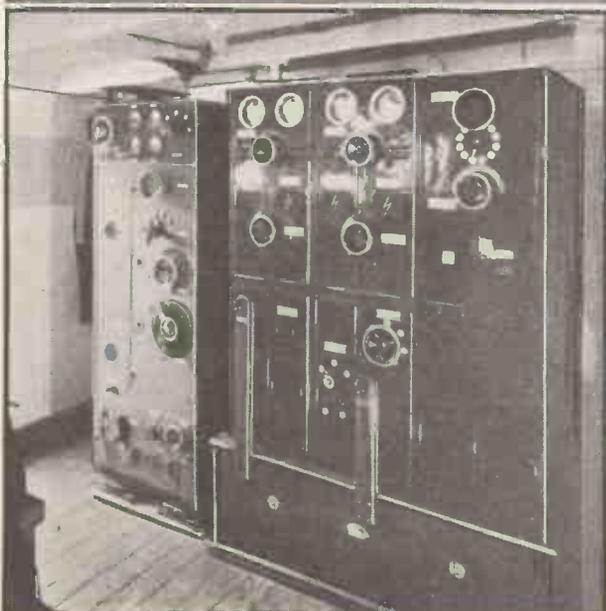
Always In Touch By Radio

Comprehensive short-wave and long-wave installations were therefore provided. The Telefunken station aboard the vessel, which is operated by the DEBEG Company, comprises:

(1) A short-wave transmitter mainly intended for communication over very great distances, which has been



The giant crane on the stern of the "Westfalen" is shown in the photograph above, and the main aerial system can also be seen. To the left are the short- and long-wave transmitters which will work over ranges of 15-90 metres and 500-3,000 metres respectively.



designed as a separately-excited telegraph and telephone transmitter of 700 watts aerial output with a wave-range of 15-90 metres; and

(2) An 800-watt valve transmitter operated on long waves, with a range of 500-3,000 metres.

These two transmitters enable all waves within the naval and aerial bands, as well as all other waves required for the vessel, to be tuned.

The Telefunken receiving plant is likewise very comprehensive, and has been adapted to the transmitting plant, thus enabling any wavelength to be received under perfect conditions. It comprises:

(Continued on page 81)

"M.W.'s" RECORD REVIEW



Some notes on the new numbers specially worth a trial, and hints by our expert upon the wise purchase of a library of records.

Unusual Numbers

EVERY collector likes to show off a rare piece, and the gramophone enthusiast is no exception. In almost every record library is a shelf on which are curiosities of one sort or another.

Consider three unusual records issued this month, and try to forecast an opinion as to the survival of their particular kind. First, due to the tremendous efficiency of recording, we have perfect performances of tenors singing duets with themselves.

Then we have a new electrically operated amplified pianoforte in which electro-magnets replace hammers and the speaker the sounding-board. It can imitate a musical box or a "swell" of an organ with equal fidelity, but will the public insist that it is not a piano?

Careful Selection Necessary

Then sports controversy: defence and attack around justifiable (lamentable) tactics which delighted (infuriated) many members of the British Commonwealth, leg-theory and body-line bowling, to wit. Shall we use a record to keep alive a *casus belli*? Lovers of controversy will support the movement, but it has its dangers!

In the choosing of unusual records, great discrimination is really necessary, or this section may easily become the major part of your library. When a new discovery is made which adds something to the art of the gramophone (e.g. the H.M.V. electrical Caruso record or the Tauber duets), the first record is well worth having, both as a first edition and as a standard of comparison with future developments.

In the building of your library, by the way, make a point of asking a good record dealer to help. Any serious buyer of even a few records a month will be welcomed, and many will send a few records for you to try

on the undertaking to keep a reasonable proportion.

Hand Picked . . .

Now for the best of the recent issues to make a selection for the library. First, do not miss hearing Strauss' *Perpetuum Mobile*, one of the merriest, bubbling pieces imaginable. Real champagne, this. By the Amsterdam Concertgebouw Orchestra backed by a rattling performance of Tschaiowsky's *Cossack Dance* from *Mazeppa*, by the Hallé Orchestra. By all means hear Columbia LX240.

If you had only one Brahms' record it would probably be of the *No. 5* and *No. 6 Hungarian Dances*. They are quite the most popular. H.M.V. E607 contains a very luxurious version by the San Francisco Symphony Orchestra which is quite a collector's piece.

That very excellent movement, the British Brass Band, held a recent festival at Leicester. A souvenir record was made—*The Passing of the Regiments* (H.M.V. B4397). This is in every way remarkable. The piece is magnificently played by the Massed

Bands and the recording is impeccable. Really, most impressive.

Duke Ellington

From an educational and sociological aspect one ought to make the acquaintance of this conductor's band. Every laudatory adjective has been accorded him.

As a sensation, or symbol of racial excitement, the picture is faithfully done. From the musical viewpoint, the normal being must admit defeat. Hear H.M.V. B6343, *Blues I Have To Sing* and *Hot Feet*, and keep it safely—if you buy—for 20 years. Then try it again and see how you react!

Singers from All Parts

The Tauber-Tauber record referred to above is really clever. This was the first of the one-man-duet records and was issued on Parlophone R020219. The songs are Mendelssohn's famous *I Would That My Love* and *Shimmering Silver, Whispering Wave*. A very artistic curiosity.

Danny Malone has a similar record in H.M.V. B4453, in which he sings *Danny Boy* and *My Ould Irish Mother*. Stuart Robertson offers four songs (not as a quartette!) on H.M.V. B4381. This is an admirable lead for any sing-song of *The Road To The Isles*, *Wrap Me Up In My Tarpaulin Jacket*, *Down Among the Dead Men* and *Funiculi, Funicula*.

Do you know Loewe's *Edward*? A most striking piece of histrionic singing (strange phrase!) is in the performance of this very gruesome ballad on Parlophone E11236. A new Scottish baritone, Robert Burnett, is the singer, and those north of the Tweed will enjoy immensely his *Wee Willie Winkie* and *Jenny Wiv' The Lang Pock* on the other side.

(Continued on page 84)

AUTOMATIC RECORD CHANGING

The present popularity of automatic record changers lends special interest to this early model, one of the first to be introduced to the American public several years ago.



PROGRESS

A COMPLETE REVIEW OF MODERN COMPONENT AND ACCESSORY DEVELOPMENT

The last few months have seen tremendous strides made in the science of radio reception. The sensitivity and selectivity of receiving sets have been increased beyond all recognition by the development of special valves, tuning coils, etc., and in this special supplement we present a bird's-eye view of

THE LATEST DEVELOPMENTS

As so often happens in cases of general advance in any science, it is the improvement of one section of the science that has forced other sections to develop and change in character.

Pushing Ahead

This is what has occurred in the case of radio reception, for the primary cause of the betterment of receiving sets has been the efforts of the valve designers to turn out valves that will give greater amplification, better volume-controlling schemes, and purer reproduction.

With these efforts meeting with success the tuning coil and transformer

manufacturers, valve holder and battery makers, and even the loud speaker designers, have all had to sit up and take notice. They have had to bring out new types of coils and transformers, special valve holders have been required, and the battery and loudspeaker firms have been swept into the general advance with the need for more suitable components.

The net result is, therefore, that everybody, in all sections of the radio industry, has been pushing rapidly ahead during the last few months, and, in fact, the "push" is not yet over. But let us examine in more detail what has been happening, and

This review will save our readers from unnecessary expense by telling them all about the new apparatus. It will enable them to take full advantage of the latest ideas in reception technique, and ensure that the great progress recently made in the world's radio laboratories will be reflected in their homes by the achievement of

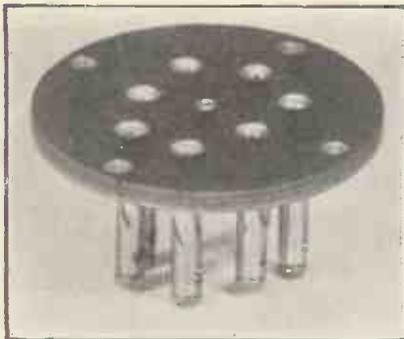
IMPROVED REPRODUCTION

see how it affects the average set builder or listener.

As valves were the primary cause of the latest general movement, we will take them first, and because they are intimately connected with them we will also include valve holders in the first section.

Q.P.P. and "Class B"

Soon after the beginning of this year rumours began to circulate that something new in L.F. amplification was about to be launched by one of the big valve concerns—to wit, Mazda. This duly turned out to be quiescent push-pull, of which readers know sufficient to make it



SEVEN SOCKETS

"Class B" and similar multi-electrode valves can be accommodated in this chassis mounting type of holder. The one shown here is a "Clix" product.

unnecessary to go into it here. But Q.P.P. was to be short-lived, for hot on its heels came "Class B," a somewhat parallel method of obtaining a big output with small battery power consumption, but with one special valve instead of two pentodes.

Though all the valve makers were working on special "Class B" valves, it was Cossor who got away first, launching the new valve on the market pretty soon after Q.P.P. had got going.

The result was that everybody forsook the Q.P.P. method of amplification and began to turn attention to "Class B." There was reason in that, for "Class B" is certainly a very much better method of obtaining big power out of a battery set with the maximum battery economy, for it obviates the annoying necessity present in Q.P.P. of the set builder matching the two output valves.

So the transformer manufacturers, who had just designed a range of

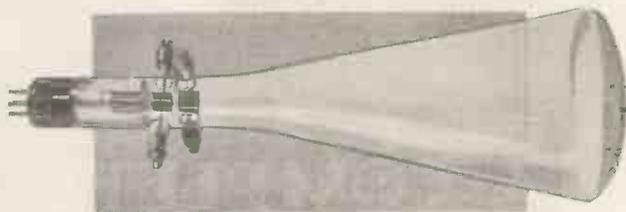
transformers for Q.P.P., had to get to work again and turn out special components for the new arrival, as you will see when we deal with the transformer and choke section of the supplement.

Unfortunately, in our opinion, the valve makers did not see eye to eye in the matter of the characteristics of their "Class B" valves, so that a multiplicity of components for matching up the various valves in "Class B" circuits is necessary.

As you probably know, the maximum power output of any "Class

rule the power output can be varied from a matter of 1,000 milliwatts to some 2,500 milliwatts maximum by the choice of the "driver" valve and its transformer.

REVOLUTIONISING TELEVISION

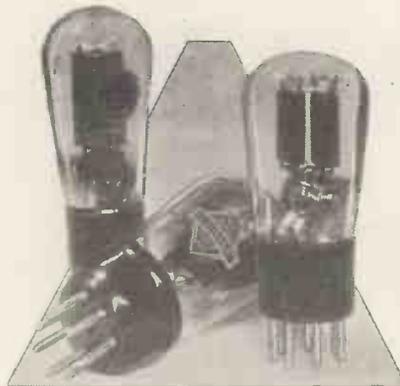


The new Ediswan Cathode Ray Television Tube which makes it possible for the constructor, with simple and comparatively inexpensive apparatus to "look in" to the television broadcasts from home and foreign stations.

This contingency had to be catered for, and when other manufacturers followed Cossor with their different "Class B" valves, the position became most complicated. The number of combinations of output—"Class B"—and "driver" valves is surprisingly large, and the transformer manufacturers had to cater for all. That that has been done satisfactorily you will see later.

But advance in L.F. output for battery sets was not the only thing that the valve designers had in store. A great deal of attention has been turned to the H.F. side of the set, as well as to the improvement of what may be looked upon as standard battery valves.

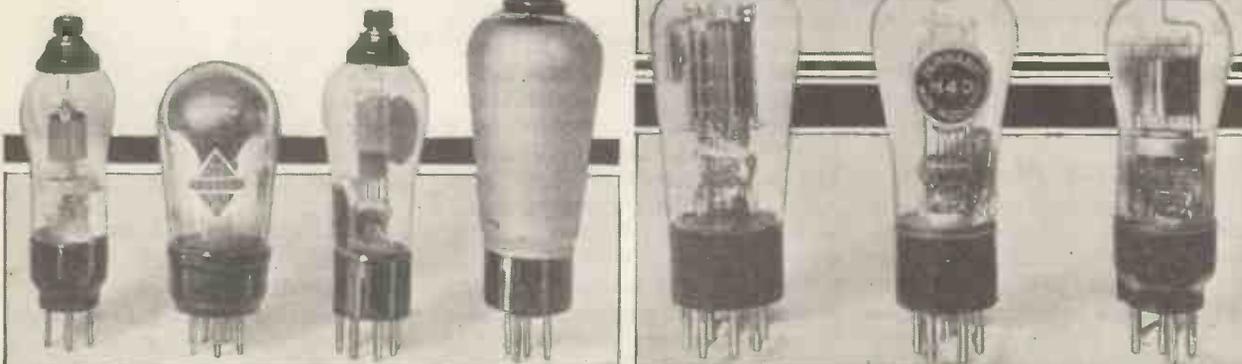
Thus we have seen the arrival of the Mullard short grid-base multi-mu screened-grid valve, the P.M.12M., which is a two-volter having a steep slope, but being completely controlled in amplification by a 6-volt bias battery. This is a great advance



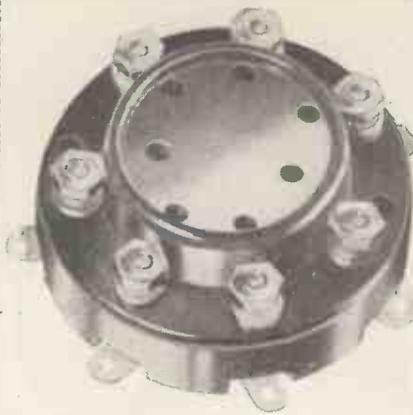
A group of the new "Class B" valves, including the Ferranti H.P.2 on the left, the Cossor 240B in the centre, and the Mullard P.M.2B.

"B" valve depends on the preceding valve and its transformer coupling to the "B" valve. As a general

LATEST PRODUCTS OF THE VALVE FACTORIES



A selection of the new types now on the market. From left to right are the Ferranti H.F. pentode (S.P.T.4); Cossor "Class B"; Ferranti double-diode triode and Mullard H.F. pentode D.P.4. Next is the Mazda "Class B" (P.D.220), with the Ferranti D.D.T. type H.4D., and the Ferranti V.P.T.4 (multi-mu H.F. pentode).



FOR THE NEW VALVES

The five-pin valve holder has now lost its monopoly, and for the new types of valves it is necessary to use one of the seven-pin type, like the W.B. illustrated here.

over the standard battery multi-mu valve, which requires, as a rule, 15 volts, unless it is in use some distance from the local station.

A new portable set output valve of the straight variety, the P.215, has just been launched by Mazda. It has a small consumption filament for an output valve, taking .15 amp. at 2 volts, and the maximum undistorted power output is about 180 milliwatts.

Automatic Volume Control

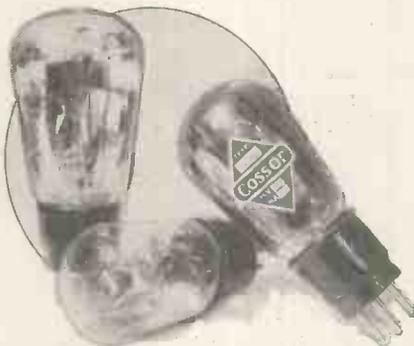
But more than to the battery set has attention been given to the needs of the A.C. receiver. Here the use of automatic volume control has been uppermost in the valve designers' minds. Special double-diode triodes have been brought out by Ferranti, Marconi, Osram, and Mullard, while Cossor have produced a valve that can be used to provide automatic amplification control in both H.F. and L.F. stages.

The first-mentioned valves, such as the M.H.D.4, allow a variation of circuits to be used, such as full-wave diode rectification, half-wave rectification and delayed volume control, together with L.F. amplification following the diode rectification.

Distortionless Rectification

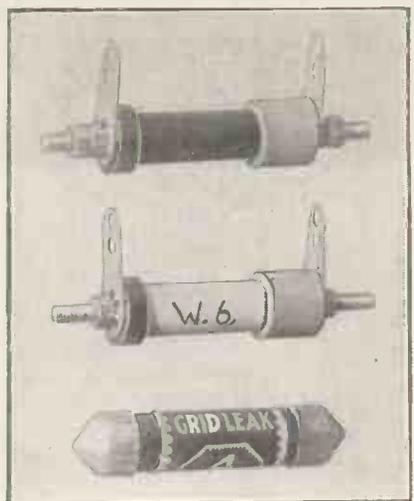
The result is that in the one glass envelope we have a distortionless rectifier of H.F., and also an ordinary L.F. amplifier. This saves a valve in the set and makes for both purity and power in A.C. set designs.

More interesting even than the double-diode triode is the Cossor valve we have mentioned, the double-diode multi-mu pentode. This valve will act as the double-diode as far as rectification and the automatic vol-



An Ediswan Thyratron and a Saturated Diode Ediswan for Cathode Ray work are shown here with a Cossor voltage stabiliser for mains units.

ume control of H.F. is concerned; but in addition it carries out pentode amplification of the rectified impulses and controls automatically the amount of that amplification according to the strength of the received station.

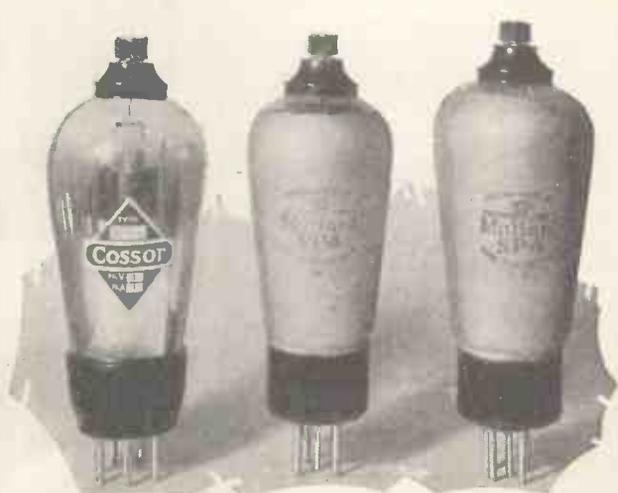
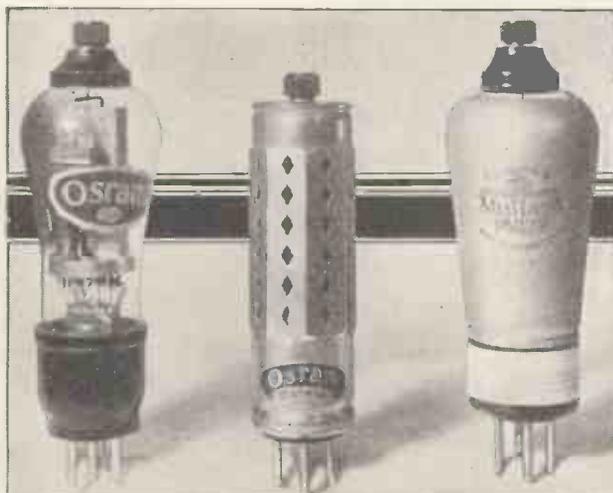


THE "WESTECTOR"

Above the grid leak are shown two "Westectors," the new metal rectifiers for H.F. work which are becoming popular in circuits for which a valve detector was previously considered essential. Such "cold valves," of course, require no filament current, and their small dimensions are evident from this illustration.

By no means least important are the all-metal Westinghouse "cold valve," known as the "Westector," and the new "Catkin" valves introduced by Marconi and Osram. A description of these latter was given last month, so there is no need to go into the details here. They are synonymous in practice with the M.H.4, M.P.T.4, M.S.4, and V.M.S.4 that have been known so long among A.C. set owners.

These new valves call for special valve-holders, and suitable seven-pin types which accommodate the "Class B," double-diode triode and pentode, have been placed on the market by such firms as Benjamin, W.B., Clix, and Ferranti.



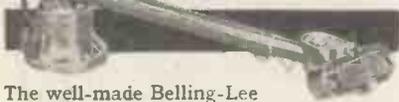
The Osram V.M.S.4 in ordinary glass bulb and "Catkin" types are on the left, beside the new Mullard short-base low-bias multi-mu battery valve. The next is the Cossor double-diode multi-mu pentode, with Mullard multi-mu and ordinary H.F. pentodes.



Messrs. Ferranti are well known as manufacturers of high-grade transformers, and they are marketing a comprehensive range of "Class B" and Q.P.P. components.

WITH the advent of Q.P.P. and "Class B" amplification the need for special L.F. transformer designs arose, and this became more and more acute as the different makes of "Class B" valves were brought out. As mentioned earlier, this type of valve has not been

FOR RECORDS



The well-made Belling-Lee pick-up and arm.

standardised at all closely, with the result that not only are the output loads required by various "B" valves different, but the input from the "driver" valves is also not standard.

This has resulted in the leading transformer manufacturers having to

A ROBUST COMPONENT



By means of tapped windings, as on this Wearite transformer, different ratios are available for "Class B" circuits.

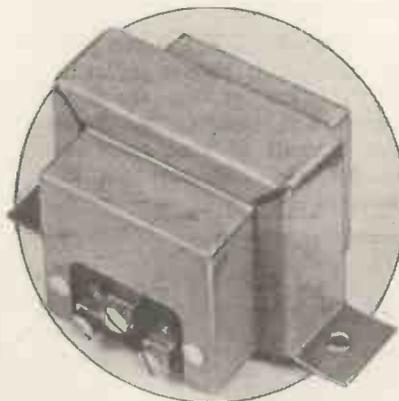
L.F. TRANSFORMERS and CHOKES

bring out a series of "driver" and output transformers and chokes to suit the various combinations of "driver" and "Class B" valves. One of the pioneers in this has been Radio Instruments, who produced not only a complete range of suitable transformers and chokes but also a most comprehensive brochure describing the transformers and their uses in connection with the various valve combinations possible.

A Commendable Effort

It is a highly commendable effort to draw together the scattered threads let fly by the valve makers when they decided to go into the "Class B" market more or less independently of each other. Everyone interested in "Class B" amplification should get hold of one of these brochures, obtainable from R.I., for it does a great deal to clear up the confusion that otherwise exists.

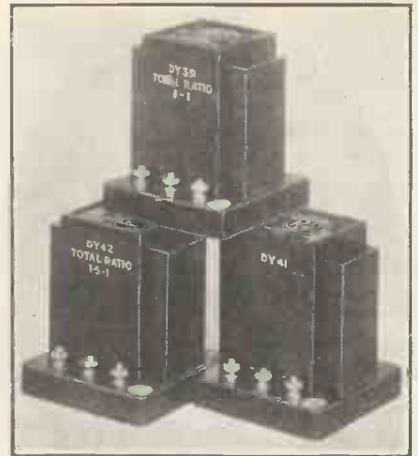
Ferranti, as might be expected, were soon in the field with "Class B" components for "drive" and output stages, although in point of fact we believe they were beaten



This completely encased transformer for "Class B" work is one of the Benjamin range.

by a short head by Multitone, Benjamin, and Sound Sales—at least, as far as the actual marketing of the components went.

It would be difficult, with fresh models still arriving, to give anything like a full list of either the makers of "Class B" parts or of the parts themselves. Most of the firms have many models, covering the combina-



One of the first firms to tackle "Class B" components was Radio Instruments, Ltd., a group of whose products are shown here.

tions referred to, and prominent among them, besides those already mentioned, are Varley, who have been well to the front in both Q.P.P. and "Class B," British Radiophone who are recent arrivals in the field, and

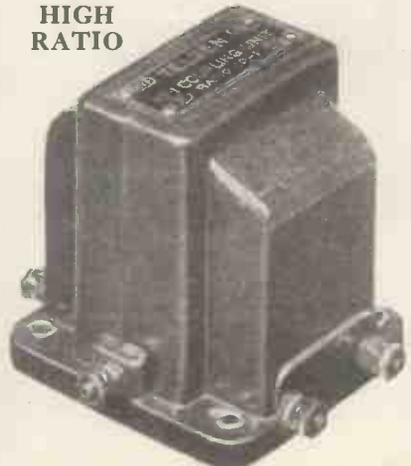


This pick-up is similar to the one shown in the other photograph, but is equipped with a special attachment for fixing to the sides of portable gramophones.

Lissen who have also brought out a "drive" transformer of excellent characteristics.

In concluding the matter of "Class B" transformers, we should also mention the two makes of "B" adaptors, or converters, that have reached us. Both are for attachment

HIGH RATIO



All-in coupling units such as this Telsen one are now popular.

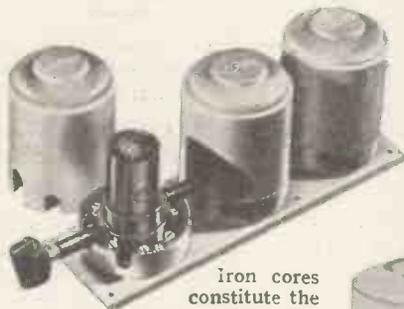


The modern trend in H.F. chokes is for complete screening, as in these of Bulgin make.

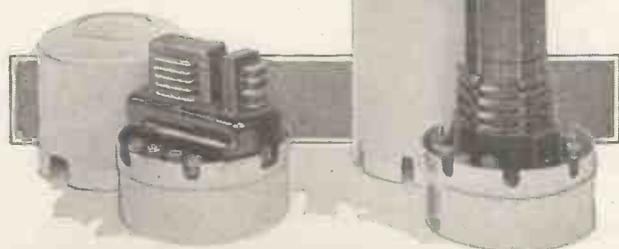
to sets so that they can be used as "Class B" receivers without further alteration; while one of the two, Ferranti, has also turned out a complete "Class B" home-constructor's kit of excellent performance. The other adaptor came from Sound Sales, Ltd.

But "Class B" has not entirely monopolised the energies of transformer and choke manufacturers, for new types of shunt-feed transformers and improvements in L.F. chokes are

IRON-CORED COILS



Iron cores constitute the latest coil development. The unit shown above is a Varley.



Two types of Colvern coils—on the left the Ferrocart, and on the right the "K" or ordinary type.

continually coming along. Notably among these are the Bulgin metal-cased models, such as the "Senator," and the Wearite range of H.T. chokes and power transformers.

We cannot close this section without reference to the various shunt-feed transformers that arrived comparatively recently:

the Bulgin Transcoupler, Benjamin Transfeeda, R.I. Parafeed unit, and the Telsen Coupling unit. These are all valuable aids to the set builder, and are steps well in the right direction. We want compactness in components, and such units greatly assist in keeping the size of sets down, as well as keeping efficiency up.

COILS AND CONDENSERS

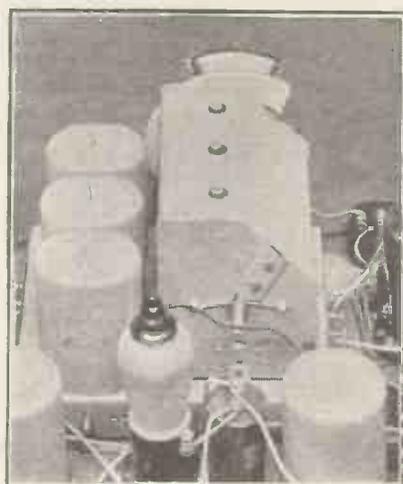
NEXT season is going to be an iron-cored tuning-coil season. Of that there is no doubt, for the coming of the Colvern Ferrocart coils has proved conclusively the advantages that can be obtained



Iron-cored coils made by Igranic Electric, Ltd., in three-gang assembly.

by the careful design of tuning inductances with iron cores.

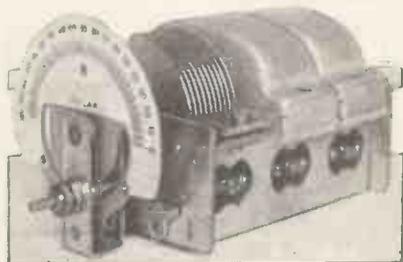
The Ferrocart coils have been on the market for some time, and have long had things all their own way. They are wonderfully efficient in operation, and we are glad to see



A big step towards the simplification of set wiring is provided by the Radiophone packs, which include coils and gang condensers arranged on a metal base to form a complete unit.

that the price has been reduced to 37s. 6d. so that they come further within the reach of the average home constructor. Incidentally, we understand that the Ferrocart principle is

GANGED AND SCREENED



This Polar all-screened triple-gang condenser is typical of the high-class workmanship put into radio components these days.

to be applied to several commercial set designs in the coming season.

But Colvern are not to remain

"CLASS B" INPUT AND OUTPUT

Varley input and output instruments with a "Class B" valve in its normal position between them.



Experiments in Permeability Tuning

unchallenged, for we have already had samples of other types of iron-cored inductances, for which great things are claimed. It is too early to give a report on them, even if this were the right place to do so, but so far coils from Igranic, Varley, Wearite, and Lewcos have been received and are undergoing tests.

Beneficial Results

The iron-cored coil, if properly designed, has a great deal in its favour. It can be small without risk of inefficiency, and the extra stage-

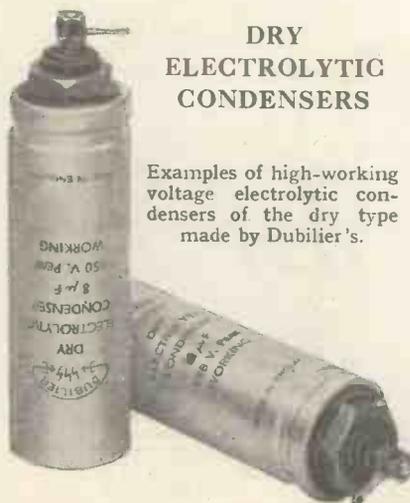


COMPACT CAPACITY

Examples of the compact design made possible by the dry-electrolytic-principle condensers. They are of T.C.C. make.

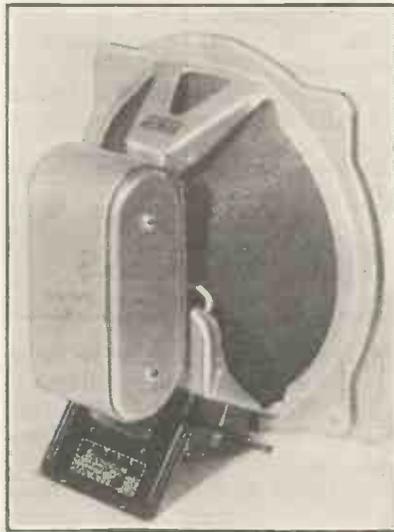
gain that it provides can be balanced against the selectivity requirements in a most valuable manner. And it can be screened without heavy loss of inductance due to the presence of the metal screen.

With the exception of the band-pass Ferrocart coils, all the iron-cored inductances that have so far reached us have been of comparatively normal types, suitable for use



DRY ELECTROLYTIC CONDENSERS

Examples of high-working voltage electrolytic condensers of the dry type made by Dubilier's.



ENCLOSED MAGNETS

The design of this Blue Spot permanent magnet moving-coil loudspeaker is rendered particularly neat by the enclosed magnetic system.

in any existing receiver, and calling for nothing special in the way of components or layout.

This is a wise move on the part of



SCREENED HIGH-FREQUENCY CHOKES

Screening for H.F. chokes is becoming more and more popular. Here are single and binocular types made by Graham Farish.

the makers, for nothing hinders the advance of a new thing so much as requirements of special accessory parts.

The Lewcos coils, however, need special mention, for they are so made that a constant tuning range is obtained from

Two Varley screened coils employing Ferrocart cores, thus ensuring high inductance and compact dimensions.

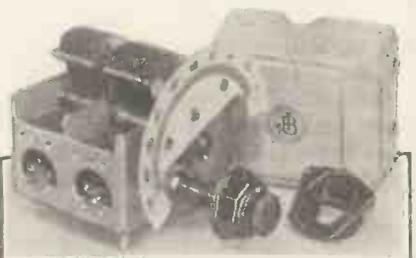


160 to 2,000 metres. They are known as "No-Gap" coils, and incorporate a wavechange switch that has three positions, covering the full range of wavelengths utilised by the European broadcasting stations.

A Further Advance

This is a great boon to the enthusiastic listener, for he is then sure of getting his fullest whack of stations; there is little more annoying than wanting to pick up a good programme and finding that you cannot because your set will not

WITH PANEL TRIMMER



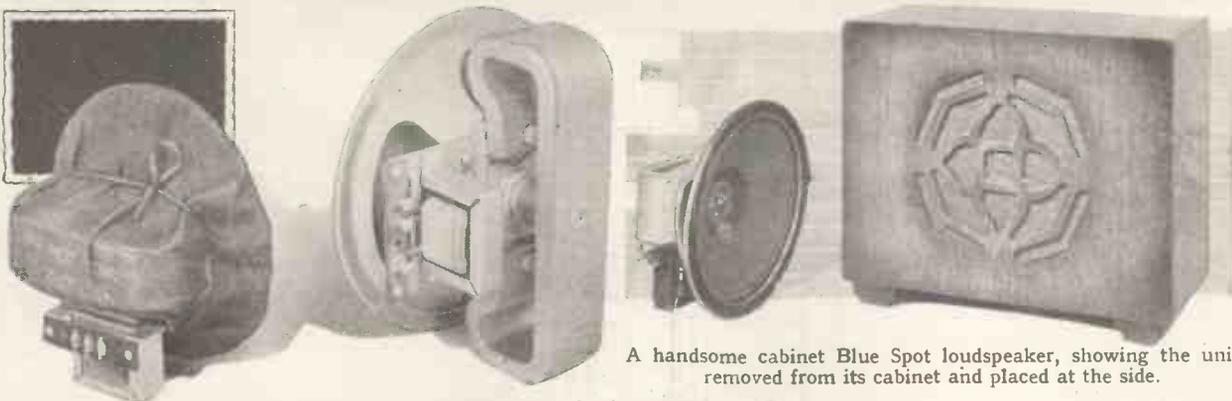
A completely screened two-gang condenser made by Jackson Bros. The smaller knob controls a trimmer and provides accurate ganging on all wavelengths.

quite reach the wavelength on which it is being broadcast.

Incidentally, these coils are the result of prolonged advocacy on the part of our weekly contemporary, "Popular Wireless," and we understand that the Lewcos Superhet coils that are shortly to be ready will also incorporate the same system of tuning.

A further advance in coil design is rumoured in the Varley camp, where experiments in permeability tuning are going on. If this type of wavelength control eventuates it will mean that sets using the new coils will not need variable condensers,

Steady Advance in Mechanical Design



A handsome cabinet Blue Spot loudspeaker, showing the unit removed from its cabinet and placed at the side.

These two permanent magnet moving-coil loudspeakers are provided with special output transformers to enable them to be used for "Class B" work.

the wave changing mechanism on the coils being used to tune them by providing a continuously variable inductance over the broadcast bands.

The complete coil and condenser pack has received a lot of attention lately, and has been successfully exploited by British Radiophone, who have brought out a number of "Radiopaks" for ordinary and single dial superhet circuits.

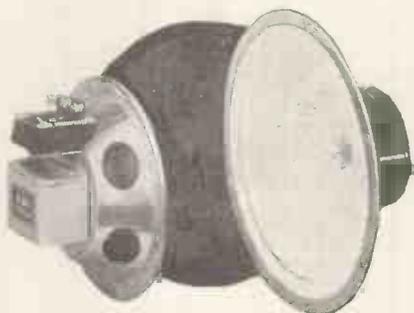
The complete unit idea is a good one, and it does much to simplify set construction. As coil and condenser

manufacturers, the complete pack could not be in better hands than those of British Radiophone.

Polar, Radiophone, Utility, Ormond, J.B., are names that occur to mind whenever good condenser

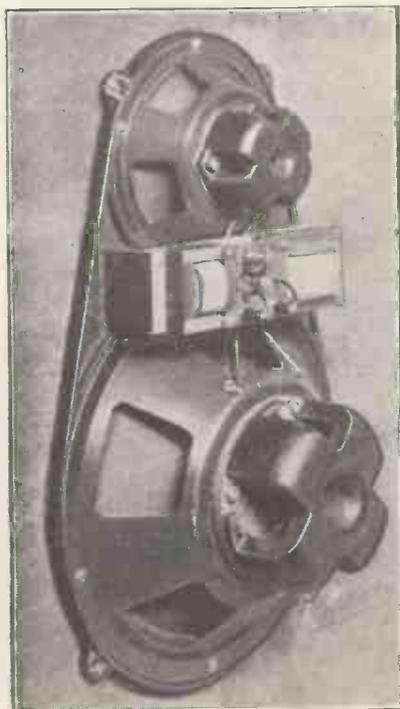
H.F. chokes have gradually become screened, one maker after another following the fashion for metal-enclosed windings. Foremost with the screened H.F. chokes were Bulgin and Graham Farish; while others to place this type of component on the market are Goltone and Wearite.

The small, flat type of reaction choke has become very popular, a large number of makes having appeared on the market, notably Telsen, Lewcos, Graham Farish, and Bulgin; while Igranic have produced a binocular choke of efficient design which takes but little more room.



Two R. & A. loudspeakers, the "Bantam" permanent magnet moving-coil, and on the right one of the moving iron types.

DUAL LOUDSPEAKERS



design is mentioned, and some of the gang condensers and the slow-motion single types turned out by these firms of late months show that while nothing spectacular is being done, they are by no means resting on their laurels.

Fixed Condensers

In the land of the fixed condenser several improvements in design have been made among the standard types. Dubilier and T.C.C. never let the grass grow under their feet, and, especially worthy of notice by the set constructor are the new T.C.C. dry electrolytic 50-mfd. condensers encased in small moulded cases. These are ideal for mains bias circuits, and are extremely compact.

Recent developments in radio apparatus are depicted in the dual loudspeaker on the left (in which one speaker looks after the high notes and the other the low) and in the Block accumulator on the right, which has no plates.

HAS NO PLATES



PROGRESS in loudspeaker design is steady but unobtrusive, though naturally the Q.P.P. and "Class B" position has had its

LOUDSPEAKERS AND POWER SUPPLY



One of the very wide range of dry batteries made by the General Electric Company.

effect on the speaker maker, and special moving-coil loudspeakers have been marketed for both systems of amplification.

The general design of the loud-speaker diaphragm and coil does not

YOUR H.T. SUPPLY



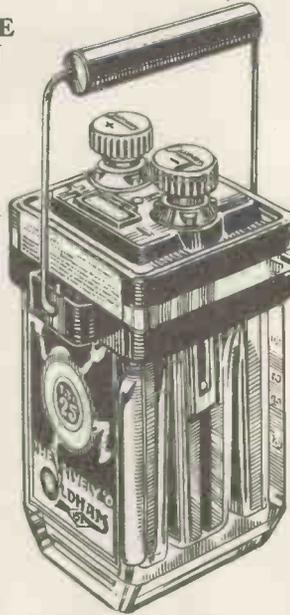
Among these items for supplying high tension are batteries of Pertrix, Ediswan, Ever-Ready and Full O'Power types.

have to be altered, and it is only in regard to the input matching transformer that the alterations have had to be made, so that practically every loudspeaker manufacturer has placed both Q.P.P. and "Class B" models

of his popular lines on the market. B.T.H., Rola, Celestion, Amplion, W.B., R. & A., to mention a few, all have their Q.P.P. and "B" models. The double moving-coil speaker

CHARGE SHOWN BY BEAD

One of the most useful developments of late in L.T. accumulators are "hydrometer" beads that are permanently incorporated to show the state of the charge. In this Oldham battery the bead fits into a special slot at the edge of the positive plate.



system is still being experimented with, and Celestion recently brought out a special double type in which the high notes are dealt with by one diaphragm and the lower notes by another larger unit. Blue Spot have recently come to the fore with some interesting moving-coil speakers, while a number of double Rola units are available.

On the power supply side "Class B" has given rise to some specially regulated mains units by Atlas and one or two other firms, but apart from steady develop-

ments in dry rectifiers by Westinghouse, in thermal delay switches by Bulgin, Varley, and Ediswan, and in general mains unit design by such makers as Heayberd, R.I., Ekco, Regentone, and Ferranti, nothing much has occurred of any note.



The Lissen dry H.T. batteries are among the most popular ones. They are obtainable in standard and super-capacity types.

The battery makers have concentrated to a certain extent on special "Class B" H.T. batteries, these being available in such makes as Drydex, Pertrix, Ediswan, Siemens, and Ever Ready, while the famous Lissen H.T. battery is still well to the fore.

WELL SMOOTHED



For those who have mains available there is no better supply than that from a good mains unit, such as the Atlas illustrated here.

L.T. batteries are steadily improving, a new feature having been brought out by Ediswan in their long-life series; while the Block battery is well worthy of notice.

AMPLE OUTPUT



The "M.W.I." mains unit specially made for "Modern Wireless" sets by Messrs. Heayberd, Ltd., is capable of supplying a large output current.

ALL TYPES FOR ALL SETS



A large range of batteries of all types for radio purposes are made by the Chloride Electrical Storage Co., Ltd. Among those shown are H.T. and L.T. accumulators, dry H.T. and G.B. batteries.



P. P. ECKERSLEY ON WHAT SET SHALL I BUY?

I EXPECT you are asked, as I am, by people "who know nothing about wireless," what set to buy. I wonder what you reply?

Knowing "something about wireless" is all very well, but to know which is the best set is impossible without knowing what people consider desirable in a receiving set.

The Question of Quality

A good on-off switch, remotely controlled, might be the beginning of my specification; others want, above all things, to reach out.

I think I could write down an "ideal" specification—ideal, that is, as far as I am concerned.

The first part should concern good quality. I criticise the set manufacturer of to-day because most sets do not give as good quality as they should.

I take back all my criticism when I am answered that the public demand an ordinary result at an extraordinary (low) price. This forces the manufacturer to economise.

Distance and Tone Control

He probably looks to his power supply first and cuts down available voltage and current to enable him to use small rectifiers and cheap smoothing condensers. He then limits "hum" by limiting bass reproduction.

He next looks to sensitivity and searches for valves which magnify as much as possible and consume as little power as possible in doing so. His high-frequency valve is thus nearly, but not quite, unstable; his detector winks at the kinks in its responsive curve, and his pentode, divinely ordained to magnify all the noisy noises, neglects the bass, cuts out the treble, and introduces a strong second harmonic.

The next part of my specification would be a demand to be able to pick

up those distant stations which produce an average night signal of about 2 millivolts per metre.

I would insist upon automatic gain control and a knob, probably labelled "tone control," which would make it possible to cut off every reproduced frequency (to a level 40 decibels or so below the fundamental) above 5,000 cycles per second,

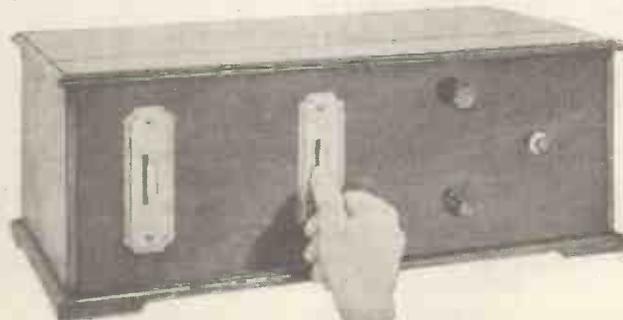
Requests from friends for advice about their new sets come to all radio enthusiasts, and here our Radio Consultant-in-Chief deals with that perennial problem. He outlines what would constitute his ideal set, and is quite frank about what he does not like, as well as about what he does!

or let me have these frequencies for local station work.

The average set could (and some do) allow me these facilities, but again the public will look at price rather than performance and frequently fall for what, to me, are necessities—to them are luxuries.

I would lastly ask for some consideration for aesthetics in the design, finish and appearance of the box. The average set is a dreadful thing to look at.

SUPERHET SIMPLICITY



If you were asked to guess how long ago this seven-valve superheterodyne was designed, you would probably say "not long." But actually it was described for constructors in 1928, being a forerunner of the modern style of easily-handled receivers.

The wood is frequently very poor. The latter point is excusable—again the demand for cutting cost—the former point could be looked after at a cost negligible compared with the overheads of manufacturing and marketing.

Super or Straight?

For example, and by analogy, a motor-car's controls have to "look engineering," and the instrument board, far from detracting from the aesthetics of the machine, adds to them. Nasty little lozenge-shaped, or square "muckite" knobs, look awful, and give the user the least of control and the maximum of discomfort.

The Americans appear to believe that my general specification, consistent with price competition considerations, could be more easily met by a superheterodyne than by a straight-tuned set. There is, of course, no way to argue this out except "quantitatively."

Production Expenses

If, for a given performance, the super is cheaper to mass produce, it is cheaper, and that is the end of the argument. The claims made for the innate superiority of the method cannot in my view be substantiated.

As I see it, the superheterodyne man might begin to argue his case by saying:

"In the super there is no necessity for a ganged condenser. An aperiodic aerial and a beat oscillator suffice." Reply: "No! You would, by such an arrangement, set up disturbances in near-by sets. You would also have the ambiguity of the oscillator which gets the same station at two different adjustments."

"Very well!" says the super man. "I'll do one with ganging, tune my aerial, and interpose a screen-grid

valve between oscillator and aerial. After that I will magnify my intermediate frequency—after first detection—and filter it, and I shall have a constant 'band width' response of all wavelengths."

"Nay, nay! You'd get a constant horrid hiss," replies the critic.

"Oh! Very well, then. I'll have a lot of valves magnifying the high frequency and inject my beat next but one to the second detector, and get over hiss."

At What Cost?

"Yes, yes! But, then, you've only got an ordinary set and added the super part and got that bit of extra selectivity."

"That's the point," says the upholder of the beat principle. "I get that extra selectivity."

At what cost?



And so we come back to my first point of: IF the super-man gets a given result from the "super" at less cost than in the straight tuning, then he is justified in using the super; but there is, according to this reasoning, no inherent superiority in the "super."

But isn't it a lovely name? SUPERHETERODYNE—the word that sold a million sets.

The Trader's Trials

I should not like to be a trader—not I; it's a difficult and hysterical business. There is fierce competition, little abiding by agreements, slumps and overstocking, booms and no stock, and all the time the poor idealist technicians are bludgeoned for

cheaper and cheaper designs, not better and better ideas.

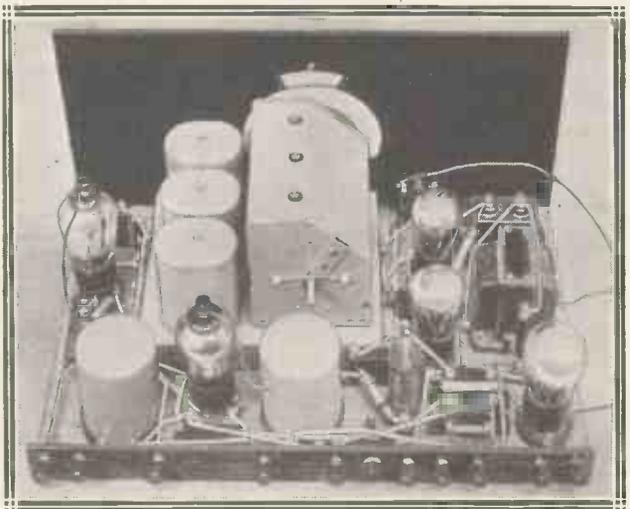
Neither one nor the other is right. It is wonderful to see, in spite of all these inefficiencies, what progress has been made, particularly, I think, in components. Some of you people, who have come into home constructing lately, little know how much better you are served by the component manufacturer now than (even) two years ago. The manufacturer, too, is benefiting and using his available materials wisely.

I never thought a set worth much five years ago; to-day I say that the



THE NEW AND THE OLD

To the right is a powerful superheterodyne employing a "cold valve" as detector. (This component looks like a grid leak and stands between the H.F. choke and coil unit, near the centre of the picture.) On the left, an old timer with a panelful of controls!



answer to what set shall I buy should be "go and listen for yourself and choose—any reputable manufacturer makes 'a good set'."

I hope you will encourage people to buy; I hope you will take a leap and construct new sets yourself; it all helps towards the day when one writes "perfection" next to the word FINIS.

FLAT DWELLERS AND WIRELESS
Timely advice about the earth.
 By W. J. WILSON.

AMONG the difficulties encountered by users of wireless receiving sets in flats is the inability to obtain satisfactory earths. By many, especially those dwellers in the larger buildings devoted to residential purposes, the trouble has been overcome by using portable receiving sets, or, where the management is progressive, renting a circuit from the amplifying set installed in the premises. In this case, usually

only the National, Regional and perhaps Radio Paris are available.

The welcome water pipe is not always successful, as it frequently happens that several earths are connected to the one service pipe. In nearly all large buildings the water pipe is several score yards in length before reaching the earth.

A German Idea

Sometimes obliteration of the programme may occur owing to the pipe acting as a conductor for wandering electrical impulses. In instances of this nature the portable set seems to

be the one best capable of giving satisfaction.

In several towns in Germany the builders of large blocks of flats have devised a means of providing satisfactory earth connections by using well-insulated cable of, say, one hundred and fifty wires, and terminating each of the wires separately in the earth. The other ends of the wires are distributed upon the different floors of the flats according to the number of residents. The points are brought to a floor skirting or wall plug and labelled. Although in some cases the earth wires are thus lengthy, it is possible for satisfactory results to be obtained. There appears to be no reason why the idea should not be adopted in England.

Volume Regulation

The question of the volume of sound from loudspeakers is always with the flat dweller. Consideration for one's fellow residents seems to be the best means of avoiding wrangles. In some Continental countries it is compulsory for all loudspeakers, gramophones and pianos to be disconnected at 10 p.m.

HOW TO USE YOUR CLASS-B VALVE

by J. GREY

UNTIL comparatively recently, output valves employed in the average sort of set—at any rate in the average sort of battery-operated set—were rated either as “power” or “super-power” types, and we had a fairly clear idea of what could be expected from them by way of output, without worrying too much about exact measurements. Of course, there were pentodes, but we thought of them as giving about the same order of output as a super-power valve.

An Important Point

When A.C. mains receivers became available to the average listener, output powers increased, and we were told that this valve was capable of an undistorted output of one watt, and that valve could give two watts, and so forth.

For the majority of listeners this information did not convey very much intelligible information, although, to be sure, the veriest novice could appreciate the fact that a two-watt valve obviously gave twice the output of a one-watt valve—but, as will be shown later, this is only half the story.

To-day, “Class B” has given battery-set owners outputs of the same order—from one to two watts—and I am afraid a good deal of misconception has arisen in this connection. The real facts of the matter are that the maximum undistorted output at which a valve is rated is, in very truth, the maximum output at which the valve can give without distorting, and that this output is most decidedly not the output which the valve should be called upon to give continuously under normal reception conditions.

A Pertinent Question

It will immediately be asked “What is the use of employing a valve which is capable of giving two

Our contributor shows that the output stage has its limitations if really good quality reproduction is to be obtained.

watts of undistorted output, only to be told that I ought not to work it to its full capacity?”

There are several ways of answering this quite natural question. I could, for instance, tell you bluntly and rather sarcastically that even with an efficient “Class B” valve, a continuous output of two watts would represent a mean anode current of about 35 milliamps., and ask you what sort of life your high-tension battery would give under those conditions.

Or I could tell you approximately what two watts of power represent

in terms of sound volume and ask you what your wife and the neighbours would think if you kept your loudspeaker continuously in action at that volume. In either case you might be convinced, but I am sure you would not be satisfied; so I am going to be, perhaps, a little long-winded, and give you a reasonable answer based upon vital radio principles.

First Principles

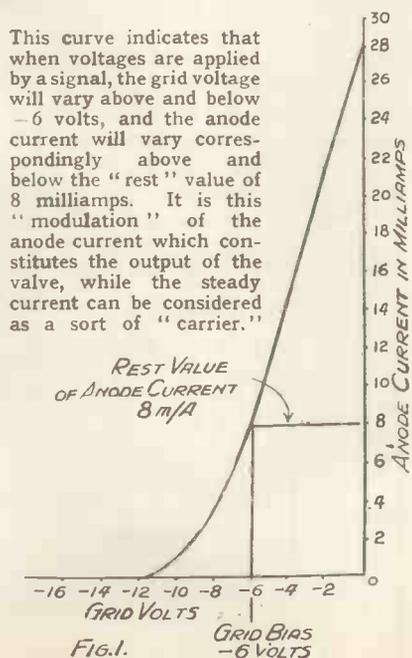
To begin with, I think we ought to be certain that we have a clear idea of what is meant by the term “output” as applied to a valve. There is, I imagine, no reader of MODERN WIRELESS who does not understand that a radio signal consists of an audio-frequency wave super-imposed upon a radio-frequency wave. The audio-frequency modulation is the programme, and the radio-frequency wave is merely the carrier—the vehicle of transmission.

In exactly the same way, the power in the anode circuit of a valve consists of audio-frequency current variations, super-imposed upon a steady direct current.

The “Rest Current”

When no signal is being received, the anode current is of a steady, fixed value, determined by the amount of grid bias. This current is often termed the “rest current” of the valve, and represents the standing losses in the output stage when no signal is applied. For example, Fig. 1 shows the grid volts/anode current curve of a typical power valve, and it will be clear that, with the recommended grid bias of -6 volts, the anode current will be 8 milliamps.

As soon as an audio-frequency signal voltage is applied to the grid, the actual grid voltage varies above and below the bias value of -6 volts,



You Can Avoid Overload

and the anode current will vary in a similar manner above and below the "rest" value of 8 milliamps. It is this "modulation" of the anode current which constitutes the output of the valve, while the steady rest current can be considered as a sort of "carrier."

Eliminating Distortion

In order that the variations in anode current shall be true reproductions of the variations in signal voltage applied to the grid, it is necessary that the incoming signal shall be limited to a value at which the positive peaks do not cause the grid to become positive and thus bring about distortion due to grid current damping, neither must the negative peaks intrude upon the bottom bend of the characteristic curve and produce distortion in this way.

The maximum undistorted output of a valve is the output corresponding to the maximum fluctuations of anode current which can be accommodated within those limitations.

I admit that I have not yet answered the question, "Why not run my output valve at its maximum output?" but I am coming to that now.

What the B.B.C. Does

You know from experience that any piece of music when played sympathetically varies in loudness. There are soft, crooning *piano* passages; jolly, loud movements; and, now and again, stirring *crescendos* leading to triumphal *fortissimos*. You will also admit that in order to obtain realistic radio, these variations in loudness must be reproduced in your speakers, which means, of course, that the signals transmitted from the broadcasting stations must also embody the "light and shade" of the musical performance.

In order to achieve this, the normal or average modulation of the carrier wave must be much less than the maximum possible modulation, leaving a reserve to accommodate the extra power required for the louder portions of the programme. Actually, the average modulation of the B.B.C. transmissions is about 20 per cent, rising to 80 per cent or more on loud passages.

Perhaps Fig. 2 will make this clearer. The diagram shows a section

of radio-frequency carrier unmodulated, a section modulated to about 20 per cent, with occasional bits of greater modulation corresponding to sudden loud sounds. Now when such a carrier has been rectified by the detector, the audio-frequency signal passed to the grid of the output valve will vary in amplitude in strict conformity with the original modulation. Thus, when the carrier wave is unmodulated, there will be no audio-

will then take care of themselves, you will get the true light and shade which the composer and the conductor intended you to enjoy; there will be the correct difference in volume between a solo and a full orchestra, and there will be no blasting due to overloading.

Bad for the Battery

So don't be greedy. Don't work your valves "all out" right through the programme. You will suffer for it in poor quality.

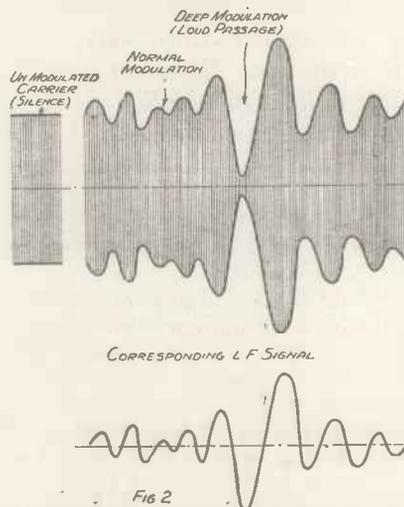
Although I have taken as examples ordinary three-electrode output valves, exactly the same remarks apply to quiescent push-pull and "Class B," with this important addition—that by loading your "Class B" or Q.P.P. stage fully on average modulated signals, your high-tension consumption will be far greater than the economic discharge rate of your battery, with the result that the high-tension battery will be rapidly exhausted, and you will decidedly *not* obtain the chief advantage of "Class B," which is: ample output for small H.T. consumption.

You see, the main difference between ordinary amplification and "Class B" is that in the former the average value of the anode current is constant all the time the set is switched on; whether signals are being received or not, something like 6 or 8 milliamps. are taken from your H.T. if you are using a power valve, or 12 to 14 milliamps. if the last valve is of the super-power variety.

"Quite Another Story!"

In "Class B," however, the mean value of the anode current *when no signals are being received* is quite small—usually of the order of 3 milliamps., and it increases only when a signal is applied to the grid. Moreover, the extent to which it increases depends entirely on the strength of the audio-frequency signal so applied. Fully loaded, a "Class B" output valve rated at about 1½ watts output takes an anode current of about 20 milliamps., which is quite beyond the capacity of a small H.T. battery. But, properly used, so that it gives its full output only on the peaks in the programme, the mean anode current at normal modulation is only about 4½ milliamps.—quite another story!

HOW THE CARRIER CHANGES



To the left is the unmodulated carrier, and beside it is shown normal modulation of about 20 per cent, which is the average used by the B.B.C. But note how occasionally a loud passage occurs and causes a momentary modulation of almost 100 per cent.

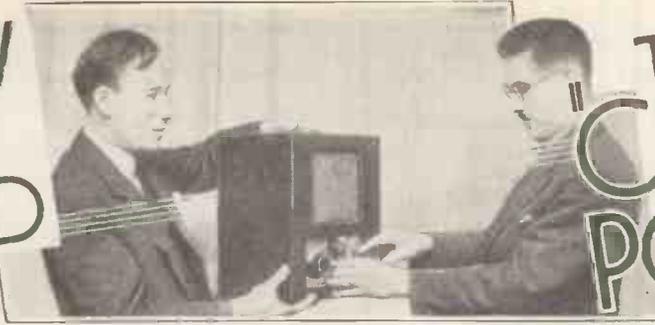
frequency input to the output valve grid. Normal modulation will give a grid input of a certain amount, and 100 per cent modulation will give a correspondingly greater grid input. This is indicated below the representation of the carrier wave in Fig. 2.

Use Your Volume Control

Now it must be perfectly clear that if the receiver is so adjusted that the valve gives its full rated maximum output when the grid signal corresponds to a 20 per cent modulation of the carrier wave, there is bound to be overloading and blasting whenever a loud passage occurs in the programme.

The reasonable way to use your output valve, therefore, is to adjust your volume control so that no blasting occurs on the loudest passages of music. The softer passages

HOW TO BUILD THE "CLASSIC" PORTABLE



THE really compact portable battery-operated receiver has received the close attention of set-designers for many years. It has appeared again and again in various forms, more or less heavy in weight, and taking on all sorts of shapes as the endeavours of the creators met with more or less success.

Sometimes small two-valvers needing a length of wire slung over a tree or across the room were designed; at others the set took the form of a superhet, which while giving more sensitivity also took up more space and turned the scales at a much higher figure.

Power Problem Solved

In practically all cases the output suffered from one or other (sometimes both) of two things—bad quality and insufficient volume. Distorted output is far too common in portable receivers to need any discussion

The coming of "Class B" amplification has vastly enhanced the possibilities of portable sets, and here is a thoroughly up-to-date design of outstanding merit. Containing its own compact loud-speaker and housed in a home-made cabinet, the "Classic" makes an ideal touring companion, for it has a remarkably wide range of reception at first-class strength. Designed and described By K. D. ROGERS.

here, though with the small speakers necessitated by a compact set the tonal balance cannot be expected to be as good as that provided by a larger receiver.

The matter of volume is one where pretty well all the portables failed, with the possible exception of the superhets, for the question of volume is not one of mere sensitivity or L.F. amplification, it is one of power supply. And with power supply we have always had to associate power

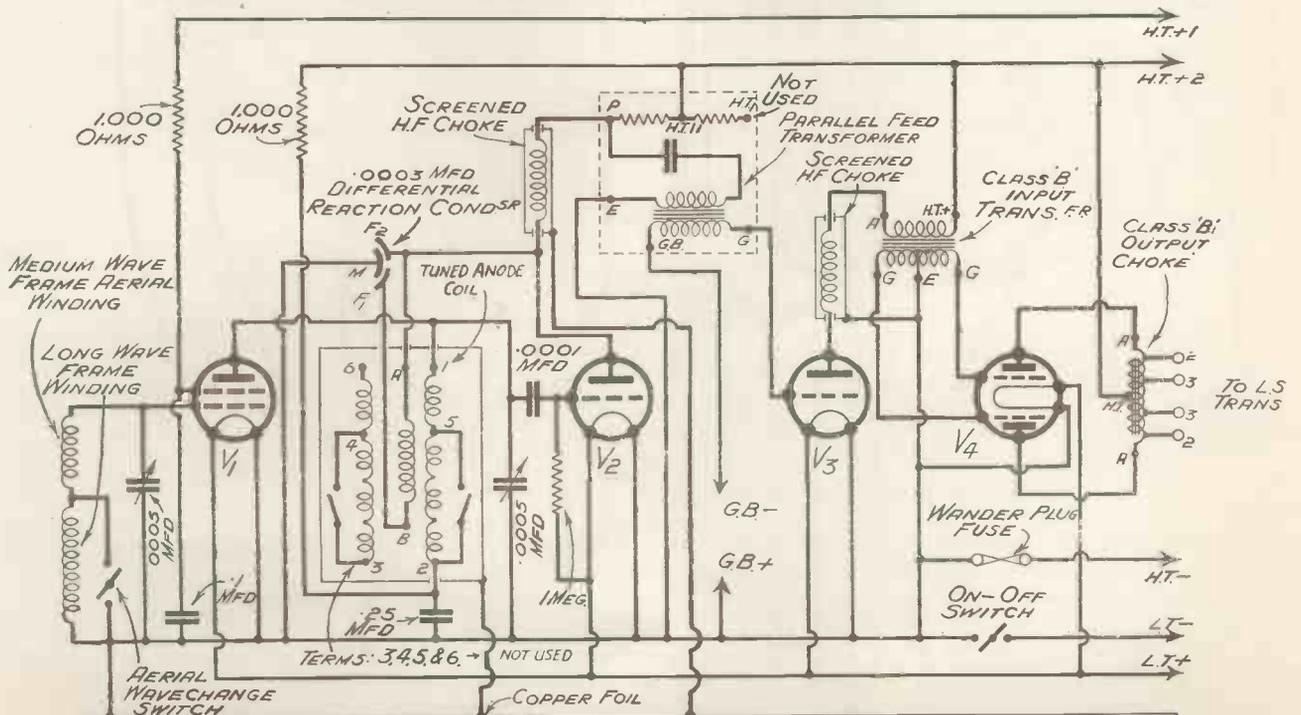
consumption and the need for large, heavy and bulky H.T. batteries.

With the coming of "Class B" amplification the problem of supplying adequate power was largely solved, for though really big milliamperage is required on occasional "peaks" in the programme when "Class B" is used, the milliamperage was needed as a steady current with the old form of output.

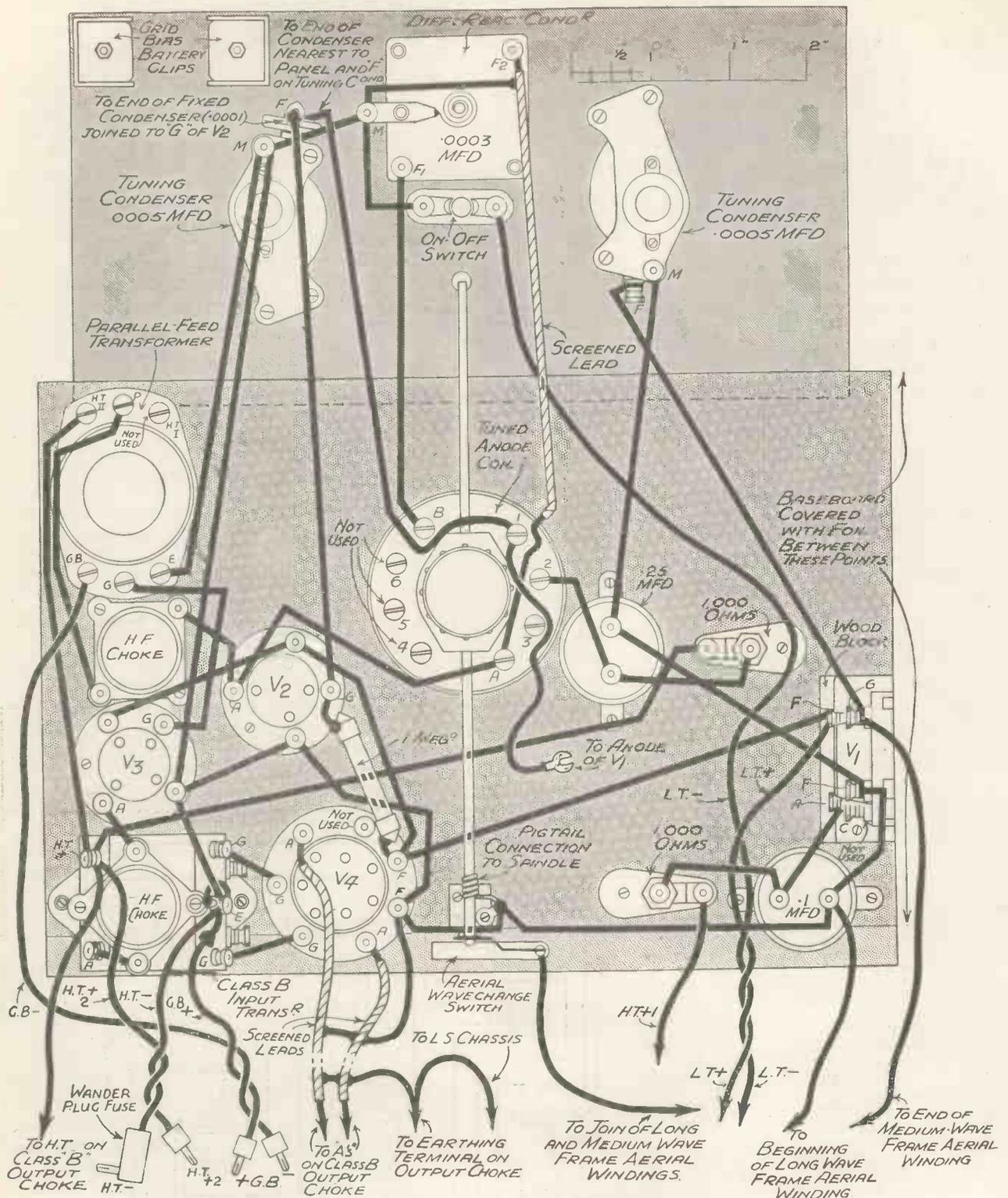
A Wide Scope

The average power of a small set need be a matter of only 300 or so milliwatts, and this can be obtained with quite small H.T. consumption. The fact that with "Class B" one pays in H.T. for what one requires in loudness of reproduction, instead of paying a flat rate, and a high one too, whether the music is loud or soft, greatly increases the scope of the really small portable receiver.

Four Modern Valves—For Modern Conditions



Four valves are employed in a team of S.G., detector, "driver" and "Class B" output. The result is a very high degree of sensitivity and big L.F. power amplification, with a minimum of H.T. battery current and low running costs.



Note the screened leads, which have been specially illustrated and marked.

In the old days it was not provident to build a portable set having any high degree of amplification on the L.F. side, because it meant having to provide a high H.T. current necessitated by the size of the output valve. The size of this was, of course, decided by the fact that it had to carry a certain amount of peak grid-input voltage.

How much easier it is now that "Class B" has come along. When the peaks can be left to look after themselves to a great extent, and when one can reckon on a definite low average of anode current consumption, unless the set-owner prefers to run the receiver with the "wick up," in which case it is his own look out.

"Class B" should see the resurrection of a number of portable sets of the small outdoor type. It is a class of set that has gradually been killed by the insolvability of the battery supply problem, and by the influx of all-mains transportable sets of all kinds and prices.

That a good, sensitive indoor or

Big Power from Small H.T. Battery Current

outdoor portable can be built is shown by the "Classic" Portable illustrated here. This set measures only 13 ins. by 11 ins. by 9 ins., approx., and its weight is such that it is no burden at all to carry; while the sensitivity evidenced during a tour on which it was taken showed that it lacked nothing in the way of generosity where the reception of stations was concerned.

Home-Made Cabinet

The whole set is home-made, cabinet and all, and one of the smallest speakers available was chosen in order to keep the size down to really low limits. The result is that the set can be carried with ease, or stowed away in a car or boat without the feeling that it is in the way.

As a touring companion the "Classic" Portable is ideal, as you will see when the full details of a tour all along the South Coast (one of the most difficult station-getting districts) are given next month. Meanwhile we can say that at Tallis House the receiver regularly picked up, at reasonable strength, Königs Wusterhausen during daylight and, of course, at full strength we had Radio Paris, Daventry, Eiffel Tower, the two London stations, and the Midland and Northern Regionals. On the small frame incorporated in the back of the set this performance is undeniably good.

A Spiral Frame

The circuit employed in the "Classic" Portable is quite straightforward, and makes use of four valves. The frame aerial is spiral-wound, in order to keep the depth of the set to a minimum, and consists of a long and medium winding connected in series. A shorting switch is used to short-circuit the long-wave frame when medium-wave stations are to be received.

From the frame we go to the grid of the screened-grid valve, which is of the ordinary type of high efficiency amplifier, not a multi-mu valve. This in itself aids in keeping down the anode current consumption of the set, for the ordinary S.G. valve is not as a rule so greedy as the multi-mu variety, and in a portable set the question of pre-detector volume control is not so vital as in the normal outside aerial receiver.

The screening-grid of the S.G. valve is decoupled by means of a 1,000-ohm

resistance and a .1-mfd. condenser, and is separately controlled as regards H.T. voltage by a separate tap on the H.T. battery.

Detector Coupling

The anode of the S.G. is taken straight to a tuned anode circuit, and through a .0001-mfd. grid condenser to the grid of the detector. In order that the tuned anode condenser may have its moving vanes at "earth" potential, the "earth" end of the tuned anode coil is connected to the filament circuit through a .25-mfd. condenser.

This condenser also acts as a decoupling condenser with a 1,000-ohm resistance for the anode circuit of the valve, which is fed with H.T. from a common source with the detector and other valves in the set.

The detector is the usual leaky grid type, a 1-megohm leak being employed, and differential reaction fed back to the tuned-anode coil.

This reaction control is also arranged so that the moving vanes of the condenser are at earth potential.

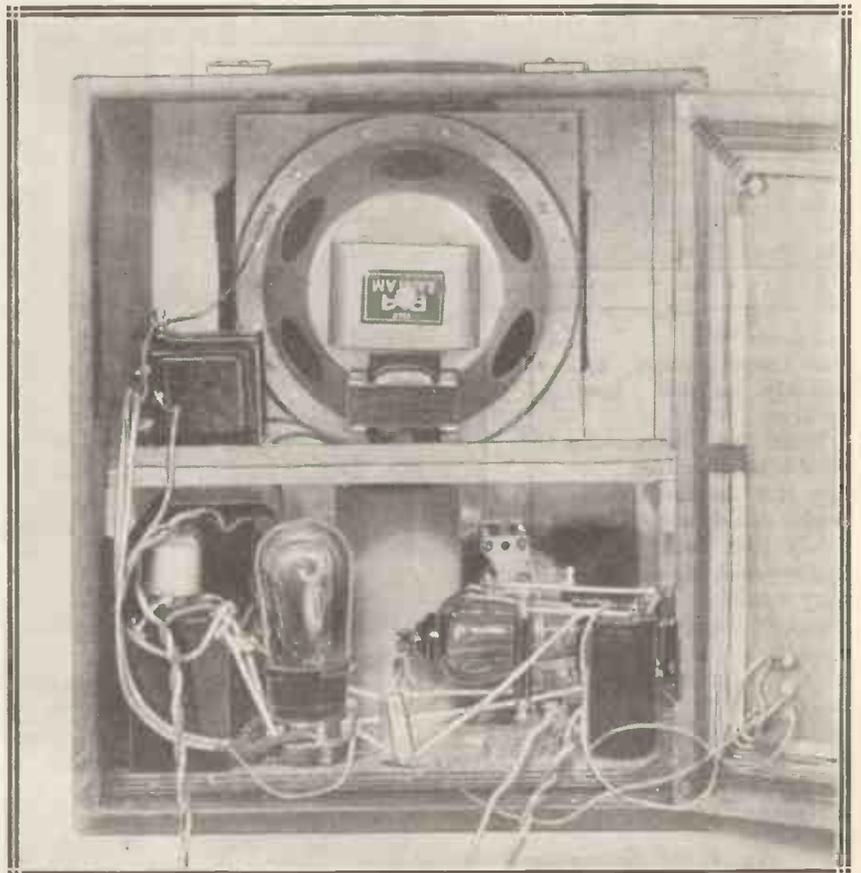
It should be noticed that the reaction choke is of the screened variety, as is the tuned-anode coil. This is a very essential part of the design, for every possible care has to be taken to eliminate the possibilities of feed between the frame aerial and the S.G. anode circuit or the other part of the screened coil, the detector reaction circuit.

Special L.F. Unit

Shunt-feeding is used for the L.F. transformer coupling the detector to the grid of the L.F. valve, a special screened shunt-fed coupler being employed. This has two resistances in series on the anode-feed side, the connection between the resistance being brought out to a terminal.

The result is that there are two values of anode resistance possible, or alternatively one resistance can

SELF-CONTAINED SPEAKER AND AERIAL



Constructed on the baseboard and panel system the set is quite easy to assemble, a compact moving-coil loudspeaker being placed as shown in the top compartment. The frame aerial is arranged on the back of the cabinet.

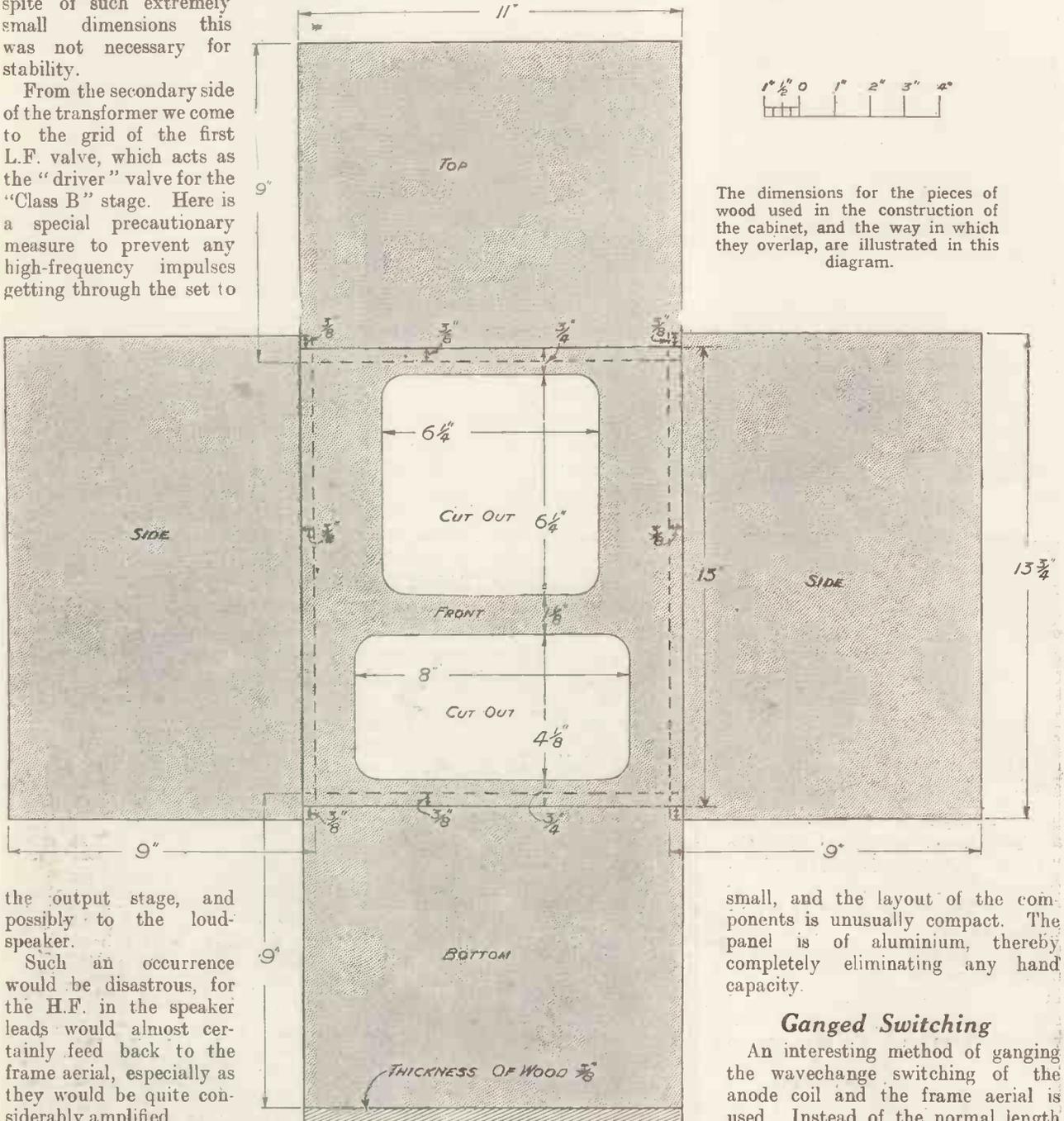
be used in conjunction with a condenser for decoupling.

In the set under consideration the decoupling method of connection is not utilised, for it was found that in spite of such extremely small dimensions this was not necessary for stability.

From the secondary side of the transformer we come to the grid of the first L.F. valve, which acts as the "driver" valve for the "Class B" stage. Here is a special precautionary measure to prevent any high-frequency impulses getting through the set to

while the use of resistance stoppers in the "Class B" stage is, of course, impossible owing to the fact that quite heavy grid current has to flow.

The whole set is constructed on baseboard and panel system with the former almost completely covered with copper foil, though owing to the size of the set the panel is extremely



the output stage, and possibly to the loudspeaker.

Such an occurrence would be disastrous, for the H.F. in the speaker leads would almost certainly feed back to the frame aerial, especially as they would be quite considerably amplified.

So in the anode circuit of the "driver" valve is an H.F. choke, shielded as before, and this apparently stops the last vestige of H.F. from getting any farther, even without any by-pass condenser being necessary.

No Grid Stoppers

For some reason or other a grid topper in the "driver" valve circuit does not have such a good result;

From the "drive" we go through a special "Class B" transformer to the "Class B" valve itself, and thence to the output choke for matching the valve with the loudspeaker.

This completes the main points about the circuit with the exception of the wander-plug fuse, which is used to protect the valves and the H.T. battery in case of a short-circuit or wrong connection.

small, and the layout of the components is unusually compact. The panel is of aluminium, thereby completely eliminating any hand capacity.

Ganged Switching

An interesting method of ganging the wavechange switching of the anode coil and the frame aerial is used. Instead of the normal length of coil spindle as supplied with the one canned coil, we used the length that is supplied with the triple gang assembly of coils, and this must be specially asked for when the coil is ordered.

To the end of the spindle remote from the wavechange knob is soldered a small piece of brass. This is arranged to make contact with a springy strip which lies along the back of the baseboard. A small brass

The Self-Contained Aerial Makes for Sharp Tuning

support for the rod at the back of the set completes the switch arrangement, for the brass arm is so arranged that it makes contact with the horizontal brass strip on the baseboard when the coil wavechange setting is at medium.

Frame Switching

The join between the long- and medium-wave windings of the frame aerial is then taken to the horizontal strip. A flex connection between the rod and the metal foil then allows the shorting of the long-wave section of the frame when the medium-wave position of the wavechange switch is used, thus ganging the wavechange of the frame aerial with that of the anode coil.

Owing to the fact that the variable condensers, the reaction condensers, and the on-off switch are all connected

on one side to earth, there is no need to bush any of the holes made in the metal panel, but the panel is not used for connection between any of the components.

It is not advisable to allow the intercomponent connections to be made via the panel, as common circuit links of this kind often lead to trouble from H.F. instability.

We took the earth connections of the variable condensers direct to the coil and the .25 mfd. condenser, and although the foil could have been made a link for L.T. between the first and subsequent valve holders, we have taken separate filament leads everywhere.

The valve holder for the S.G. valve is of the horizontal mounting type, and is fixed on a small block of wood, about three-quarters of an inch thick. This is to raise the valve up so that

it will clear the rod controlling the wavechanging of the anode coil and the frame aerial.

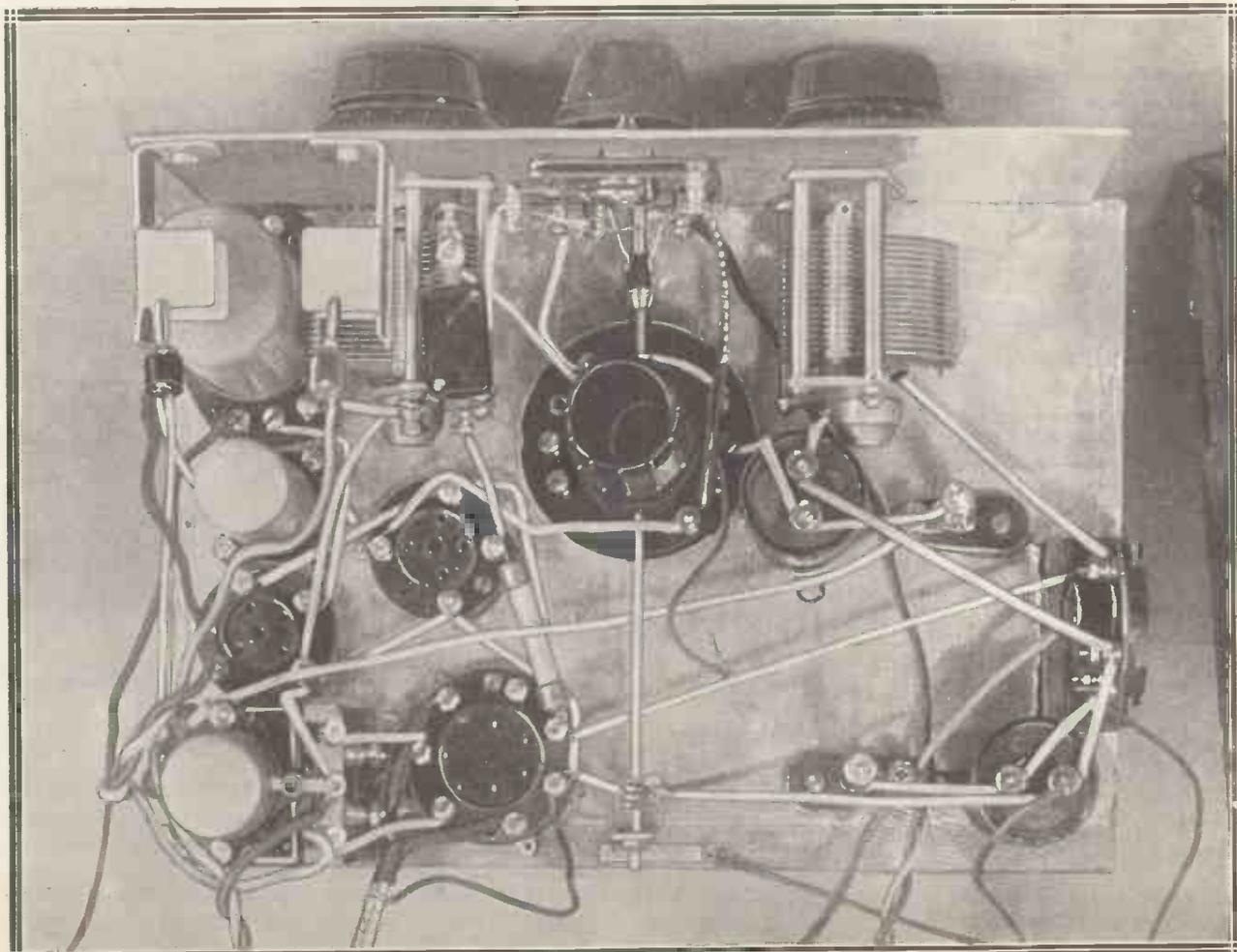
A screened lead is used for the reaction feed from the differential condenser to the anode coil to prevent it feeding into the variable condenser which is situated very close.

The frame aerial consists of 18 turns of 28 D.S.C. wire for the medium waveband, wound clockwise in two grooves of four 10-groove spacers, forming a rectangular frame of helix type, the two innermost grooves being used for this part of the frame.

Long-Wave Winding

In series with this there are 40 turns of 32 D.S.C. wire, continuing the winding throughout the remaining grooves, the number of turns being equally spaced through the eight grooves.

How the Main Components Are Placed and Spaced



The baseboard is almost completely covered with copper foil, and the panel is of aluminium, thereby eliminating any possibility of hand-capacity effects.

BUILD YOUR "CLASSIC" PORTABLE WITH THESE COMPONENTS.

| Component. | Make used by designer. | Alternative makes of suitable specification recommended by the designer. | Component. | Make used by designer. | Alternative makes of suitable specification recommended by the designer. |
|--|-------------------------------|--|---|------------------------|--|
| 1 Aluminium panel, 10 in. x 5 in. | Peto-Scott | — | 1 Set frame aerial spacers | Bulgin I.12 | — |
| 1 Wood baseboard, 11 in. x 7½ in. | Peto-Scott | — | 1 Loudspeaker | R. & A. "Bantam" | — |
| Copper foil, 11 in. x 7 in. | Peto-Scott | — | 1 L.T. on-off switch | Lissen | Telsen, Igranic, Bulgin |
| 2 .0005-mfd. variable condensers | Polar S.M. | — | 3 Yds. insulating sleeving | Lewcos | Goltone, Wearite |
| 1 .0003-mfd. differential condenser | Graham Farish | Telsen, Peto-Scott | 4 Yds. 18-gauge tinned copper wire | Lewcos | Goltone "Spiral" type |
| 1 .25-mfd. fixed condenser | Dubilier 9200 | — | 1 Yd. screened sleeving | Lewcos | — |
| 1 .1-mfd. fixed condenser | Dubilier 9200 | — | 4 Battery plugs | Belling-Lee | Igranic, Bulgin, Goltone |
| 1 .0001-mfd. fixed condenser | T.C.C. type M. | Dubilier 665, Ferranti, Telsen | 1 Wander fuse | Belling-Lee | — |
| 1 "Class B" input transformer, ratio 1:1 and 1.5:1 | Varley | R.I., Sound Sales | 2 Accumulator spades | Clix | Belling-Lee, Igranic, Bulgin |
| 1 "Class B" output choke (or transformer) | Sound Sales | Wearite, R.I., Ferranti | 1 Brass bracket, 1½ x ½ in. x ½ in. | — | — |
| 1 L.F. coupling unit | Benjamin Transfeeda | — | 1 oz. double silk 28-gauge copper wire | — | — |
| 2 Screened H.F. chokes | Wearite H.F.P. and small type | — | 1 oz. double silk 32-gauge copper wire | — | — |
| 1 Canned coil (with 3-gang spindle) | Colvern K.5 | — | 1 Pair 1½-in. x ¾-in. brass hinges | — | — |
| 2 1,000-ohm resistances, with vertical holders | Graham Farish "Ohmite" | — | 1 Block wood, 2 in. x 1 in. | — | — |
| 1 1-meg. resistance, with wire ends or terminals | Dubilier 1-watt | Goltone, Graham Farish "Ohmite" | 2 Pieces wood (front and back), 13 in. x 11 in. x ¾ in. | — | — |
| 2 4-pin valve holders | W.B. | Telsen, Lissen, Benjamin | 2 Pieces wood, 13½ x 9 in. x ¾ in. (sides) | — | — |
| 1 5-pin valve holder, for horizontal mounting | W.B. | Lissen, Telsen | 2 Pieces 9 in. x 11 in. x ¾ in. (top and bottom) | — | — |
| 1 7-pin valve holder | W.B. | Benjamin, Wearite | 1 Piece, 3½ in. x 11 in. x ¾ in. (shelf) | — | — |
| 1 Pair grid-bias battery clips | Bulgin No. 1 | — | 1 Piece, 7½ in. x 7½ in. x ½ in. (baffle) | — | — |
| | | | 1 Carrying handle | — | — |

The ends of the frame, and the tap taken where the two sections are joined, are taken to anchoring screws in the wooden back of the cabinet on which the frame is wound. From these screws flex leads are taken for connection with the receiver.

The cabinet is made throughout with ¾-in. ply, and is extremely simple to construct. A square-cut vignette, with rounded corners, is used for the speaker, the vignette being backed by a piece of wood with a circular hole acting as a baffle.

Speaker Matching

The speaker is an R. & A. "Bantam," having the usual transformer on it so that a matching output transformer between the set and the speaker is necessary. A piece of ¼-in. ply is used for this baffle, it being about 7 in. square.

Below the speaker baffle is the vignette for the panel, also rectangular and measuring 4½ in. deep and 8 in. long, also with the corners rounded.

A shelf is fixed behind the speaker, for the batteries wedge conveniently between the speaker magnet and the back of the cabinet. The shelf is situated well back in the cabinet, allowing clearance for the output transformer, which is fixed to the left of the speaker "pot."

The bias battery for the set need be only 4.5 volts, and this is fixed in clips on the top left-hand side of the panel, looking at it from the back. It should also be noted that the screened H.F. choke that is in series with the anode of the "drive" valve is mounted

on the top of the "drive" transformer, being kept rigidly in place by very short stiff connections.

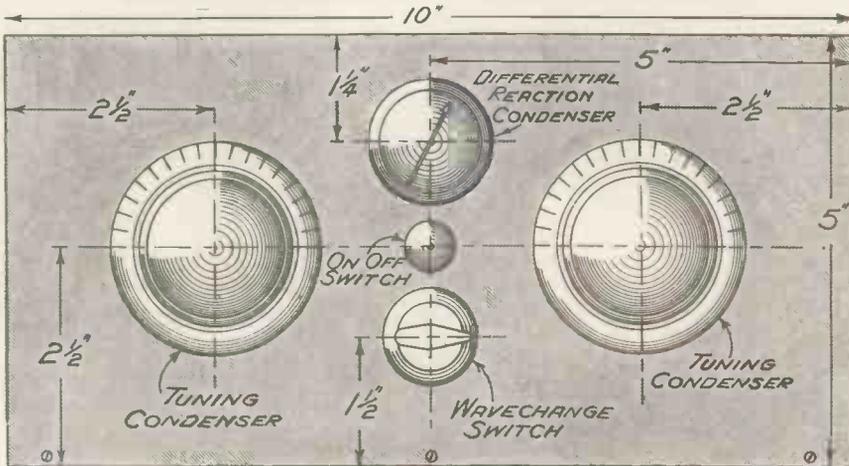
This choke is quite immovable, for beside the two connections to its terminals, a third is taken from the soldering tag on the eyelet in the base to the centre terminal of the drive transformer secondary. This terminal being also connected to the L.T.

long as they have to go to the matching transformer which is screwed to the side of the cabinet near the loudspeaker.

Connection to Foil

Care should be taken in making the set that the copper foil which covers the baseboard is well tucked down behind the panel, thereby

SENSITIVE—SELECTIVE—EASY TO OPERATE



PANEL LAYOUT

Remarkable ease of control is one of the special features of the "Classic" Portable, which is an ideal receiver for summer-time radio.

switch, the tag effectively earths the screen of the choke.

The connections from the output terminals of the seven-pin valve holder (for the "Class B" valve) should be covered with screened sleeving to prevent any possibility of L.F. feed-back into the set. These leads are of necessity comparatively

satisfactorily "earthing" the foil. Also it is important that the spiral screening of the shielded sleeving be "earthed."

This could be done by unwinding a short length of the metal shielding in the case of the reaction lead, and connecting it to the moving vanes terminal of the reaction condenser.

Suitable for Indoor Use As Well

RECOMMENDED VALVES AND ACCESSORIES TO USE.

| Make. | S.G. | Det. | "Driver." | "Class B" Output. |
|---------|---------|-----------|-----------|-------------------|
| Mullard | P.M.12 | P.M.1H.L. | P.M.2D.X. | P.M.2B. |
| Cossor | 220S.G. | 210H.L. | 220P.A. | 240B. |
| Marconi | S.22 | H.L.2 | L.P.2 | — |
| Mazda | S.G.215 | H.L.2 | L.2 | P.D.220 |
| Osram | S.22 | H.L.2 | L.P.2 | — |
| Eta | B.Y.6 | B.Y.1815 | B.W.1304 | — |
| Hivac | S.G.210 | H.210 | — | — |
| "382" | S.G. | H.F. | — | — |

Ferranti H.P.2 "Class B" valve is also suitable.

ACCESSORIES.

| Batteries. | Make. | Type. | Dimensions. |
|--------------------|---------|-------------------|--------------------------|
| 2-volt accumulator | Oldham | J.S.M.V.3 | 1½ in. × 4½ in. × 3½ in. |
| H.T. battery | Ediswan | Standard 120-volt | 8½ in. × 6½ in. × 2½ in. |
| G.B. battery | Siemens | Standard 4½-volt | 2½ in. × 3½ in. × ½ in. |

NOTE.—The batteries mentioned above were used by the designer in the original set. In the case of H.T. and G.B. batteries, suitable alternatives are as follows:
 H.T. battery: Drydex, Lissen, Marconiphone, Siemens, Ever Ready.
 G.B. battery: As above.

In the case of the two loudspeaker leads the shields of the two leads should be bonded together and connected by a length of wire to the filament negative terminal of the seven-pin valve holder.

There is no need to use a metallised H.F. valve in the "Classic" Portable, though one can be used if wished, but it is desirable to use a metallised detector. An L.P.2 type of valve (that is, a small power valve) will be required for the "driver," so that the maximum power can be obtained from the output valve.

The operation of the "Classic" Portable is normal in every respect. The aerial and anode circuits are separately tuned, so there is no trimming to be done; and if the connections to the "driver" and output transformers are followed according to wiring diagram, everything should be O.K. provided the Cossor or Mullard "Class B" valve is used.

Other types of "B" valves may need slightly different transformer ratios, and it is advisable before building the set to get in touch with the makers of the valve you choose to get their advice concerning the correct transformer ratios.

Matching the Valve

The whole success of "Class B" amplification is jeopardised if the matching between "driver" and "B" valve, and between the latter and the speaker is not right. Unfortunately, no standardisation of valve characteristics has yet been attempted, and so there are many types as well as makes of transformers from which to choose. It is a pity, perhaps, but there it is.

A small, portable type of L.T. battery fits comfortably on the battery shelf, together with a 120-volt H.T. battery of normal size. This has two positive tappings taken from it, one of 78 volts for the S.G. valve screen, and the maximum for the rest of the circuit.

Grid bias is supplied by a 4.5-volt battery placed in the battery clips on the back of the panel. The only bias required, of course, is that to the "drive" valve which needs the full 4.5.

The outside of the cabinet can either be stained and polished, or covered with waterproof American cloth or Rexine, or some such material. We prefer the stained wood from a technical point of view—though we show cloth covering in the photos—because many of the waterproof materials are partly conductive, and act as a rather upsetting conductive band all round the set.

This has the result, in some cases, of causing the most baffling howling or H.F.

instability; so should you decide to cover the set, it should be tested thoroughly in its naked cabinet first, so that you may judge the effect, if any, of whatever material you fancy.

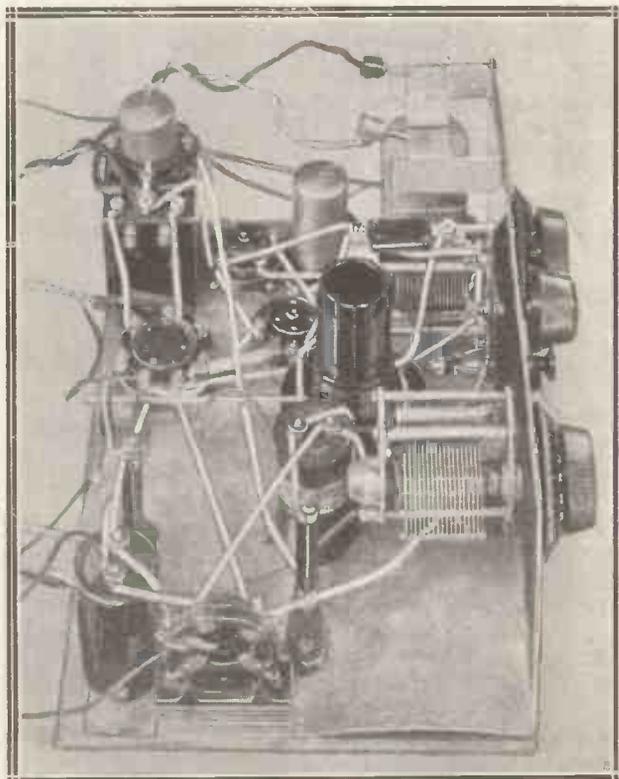
Checking Switching

Attempts at "earthing" the covering to L.T. negative sometimes achieve the desired effect, but at other times it has been found that such a procedure has acted too much like a shield for the frame aerial, with deleterious effect on the sensitivity and tuning of the receiver.

We have mentioned before that the simple home-made switch for the frame aerial has to be so arranged that it makes contact when the spindle of the canned coil is in the medium-wave position, and before testing the set it is advisable to check up this point to see that it is so.

It may not seem, at first sight, easy to find when the coil is in the medium- or long-wave condition, but if it is remembered that the Colvern coil switching arrangement is so assembled that the switch contacts are closed when the flat side of the spindle is

FULL "CLASS B" OUTPUT



The S.G. valve holder, which can be clearly seen in the foreground of the above photograph, is mounted on a wooden block and not direct on the foil.

Real Portability and "Class B" Amplification

horizontal, the checking becomes a simple matter.

For the first test it is a good plan to leave the back of the cabinet off, resting it against something so that the frame aerial is vertically disposed. With this so arranged it is easy to get at anything inside the set should any matching adjustment of the output transformer need to be done.

Quite sharp tuning will be a feature of the set, and, of course, reaction will have to be used for nearly all but the local stations. This is to be expected in a portable, though you will probably be surprised at the sensitivity evidenced, and at the ease with which distant programmes can be picked up.

Hinge the Back

With the set operating properly the back can be placed in position. It is convenient to use a couple of hinges for one side of this, and some form of easily-opened hook catch on the other.

The back must fit firmly, however, for it has to come up against the batteries and keep them in position. As batteries vary a little in size, according to make and type, it may also

be necessary to wedge them at the sides and ends to keep them absolutely fixed in position.

Sorbo rubber is best for this purpose, though ribbed cardboard is also very useful. Naturally, the L.T. battery is of the unspillable type, so that it will be perfectly safe to carry the set about, and to place it in

boats or cars for transport to picnics and so forth.

But whether out of doors or at home, the "Classic" Portable will always be ready to provide plenty of good entertainment from Britain or the Continent, for its sensitivity is such that it has a remarkably wide range of reception at first-class strength.

KEEP YOUR SOLDERING IRON CLEAN
A tip worth noting, and a suggestion for substitute insulators.

WHEN soldering, one of the greatest difficulties experienced by the home constructor is that of keeping the soldering iron clean—or cleaning it quickly when withdrawn from the fire. Filing is fairly satisfactory, but this is rather hard on the iron and it also removes the tinning, and by the time the iron has been re-tinned, the iron can only be used for a short period before re-heating is necessary.

Instead of cleaning the iron with a file, a length of file card—which may be obtained quite cheaply—should be

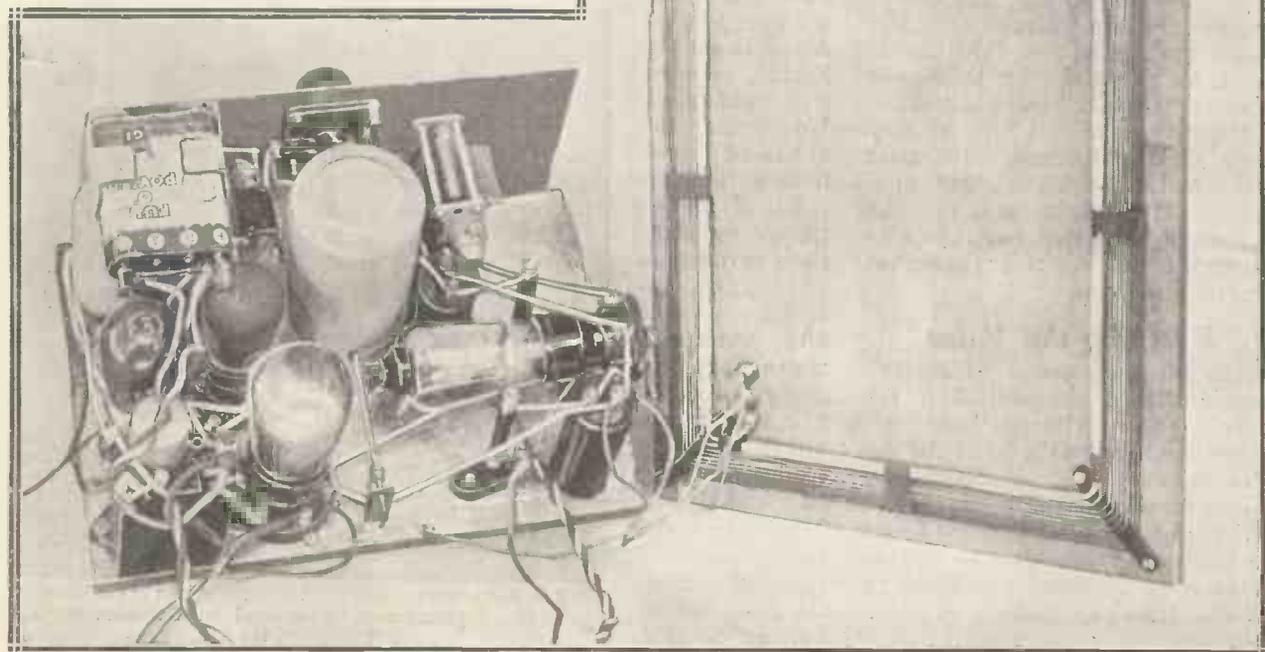
nailed to a piece of wood and this file-card file employed in place of an ordinary file.

Indoor Aerial Insulators

Small china door knobs are an efficient substitute for indoor aerial insulators. These knobs are obtainable in various sizes and should be screwed to a block of wood as shown. To the end of the length of wood should then be attached two metal brackets, and the brackets in turn fastened to the wall. Since the wooden strip or rod may be of any length, the aerial as a result may be placed at a reasonable distance from the wall, thus resulting in a far more efficient arrangement than that obtained with the aerial placed only a few inches from earthed objects.

LONG RANGE ON A FRAME

The "Classic" Portable is entirely self-contained, making use of a spiral wound frame aerial, in which the long-wave section is shorted out when not required. The frame has the advantage of directional properties which enable a high degree of selectivity to be achieved, in spite of the comparatively simple circuit employed.

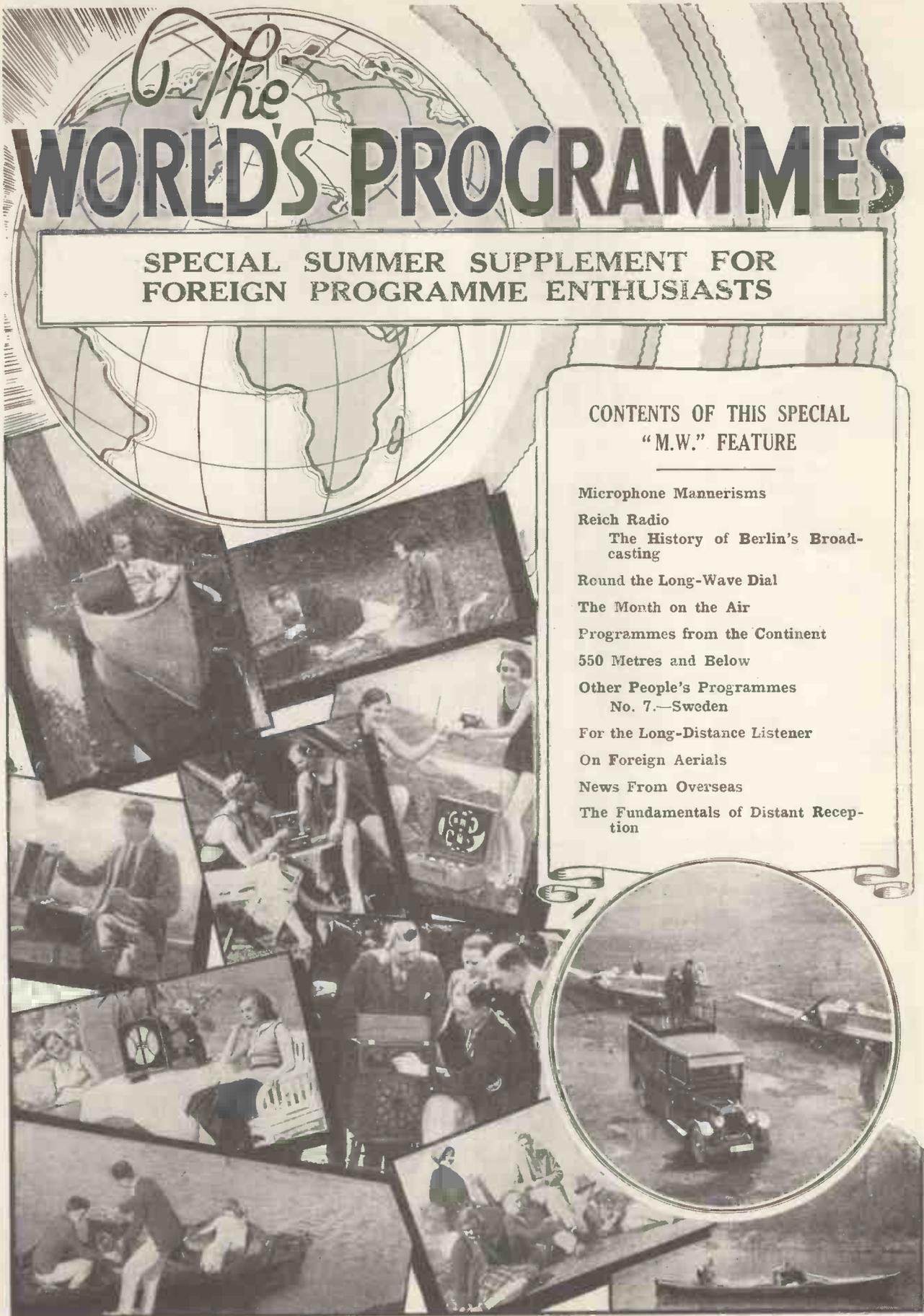


The WORLD'S PROGRAMMES

SPECIAL SUMMER SUPPLEMENT FOR
FOREIGN PROGRAMME ENTHUSIASTS

CONTENTS OF THIS SPECIAL "M.W." FEATURE

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tion



MICROPHONE MANNERISMS



M. HERRIOT, ex-Fremier of France, speaking into the microphone on a recent visit to the States. HENRY HALL'S SINGING TRIO are seen in the circle.



MARION HARRIS, the American cabaret star, in the studio.



ADOLF HITLER, the German Chancellor, addressing a mass parade of Brown Shirts at Kiel. On the left, CARL BRISSON is taking part in a television broadcast to Copenhagen.



These five photographs representing England, France, America, Germany and Denmark show a remarkable similarity in the attitudes adopted by radio stars. Marion Harris, who is broadcasting to an unseen audience, makes as much use of her hands as does Hitler, whose audience is visible.

The majority of radio performers, whether they come from the stage or the public platform, cannot discard their personal mannerisms even in front of the "mike."



THE capital of the German Reich is also its radio centre. Excepting for the shore station of the ship-to-shore service, at Norddeich, Germany's complete wireless transmitting and receiving stations are situated close to Berlin.

Apart from the famous commercial station Nauen and its receiving post at Beelitz, the centre for European traffic at Königs Wusterhausen, with its receiving post at Zehlendorf, there are the three Berlin broadcasting stations: Witzleben, Boxhagener-



NOT FULL SIZE!

A special model showing Berlin's broadcasters. In the centre is Königs Wusterhausen, Nauen is to the right and Beelitz on the left.

strasse and the Deutschlandsender at Zeesen.

One week this summer I set out to visit all these stations, and I very

This month we are pleased to be able to present for readers of "The World's Programmes" the first of two special articles on German Broadcasting as it affects the Berlin listener. Brief notes on the history of some of the more important of the stations, glimpses of famous personalities and visits to the actual broadcasting are all included in this entertaining feature

By A. A. GULLILAND.

much regret that after having been to Königs Wusterhausen, Zeesen, Nauen and Beelitz I did not feel like going out to the East End relay at the Boxhagenerstrasse, nor to the purely commercial traffic receiving post at Zehlendorf. But in spite of this, my visits gave me a very comprehensive idea of all that has to do with broadcasting and wireless in and around Berlin.

THE NERVE CENTRE

The nerve centre of all radio telephony in Berlin is to be found at the trunk exchange, the Fernamt.

After obtaining the necessary permits from the Ministry of Posts and from the head of the Berlin post district, I was duly permitted to enter the red brick building in the Winterfeldstrasse. But before being

shown over the premises I had to sign a paper that any photos I should take would have first to be submitted for approval.

After all formalities had been duly executed I was handed to an official who very kindly explained everything to me.

All cables to and from the transmitters pass through the trunk exchange and are switched here. At the same time all cables to and from other cities can be switched here. Subscribers' calls are dealt with in

long halls with four rows of operators in each. Overseas radio telephony communications are switched in a special and much smaller room. And all broadcasting connections are again dealt with in another room.



ONE OR TWO WORDS?

The railway station is proof that the town itself spells Königs Wusterhausen as one word.

GERMANY'S FIRST BROADCASTING STUDIO

For transatlantic relays an official enters a special cabin and establishes connection usually about half an hour before the actual broadcast. Should at any time the telephony connection break down, he can make use of a Morse key situated at his right hand and thus inquire as to the reason of the breakdown.

A programme produced in the Berlin Broadcasting House first passes through the control-room there and then out through the Fernamt to the transmitter, or to the transmitters in Germany or in Europe that are taking the relay.



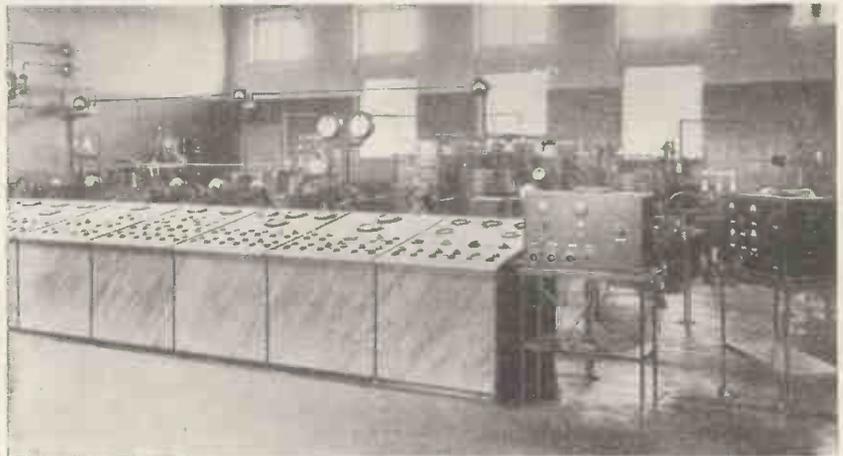
Baumann, the famous German radio and gramophone tenor, in the uniform of the "Brown Shirts," broadcasting for the short-wave transmitter.

A programme originating in a Berlin café first passes through the Fernamt to the control-room at the Broadcasting House, and then re-passes back to the transmitter. In the case of a transatlantic relay the programme is taken out to Nauen, or to a short-wave station at Zeesen, and from there it is broadcast by beam across to the receiving station in America.

The next day I mounted the train which leaves the Gorkitzer Bahnhof for Königs Wusterhausen.

Königs Wusterhausen is a delightful little township of some seven thousand inhabitants, and became famous in the eighteenth century owing to Frederick the Great of Prussia's father holding many meetings of his famous "Tabakskollegium" in the hunting lodge.

The town then seems to vanish from history and only appears once



TYPICAL TEUTONIC TRANSMITTER

The 60-kilowatt transmitter of Berlin's Deutschlandsender, showing the modern and compact apparatus which characterises German radio.

again in connection with a cholera epidemic some time in the nineteenth century. Then in 1913 the German army's wireless company was stationed at Königs Wusterhausen, and the hill where the first transmitter stood became the "Funkerberg."

After the war the German Post Office took over and Königs Wusterhausen became the Hauptfunkstelle Königs Wusterhausen. One of the officials there, Mr. Schwartzkopf, took up experimental broadcasts in 1919, and the first "concert" was broadcast in 1920.

At that time the waves used were between 2,700 and 2,800 metres. The very first transmissions took place with a Poulsen arc transmitter, and valve transmitters followed shortly after.

Herr Schwartzkopf is now the engineer in charge of the Deutschlandsender at Zeesen, and I am indebted to him for many interesting historical details.



An official in the Berlin "Fernamt" is here arranging a relay to the U.S.A. of a German programme.

At Königs Wusterhausen I again encountered that ominous slip of paper which I duly signed about photos. Organisation is the German's strong point, and one request at the Ministry had smoothed and prepared everything for me.

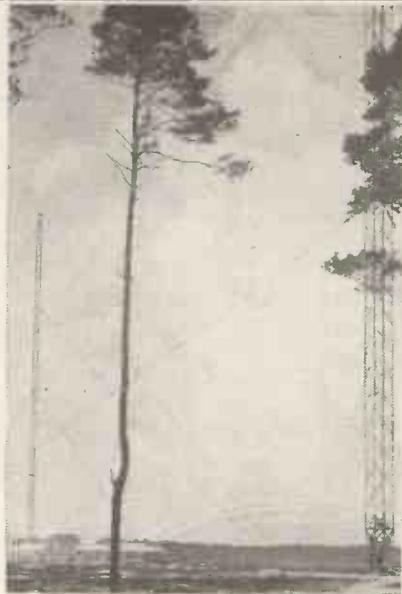
I saw the room, now used for office purposes, which in 1920 and later was used as Germany's first broadcasting studio before the opening of the official service in 1923. Then an



Lydia Binder, the announcer for the special short-wave broadcasting station, announces in German and English.

engineer took me over to "House No. 3," where the first Deutschlandsender, the 20-kw. transmitter, still stands.

I tried clambering up the famous central mast at Königs Wusterhausen which is 265 metres high, but I must say after having had a good look round the country from 50 metres I preferred to go down again as I still wanted to go over to Zeesen that day.



ROUND THE LONG-WAVE DIAL



With notes on stations at the bottom of the long-wave list, which are not usually logged.

WITH the coming of Radio Luxemburg as a regular high-powered broadcaster, people have been paying more and more attention to wavelengths in the neighbourhood of 1,000 metres. And many listeners are waking up to the fact that although the long waveband is commonly supposed to cut off there, a number of interesting stations are, in fact, to be found below the 1,000-metre mark, sandwiched in between medium and long waves.

These "in-between" stations include a second Budapest station, called Budapest No. 2 and located on 840 metres; a number of interesting Russians, testing vigorously with a view to powerful operation in the autumn; and the new Swiss regional station that is officially listed under the name "Monte Ceneri."

Monte Ceneri was built in the Marconi Co.'s works at Chelmsford, Essex, and employs a power of 15 kilowatts.

Officially its wavelength is 678.7 metres, approximately half-way between the top of the medium waveband and the lower end of the long waves. But the engineers have been experimenting with all sorts of other adjustments, so Monte Ceneri is a difficult station to find.

(Amongst other adventures, it has been on 1,140 metres, and also

sandwiched in [between London National and Moravska Ostrava, on 263.2 metres!]

The language used is always Italian.

The old Leningrad station, which for a long time occupied the 1,000-metre wavelength that is now allotted to Moscow, has been working on 857 metres. And other Russian stations have been cropping up unexpectedly in the long waveband itself between 1,000 and 2,000 metres.

Daventry National listeners have sometimes been surprised to hear a "Moscow Trades Union" announcement near the 1,554-metre setting, the allotted wavelength of the Trades Union station being 1,304 metres.

Interference from atmospheric disturbances is always expected to be at its height in midsummer, but so far there has not been excessive trouble from this source.

There have been bad bouts, of course, when real long-distance work

was not worth while; but rarely have the "X's" obtruded themselves when the local station's programme was being received. And in the South of England, at least, neither Luxemburg nor Radio Paris are often affected.

On the other hand, numerous complaints have been made of the disturbances due to Morse stations. Messages in code, aviation reports, time signals and so forth seem to be on the increase, with consequent additional heterodyne whistles in some instances.

Perhaps the recommendations of the Lucerne Conference may do something to clear up this cause of complaint.

Little need be said of the performances of the regular long-wave favourites, as they have all been up to expectations. Neither Motala nor Oslo seems to be quite so good as a month ago, but Kalundborg has frequently proved to be distinctly strong on 1,153 metres. It was expected that the new Kalundborg would be testing on that wavelength by mid-summer.

Warsaw has been a specially interesting station to watch, and a well-situated and sensitive set is quite capable of getting his daylight broadcasts clearly.

They usually start at three minutes to twelve with the famous Cracow bugle-call from St. Mary's Church—generally considered to be Europe's most romantic relay. D.X.

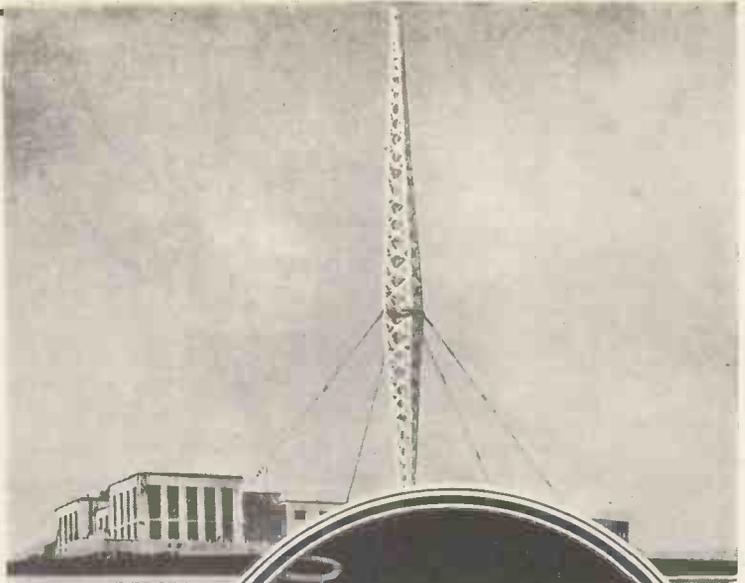


THE MONTH ON THE AIR

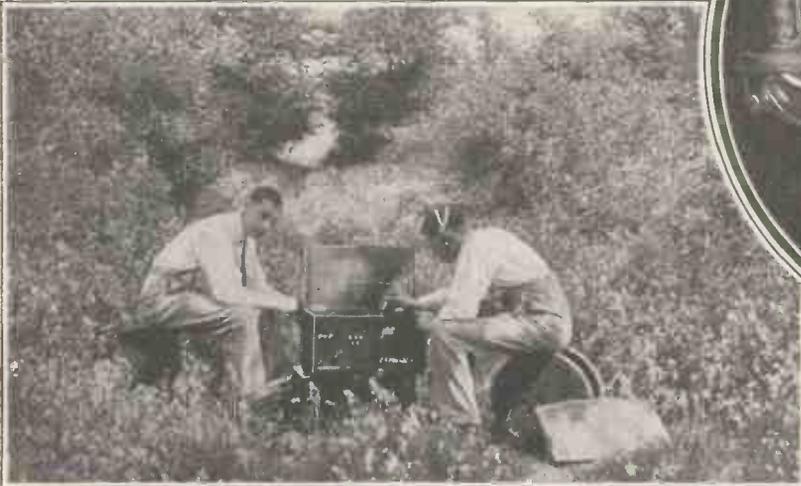
Radio activities pictured during June.

VIENNA (Austria). The mast of the new Austrian transmitter at Bisamberg which was opened officially during the month. The engineers have overcome certain technical difficulties which at first prevented it from being the pride of Austria.

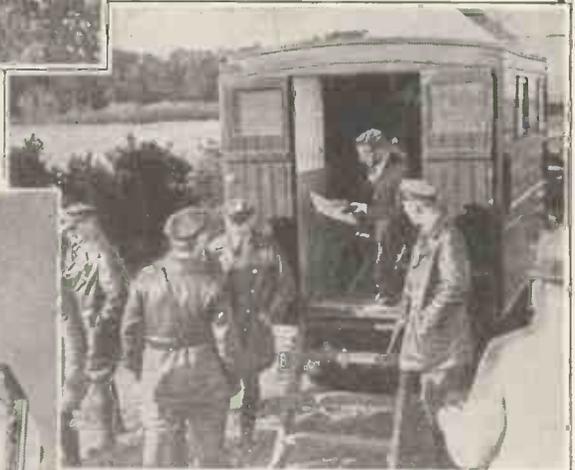
PANGBOURNE (England). A picture which shows (below) that the nightly broadcasts of the song of the nightingale by the B.B.C. are really genuine relays from the woods of Berkshire, and not—as many listeners have written to suggest—"fakes" carried out by means of gramophone records!



LOS ANGELES (U.S.A.). The first broadcast on a new type "mike."



REGENT'S PARK (London). In the picture below, "Cocky," the famous Zoo parrot, is seen making his debut in front of the microphone at a dress rehearsal for the recent Zoo broadcast.



HARWICH PORT (U.S.A.). Kidnapping of famous children has become such a common occurrence in America that a special two-way radio police van is now employed to direct the search for kidnapers.



PROGRAMMES FROM THE CONTINENT



CONTINENTAL listening, under the influence of summer weather, has followed the British tendency for lighter programmes. Some very entertaining evenings have been spent in various countries, among the outstanding programmes being those mentioned here.

AUSTRALIA

Although this should not strictly be included here, it is interesting to note that a plebiscite of listeners has put the radio play an easy first in a programme popularity contest.

AUSTRIA

It is hoped that the Vienna State Orchestra, which has provided some unusually fine concerts during the past month, may be persuaded to attach itself officially to the RAVAG concern, which will please all those listeners who can hear the new Bisamberg transmitter. Austria can always be relied on for good programmes.

BELGIUM

Ketelbey is always the most popular British composer on the Continent, and a recent programme from Brussels No. 1 was devoted entirely to his works. Very good it was.

DENMARK

The concerts which Emil Reesen conducts regularly from Copenhagen are becoming as tuneful and light as our own Commodore Grand Orchestra, and, as such, are to be recommended. Two recent concerts covered the works of Offenbach and most of the "old favourites" in the Viennese waltz business!

GERMANY

The martial tendency is increasing in Germany, and orchestral concerts,

Brief comments on the programmes of other countries during the past month, showing that "foreign listening" is still worth while from an entertainment point of view.

as well as talks, are reflecting it to a great extent. Recent talks included such titles as "U-boat 116"; "The Fate of Germany, 1914-1918"; "Aviation in England," etc., while military marches have been very much in evidence.

Among the lighter programmes a concert of Hungarian Dances and other light numbers by a mandolin orchestra, a gramophone lecture on Modern Dance Music, a report on the Davis Cup-tie between Germany and Japan have been outstanding.



SEWER RELAY!

A German radio reporter enjoying a breath of fresh air after completing an O.B. from the sewers under Munich.

A relay of the King's speech at the opening of the World Economic Conference was also taken.

HOLLAND

Hilversum was responsible for providing the European concert during June, and this was relayed by many of the European stations with much success. The well-known Vara Symphony Orchestra was used for this concert, and I hope that many English listeners heard it.

A performance of Shakespeare's "A Midsummer-Night's Dream" helped to give a home-like flavour to those listeners in this country who tune to Hilversum.

ITALY

Lovers of light operettas will never tire of Oscar Strauss' "The Waltz Dream," and a recent performance of this from Rome was well worth listening to. Even for those who do not know a word of Italian, these performances of tuneful operettas provide no little entertainment. I enjoyed it immensely.

NORWAY

L. du Garde Peach, the British radio playwright, had a sketch of his performed from Oslo during the month. This is one more tribute to British radio plays, which are eagerly sought after on the Continent.

SPAIN

The humorous review of the week, with musical accompaniment, still continues, and I again offer it as a suggestion to the B.B.C. Done in the manner of Flotsam and Jetsam, it would be a most attractive item.

SWITZERLAND

Radio Suisse Romande was another Continental station which included a relay of the King's speech—in the English version—in its programmes.

COSMOPOLITE.



550 METRES AND BELOW

A report on the latest medium-wave listening conditions.

NEVER since radio began has the keen long-distance listener had such a variety of good summer programmes to choose from as that now available.

From the new Vienna station at the upper end of the medium-wave dial, down to 200 or so metres, there always seems to be something worth tuning for, even in daylight. And the really good long-distance set, with two or more H.F. stages, can roam round Europe on an indoor aerial with surprising freedom from the limitations of "summer conditions."

* * *

This good reception is partly due to the higher power now generally used at the transmitters; and partly to the fact that Mother Nature is providing the world with conditions favourable to the transmission and reception of electro-magnetic waves.

(Why such conditions should vary in regular cycles over the years, as they appear to do, is an interesting study, and investigations into the subject are now being carried out all over the world.)

* * *

Vienna's new station at Bisamberg is now working with a power of 100 kilowatts, on 517 metres. With Prague and Leipzig it now ranks as one of Europe's super stations, its power being twice that



of any of the British regionals. As its long wave is favourable to long-distance reception, this is a transmission well worth trying for.

* * *

Another new-comer which has caused considerable interest is Monte Ceneri, the new Italian-speaking Swiss station. The question of the best wavelength for this station is one that is exercising Swiss listeners nightly, and frequent changes have been made from 678.7 metres (the officially-allotted wavelength) in an attempt to get clear reception.

As both Sottens and Beromünster, the other Swiss regionals, have become favourites in this country, it is to be hoped that Monte Ceneri will eventually find a satisfactory position on the dials.

* * *

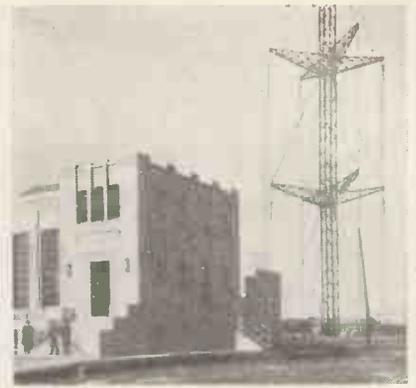
When the very popular Radio Toulouse station was burnt down a month or two ago, and it was learned that another powerful station had, prior to that, been erected in the vicinity and was actually ready for testing, it was naturally assumed that this latter would step into the breach at once.

But France has no national broadcasting system like ours, and consequently the Toulouse listeners are still without a high-power service at the time of writing.

Whatever the rights and wrongs of the matter, it is a great pity that France has not put forward another representative of the calibre of the old Radio Toulouse station, on 385 metres.

* * *

Belgrade is also reported to be trying out a new transmitter. The old Belgrade station, on 430.4 metres, was often clearly receivable in this country in the winter months, even on simple two- and three-valve sets, so we may confidently look forward to good reception from the high-powered successor in the autumn.



Belgrade is about 1,055 miles from London, so we can hardly expect to hear much except under favourable circumstances.

There is now such a wide choice of stations after dark that a better idea of reception conditions will be gained from a consideration of the daylight programmes—of which there is no lack.

On the higher readings, Prague and Brussels No. 1 have been noteworthy, whilst Langenberg continues to put up a remarkably consistent daylight showing.

* * *

Poste Parisien and Hilversum have both been notable because of their consistency, whilst amongst those that appeared and disappeared at varying intervals have been Nürnberg, Trieste, Hörby, Heilsberg, Breslau and Brussels No. 2.

On other aerials no doubt a different list would be chosen, but the above at least indicates how excellent daylight reception can be at this season of the year.

Some Newcastle listeners have had a striking demonstration of the fact that reception is now phenomenally good. They have been surprised to receive the new Hungarian station at Pecs, despite its low power of only 1¼ kilowatts! The wavelength is immediately below Newcastle's, but interference was certainly not expected.

D. X.





Other Peoples' Programmes

No. 7—SWEDEN

Stockholm's Problems—Popularity of Plays—Listening Groups Like Our Own.

No one would be likely to believe, after listening regularly to the programmes of Sweden, that Swedish broadcasting labours under difficulties which might seem insuperable. Sweden, with its fine orchestral concerts, its illuminating talks, and its radio play production which rivals that of the B.B.C., has a broadcasting system which is run under conditions of which even its own listeners are probably unaware.

AN ENTHUSIASTIC OFFICIAL

But there is no sense of depression among the men and women who are responsible for these programmes. They may mention the difficulties in passing, but the trend of their conversation emphasises the future and what it holds.

I had no apologies or complaints from Mr. C. A. Dymling when I met him recently to discuss Swedish programmes and their aims. Mr. Dymling's whole life is bound up in the radio play, and his views on that subject were more than interesting; but he also has the whole of Swedish broadcasting very much at heart, so that the "few questions" which I intended to ask him became a long and, I am glad to say, one-sided conversation which left me envying the Swedes their good fortune.

SCATTERED LISTENERS

There are about 650,000 licensed listeners in Sweden, which holds the proud position of third in the world as regards percentage of listeners to total population. But these listeners (who pay 10 Swedish crowns—about 11s.—for a licence) are so spread over the country, separated by forests

and pasture lands, that no less than ten State-owned transmitters, to say nothing of about twenty other privately-owned stations, are required to provide adequate programme service.

POPULARITY OF TALKS

Problem number one, therefore, is the necessity to use more stations than the B.B.C. owns to provide a service to one-tenth the number of listeners!

In charge of the broadcasting and its problems at Stockholm is Mr. Gustav Reutersvand, the Sir John Reith of Sweden, whose influence makes itself felt in every branch of

cidedly fewer—only about 40 per cent of the total programme time; but as this is accounted for by the fact that a day's items have to be packed into the hours between 5 and 11 o'clock in the evening, it is no great change.

Actually, however, the temperament of the Swedish listener does not suit him to an overdose of music, light or serious, and the quality of the talks on every subject under the sun justifies their accounting for some 20 per cent of programme time.

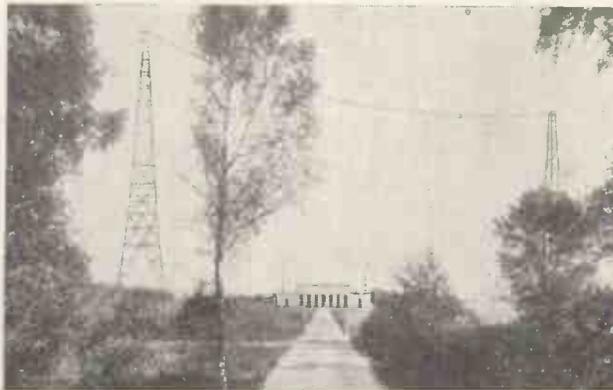
TWO PLAYS PER WEEK!

Incidentally, it is the Talks section which presents to listeners Sweden's most popular broadcaster, Sven Jerring. The first man to speak regularly from Stockholm, Mr. Jerring is in charge of running commentaries and eyewitness accounts of important events; and although he may be likened to Mr. Christopher Stone in manner and popularity, his tall stature belies the comparison!

But no visit to the ether of Sweden could begin to be complete without reference to the radio plays. One hundred and forty plays during 1932 means that nearly three plays a week were on the programme; and, indeed, the Director of Plays makes it a rule to include at least two plays every week.

FIRST RELEASE BY RADIO

These plays are representative of every school of thought in Europe, with America thrown in, and the selection, production, and acting in Sweden make that country the one really serious rival to the radio play activities of the B.B.C.



IN SYLVAN SETTING, the transmitter at Motala is found at the end of a long and picturesque drive, typical of the country which it serves so well.

the service; an influence which has been the main reason for the success of the programmes in all parts of the country.

Many of you will have noted that the main trend of programme policy in the countries of Europe—with the possible exception of Germany—varies very little throughout the Continent. Sweden is no exception from the rule.

The musical programmes are de-

"INESTIMABLE GOOD FOR THE DRAMA"

During 1932 it is interesting to note two points. "Mourning Becomes Elektra," the famous play by the American Eugene O'Neill, was performed in the Stockholm studio before its production anywhere else in Europe. It was only after the broadcast performance that this play was seen at the Royal Theatre, Stockholm. The Director of Plays is confident that such a course, far from detracting from the merit of a stage play, actually increases the interest.

A SUCCESSFUL COMPROMISE

The other point is that no less than fourteen plays by English playwrights were produced during the



A STUDIO at Stockholm, with provision for altering the acoustics by moving the screen at the end. This is one of the smaller studios used for talks, plays, etc.

year. These included such names as John Masefield, Arnold Bennett, Laurence Housman, John van Druten, L. du Garde Peach, Ashley Dukes, and Clifford Bax.

In production, the Swedish officials adopt a compromise between the methods of Germany and the B.B.C., which seems to be most successful.

A SHORTAGE OF ACTORS

At Broadcasting House, London, radio plays are produced in several studios and co-ordinated by a producer at a distant control panel—a producer who cannot see his actors. At Broadcasting House, Berlin, the actors, effects, orchestra and producer are all gathered in one room and the producer takes a very active part in the play!

At Stockholm they use several studios and the B.B.C. type of "mixing panel," but the producer's control room has glass walls which allow him to keep an eye on the various studios. This method has proved the value of the "mixing

panel" for balance and tone, as well as the personal touch which the presence of the producer gives to the play. It is probable that this method is the most successful technically, as well as being the most obvious psychologically.

But even the Director of Plays has his troubles. The lack of actors is one of them.

For two years the idea of a small repertory company was tried, but the ever-present matter of expense meant cutting down the numbers to five or six, and, besides, listeners grew tired of hearing the same voices three times a week! And so this idea was abandoned—but the fact that the majority of actors in Sweden are, unlike the English system, tied to one theatre for a year or more, makes it hard to obtain fresh talent or even any talent at all.

LISTENING GROUPS FOR PLAYS

Mr. Dymling showed me the grey hairs which he had acquired as a result of trying to arrange for actors, rehearsals and new plays 140 times a year!

Unemployment in the theatre industry has helped the B.B.C. to gather together some excellent companies for its radio plays. There is no such unemployment in Sweden, except in small and unimportant centres.

Perhaps the most interesting part of the Swedish radio play are the Listening Groups run in co-operation with the Director of Plays.

The idea of Listening Groups for talks, as practised in England, has long obtained in Sweden, but I believe that they are the first to adapt the idea to radio plays.

LISTENER CRITICS

The organisation of these groups is extraordinary. About 1,200 members belong to some 140 groups, and every month each one is supplied

with a copy of a play shortly to be broadcast, together with suggestions for discussion.

For three weeks they meet and discuss—and at the end of the month they listen to the play. When you remember that there are thousands of people in the country who have never been inside a theatre or seen a play, you will realise the inestimable good which Mr. Dymling and his colleagues are doing for drama.

BASED ON OUR B.B.C.

When Swedish broadcasting started in 1925, it was decided to lay its foundations upon the same ground as that of the B.B.C., which explains the rather extreme similarity in the two systems.

But the difficulties with which those enthusiastic men in Sweden have had to contend make their achievement a really fine one.

The programme department of Sweden, which is kept quite apart from the technical side in the hands of the Telegraph and Telephone Company, is divided into three main heads, music, talks and drama, each under the control of an expert and co-ordinated under the Director-General.



IN MODERN STYLE is this larger Stockholm studio, with its heavy drapings, the result of much experiment in sound effects.

Only a small orchestra of some thirty players is kept in the studio and this is used mainly for light music, the more serious side of this work being taken by relays from outside. Relays of opera from one of the fine opera houses are a frequent occurrence, while occasional acts of musical comedies are also taken from outside.

P. C.

The latest news and views

FOR THE LONG-DISTANCE LISTENER

compiled by our special correspondents
for "The World's Programmes."

SHORT WAVES AND DX

WE are now at that part of the year at which daylight seems to extend from the small hours of the morning until midnight! Let me explain that by "daylight" I mean "daylight conditions" for reception. If we listen to the U.S.A. at midnight, although the sun has set in our longitudes, it is still shining over there, and we have no trouble in maintaining excellent reception.

Even W 2 X A D on 19.56 metres and W 8 X K a fraction of a metre higher up continue to come over at



GERMANY'S FIRST STUDIO opened at Königs Wusterhausen in 1920. It was later burnt out, which gives this photo an historic interest.

good strength until after midnight, when their late schedule is in force.

An outstanding case of "freak" reception has come to my notice during the past month—namely, the reception of tests from Tokio (J 1 A A) on 19.36 metres at 11 p.m. In the amateur band on 20 metres, too, I have heard New Zealand stations between 11 p.m. and midnight—a thing I never remember having logged before.

SUNSPOT ACTIVITY

Conditions have been quite abnormally good since the middle of May, although we are assured that this summer is a period of minimum sunspot activity. We seem to be able to place about as much reliance on these sunspots for radio conditions as we can on them for our weather!

I notice an enormous increase in the number of television and

picture transmissions on the short-waves. Does this mean that our all-too-few broadcast stations are going to be "hashed up" by the familiar saw-tooth noise, or will the television people be allotted separate bands? Personally, I see an enormous future for wide-band television over fairly short distances on the ultra-short waves—below 10 metres; but I cannot say that I am enthusiastic about putting them out on the wavelengths that give them a world-wide range, at a time when there are so few television receivers about.

RELIABLE STATIONS

Readers in search of new countries will find a happy hunting-ground in South America for the remainder of this summer. Between 46 and 50 metres we have Quito, Ecuador (H C I D R) on 47; two Colombian stations, H K C and H K D, on 48.33 and 48.05 respectively; Maracay, Venezuela (the famous Y V 11 B M O) on 48.95; and Caracas, Venezuela (Y V 1 B C) on 49.08 metres. All these stations come over quite reliably in the late evenings.

Below 46 metres we have Riobamba (Ecuador) on 45.31; Guatemala City (T G W) on 45; Bogota, Colombia (H K F) on 39.7, and T G X again on 33.5 metres.

THOSE SOUTH AMERICANS

It seems strange to note all this activity from South America when one reflects that a year ago the only stations being received at all from that continent were Rio de Janeiro and Buenos Aires—neither of them conducting a regular broadcast at that!

Among the newer American stations, those that continue to be well received are Wayne (W 2 X E) on 25.36 and 19.64 metres, and Boston (W 1 X A L) on 25.45 metres. Everyone with a short-wave receiver seems to have written to tell me about the way in which these two are showing up some of the older and more familiar stations!

It is a great pity that there are

not more active short-wavers in the Antipodes. V K 2 M E and V K 3 M E, both in the 31-metre band, are the only two broadcasting stations to gladden our hearts, although several Australian commercials may be heard on 'phone from time to time. V L K (Sydney) is on several wavelengths and is usually so strong that one passes him over as "not worth listening to."

W. L. S.

CANADIAN STATIONS THAT ARE "GETTING OVER" THE ATLANTIC

Until this winter medium-wave Canadian stations were seldom heard in Great Britain, and even now a scarcity of programmes and stations is noticeable from this quarter, despite the excellent conditions now prevailing for North American reception.

Probably the most heard Canadian transmitter is V A S, which is owned by the Canadian Marconi Company, and which broadcasts weather reports to fishermen on behalf of the Canadian Government. Within the last few weeks this station has been received in all parts of Great Britain.

Although normally used to broadcast weather reports, V A S occa-



A LOVE SCENE from a Munich radio play looks a tame affair compared with what we are used to in the "talkies"!

sionally broadcasts musical programmes. Of late it has done so quite frequently, and for this reason has become an extremely popular station, both in the United States and this country.

NOTES AND NEWS FOR THE DX ENTHUSIAST

Persons receiving V A S, which, by the way, is located at Glace Bay, Nova Scotia, should bear in mind that being a station almost solely devoted to Government work, verification cards and stamps are not issued, whilst in all probability it may not verify reception in any form.

Fortunately there is another way of procuring confirmation of reception. Many of the musical programmes broadcast by V A S are organised by one or other radio club, and if the club who puts the programme out is written to, and if sufficient details are given to verify the programme, confirmation of reception will be sent by the club in question.

A "PHANTOM" CALL

Another Canadian station recently heard in Great Britain is C J G C, London, Ontario. This station operates upon 329.6 metres, and at times provides a clear and moderately powerful signal. This station is owned by the Free Press Printing Company, Limited, and verification of reception may be had if an international reply coupon be sent for return postage. For a sum equivalent to 10 cents this station will send a special verification stamp, known in the United States as an Ekko stamp.

From studios in London, Ontario, the Canadian National Railways put out programmes over C J G C, and whilst doing so employ a "phantom" call, C N R L. Consequently, if you hear C N R L you may know that you are really listening to C J G C, for although a different call is used the same transmitter is used.

L. W. O.

A FRAME AERIAL TIP

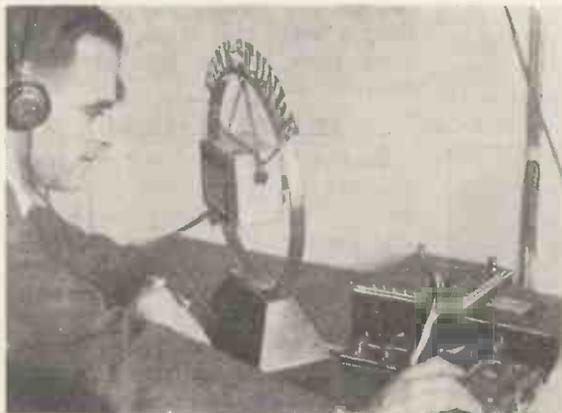
Frame aeriels are still used a good deal, and there is much to be said for them, for they undoubtedly help to reduce the effects of atmospheric interference and add to selectivity owing to their directional properties. The frame, though, is unfortunately a considerably less efficient collector than the average suspended wire, and even when a set contains several stages of high or intermediate frequency amplification it is sometimes found that it is not possible to tune in weak and distant transmissions with it. A great improvement can often be made by earthing

the terminal of the frame which goes to L.T. minus of the set. Its efficiency as a collector is considerably increased in this way, but sometimes, though not always, it loses a good deal of its directional properties.

HANDY STATION-FINDER

Whatever kind of tuning dials you have, one of the most convenient ways of finding your way about the wavebands is to make a little set of tuning cards. Correspondence cards, which you can purchase at any stationer's, do very well for the purpose. Rule each card off into columns for Frequency, Wavelength,

Another very valuable point about these cards is the way in which they facilitate identification of stations. Remember that the dial-distance between stations will not be quite the same for all parts of the waveband if you are using, as you probably are, logarithmic condensers. It is easy, though, to find out what it is for any small patch of wavebands by reference to the settings already filled in on the appropriate card. If you hear a station whose call-sign you cannot pick up, you have only to compare its settings with those of other stations that come in on the same part of the



SHORT-WAVE RADIO INTERVIEW

The first long-distance radio interview was recently carried out between Dr. Rathke (left) in the Berlin studio and von Gronau, the ocean flyer, in Batavia. Listeners heard both speakers very clearly.

SOCIETY INVADED THE STUDIO when Ivia Marshall, well known in London and Paris society circles, decided to make radio announcing and entertaining her career.

Station, and Condenser Settings. Start from the top of the waveband and put in, whether you have ever heard it or not, every station that has a channel of its own. Each card will hold about twenty channels, and seven or eight will cover both the medium and the long waves. Pierce a hole in the top left-hand corner of each and string them on to a key-ring. You can then turn to the one that you want in a moment.

FILLING IN THE CARDS

Fill in right away in their proper places all of the stations that you have so far received and whose settings are known. At first the cards will probably contain many gaps, some of them pretty large. But you will find it surprisingly easy to fill up these gaps with the help of the settings on the card.



dial to make identification easy. Suppose, for example, that you want to find Brno on 342 metres, the easiest method is to narrow down the search by finding big stations above and below it.

The reading for Brussels is, say, 49 and for Strasbourg 51½. Then you know that Brno will be found, if it is findable, at a setting about midway between these two.

R. W. H.

COPENHAGEN, DENMARK. The total number of licensed listeners in Denmark on April 1st was 514,273. This is an increase of some 20,000 over last year's figure.

It is expected that a big rise will take place as a result of the new Kalundborg station and other improvements in the Danish service.

EAST AUSTRALIA. For some reason the Empire Programmes from the Daventry short-waver are badly received in East Australia.

Experiments with a view to improvement are now being carried out.

NEW ZEALAND. During a debate in the New Zealand Parliament on interference with the radio programmes, the Postmaster-General was questioned by an M.P. who had formerly been an announcer.

MOSCOW TRADES UNION. This station has recently been on a wavelength just under Daventry 5 X X, instead of on 1,304 metres. It was then using a power of 500 kilowatts.

AMSTERDAM. The recently issued total of receiving sets in use in Holland was 280,610.

BISAMBERG. The new Vienna station at Bisamberg employs its cigar-shaped mast as the actual radiating aerial, following the system introduced in America.

It is 430 ft. in height, and being on a hill its lighthouse tower signal light (for the benefit of aeroplanes) is visible thirty miles away.

NORWAY. The technical development of Norwegian broadcasting is to be placed in the charge of the Telegraph Service.

BUDAPEST, HUNGARY. A new interval signal is being tried, consisting of a nine-note melody from a popular Hungarian song.

ZURICH. The new Swiss Broadcasting House, which was officially opened last May, is situated just outside Zurich.

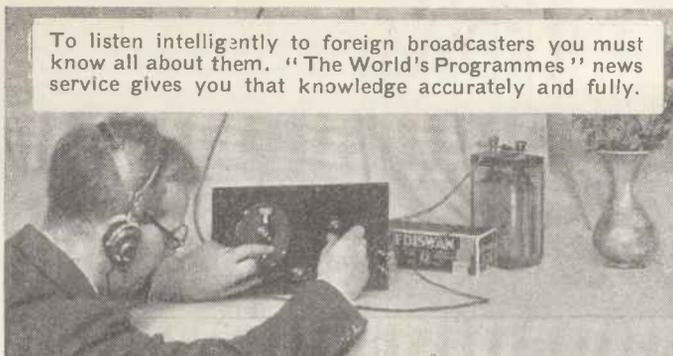
EMPIRE STATION. Tests with Australia show that not only wavelengths but hours of transmission need to be altered to provide a satisfactory service.

The following are the projected hours of service for Zone 1, Australia:

| | | |
|-----------------|-------------|--------|
| July (and June) | 04.30—06.30 | G.M.T. |
| August and May | 05.15—07.15 | " |
| Sept. and April | 06.00—08.00 | " |
| Oct. and March | 07.00—09.00 | " |
| Nov. and Feb. | 07.30—09.30 | " |
| Dec. and Jan. | 08.00—10.00 | " |

(In the time groups the first two figures represent the hour, and the second pair the number of minutes, as usual—e.g. 07.30 = 7.30 a.m.)

INDIA. Reports on the working of the Empire station at Daventry show that the best zone results are obtained in India.



CAPE-CAIRO AIR ROUTE.

To determine the best type of radio apparatus for the "Atlanta" type aircraft on the Cape-Cairo service, a Marconi expert spent six months flying over the route.

A combined transmitter and receiver covering 40/80 metres and 500/1,000 metres was decided upon.

HILVERSUM, HOLLAND.

The official hour of the time signal is 10 hours, 55 minutes, 27/87 seconds

B.S.T. (11.15 p.m. Dutch time).

HELINGFORS. Promising results have followed a campaign by the radio engineers to eliminate disturbances due to man-made "atmospherics."

HOLLYWOOD, CALIFORNIA. The National Broadcasting Company is pushing ahead with the construction of a special studio at Hollywood, in preparation for an expected increase of public interest in television.

PARIS, FRANCE. It has now been definitely decided that French radio listeners shall be subject to a tax, and there is also to be a levy on valves imported into France.

THE REGIONAL STATIONS. At the time of going to press the latest news of the Lucerne Conference indicated that the wavelength allotment for the Regional Stations is likely to be as follows:

- North Regional, 450 metres.
- Midland Regional, 396 metres.
- Scottish Regional, 373 metres.
- London Regional, 342 metres.
- West Regional, 307 metres.

THE NATIONALS. The following are the likely wavelengths for the British National Stations, after the Lucerne Conference "re-shuffle":

- Daventry 5 X X, 1,500 metres.
- North National, 296 metres.
- Scottish National, 295.5 metres.
- London National, 259 metres.
- West National, 259 metres.

BRITISH NORTH-EASTERN STATION.

It is reported that the B.B.C. is contemplating the erection of two new stations, one in Northern Scotland and the other to be known as the "North-Eastern."

HILVERSUM, HOLLAND. The dress-making talks which Hilversum has been broadcasting on 296.1 metres were so successful that about 20,000 listeners applied for the explanatory pamphlet issued in connection with them.

HUIZEN, HOLLAND. Commencing on July 1st, Huizen programmes are to be radiated from Hilversum, and vice versa.

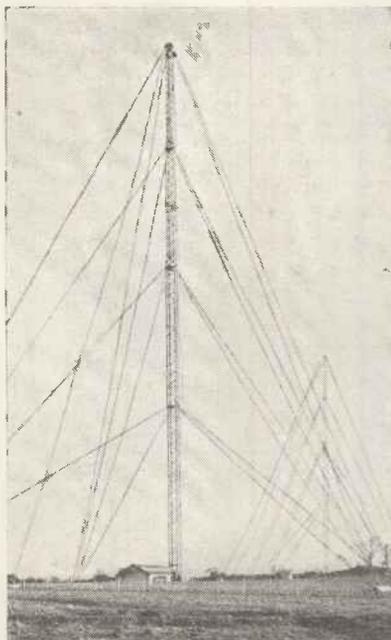
ON FOREIGN AERIALS

News and views about World Broadcasting.

BERNE. The Swiss licence figures which have recently been issued show that 231,397 licences were in force at the end of 1932—a very large increase on the 150,021 recorded for the previous year.

MONTREAL. The University of Montreal has applied to the Federal Government for permission to erect a short-wave educational station on the University's main building in St. Denis Street.

PRAGUE. The famous cock-crow opening call with which Prague commences its programmes on 488.6 metres is not a fake, but is the gramophone record of an actual rooster on a farm at Hostivar.



NEXT MONTH—

"The World's Programmes" will contain a special article about **AMERICAN BROADCASTING**. It will be found in the issue of **MODERN WIRELESS** ON SALE AUGUST 1st.

NEWS FROM OVERSEAS

"The World's Programmes" News Service keeps you up to date with the many additions and changes in foreign station service.



DAVENTRY 5 X X. The new "Daventry 5 X X" transmitter, which is to be erected near Droitwich, will consist of five aluminium units resembling those of the Regional stations. It will not be ready for operation till next year.

BARI, ITALY. A crystal oscillator with temperature control is provided to keep this station exactly on its allotted wavelength of 269.8 metres.

MANCHESTER AIR PORT. The radio equipment installed since May 1st at Manchester is able to keep in touch with aircraft crossing the Irish Sea to Belfast or Dublin.

GRENOBLE, FRANCE. The transmissions on 566 metres, which now go out with a power of 2 kilowatts, are to be strengthened up to 20 kilowatts.

INDIAN OCEAN. Radio low-frequency amplifying apparatus will be employed by the expedition leaving London next month with the object of "plumbing" the Indian Ocean's bed.

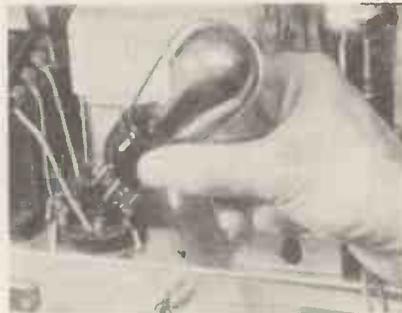
In this type of apparatus a low-frequency impulse is sent from the ship to the bottom of the ocean and reflected back again, the time of transit affording an accurate measurement of the distance.

VIENNA, AUSTRIA. The opening bars of the "Blue Danube" waltz have been adopted as the interval signal for the new Vienna station at Bisamberg (517 metres).

OSLO, NORWAY. The new Norwegian three-year radio plan provides for a total of forty-three broadcasting stations.

XX ON 4 A U. This is the call-sign of a Puss Moth Gipsy plane that is testing the apparatus which will eventually accompany Professor Piccard on his next attempt on the stratosphere record.

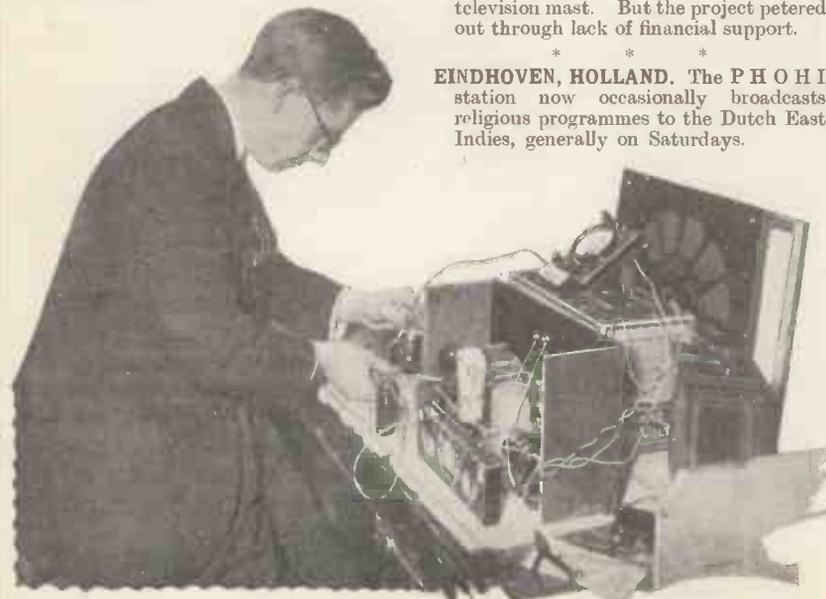
The transmissions have been made on Sundays and Thursdays, between 3 p.m. and 6 p.m. B.S.T.



DUBLIN 2 R N. The decision to reopen the Dublin station to act as a relay of the high-power Dublin programme from Athlone was taken in response to requests from crystal-set users in the I.F.S. capital.

CHICAGO, U.S.A. The original plans for the Century of Progress Exposition at Chicago included a steel tower to provide the world's tallest radio and television mast. But the project petered out through lack of financial support.

EINDHOVEN, HOLLAND. The P H O H I station now occasionally broadcasts religious programmes to the Dutch East Indies, generally on Saturdays.



SCOTTISH REGIONAL. This station was regularly received in India last winter. One listener reported that he could receive it any night, after Bombay and Calcutta had closed.

BERGEN, NORWAY. The 20-kilowatt new Bergen station is to be supplemented by three low-powered relays, to be erected before the end of 1935.

THE STRATOSPHERE. During Professor Piccard's ascent this month, M. Max Cosyns, the Belgian amateur, will transmit from the balloon on 21.4 and 41.1 metres.

CHRISTCHURCH, N.Z. The new transmitter for 3 Y A is rated at 2½ kilowatts, but its power will be increased to 10 kilowatts if this is found to be necessary. The wavelength allotted is just over 525 metres.

THE NATIONAL PHYSICAL LABORATORY. Research on acoustics will be greatly facilitated by the new acoustic laboratories now nearing completion at the N.P.L.

One feature is that ceiling and floor and opposing walls are not parallel to one another, in order to minimise the usual reflection effects.

LENINGRAD, U.S.S.R. As a result of the famous Piccard balloon ascents in Belgium, experiments with radio-equipped balloons are to be undertaken in Leningrad during July.

KÖNIGSBERG, E. PRUSSIA. This station has now adopted an interval signal consisting of a few bars of a well-known martial Prussian song. Heilsberg, which relays Königsberg, will use the new interval signal too, of course.

SARAGOSSA, SPAIN. The police recently ran to earth five unauthorised transmitters who had been spreading anti-Government propaganda.

RADIO EXCELSIOR. The new Buenos Aires station, which was recently completed, has a power of 200 kilowatts. Its masts, in 700-ft. towers, are among the highest in the world.

VIENNA. Now that the new station is in full swing, it is hoped to "rope-in" the famous Vienna Symphony Orchestra as an integral part of the programme organisation.



The Fundamentals of DISTANT RECEPTION

To some, distant reception seems to be just a matter of turning dials and saying, "That's Turin, that was," and then tuning to the next one on the list. To others it is a laborious process of trying to get sense out of a carrier which persists in completely vanishing just when they are on the point of resolving it.

Of course, a lot to do with it is the set. But no matter whether this be a simple single-valver or an elaborate superhet, there are certain fundamental aspects of receiving distant transmissions that must be appreciated if success is to be attained.

GETTING THE RIGHT ANGLE

It is my intention in this article to deal with these fundamental principles themselves rather than their application to specific types of receivers. Those who are new to distant reception as well as the old hand will then be able to get the right angle on the subject, and to know that they are tackling distant reception along lines that are bound to lead to success in the end.

First of all, about the size of the receiver. Let there be no mistake, the more powerful the set the better. It is essential, however, that whatever the receiver, it must be working properly in each stage. It must be absolutely up to scratch and in A1 condition.

A POWERFUL SET BEST

This question of efficient working or otherwise accounts very largely for the much better results some listeners obtain with a small set, over those which others may receive with sets using many more valves. It is easier to be sure that two valves are giving of their best than to be certain that five stages are working properly. And that is the only way

It's no good trying to cover colossal distances unless you are working along the right lines. No matter what your set, there are certain considerations that govern all successful long-distance reception, and they are outlined in this article, which is of vital interest to the old hand, as well as the new-comer, to distant reception.

in which a small set is likely to score over a multi-valver where distant reception is concerned.

ALWAYS WORTH WHILE



Unless you make a log of stations received, you may waste hours and hours identifying the same stations, and you will not know where to tune for the more distant and weaker transmissions.

So, on this point, my advice is to have as powerful a set as you can, but to satisfy yourself that it really is giving the performance of which it is capable.

UNWANTED NOISES

There are quite enough unwanted noises brought in out of the ether, when powerful amplification is in use to bring in stations situated

hundreds of miles away, without clicks, bangs, buzzes and so forth being added by the receiver. But it is surprising the number of unnecessary noises that go to make up the background of many sets, and which tend towards failure even before the dials are turned.

The more silent your background the better chance that 5-kilowatt away down in the south of the continent has of making itself heard. And the biggest culprit where noisy background is concerned is the H.T. supply.

AERIAL EFFICIENCY

Anything you can do to ensure a pure H.T. supply is well worth while. New H.T. batteries, more smoothing in the mains unit, better decoupling, and so on, are items of first importance to the long-distance enthusiast.

Aerial efficiency is inclined to be overlooked in these days of powerful broadcasters. And because a small aerial is often advised in preference to a larger one, there is a tendency to think that any old piece of wire will do.

Generally, the real reason for the advice to use a smaller aerial is to improve selectivity by reducing damping, and to reduce the aerial's capacity. A short but poor aerial, with high resistance and large capacity, might easily counteract all the good done by providing a smaller aerial.

POINTS TO NOTE

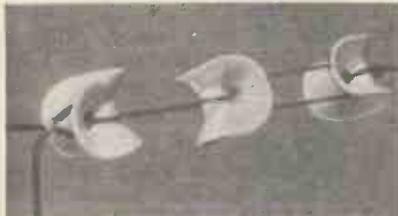
While 100-ft. aerials are seldom desirable, especially in localities near a broadcast station, you should nevertheless try to make your aerial as efficient as possible from the electrical point of view. See that insulation is good everywhere, that the wire is well clear of all earthed objects and that a low resistance type of wire is employed.

NEVER BE CONTENT WITH YOUR SET'S PERFORMANCE!

Your object should be to get as much as your set needs out of as small an aerial as you can. If you can get as good results from, say, Rome, on a 20-foot outdoor aerial as on a 40-foot indoor aerial, then the outdoor one is the aerial to use, for you are likely to find selectivity is better with it.

This conserving of energy in the aerial has a parallel in the set itself.

WATCH INSULATION



Good insulation is a vital factor in all parts of an installation, especially in connection with the aerial. You should make your "pick-up" system as efficient as you can.

There is no point in getting colossal magnification from an S.G. valve if half of it is immediately lost by dust on the components comprising the detector stage. Quite a lot can be lost by dust, so keep the "inwards" of your set as clean as possible.

Quite a lot can also be lost in bad contacts and poor soldered joints. So examine all valve pins, wander plugs and connections to see that they are sound.

TRY DIFFERENT TAPPINGS

Never be content to leave the performance of your set where it is. Always try to improve it. Small items that in themselves seem to make no difference are well worth while if they are improvements, for two or three of them can easily add up into an appreciable increase in overall efficiency. Aim at making every part of the set as efficient as possible.

See that you are using the best tapplings on the coils, and that the coupling condensers and the grid leaks are of the most effective values. Also be sure that H.F. chokes, especially those in anode circuits of S.G. valves, are of really good make. In short, try every little dodge and idea you can think of for getting the most out of each stage.

Now we come to a most important consideration, the use of correct types of valves. Don't be content

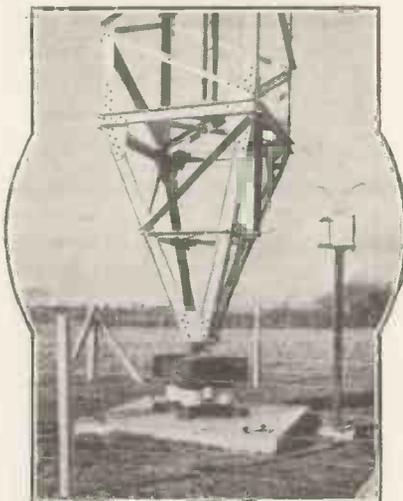
to use any old valves so long as they work after some sort of fashion.

VALVES AND THEIR VOLTAGES

The use of valves with the right impedances and amplification factors is quite important when it comes to getting the last ounce out of a set. So keep to the types of valves that are recommended by the designer.

And not only is it desirable to use just the right valves, but they must have the right high-tension voltages applied to them. You can get results that are passable when running valves well below their rated voltages, but for maximum results it is best to aim at employing the highest voltage permissible. That

AT ATHLONE



The base of one of the masts at the powerful Irish station. Don't be content with hearing powerful stations such as this—go out for the small-powered ones as well.

is, of course, always assuming the set is not specially intended to be used with lower voltages.

Many receivers are equipped with some kind of selectivity control, which in a good many cases takes the form of a series aerial condenser. Unfortunately, in most cases, increases in selectivity entail some loss in strength of reception.

STRENGTH AND SELECTIVITY

For this reason it is wise not to turn the selectivity control farther than is absolutely necessary for the station to be received. The best plan is to vary the control for each station so that the maximum possible strength is always available.

Careful tuning is a most necessary thing if you are to receive really distant, weak transmissions. Too many listeners swish the dials round as though they were looking for the local station.

AUXILIARY CONTROLS

When there is more than one, keep the dials as accurately in step as you can, and turn them slowly, investigating anything that sounds like a station or carrier.

Also, make full use of all the controls on the set. Don't ignore grid-leak potentiometers, or screening-grid potentiometers and similar knobs, but see they are always set to the best positions.

Finally, you will not be listening for distant stations long before you find a log of some sort is absolutely vital. Undoubtedly the best thing to do is to make a graph showing wavelengths against dial readings.

USE A TUNING CHART

With this in front of you, you will not waste time identifying stations you have already identified at some other time. And knowing the wavelengths represented by all the dial readings, you will know just where to look for a new station, or for a station that you have not heard before.

Such a chart—whether it be a home-made graph on squared paper, a Dial Diamond, or a set-manufacturer's chart—assists the listener every time he tries for an unfamiliar station. It forms a convenient permanent record of dial-positions, and

TUNE CAREFULLY

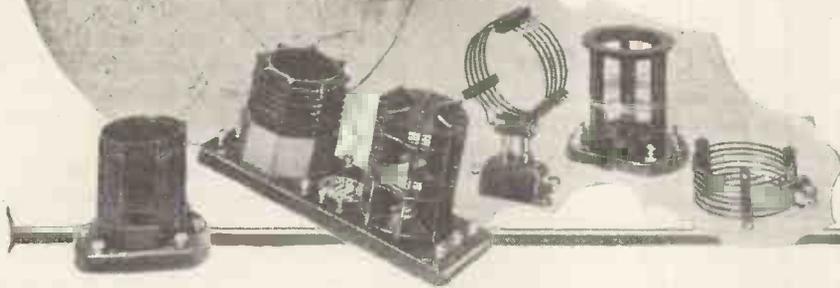


If you swish the dials round quickly you'll miss a lot. Keep them in step and listen intently the whole time, and your log will soon begin to grow.

thus affords a clue to all the wavelengths covered, and to the programmes that may be expected at all the degrees on the dial.

A. S. C.

ON THE

SHORT
WAVESby
W.L.S.

WE have just been passing through one of the most interesting periods of the year for short-wave work. It is strange that the months of May and June, on whatever part of the "conditions" cycle they happen to fall, are nearly always productive of a good crop of long-distance reception. The past two months have been no exception, and although long-distance work has been somewhat freakish, there have been few parts of the world that could not be picked up "for the asking."

Acts as a "Barometer"

I make no apology for referring once again to the 20-metre amateur waveband, which always acts as a kind of "barometer" for the rest of the spectrum. If one hears a Japanese amateur coming through on 20 metres, one can be quite sure that any Japanese broadcasting stations that are on the air anywhere near that wavelength will be coming in extraordinarily well.

One very unusual event has been the reception of New Zealand amateurs on 20 metres *late at night*, all mixed up with the "Yanks," who generally have the band more or less to themselves at 11 p.m. What a pity it is that there are no regular broadcasts from New Zealand. We could do with a few more from Australia, too.

Salient Features

I suppose the trouble is that we short-wave fans are prone to imagine that all these long-distance stations are radiating their kilowatts especially for our benefit; doubtless if there were any great demand for broadcast

No matter what branch of short-wave reception claims your special interest, you will find these pages by our popular contributor make uncommonly good reading.

"W.L.S." combines a ripe experience and knowledge of his subject with a special aptitude for clear writing on the really interesting short-wave topics of the moment.

from the Antipodes on short waves, it would be met.

Salient features of the last two months on the short waves have been the great regularity and steadiness of the North American broadcasters; the improvement in the reception of

the various South American countries—Venezuela, Colombia and Ecuador not being forgotten; and the comparative absence of broadcasts from Africa and Asia.

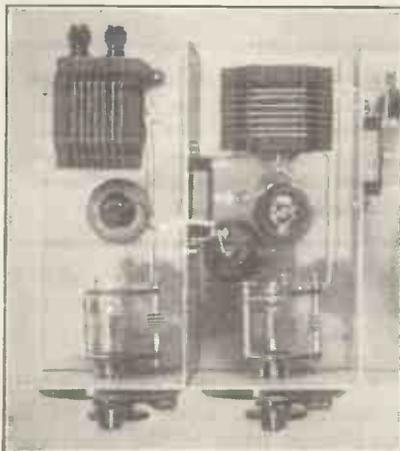
Although the "Popular Wireless" Crystal Palace 5-metre tests are all over and done with (for the present!), there is a considerable amount of interest being taken in 5-metre work. Perhaps the most surprising feature of those tests, apart from the rather amazing results obtained, was the way in which readers of "P.W." made up a 5-metre receiver at two or three days' notice, listened, and duly heard! That just shows how simple the construction and handling of a "super-regen." must be.

Scores of readers had never thought of attempting 5-metre work before May 17th, and yet on the 21st they heard G 6 Q B from the Crystal Palace, their first reception of a 5-metre transmission.

Great Possibilities

They are now beginning to ask what all this 5-metre fuss is about, if there is nothing to listen for at the moment. Well, naturally this band is going to be developed; these thousands of useful kilocycles are not going to be left lying idle for ever.

Personally, I look upon 5 metres as the possible salvation of television and picture transmission. Figuratively speaking, between 5 and 10 metres one has acres of room, as compared with the few square feet into which all the broadcast stations of the world are crammed. This is significant enough on its own, but there is another huge advantage.

USE SMALL CONDENSERS

The tuning conditions on the short waves are not the same as those which hold good on the broadcast bands. Satisfactory tuning can usually only be achieved by employing condensers of low capacity, such as .0001 or .00015 mfd., assisted by well-designed slow-motion dials.

Although there are so many "channels" available on these ultra-short wavelengths, their carrying power is so limited that two stations a hundred miles apart or so could work on identical wavelengths without interference. In this country alone there would be room for thousands of stations between 5 and 6 metres only!

The "Ultra-Shorts"

I have not the least doubt that in twenty years—or possibly ten—we shall find the "ultra-short" playing a huge part in the general scheme of radio communication and broadcasting. Correct me if I'm wrong when 1953 comes round!



One or two regular readers of "M.W." have taken me to task for my apparent neglect of the pentode as a detector for short-wave work. They remark, with some justice, that though I appear to be very keen on single-valvers, I have left severely alone the one valve that should make possible a single-valve set *par excellence*.

Not so, my friends; there is method behind my apparent madness. I find that a pentode detector gives results that are almost indistinguishable from those obtained with the conventional triode detector plus one

"They are now beginning to ask what all this 5-metre fuss is about, if there is nothing to listen for at the moment. . . . Personally, I look upon 5 metres as the possible salvation of television and picture transmission. Figuratively speaking, between 5 and 10 metres one has acres of room, as compared with the few square feet into which all the broadcast stations of the world are crammed."

stage of L.F. From an economy point of view this is all very well; but it only affects those who are making their first attempt at short-wave work. Surely all of us own L.F. transformers and resistance-coupling units? And surely it is more economical (if that is the main point) to use these, together with two triodes that we already possess, than to launch out and purchase a brand-new pentode, which is rather on the expensive side?

Short-wave people, after all, are rather more experimentally-minded than the average man who builds a set for his own amusement, and allows it to "stay put" once it works properly. They delight in making new sets which use up all their old "junk," and rightly so. There is a great satisfaction in making a nice useful set out of a lot of odds and ends that happen to be lying about the place. And in my experience these "odds and ends" don't usually include pentodes.

Easy Change-Over

However, for the benefit of those who are really keen on trying out a pentode detector, let me assure them that all they have to do is to take a single-valver, insert a pentode instead of whatever they are using in the way of a triode, and connect the spare terminal to the positive end of their H.T. supply. 'Phones wired directly in the plate lead of a pentode are quite satisfactory, and if an output choke is used, provided that this is of a fairly high impedance, results will be better still.

To me, one of the charms of a single-valver is its quiet background and its generally "restful" effect. To use a pentode usually means doing away with both of these charms and transforming it into a fair semblance of the average "two."

Short-Wave Condensers

I have also been asked to talk about short-wave condensers. In this department we have been luckier than in most, for quite a number of firms are marketing really nice condensers, specially designed for short-wave work and selling at very reasonable

prices. It is well worth one's while to invest in one of these rather than attempting to "make do" with an old condenser cut down in size.

Nothing bigger than .0001 or .00015 is necessary, in order to cover the more usual parts of the short-wave spectrum in three "bands." A .0001 with suitable coils will give ranges of roughly 18-30, 28-50 and 40-85 metres. Furthermore, the tuning, though admittedly sharp, will not be too difficult for anyone en-

dowed with those grains of patience that are so necessary for success on short waves.

Spread the Readings

Personally, I am all in favour of using a much smaller condenser in parallel with the .0001. Something of the order of .00002 does very well, and the short-wave broadcast bands can then be "spread" over the whole tuning scale of this small condenser.

It is undoubtedly nicer to have your little group of, say, fifteen stations spread over a full 180 degrees than to have to find them all in the space of 20 or 30 degrees. I admit that it isn't necessary, but it is convenient.

After all, I suppose the aim of every one of us is to make short-wave reception as reliable, as convenient, and as "comfortable" as possible. I just can't see the point of view of a man who makes a set, listens on it for months (or perhaps years) on end, and is thoroughly happy without ever wanting to improve it. But then that sort of man doesn't read these notes, or even "M.W."!

POLICE RADIO



The short waves are now being used by the Vienna police, who are equipped with super-portable transmitters. Wireless has, of course, been employed for a long time by the police authorities in this country, the officer in the above photograph—a member of the Brighton mobile police force—being "caught in the act" of receiving a message from headquarters.

Refinements for Trouble-free Reception

Someone asked me a week or so ago whether I could tell him exactly what use was being made of short waves, apart from the well-known aspect of broadcasting. I have been at some pains to find out, and wherever I look I come across new uses for them. Practically all the traffic that used to be handled on the "ultra-long" waves—between 6,000 and 25,000 metres—now seems to be done on the short waves. The "abridged" list of short-wave commercial stations occupies some thirty pages of small type.

Rocky Point's Record

All the big communication companies have telephony stations working between 13 and 80 metres. Rugby alone must have over a score of short-wave transmitters; and as for Rocky Point, U.S.A., you can't count them!

Air Force and Army stations are there in thousands; battleships and liners occupy a fair proportion of the spectrum between 40 and 28 metres; some 40,000 amateur transmitters keep to their closely-defined limits in the regions of 80, 40, 20, 10 and 5 metres.

It seems to me that a fairer question would be, "Who is there that *doesn't* make use of short waves nowadays?" I see that the Viennese police are equipped with super-portable transmitters by means of which they report to headquarters. The League of Nations station at Geneva has seven different wavelengths between 15 and 40 metres. U.S. coastguards and, needless to say, rum-runners think in terms of thousands of kilocycles.

Scientists of the G.E.C. of America predict that ultra-short waves will be used to cure all human ills before long; and another American scientist is convinced that we can communicate with Mars if we use waves of 42 cms.!

"What use is being made of short waves?" Phew!!

Improving the Circuit

I shall be in serious trouble with the Editor if I don't come back to earth and get on to technical aspects again. Two months ago I described a straightforward circuit and proceeded to improve it, giving two diagrams to prove the point. One or two readers have been kind enough to

tell me that, although I referred to the necessity of decoupling, I had omitted it from the second diagram. Too true; the fault was mine, and it was most unfortunate, since it might have given the impression that I didn't think it was really so important after all.

The same readers, however, proceed to "bait" me by telling me that they have made sets without any of the refinements that I suggested, and that they work perfectly. That being the case, they argue, why should they "clutter up the baseboard" with a lot of unnecessary components?

And echo answers, "Why should they?" Obviously there's no need

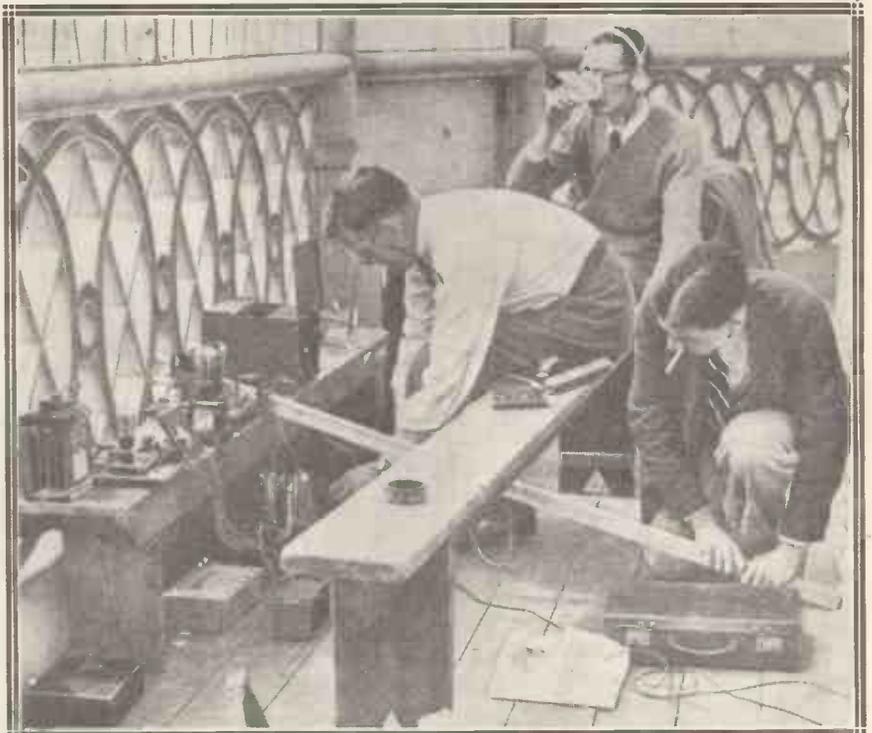
loose connections about the place, together with other undesirable conditions, you will need all these precautionary measures.

On the principle of "It's better to be sure than sorry," I advise everyone to take every possible step to ensure that his set will work first go. Last month's remarks on the subject of layout may be similarly construed.

Hit-or-Miss Methods

There must be hundreds of sets working quite well with the rankest of bad circuit arrangements and layouts; but it's more luck than judgment that makes them work. If anything important hung on the

WORLD'S RECORD FIVE-METRE TESTS



The successful 5-metre tests recently conducted by "Popular Wireless" resulted in the reception of messages over a distance of approximately 200 miles, constituting a world's record for transmission on this wavelength. The transmitting equipment was installed at the top of the North Tower at the Crystal Palace, and in the photograph above we see Mr. L. H. Thomas (wearing headphones), with two enthusiastic helpers getting ready for the tests.

to do so when the set already works well. Refinements of the type I mentioned, however, which include alterations in the circuit so as to get condensers at earth potential, and so on, are to be regarded as precautionary measures.

If you are lucky, your set *may* work perfectly without them. But when you have a long earth-lead, a doubtful H.T. battery, half-a-dozen

ability of those sets to "deliver the goods" with the greatest regularity, they wouldn't pass the censor.

There's no satisfaction in getting good results by "hit-or-miss" methods. On the other hand, I know of no feeling more pleasant than that of knowing beforehand that your set is going to work according to schedule, simply because you have used common-sense in its construction.

A DAY IN RUSSIA

Read this vivid pen-picture of a famous traveller's impressions of Soviet broadcasting.

Miss Rosita Forbes was in Moscow during the trial of the British engineers, and the account of her experiences, full of human interest, is both absorbing and informative.

ment instead of one. Incidentally, the shock-headed youth turned out to be wholly charming. He was a Spanish Communist, discontented with his own revolution because it had been bloodless!

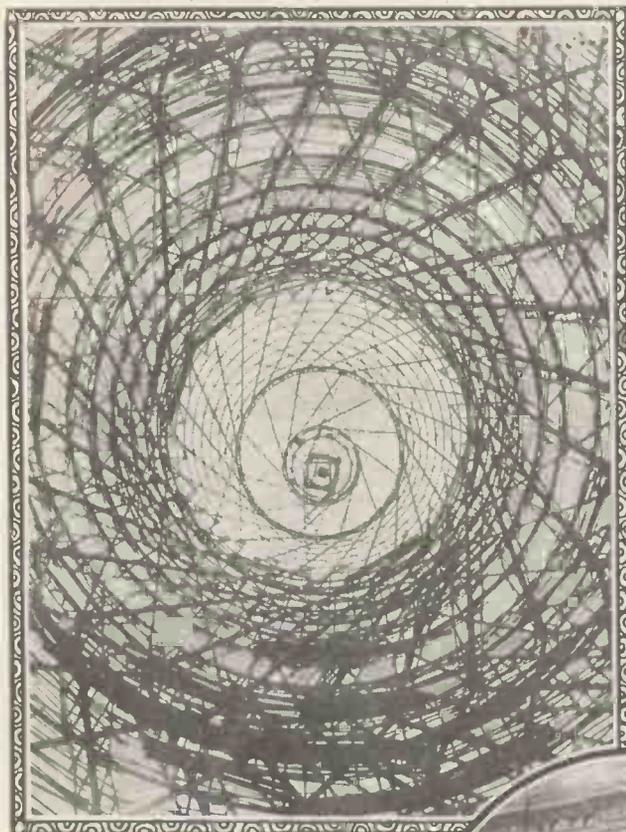
Atmosphere of the Dustbin

I retired to the upper berth, but it was impossible to sleep. The windows had been sealed for six or seven months. Not a breath of air penetrated. The atmosphere was that of a dustbin.

At an hour upon which our watches disagreed, but which was certainly between six and seven a.m. there was a rattle of conflicting sounds, a loudspeaker, hitherto unobserved, emitted a flood of music. This seemed to cheer everyone except myself.

During the next few days in Moscow the things which surprised me most were the ubiquity of the radio, the elusive quality of the rouble, and the spate of talk in which everyone indulged with or without provocation.

In the flat where I was the guest of a Russian married to an American, was a magnificent bathroom. "When we have enough money," said my hostess, "we shall put in a bath." Meanwhile, it was



An unusual view of the great Moscow wireless aerial tower.

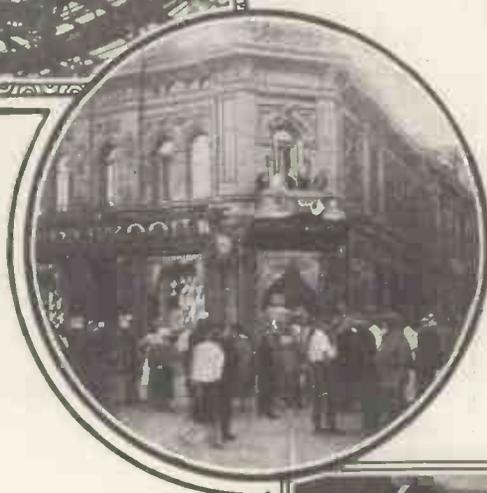
RUSSIA is whole-heartedly friendly towards the individual traveller. "We want to hear all you can tell us—talk, go on talking; don't ever stop talking. We dislike your system, of course, but we like you," is the attitude of everyone on trams, trains and buses; at clubs and cinemas, in cafés, factories, farms, and all the institutions into which the foreigner is led, beguiled or driven in order that he may see how the new Russia is growing.

No Smile for Fifteen Years

Before one leaves England one is assured that once across the Red frontier, nobody will dare to speak to one, and, of course, it is a well-known fact that in the U.S.S.R. nobody has smiled for fifteen years! It was, therefore, rather a shock to find customs officers who giggled at the unexpected contents of my suitcases, and passport officials laughing at my three words of Russian.

It was perhaps less of a joke to find I was expected to share a sleeper with a shock-headed young man full of gold teeth. However, nothing could be done about it. The guard seemed extremely surprised when I objected.

If I liked, he explained, I could travel "hard" and then I should probably have three men in the compart-



This peasant is listening in a remote Siberian village, and in the circle is depicted a typical Russian street scene.

WITH THE RADIO

by ROSITA FORBES

necessary to walk to the end of the corridor, borrow the communal bathroom key from its guardian, invent a plug out of the largest available cork, and wash—to the sound of the neighbour's wireless—in water that, although as red as Russia, was agreeably hot.

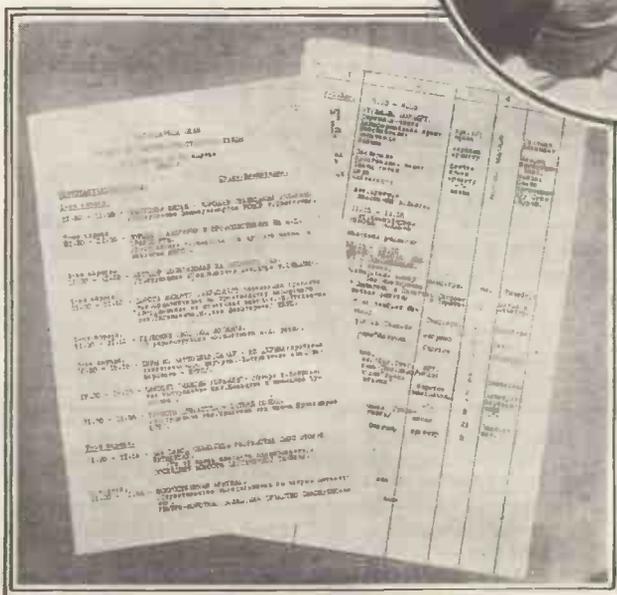
Alternative Confessions and Denials

Breakfast—mine, in any case—synchronised with the re-opening of the British engineers' trial at the Trades Union Hall. The loudspeaker told us all about it.

One of the Englishmen was asserting—in front of the microphone which stood between the prisoner's dock and the table whereat a puzzled and sometimes exasperated Prosecutor strove to disentangle alternate confessions and denials—"I came into this court an honest man and, whatever the verdict, I shall leave it an honest man." The sentiment was true and it sounded true, even mixed up with a measured pat of butter, dark bread, currant jam and thin acorn coffee.

From the sixth storey flat in a scarcely finished building, one of a host which testify to the exuberant growth of the capital, I walked to the Free Market. Loudspeakers attached to telegraph poles, or to the corners of houses, poured information on to the shawled heads of the pedestrians.

THE DAY'S PROGRAMMES. Some of the printed sheets handed to Miss Rosita Forbes, and containing details of the broadcasts from Moscow.



FOR YOUNG AND OLD. The Soviet Youth Associations are keenly interested in radio (left), whilst the older members of the community find in it a means of overcoming the isolation of Russia's great distances.



Trams so crowded that the passengers appeared to be compressed into a dark-coloured mould, passed in endless procession. The cars were scarcely noticeable among drays, trucks and lorries full of soldiers. Wherever a queue waited in front of a stall to buy cigarettes or newspapers, or in a more solid wedge spread,

sometimes for a hundred yards, in front of a food-shop, the radio furnished "culture and education."

Comments on the Plan

Here its aim is in accordance with the intensive purpose of the U.S.S.R., in which vast aggregation of peoples and territories nothing exists solely for amusement. The newspapers have eliminated sex, crime, sport, fashion, and advertisements from their pages. The radio follows suit. Its programme is divided into three main sections, music and literature, in which the first predominates, education which includes lectures and discussions on every possible industrial and agricultural subject, and news. Under the last heading come explanations and comments on the working of the Plan.

In the Free Market, a vast building with an arched glass roof, a mass of rather drab humanity, pale-skinned

How They Listen to the Soviet Stations

after their winter behind sealed windows, shapeless in their thick, wadded coats, with goloshes over lamentable shoes, or felt boots hiding harsh-coloured cotton stockings, listened to the news which poured out of a succession of loudspeakers. It was still the Trial.

Vishinsky, the Public Prosecutor, was—perhaps of set purpose—attempting to goad the Englishmen into the sort of defence which would justify a nominal sentence, but they did not respond. Perhaps, having so well served Russia, they could not realise that their long forged links with her were finally broken.

The crowd was apathetic. It made no comments. It was extremely friendly when we asked any questions of any portion of it.

The Girl with the Knife

The scene before a counter where sturdy, red-cheeked peasants from a Communal farm sold butter at fifteen roubles a pound was more animated. I noticed the girl in charge of the knife generally gave it a good lick before using it, but nobody seemed to mind.

Every type of individual crowded between the sparsely filled shelves and counters, which, by mid-day, were empty except for extravagantly priced "dry goods." Peasants in tattered leather coats and sheepskin hats jostled women with cigarettes between their painted lips, who carried a variety of old household utensils, basins, jugs, saucepans, filled with the result of their marketing.

Rheumy-eyed old men stared wanly at nothing at all. A boy in rags was trying to sell a string of fungus. There were tragic figures which seemed to be held together with string beside women in cheap fur-trimmed coats and solidly dressed townsmen, shawled heads of factory girls, and a few bright handkerchiefs framing country faces, with here and there a knitted cap, or a serviceable khaki uniform.

Everybody except the most forlorn seemed to be carrying different sized lumps of bread. A fisherman was asking eight roubles for what looked like a small flounder.

It was a veritable mart of life in which all of Russia was presented, from the individual peasant in process of "liquidation," trying to sell a few poor scraps of meat, to the prosperous technician assured of his wages and buying beyond the allowance of his food-card.

"Women of the Revolution"

I spent several interested—not to say enthralled—hours in a Workers' Club attached to a soap factory. The director was an enthusiastic Circassian, distressed because among the most profitable products of the factory was a line of cosmetics, and he was convinced that "the women of the Revolution" should not use them.

"It is bourgeois. It is degrading," he said, and sighed, for in Russia there is complete equality between men and women, so he could not comfort himself with the thought that it was only the inferior female mentality which could find pleasure in such futility!

We took part in an ardent discussion as to the dressing of a play in which French sailors mutinied and gallantly threw their officers to the sharks. We attended a conference in which professors and students reviewed the results of a month of "shock-work" at the university.

We joined in a dozen vigorous arguments about such subjects as "Is Russia more important than the Revolution?" "Can the State take the place of the family?" "What is the value of the individual against the Co-operative?" and so on.

Talks on Everything

It seemed to me that everyone talked at once, that we smoked a lot of tightly rolled Russian cigarettes and drank innumerable glasses of tea, while different loudspeakers emitted folk-songs, or classical music, or talks on everything from the way to clean one's teeth to the electrification of the Ural Mountains. Towards midnight we moved to a room in a students' lodging-house. Inevitably conversation took place to the accompaniment of the radio—I rather think it was the final news bulletin, retailing a succession of disturbances in capitalist countries, for which Rudolph Island in the Polar Circle and other icebound outposts wait with such passionate interest that they send communal and co-operative cables whenever it is not sufficiently detailed.

At last, when I'd ceased to remember the hour, I walked back to the flat where I was lodging. The streets were comparatively empty. As usual I noticed the dearth of policemen. With dismal patience an early morning milk queue was forming in front of a closed door.

I was prepared to creep into the flat so as not to disturb its sleeping occupants. But when I opened the ill-fitting door, I found these had spread and multiplied. Perched on the beds, on the table, still drinking

tea, still talking, were at least a dozen people.

The radio was as active as it is during any other hour of the twenty-four.

No Satisfactory Answer

"Don't you ever turn it off?" I asked my hostess.

"Well, I don't know. Ivan always works better when it's on." Ivan was, at that moment, doing what looked like abstruse geometrical calculations. "And I don't seem able to get to sleep without it. We're used to it, you see."

"How often do you really listen to it?"

I never got a satisfactory answer to that question.

THE MOSCOW TRIAL



A scene during the concluding stages of the trial in Moscow of the six Britons accused of sabotage and espionage. Mr. MacDonald is shown speaking into the microphone.

DO YOU LISTEN through a background of conversation, from early morn till late at night, like the Soviet Citizens in Miss Rosita Forbes' article?

Or do you prefer to show discrimination in your listening? To follow the trend of broadcasting, and to keep in touch with its latest developments, you should regularly read **MODERN WIRELESS**.

FAULTS I HAVE FOUND



by a
SERVICE ENGINEER

I WONDER if any readers have experienced the rather unusual fault on a radiogram that is rightly termed "microphonic pick-up"?

I have only met the trouble on two occasions, but when I first came up against it I found the symptoms extremely puzzling.

"Microphonic Pick-up"

You will only meet the fault on alternating current models which employ induction motors to drive the turntable, for the root-cause of the trouble is the extensive magnetic field set up by this type of motor.

The effects of "microphonic pick-up" are unusual and, to say the least of it, distressing.

When the pick-up has traversed about half of a record, and all is going well, a low moaning noise suddenly becomes apparent beneath the normal reproduction.

The noise gradually builds up in intensity and finally attains awe-inspiring volume.

Immediately the pick-up is lifted off the record the noise disappears and the record can be started again; it will play perfectly until the same point is reached, when the identical noise will begin once again.

The Damping Rubbers

The cause of the trouble is that the pick-up moves into the magnetic field of the motor coils when it is about half-way across the turntable; this field is, of course, alternating and, in those certain circumstances that render the pick-up "micro-

phonic," the pick-up armature will vibrate in sympathy with the field variations.

The "certain circumstances" appear to be directly connected with the damping of the armature.

I found that the damping rubbers on this particular pick-up that was so affected were distinctly slack, and that when they were adjusted to give normal pressure on the armature faces, the fault disappeared. It is safe to presume, however, that the damp-

Can you connect alternating current the "wrong way round"?

Without stopping to think this out, I feel sure you will answer that A.C. can be reversed at will without affecting the operation of any ordinary circuit.

An A.C. Surprise

This is generally true, but, like every other "rule," there are exceptions.

I came across one the other day that puzzled me, for I had long regarded A.C. as a type of supply that could be connected in and out of circuit without any particular care or attention.

I wanted a 4-volt raw A.C. supply for a mains set I was working on, and the only mains transformer I had by me had two separate 2-volt windings only.

Obviously, these windings could be connected in series to give the required voltage, so I strapped the two nearest 2-volt terminals together and connected the other two to the receiver.

The valves refused to light up.

Tracing Back

Tracing back for faults in the L.T. wiring that did not exist, I finally applied the test that should, of course, have been the first to be tried; I put my A.C. voltmeter across the L.T. windings of the transformer.

Zero volts!

Fearing an open circuited winding, I tested the two windings separately and obtained 2 volts A.C. from each.

After a few moments thought, it was as clear as daylight that I had

HIS EXPERIENCE AT YOUR SERVICE

This series of really practical articles by a radio-fault-finding expert will prove of the utmost value to our readers. In the course of his duties our contributor meets the most difficult and unexpected problems, and his solutions and experiences are remarkably enlightening.

ing conditions must be such as to cause the natural frequency of the armature to be round about 50 cycles per second—the frequency of the variations of the motor field.

SHUNT-FEED RESULTS



The parallel-feed method of L.F. amplification is one that gives excellent results, provided the correct values of anode resistance and coupling condenser are used. In the event of a fault occurring on this side of a set, these two components should be tested to see whether one of them has become defective.

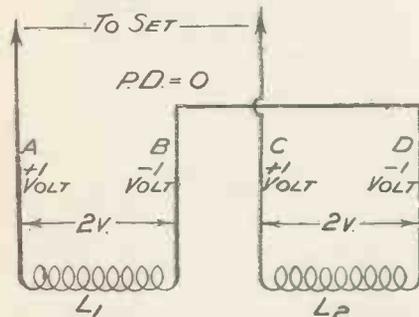
connected the two windings in opposition, so that the two 2-volt supplies cancelled each other out.

I have shown this diagrammatically on this page.

The two windings are shown as L_1 and L_2 .

At a given instant, the voltages at the terminals A, B, C and D will be as shown.

THE WRONG WAY



When the windings were connected like this, the A.C. voltmeter gave a zero voltage reading.

In connecting the two windings together at random, I had joined terminals B and D together and lead off to the set from A and C.

Supplies in Series

Now A and C are at equal + volts at the given instant, so that the difference in potential between them is zero.

Hence the tears.

The correct connections are shown underneath where B and C are linked; the circuit now resembles two ordinary supplies in series.

(These figures will, of course, obtain for one particular instant only, for we are dealing with A.C.)

If you care to go to the trouble of putting the reversed figures down, however, you will find that the differences between the voltages at the various terminals will remain the same—i.e. zero volts for the top connections and 4 volts in the case of the correct connections.)

Overhauling Loudspeakers

My experience has been that every moving-coil speaker requires an overhaul and a thorough cleaning at least once a year; apart from anything else, the continual vibration to which the coil is subjected is bound to produce rattle after a long period.

One of the great disadvantages of D.C. mains for wireless work is that relatively high currents can be taken through the circuit without any danger signal to warn the listener that all is not well.

One of many such cases, I recall,

occurred in a most inaccessible part of the world—a fact that increased the complications and, of course, the cost of servicing—where a four-valve radiogram was installed on a D.C. main.

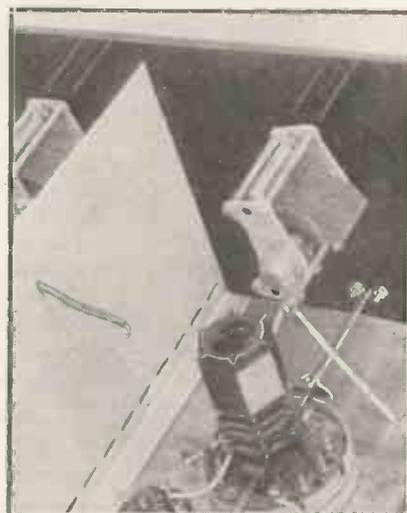
A Burning Smell

A letter was received stating that the receiver had stopped working suddenly following a "slight smell of burning" from the instrument.

Enclosed with this letter was a very charred anode feed leak which, it was stated, had been found on the floor underneath the set.

Accordingly, a service engineer started off for this remote region equipped with suitable spares, including, of course, the type of leak that had been returned.

AN IMPORTANT POINT!



In sets which have the S.G. anode lead passing through a vertical screen it is important that the lead should be well insulated. This is because the metal screen is earthed and since the anode connection goes to H.T.+, faulty insulation here will cause a short circuit.

After spending almost a whole day travelling, he arrived.

When the back of the cabinet was removed, he found to his horror that the whole receiver chassis was a charred mass and was quite beyond repair.

Inquiry elicited the information that the burning smell had always been noticed faintly, but the owner had been informed by the dealer who sold it to him that it was probably the new paint burning off and that it would go away in a short time!

Shorted to Earth

The real trouble undoubtedly was that there had been a partial short circuit to earth that had been causing an abnormally heavy current to flow through the wiring of the receiver.

This had caused the wires to get hot and, after a time, the insulation had scorched through; after that, of course, it was but a matter of minutes before a real and complete short circuit occurred.

In this case, it is true that the "burning smell" should have proved an effective warning that a fault existed; but one can forgive the dealer's optimistic trust in the "new-paint" theory, for his customer was more than fifteen miles away!

In the first articles of this series you may remember that I described a simple test for checking the performance of moving-coil speakers at full volume; it was simply to listen very close to the speaker with your fingers pushed hard into your ears.

Such a test, as I mentioned at the time, is almost sure to reveal unpleasant scratching noises and rattles for, even if the speaker is not actually overloaded, there may be a very slight slackness between the coil and the cone, or maybe in the turns themselves.

Fixing Loose Turns

In such circumstances the service-man must dismantle the speaker and remove the coil and diaphragm.

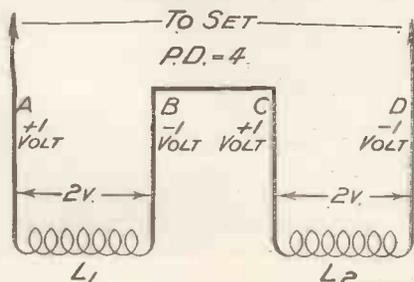
The looseness will probably be too slight to be noticed, and it is not advisable to probe about too much in case he does some damage.

But if he lightly coats the coil and the points at which it joins the cone with warm shellac, the trouble will have disappeared by the time it is dry.

Only a very thin coating should be put on; the best way is to dip the finger in the shellac and gently rub it over the windings and other possible hiding places of trouble.

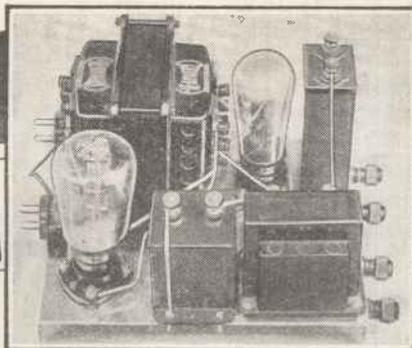
Whilst the cone is drying after this treatment, it is a good plan to look around for other possible faults; they may not have been apparent when the speaker was running, but there may be trouble stored up for a later day.

THE CORRECT METHOD



When the transformer windings were joined up as shown above, the A.C. voltmeter read 4 volts.

The SAFE LAG



MAINS UNIT

PROBABLY all my readers are familiar with the pause that occurs between the switching on of a mains set and the gradual arrival of broadcast reception from the speaker.

Possibly many have at one time or another been somewhat annoyed at the half minute or so of delay, especially when they have been eager to hear what was being broadcast.

That delay, as you know, is caused by the time taken for the cathodes of the mains valves to heat up sufficiently for electron emission to commence, and it occurs in all sets using indirectly-heated valves.

When You Switch On

But it does *not* occur in the majority of the mains packs associated with those sets, whether the packs be external or integral with the receiver design. And therein lies the possibility of serious trouble.

Consider what happens when a mains set is switched on. If it is a D.C. set, the full voltage of the mains (up to 240 volts) is applied to the cold valves, and as they heat up so they take anode current, causing slight voltage drop in most circuits due to the circuit resistances.

That is all quite in order. But with A.C. sets it is different.

Unless the power pack has an indirectly-heated valve rectifier—which is an unusual state of affairs so far, there being few types of such rectifiers yet available—as soon as the power is switched on the rectifier starts to operate *with no load on its output*.

Peak Voltages

The immediate result is a peak of voltage which may reach some 105 or more volts above the working voltage of the valves in the set, especially if the power unit is designed to be fed to the set via a loudspeaker pot winding.

In such a case it is common to use a power pack capable of giving about

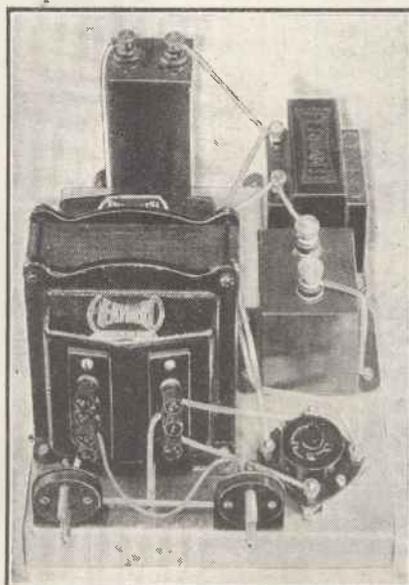
Designed to give an output of 50 milliamps., this efficient trouble-free little unit is eminently suitable for use with all-mains A.C. receivers employing up to four valves. The special vacuum delay switch automatically connects the heaters when the heaters reach their working temperature.

Designed and described by The "M.W." RESEARCH DEPT.

350 volts at 50 milliamps., the working voltage of the last valve being 250, and the 100 volts being dropped under load through the loudspeaker pot winding. This unit used *unloaded*, as it is—while the valves of the set are heating up, will probably give a peak voltage of 500!

That would not be harmful if the condensers in the unit and the set were designed to withstand such a voltage. But high voltage condensers are expensive, and it does seem a

EASY TO CONNECT UP.



The two two-pin plugs at the back of the chassis go to the mains and mains switch on the set. The plug nearer the valve holder is the one that connects to the mains.

waste to use 500- or 750-volt working condensers for a set that is to work on 250 volts!

A Solution

The obvious way out of the trouble is to heat the set valves up first, and then switch on the mains unit. Simple, perhaps, but not a pleasing idea from the operation point of view. Who wants to have to wait by the set and time the valves as they warm up prior to operating a second on-off switch?

As usual, an alternative method was devised, apart from the indirectly-heated rectifier already mentioned, and that was the thermal delay switch.

This is a device which operates on the principle of the different heat expansion of dissimilar metals. When a strip of metal (say, brass) is heated it expands. If another piece of metal be fixed firmly to it (say, iron), this also expands, but at a different rate and by a different amount. The result is that the composite bar or strip bends as it heats.

By carefully choosing the thickness of the metal strips and their material it is possible to make the strip bend an appreciable amount, say, a quarter of an inch or more, and the rate of bending can be regulated by the heat applied and the tension of the strip, which is chosen so as to be springy.

Heat Controlled

Now if the strip tends to spring in one direction and when heated to bend in the opposite direction we have all the requirements of an automatic heat-controlled switch. All that has to be done to our strip is to mount it firmly and to place it so that on heating it will bend until it presses against an electric contact, the strip itself being one side of the contact.

On cooling it will gradually bend back to its normal position, assisted by its natural springiness.

By careful design we can arrange that a heater winding taking about 1 amp. at 4 volts shall be wrapped round the strip, and that it shall heat the strip at a predetermined rate. Usually this is arranged so that complete bending occurs in either

is hot, no H.T. is supplied by the mains transformer to the rectifier until the delay switch clicks over.

By this time the valves in the set are ready to draw current, and so the peak voltage so harmful to condensers is obviated, and we can use moderate

switch: the open type which consists of the strip of metal and its heating winding, the strip operating directly on to an electrical contact; and there is the vacuum type which looks like a valve and has a luminous heating element which heats a thin metal spring by radiation rather than conduction.

THE PARTS YOU WILL NEED

| Component. | Make used by designer. | Alternative makes of suitable specification recommended by designer. |
|---|---------------------------------|--|
| 1 Mains transformer | Heyberd type 803 | — |
| 1 Smoothing choke | Ferranti B.10 | — |
| 1 4-mfd. condenser | T.C.C. type 81 | Dubilier, Ferranti, Telsen |
| 1 4-mfd. condenser | Dubilier type L.S.A. | Ferranti, T.C.C., Telsen |
| 2 Valve holders | Benjamin | W.B., Lissen, Ferranti |
| 2 Mains plugs and sockets | Goltone type M.C./9 and L.S./31 | Belling & Lee |
| 4 Indicating terminals | Belling & Lee type B | — |
| 3 Insulating washers for above | Belling & Lee | — |
| 1 Sheet of 16-gauge aluminium, 7 in. x 11 in. | — | — |
| 1 Yard of insulating sleeving | Goltone | Wearite |
| 2 Yards of 18-gauge tinned copper wire | Goltone | Wearite |
| 6-B.A. bolts and nuts, flex, etc. | — | — |

RECOMMENDED VALVES.

RECTIFIER.—Marconi or Osram U.10, Cossor 506B.U., Mazda U.U.2, Mullard D.W.2.
 VACUUM TYPE THERMAL DELAY SWITCH.—Ediswan type D.L.S.1.

Arcing Avoided

This latter type has an advantage over the former in that it is in a vacuum, so that there is no possibility of arcing at the contacts, upsetting the operation of the switch. Arcing often causes a nasty switch chatter, resulting in horrible noises in the loudspeaker of the set in which the delay switch is connected.

Naturally, as the delay switch is to break contact in the H.T. circuit, and also to be operated by current from the L.T. circuit of the power transformer, care has to be taken that there is no great potential difference between the heater winding or element and the metal strip which acts as one arm of the H.T. switch.

This precaution is quite easily taken, however. The provision of such a switch should be borne in

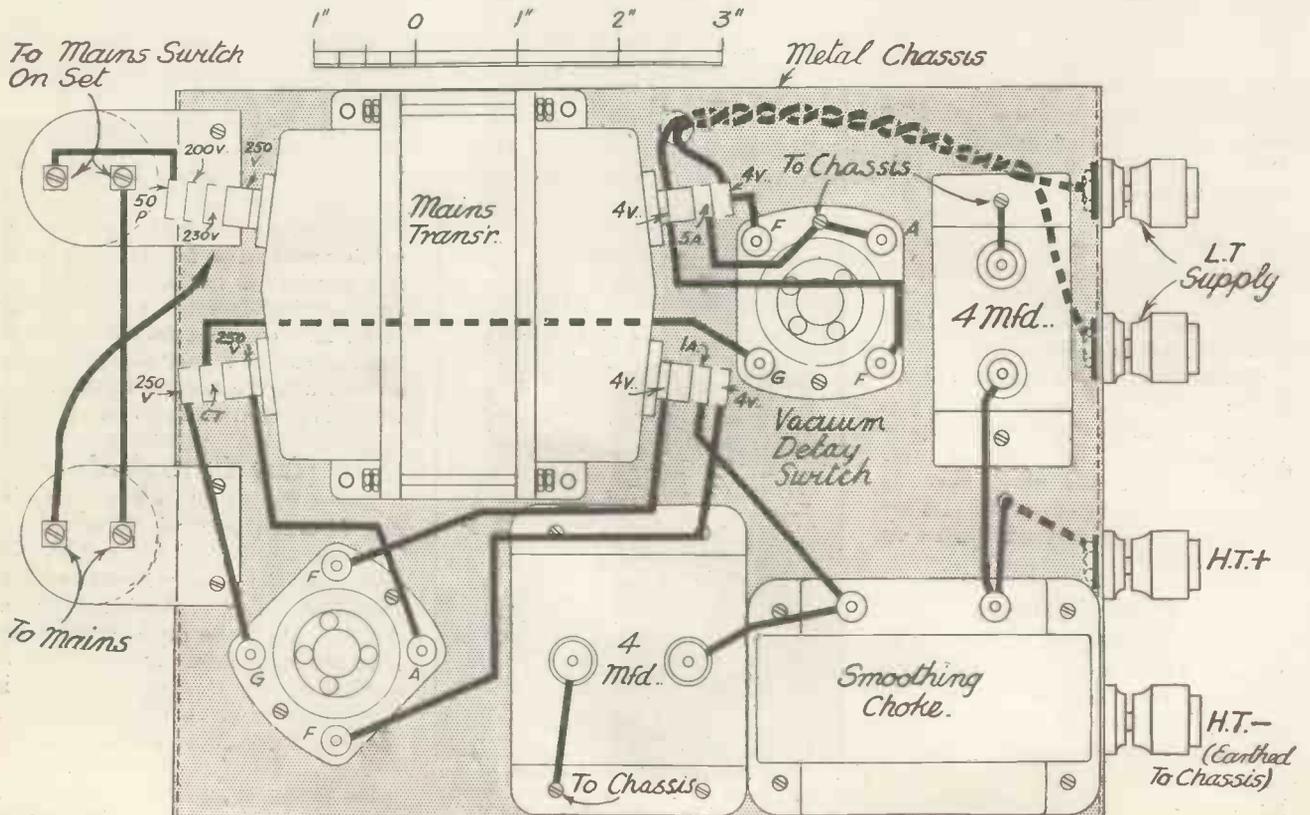
half a minute or one minute, to suit the heating-up times of the average indirectly-heated valves in a radio set.

This thermal delay switch is placed in the H.T. circuit, and though the mains unit is "on" and the rectifier

volume condensers in the set. This means a great saving of expense, for the delay switch costs but seven and sixpence, and protects a number of condensers, not forgetting grid condensers and the like.

There are two forms of delay

Chassis Assembly—Automatic Delayed Switching



The full-wave rectifying valve is inserted in the valve holder on the left. It will be noticed that the mains transformer has two L.T. windings: one for the vacuum delay switch and heaters, the other for the rectifier valve.

A Unit of Proved Efficiency

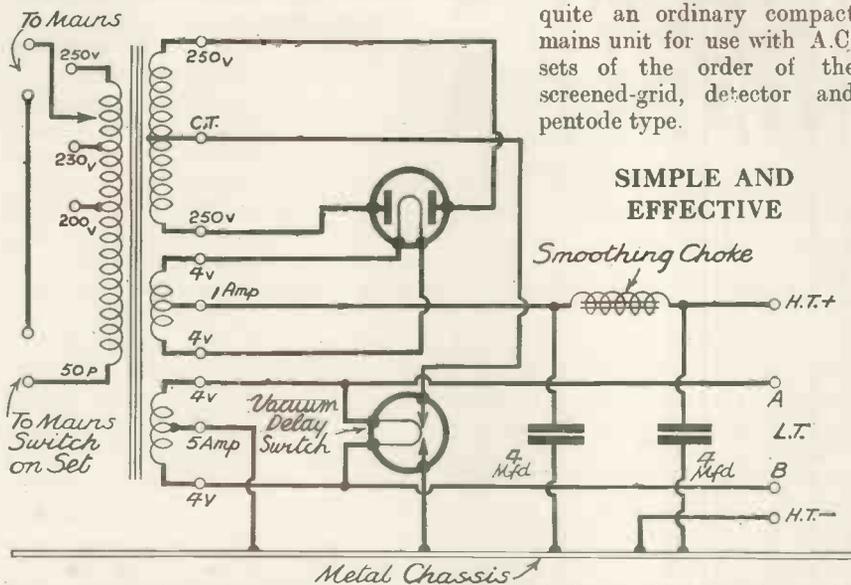
mind when the mains transformer is chosen. If this is done the transformer can be picked so that, besides supplying the requisite H.T. and

delay is also applicable to dry rectifying H.T. supplies.

The particular example of its use with which we are concerned is in quite an ordinary compact mains unit for use with A.C. sets of the order of the screened-grid, detector and pentode type.

from the L.T. winding supplying the heaters of the set.

Connection to the unit is extremely simple, as is its construction. There are only two H.T. terminals, positive and negative, and the two L.T. terminals complete the output side. Accordingly, any set used with the unit must have incorporated in it the necessary voltage breakdown and decoupling devices for circuits where less than 250 volts are required.



SIMPLE AND EFFECTIVE

Operated from Set

The two input plugs may puzzle some readers. These are joined so that the unit—i.e. the whole power supply—can be operated by a mains switch on the set to which it is attached. The mains themselves are attached to one of the plugs, and the other is taken to the two sides of the on-off switch.

A metal cover should be made for the power pack, unless it is to be stowed away safely out of reach.

The metal cover should either be drilled for valve and switch ventilation and cooling, or else should have a metal gauze top.

And, in conclusion, one word about those H.T. and L.T. terminals. With the exception of H.T.—, they *must* be well insulated with ebonite bushes where they pass through the metal chassis.

The vacuum delay switch is connected so that practically no difference of potential exists between the heater element and the switch mechanism—a very important point in a device of this nature.

L.T. power for the set and the rectifier, it also will provide 1 amp. more from either the set L.T. or the rectifier L.T. winding.

If the extra current is available on the set's 4-volt heater winding, then the thermal delay switch is connected so that it breaks the H.T.—lead. The heater winding on the switch is connected across the L.T. supply to the set, and the two switch contacts are placed in series with the lead from the H.T.—point on the transformer, the centre tap of the H.T. winding in a full-wave valve rectifying circuit.

No Insulation Strain

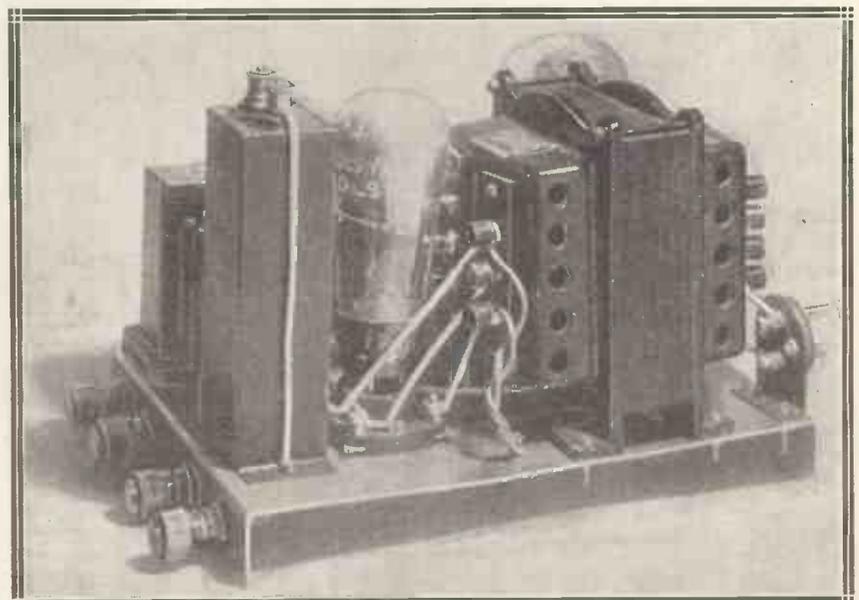
On the other hand, if the extra power for the switch is available from the rectifying valve L.T. winding, the switch must be arranged to break the H.T. positive feed, for it is the rectifier L.T. winding that is the H.T. positive "source."

By these precautions the heater winding of the thermal delay switch is kept at practically the same potential as the metal strip, and no strain on the insulation occurs.

In this article we are concerned only with the application of the thermal switch to valve rectifying mains units, for the "time-lag" unit illustrated here incorporates one of the vacuum type; but the thermal

The unit is capable of providing 250 volts and 50 milliams., and incorporates a full-wave valve rectifier. The thermal delay switch is placed in the H.T. negative lead, so that there is practically no potential difference between the two sections, the heating element being energised

GIVES AMPLE OUTPUT POWER



The two flexible leads shown above go to the L.T. terminals on the unit. The vacuum delay valve can be seen next to the mains transformer, with its two heater leads and also the lead which is connected from the centre tap to the metal chassis.



ROUND *the* TURNTABLE

Danny Malone sings a "duet"—A Neo-Bechstein piano recording
—The latest Garrard pick-up.

By TONE ARM,

THE gramophone companies are hard at it trying to get out original novelty records, and each month the competition is becoming keener. Four-in-one records vie with unbreakables, and other ingenious schemes to attract the public, with the result that value for money is steadily increasing.

A Clever Achievement

The very latest is the starring of Danny Malone, the tenor the B.B.C. is supposed to have "discovered" as a duettist singing with himself. It sounds rather impossible at first, until one remembers the scientific "tricks" that were played with the old acoustic Caruso records, which were re-recorded with new accompaniments.

The success of these re-recordings suggested the application of a similar scheme of superposition of voices on one record in the case of Danny Malone, who has a peculiarly suitable voice for the task.

Malone is capable of singing a high or a low part with equal advantage as regards quality, for his voice has an amazing range of natural reproduction. He does not have the same recourse to what might be called the "head voice" when dealing with high passages that other singers have, for he possesses a really natural high-note reproduction.

The result is that he can sing both the high and low parts of a tenor and baritone duet (separately, of course), and by the combination of the two on one disc the "duet" has been achieved.

Well Worth Hearing

The items chosen for the record are "Danny Boy" (the "Londonderry Air") and a special composition by

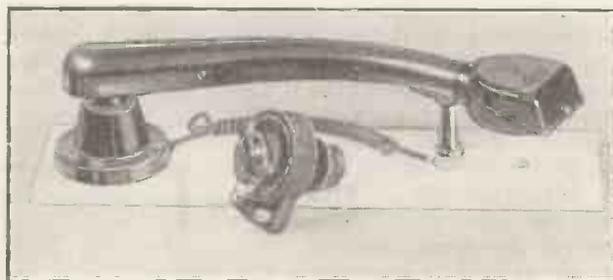
the man who "found" him, Mr. Basil Dean, to commemorate Malone's recent visit to his mother in Ireland, the first visit since he became famous.

Mr. Basil Dean is not the stage producer, so to avoid confusion with that eminent figure of the theatre world he is calling himself Mr. B. Charles-Dean. The Danny "duet" record is worth hearing, and will be of special attraction to radiogram owners who are interested in the technical aspect of it.

I must be excused taking up so much space this month on the subject of records only, but these special types

A MODERN PICK-UP AND TONE ARM

This good example of up-to-date craftsmanship is from the Garrard factory.



that are being turned out are particularly interesting, and have unusual attraction.

Novelty Piano Records

Accordingly I am going to remind dance record "fans" that Duke Ellington, the finest exponent of "hot" music, is in England at the time of writing, and, unless he alters his plans, will for some time be running round the various centres with his band, and possibly broadcasting again as well.

A further novelty record, while we are on the subject, is the playing of the Neo-Bechstein piano on H.M.V. This is the piano that has no other sound emanation other than that provided via microphones and an

amplifier and loudspeaker which are incorporated in the instrument.

Amazing Results

I believe there are something like 18 microphones, each dealing with the vibrations from five strings, and these microphones supply an L.F. amplifier with impulses which are amplified and then converted to sound through the medium of a moving-coil loudspeaker.

The results are astonishing, and effects varying from those of a harpsichord to the swelling of an organ can be obtained. The best record, in my opinion, yet made with the new piano is that of "Young and Healthy" and "Look What You've Done," recently recorded at the H.M.V. studios in London, where a special model of the piano was built for the occasion.

But whatever the record, be it novel or straight in character, it needs a good radio-gramophone to reproduce it. And this entails the use of a good pick-up. Such a pick-up has just been sent to me for test, and I can heartily recommend it.

Excellent Value

It is similar to that used on the Garrard automatic record-changer I mentioned a short time ago, and is made by the Garrard Engineering Co. of Swindon.

The price is 32s. 6d., and at that figure the instrument is excellent value.

It has a very good response, with a bass lift that has been calculated to operate with best results on all normal records without any trace of artificiality.

Each pick-up is supplied with a fixing template, and the makers recommend a 50,000-ohm volume control for their standard model. The price of the pick-up with volume control is 37s 6d.

P. P. ECKERSLEY,

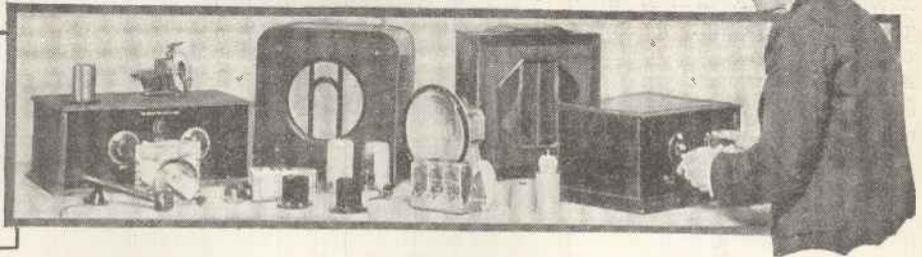
M.I.E.E.,

the eminent engineer and originator of Regional Broadcasting, is "M.W.'s" Radio Consultant-in-Chief. His unrivalled experience in every phase of wireless is therefore at the disposal of all readers of

MODERN WIRELESS

AT YOUR SERVICE

by
**OUR TRADE
COMMISSIONER**



No-Gap Tuning

ANYTHING that saves the radio temper these hot days—I am writing in the midst of a heat wave—deserves the highest commendation. And one of the most prolific sources of frayed temper is that station we want to hear but can't quite get because it is just above (or below) the wave range of our set.

The London Electric Wire Co. & Smiths, Ltd. (conveniently and kindly abbreviated to Lewcos) have decided to abolish this and to make 1933-34 a "no-gap" tuning season. With ordinary tuning coils we get wave-ranges that vary from some 200-220 up to 520 or 550, and then there is a gap to about 800 or 900, whence we run up to 2,000.

This means certain stations lost, depending on the make of coil and to some extent the circuit. And not only are stations lost between the two ranges, but below the bottom of the lower range. Here, as a matter of fact, it is not uncommon to lose one or two of the lower Britishers besides some foreign programmes.

The new Lewcos "No-Gap" series of coils—they are to be used in iron-core form for ordinary sets and also in oscillator circuits for superhets—close up the medium- and long-wave bands, and give with these wavechange switch positions a continuous band of 160 to 2,000 metres.

Without Condensers?

There seems a possibility in the near future that we shall return to the old days with no condenser tuning. It will not be carried out in the same way as in 1924, when variometers were all the rage, but the effect on the set operation will be the same.

The new system, called "permeability tuning" is being developed by Varley, and if reports are correct we should see the first coils before very long. They will be of iron-core type, tuning being carried out by—well, I

Some trade news and views that will prove of interest to readers, whether or not they are connected with the radio industry. Members of the trade are invited to send items of interest or photographs to be included under this heading.

must not give away the secret—a very ingenious method.

Special Supplement

This month we are including a special "Progress" supplement in MODERN WIRELESS, dealing with the latest developments in all sections of radio reception. In this supplement are discussed such things as the new Cossor double-diode multi-mu pentode valve, the latest "Class B" components, which seem still to be fairly raining on us, and new designs in speakers, coils, and so on.

GOOD MATCHING

Portables to match the car are the latest fashion, and these picnickers have an H.M.V. portable in green to correspond with the car's upholstery.



Particularly interesting, though it must be very exasperating to the manufacturer, is the "Class B" position, for in our good old British way the makers of "Class B" valves have agreed to differ as regards characteristics, with the result that the transformer manufacturer has had to put a most complicated range of types on the market.

No doubt the commercial set designer is well served, and he can choose

valves and transformers to match, but the home-constructor is likely to have a bad time trying to sort things out.

R.I. have come largely to the rescue with their "Driver-Mu" booklet which I mentioned last month. I refer to it again because since then two more "Class B" valves have appeared (both different), and without knowledge of the necessary matching data it is impossible to get the best out of a "Class B" receiver.

The "Iron Age"

The next "season" is definitely going to be something of a radio "iron age." The coil market will be full of iron-cored inductances. Ferrocart coils have met with success everywhere, and it was only to be expected that they would not go unchallenged for long.

Consequently we are to be treated

to unusual activity on the part of coil manufacturers, most of whom seem to be busily engaged on the problem of the production of efficient iron-cored inductances.

So far advanced are some of them that we have already received samples for test. Among them are Varley and Igranic coils, and the Lewcos "No-Gap" range I have already mentioned.

In addition, I understand that Colvern Ferrocart coils are to be

For Better and Cheaper Results

reduced in price forthwith, this having been made possible by improved production methods, and the fact that the special Ferrocarril material is being made by the G.E.C. and no longer has to be imported.

"Better and Cheaper Radio"

Such is the title that adorns the latest folder (No. 68) from Clark's Atlas. It is conveniently arranged with folds so that consecutive "pages" overlap the one on top, and the overlapping portions are clearly labelled in black and red, according to whether the page contains details of ordinary or mains components.

Full details are given of such interesting components as the Atlas L.F. transformer, moving-coil loudspeaker, pirtoid tubing, short-wave coils on the black sections of the folder, while details of the many Atlas mains units are provided on the red portions.

The folder is most comprehensive,

penny book which gives the most minute details for the construction of a series of power amplifiers and receivers. It contains 52 pages crowded with interest, and deals very thoroughly with eight amplifiers or sets.

Probably one of the most interesting sections is that dealing with a "Class B" amplifier, which is rated to give a maximum undistorted output of 3,000 milliwatts, using the new Ferranti "Class B" valve, the H.P.2. It is well worth dropping Ferranti a line, and sixpence for this book, for full working drawings, and diagrams are provided for the sets, together with complete lists of components and costs. The address is Ferranti, Ltd., Hollinwood, Lancs.

Seven-Pin Valves

I have been asked by several readers how the various valve pins of the double-diode triode valves are arranged. Here they are: No. 1 Diode,

New H.M.V. Instruments

Continuing their policy of making available new instruments throughout the year, The Gramophone Company announce the introduction of two new models and an improved version of an existing receiver.

The most interesting is a five-valve (including rectifier) A.C. mains superheterodyne radio receiver in a walnut table type cabinet of modern and particularly attractive design, incorporating an energised field moving-coil loudspeaker. It is priced at 15 guineas and is called the "Superhet Selective Five."

Eliminating "Second Channel"

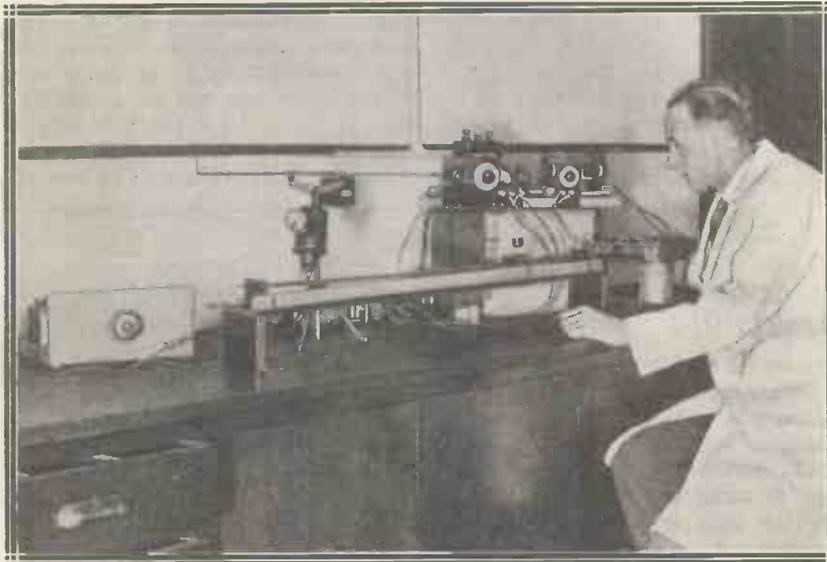
The two H.F. circuits have been specially designed to eliminate second channel or "image" interference for the first time in this class of receiver. This is due to an important invention by a member of the "His Master's Voice" Research Laboratories in the form of the double action "image" suppressor which operates efficiently on the whole wave range.

The chassis of the H.M.V. "Superhet Selective Five" also forms the basis of a new radio-gramophone, the "His Master's Voice" "Superhet Five" Radiogram, an upright instrument in a fine walnut cabinet priced at 29 guineas. The radio arrangements are the same in the combined instrument as in the radio receiver, except that the wavelength scales and controls are mounted on the motorboard.

A new type of "His Master's Voice" pick-up, in which the head and arm are moulded in one unit, is standard on this radio-gramophone. By an ingenious spring arrangement the whole pick-up arm can be raised vertically to facilitate needle changing.

The modification to be marketed by The Gramophone Company is the six-valve superheterodyne portable battery receiver incorporating a moving-coil loudspeaker. It is designated as "The Superhet Portable Six M.C.," Model No. 459 M.C., and is an improved version of the first superheterodyne portable receiver introduced by "His Master's Voice" last year. This instrument was originally marketed at 14 guineas, and provides excellent reception on literally dozens of stations of good quality, with complete transportability.

BRITISH RESEARCH IN RADIO



King's College, London, has now been provided with new laboratories at Chesterfield Gardens, Hampstead. The section shown here is for investigating ultra short-wave transmissions.

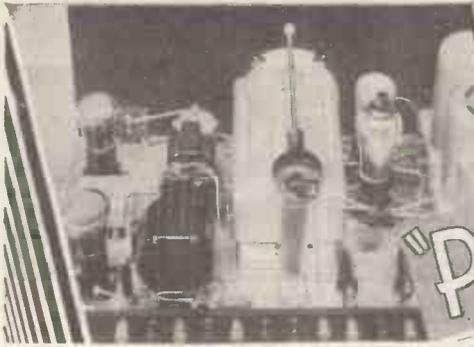
and readily referred to, without being at all unwieldy or awkward in size. It can be obtained by request from H. Clarke & Co. (M/cr), Ltd., George Street, Patricroft, Manchester, or Bush House, London, W.C.2.

Constructional Amplifiers

Talking about folders, let us go one further and have a look at the Ferranti list, Wb. 513. This is the latest edition of a wonderful six-

No. 2 Metallising (if used), No. 3 Diode, No. 4 Heater, No. 5 Heater, No. 6 Cathode, No. 7 Triode anode. The triode grid is taken to the terminal on the top of the valve bulb.

The price of these valves is 15s. 6d., and in the case of the Marconi and Osram models, which have recently been released, the amplification factor of the triode section is about 40, the impedance being some 18,000 ohms or so.



More About the Future of

"POSITIVE DRIVE"

BY

C. PATERSON

A SOMEWHAT jaundiced view of the possibilities of battery "Class B" and a rather premature prediction of the ultimate application of the much-discussed "positive drive" method of amplification. That is my interpretation of Mr. P. Woodward's article in the June issue of MODERN WIRELESS.

But neatly sandwiched between the two is a general condemnation of quiescent push-pull on the grounds that valve renewals, when they become necessary in a Q.P.P. circuit, demand the attention of a skilled technician—it is not simply a matter of plugging in a stock valve, when the question of matching arises.

Those Replacements

Because this Q.P.P. question is more or less incidental to the main issues of the article, I would like to dispose of it first, leaving the decks cleared for the more important matter of "Class B," and I am all the more willing to do this because, in the main, I agree with Mr. Woodward's remarks anent Q.P.P. replacements.

But I think the suggestion that an undue number of service cases will arise out of the failure of one valve in a Q.P.P. pair is sheer pessimism. The man who will call in professional advice on such an occasion is also the man who will call in professional advice whatever the trouble with his set—in other words, he is the absolutely non-technical listener who calls his receiver a "machine," and has not the vaguest idea as to how it works.

Matching Up

As for matching up, I believe that the standard of uniformity as between valve and valve of a given make and type is now so high that it is not necessary to purchase specially matched pairs for quiescent or any other form of push-pull. At any rate, the Mullard people make this statement definitely in their literature concerning triode and pentode valves for Q.P.P.

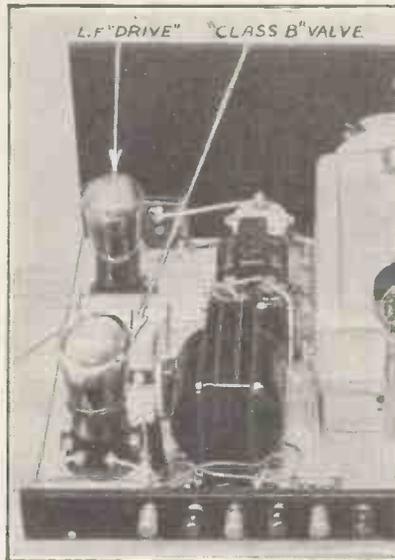
Here is a pungent reply to Mr. P. Woodward's provocative article on "positive drive" which appeared in our last issue.

In putting forward the other side of the question our contributor shows that the "Class B" system does appear to possess very definite advantages.

Of course, some adjustment of auxiliary grid voltage is necessary in the case of pentodes, and the percentage of amateurs who possess a milliammeter is still lamentably small.

But I think we can leave quiescent push-pull to retire, as retire it must, into the obscurity from which, after years of hibernation, it emerged last winter. Serious radio engineers consider Q.P.P. only as a sort of half-

THE MERITS OF "CLASS B"



"With 'Class B' the high-tension current is large when volume is large, small when volume is small, and negligible when no signals are being received. You pay for what you receive and for nothing more, and what can be fairer than that?"

way house to "Class B" which has now completely taken its place. *Requiescat in pace!*

And now to cross swords with Mr. Woodward on the question of "Class B."

I do not think that any manufacturer, and most decidedly any valve maker, has claimed that a 2-watt "Class B" valve is suitable for operation from a quite small H.T. battery. A valve taking peak currents of 50 milliamps. most decidedly needs a fairly big H.T. battery; but it must not be forgotten that peak currents are peak currents—the mean value of the anode current for a 2-watt "Class B" valve fully loaded is nearer 35 milliamps.

Output Rating

But the advantages promised for "Class B," namely, ample power in battery-operated sets for a high-tension current consumption within the economic rating of a small high-tension battery, are still available by the intelligent application of the smaller—1½-watt—valves such as Mullard's P.M.2B.

There seems a terrible amount of confusion about this output rating. The correct way of employing a "Class B" stage is to so arrange the input that the maximum output is obtained only on peak signals—deeply modulated passages which only occur very occasionally.

Under such conditions, the mean anode current of a 1½-watt "Class B" valve is less than 5 milliamps. during the bulk of programme time, rising to some 20 milliamps. on peak signals. Such a drain is within the capacity of a small H.T. battery, especially if a fairly big tank condenser is connected across the H.T.—it will supply the extra power for "squirts"—provided the squirts really are squirts and not habitual overloads.

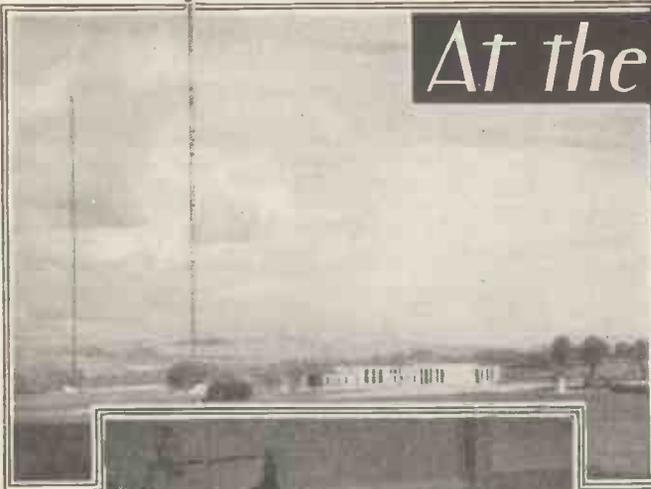
Internal Resistance

The next argument put forward by the "prosecution" is that when the battery, through age, develops high internal resistance, it will not be able to deliver the famous "squirts." Of course it will not! But neither will an old battery give full output with ordinary "Class A"

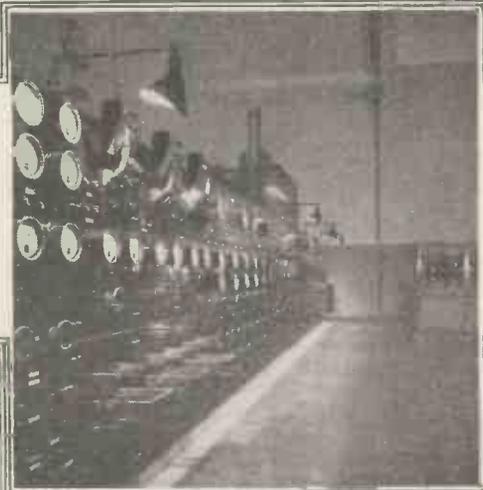
(Continued on page 82.)

At the WESTERN REGIONAL

VIEWS OF THE LATEST BRITISH STATION



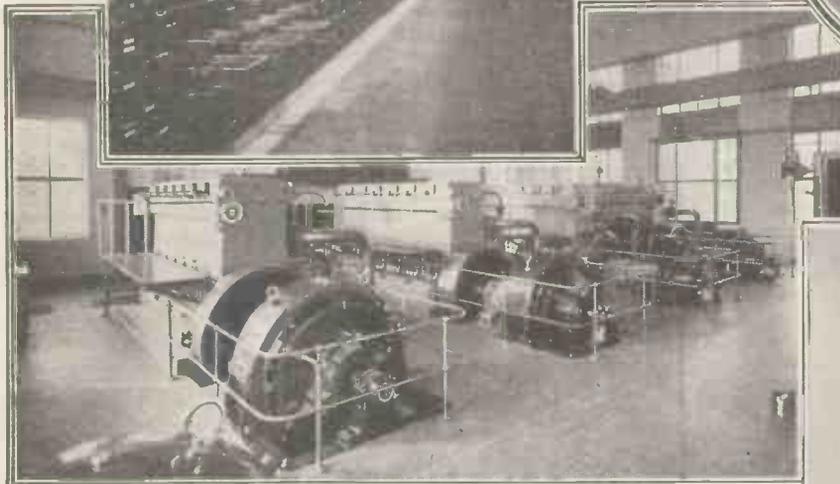
Above: A general view of the new station.



A striking view of the power switchboard is on the left, and below it is the power house, showing the Diesel engines and generators.



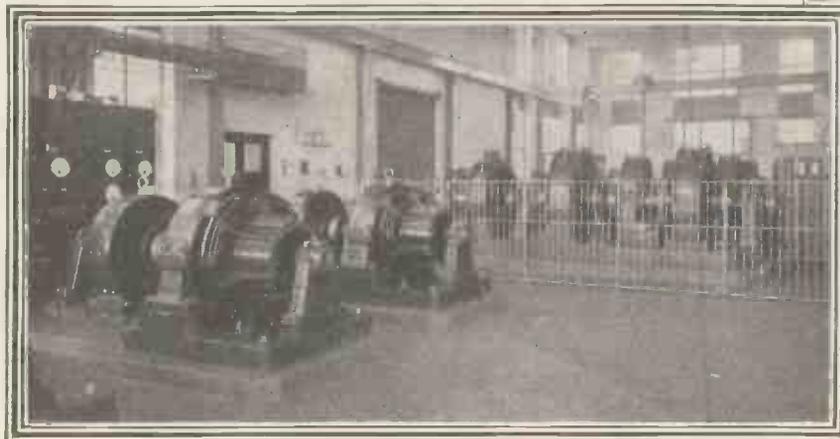
An impression of the main transmitting hall, showing the control desks.



Two of the L.T. generators and the 12,000-volt H.T. generator are shown below.



A programme control desk with amplifier. Note the modernistic chair.



THE "ATTACK" ON TRANSIENTS

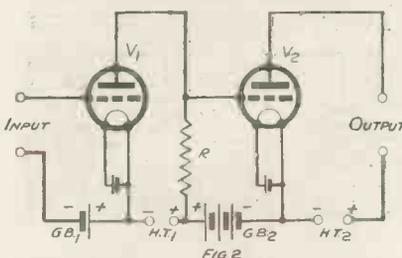
IT is rather curious to reflect that some of the very first circuits for the use of resistance coupling did not employ grid condensers and leaks, but had separate batteries for each stage, somewhat as in Fig. 1. It was at once discovered that there was a serious practical drawback here, in that the voltage drop across the anode resistance R was apt to apply a most excessive negative bias to the second valve.

Grid Condensers

Moreover, no one was anxious to duplicate his H.T. batteries just for the sake of being able to use resistance coupling (H.T.'s cost money in those days), and so we began to use grid condensers and leaks to enable us to apply a suitable bias to the valve from a separate small G.B. battery.

And there the matter ended for quite a time. Most of us tried resistance-capacity coupling, were depressed by the low amplification it gave (high μ valves had not yet arrived), and not much impressed by the quality we got, this last because the mathematics of the R.C. stage had not then been worked out, and we chose our circuit values on hit-or-miss principles, usually getting them nowhere near right.

DIFFICULT TO ADJUST

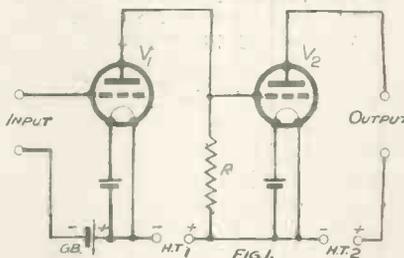


This arrangement is similar to Fig. 1, except for a G.B. battery whose task it is to maintain the grid of the valve V_2 at the correct potential. The scheme, however, has many practical drawbacks.

All about a new method of quality amplification.
By P. WOODWARD.

Later the theory of the resistance-capacity method of coupling was explored fully and the method of making a correct choice of values demonstrated, which, with the aid of higher amplification valves, enabled really good results to be obtained. The use of a grid condenser and leak, of course, was by this time well established, and so resistance capacity

AN EARLY FORM



Some of the earliest resistance-coupled receivers did not employ coupling condensers and leaks, but had separate H.T. batteries.

as we know it to-day became pretty well stereotyped.

Here we became afflicted with the modern curse of measurements of frequency characteristics. In this way it was shown that a good resistance-capacity stage could give substantially even amplification of all frequencies from, say, 50 cycles to perhaps 10,000 cycles, and it was argued that this proved that it gave correspondingly perfect reproduction.

There for some time we stuck, with the theorists maintaining that R.C.C. was sufficiently perfect for our needs. Lately, however, our knowledge has taken another step forward, and it has

at last been realised that to determine the frequency characteristic of an amplifying stage is not a complete exploration of the problem.

Beyond this there is an important little something which is not elucidated by making amplification measurements with a continuously applied input of A.C. of various frequencies. This "something" is the behaviour of the amplifier when dealing with those rather mysterious things called transients.

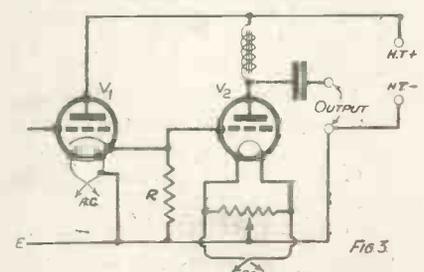
What They Are

These may be visualised as the phenomena which take place when there is a sudden change of some sort in the input of the amplifier, such as when a sudden sharp noise occurs, or one note changes quickly to another.

If an amplifier deals faithfully with transients, such sounds as the sharp ring of the triangle, hand-clapping, and so on, will sound crisp and clear. If it deals poorly with transients, these and similar effects will seem blurred and indistinct.

This is perhaps rather a "popular" way of explaining transients, but the subject is rather an abstruse one, and I am more concerned here with certain of its practical aspects than its theory.

CATHODE COUPLING



Cathode coupling in its simplest skeleton form. It will be noticed that a resistance R is inserted in the common cathode-grid leads of V_1 and V_2 .

To investigate the way an amplifier deals with transients is a far more difficult matter than to determine its frequency characteristic. It really calls for oscillograph methods, and that means laboratory equipment of an elaboration which few people possess.

A MAINS VERSION

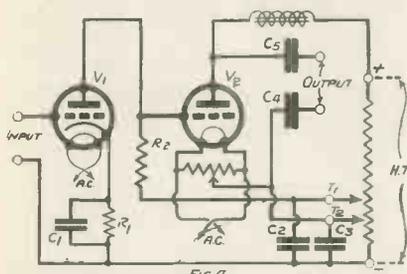


FIG. 4

In this circuit the excessive bias due to the voltage drop across R_2 is partly neutralised by the potential obtained from the tappings on the potential divider across the H.T. supply.

A certain amount of work is being done on the problem, however, and some interesting things have come to light. First, it would seem that any kind of iron-cored apparatus makes it considerably more difficult to handle transients faithfully, so we are confirmed in our suspicion that resistance coupling is the easiest way of getting really super-excellent quality of reproduction.

Of Real Importance

It further appears that there is some hitherto unsuspected possibility of poor response to transients even with resistance coupling, for some amplifiers of this type seem to handle them better than others. Now, this is probably a question which will only be settled after much acrimonious debate, but already there is a feeling abroad that perhaps the grid condenser is not quite such a harmless little gadget as we used to think.

It is true that good rendering of transients is bound up with the reproduction of the really high frequencies of 5,000 cycles and over; but there is most probably more in it than this, and attempts have been going on for some time to devise satisfactory amplifiers using what may be called pure resistance coupling, without grid condensers. There are considerable difficulties involved, but some of the results obtained have been so startlingly good that the subject is evidently of real importance.

How Is It Done?

For example, the amplifiers used in certain London theatres (notably at Drury Lane) for sound effects and

music give such amazingly realistic results that the keen quality merchant has only to hear them to wonder how on earth it is done. The amplifiers in question are known as the "Pamphonic" type, and it is perhaps significant that one of their special features is a resistance-coupled output stage without grid condenser!

Granted, then, that it might be worth while to look into this grid condenser business, it would obviously be possible to try a condenserless resistance amplifier on the lines of the circuit shown in Fig. 2. Here a grid-bias battery has been added to neutralise in part the excessive negative bias applied to the second valve by the voltage drop across the resistance R .

To obtain a correct adjustment of bias in this circuit is rather difficult, and it is really best to do it by trial and error, starting with a very small "backing-off" voltage, and gradually

REDUCES COUPLING

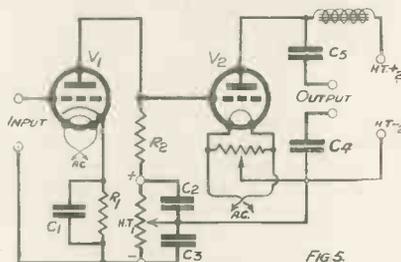


FIG. 5

With this scheme it is easier to avoid coupling effects between the valves than with the Fig. 4 arrangement.

increasing it until the anode current of V_2 rises to normal. The circuit is then capable of decidedly interesting results, but it is rather a dangerous one to try with modern high-emission valves because if any disconnection occurs in the anode circuit of V_1 , V_2 is left with a considerable positive bias on its grid, and is pretty sure to be damaged thereby.

Run from Mains

Since real quality amplifiers are nowadays practically always run from the mains, I propose to confine the rest of this discussion to mains circuits, starting with Fig. 3, which shows what is called cathode coupling in its simplest skeleton form.

This circuit has the advantage that only a single H.T. source is needed, and the secret lies in the insertion of the intervalve coupling resistance R in the cathode lead of the first valve, V_1 . Here the grid-bias correcting device for the second valve is not shown, but it can be inserted in a variety of ways.

A good deal of work has been done on circuits of this type, but they all suffer from what at present seems a fatal drawback: to prevent hum it is almost always necessary to earth the A.C. heater circuit of V_1 , and this results in the voltage due to the drop across R being applied between cathode and heater.

Input Circuits

Unfortunately, present-day indirectly-heated valves were never intended to stand this kind of treatment, and they usually resent it. There are other difficulties, too, notably the very acute one of devising suitable input and G.B. circuits for V_1 , and it is doubtful whether cathode coupling circuits are really practical.

When mains circuits are used the previous objections to extra H.T. sources (or voltage) partly disappear, and so an amplifier like Fig. 4 becomes permissible. Here we have a circuit in which the excessive negative bias applied to V_2 by the voltage drop across R_2 is partly neutralised by a positive potential obtained from tappings on a potential divider across the H.T. supply.

This is a perfectly practical circuit, and represents very much the type of condenserless resistance amplifier now being developed. It is capable of very fine results, and will give the inquiring experimenter quite a good idea of the response to transients which can be got when the grid condenser is eliminated, and it will also serve to demonstrate the absence of the bass restriction which is so often produced by a grid condenser of incorrect capacity.

High H.T. Voltage

It has certain practical drawbacks, notably the need for a considerably higher value of H.T. voltage than usual. Actually, the normal voltage for V_2 must be present between H.T. positive and the tapping point marked T_2 on the potential divider, and that for V_1 must be found between the

FOR THE EXPERIMENTER

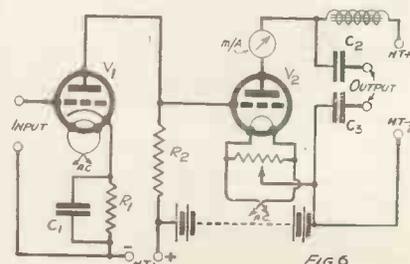


FIG. 6

A practical circuit worth trying. A separate battery is provided to supply the "backing-off" bias for the output valve.

The Secret of Realism is Good Transient Response

negative end of the divider (i.e. H.T. negative) and T_1 . Between T_1 and T_2 there must be sufficient positive potential to offset the excess of negative bias developed by the voltage drop across R_2 , and leave a resultant negative voltage which shall provide just the correct bias for V_2 .

Use a Delay Switch

Finally, there is the objection that there is a certain amount of danger to the (usually expensive) output valve, due to the fact that its negative bias (and hence its safety) depends on the flow of anode current to V_1 through R_2 . Since the indirectly-heated valve V_1 will heat up more slowly than the directly-heated types likely to be used in the V_2 position, this means that a thermal delay switch must be employed to hold back the application of the H.T. to V_2 until V_1 has warmed up to its work. For a small amplifier, of course, an indirectly-heated valve could be used for V_2 , and this would make the T.D. switch unnecessary.

Certain practical points require careful note by those who are tempted to try the circuit, notably the need for condensers of really adequate capacity for C_2 and C_3 . It will be seen that C_3 provides the only effective earth on the filament circuit of the output valve, and so it must be large, preferably as much as 6 or 8 mfd.

Similarly, C_2 prevents undesired coupling effects in the H.T. circuits, and here again a large capacity is needed. A supplementary 4-mfd. or so shunted between T_1 and T_2 may also be helpful. Just a little actual resistance and capacity decoupling in the lead from T_1 is also used sometimes, but the value of the resistance must be kept low (not more than 10,000 ohms), or bias adjustment difficulties will be encountered.

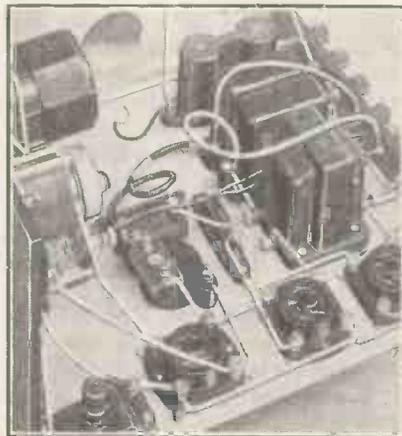
Most Practical

These drawbacks, as will be seen, are all of a nature which can be to a large extent discounted in practice, and the circuit has the notable advantage that perfectly normal input and G.B. arrangements will suffice for

V_1 . Altogether it is the most practical of the direct coupled circuits I have yet seen.

It has just one more feature which may be puzzling at first sight, and that is the arrangement of the output

THE GRID CONDENSER ?



"It further appears that there is some hitherto unsuspected possibility of poor response to transients even with resistance coupling . . . already there is a feeling abroad that perhaps the grid condenser is not quite such a harmless little gadget as we used to think."

circuit. The reason why this takes the form it does is that the filament circuit of V_2 is above earth potential (i.e. H.T.—) by the amount of the voltage between H.T.— and T_2 , which may approach 200 volts on occasion.

HOW DO THESE SOUND ?



If an amplifier deals faithfully with transients, sudden noises such as might be produced by the sharp ring of a triangle, hand-clapping, or the B.B.C. sound effects department, will be crisp and clear. If the amplifier deals poorly with transients, these and similar effects will seem blurred and indistinct.

With the ordinary form of output filter this would mean that the loudspeaker circuit would be above earth by a similar voltage, and there would be a risk of shocks when handling it. To prevent this the two output condensers C_4 and C_5 are used, exactly as in a D.C. mains receiver.

Separate Supply

It will be noticed that the same kind of output circuit is provided in Fig. 5, which shows a scheme very similar to the previous one, but with an entirely separate H.T. supply for the first valve. There is no particular merit in this, except perhaps that it makes it rather easier to avoid coupling effects between the valves other than the desired ones produced by R_2 , but it is sometimes cheaper to generate the necessary small supply of current for V_1 separately, rather than to provide it in the form of increased voltage from the principal H.T. source, which has, of course, to be capable of supplying the large currents needed by the output valve.

There is also a small saving in the condensers required, since C_2 can now be quite small, say, 2 mfd., or may even be omitted altogether in some cases. A large capacity is still needed for C_3 , however.

This last circuit forms the basis of the one I should advise the reader to adopt, for his first trial of direct coupling. It is shown in Fig. 6, and will be seen to be identical with the

previous one, except that the backing-off bias for the output valve comes from a battery instead of the H.T. circuits. This makes the arrangement simple to set up and adjust, so that it can be rigged up on a board with "bits" and got into working order with the aid of nothing more than a milliammeter.

Few Milliamps.

The separate H.T. supply for the first valve can come from any small mains unit giving about 200 volts (the small type rated to give a maximum of 150 volts will probably do, since we are only going to draw a few milliamps. from it, and so the voltage will most likely rise a good deal). The supply for the output valve, however,

(Continued on page 83)

AN INTERESTING VALVE DEVELOPMENT

Details of a new German six-electrode valve, that will quite conceivably have a big effect upon future receiver design.

By DR. ALFRED GRADENWITZ.

A NEW departure in the development of German amplifier valves has been made at the Telefunken laboratories, which are shortly to bring out a new type of valve known as the *Hexode*, of which two models have so far been designed.

The new valve is mainly intended for high-grade reception and is bound to give a stimulus to the development of new sets.

What is a Hexode? The principle underlying its construction comprises some decided novelties.

Six Electrodes

The number of its electrodes can be inferred from its name; a Hexode, in accordance with the Greek numerals, being a valve comprising six electrodes—i.e. four grids. In fact, it comprises one grid more than valves described as pentodes.

One of the two models to be brought out is intended specially to be used in connection with superhets as a combined oscillator and mixer valve; and the other model will be used generally in high-frequency amplifier stages in the place of the valves at present in use.

For Superheterodynes

First as to the "Mixer Hexode." Whereas in the oscillator stage of a superheterodyne, and for what is called a "mixer" (first detector), there have so far been used either separate valves or special valves, devised for other purposes but adapted by means of special arrangements of connections, the new "Mixer Hexode" has from the outset been designed for the particular tasks of the oscillator and mixer stages.

The first grid carries the receiving frequency, while the third and fourth serve to produce the superheterodyne frequency. The intermediate frequency is derived from the anode circuit.

Separate electrodes are thus provided for each frequency; and the second grid, being designed as screen grid, will prevent the oscillator frequency penetrating into the input circuits or radiating from the aerial

(with consequent disturbance by reaction upon neighbouring receivers).

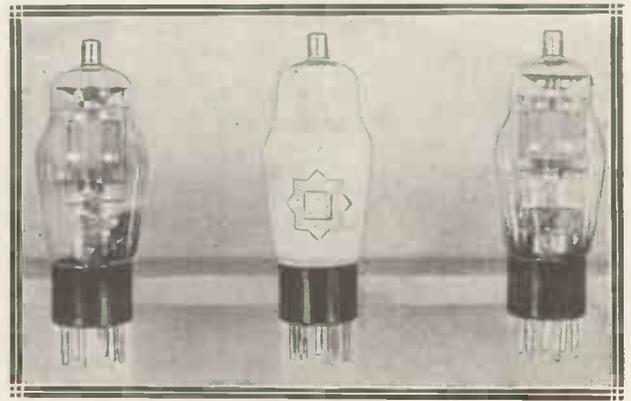
Advantages of the new valve over other types are a more straightforward arrangement of connections and, accordingly, greater freedom from receiving trouble; also because of some special effect with regard to the production of the intermediate frequency (of which nothing more definite can so far be said), the possibility of securing greater freedom from upper harmonics.

The new valve is not intended to be any more sensitive than the best types so far in use.

The "Fading Hexode" design serves for high or intermediate frequency amplification. The degree of amplification (steepness) is regulated by controlling the grid voltage, just

THE NEW DEPARTURE

Four grids—instead of only three as in a pentode—are embodied in the Hexode, of which different types for different purposes are illustrated.



as in the case of the "exponential valve"—"exponential valve" being the term used in Germany for what we call a variable- μ or multi- μ valve.

A new feature, however, is that not only the first grid—in the receiver circuit—but the third grid, which is placed between the second and fourth grids, is also used in connection with amplification regulation. This new arrangement enables the regulating voltage to be reduced from 40 volts (which is the present figure) to about 10 volts, while raising the amplifier regulation from 1:300, as in the usual valves, to more than 1:10,000.

Simplified Arrangement

While the new valve is not intended to secure any higher amplifications

than those so far in use, the lower regulating voltage is bound to result in a simplified arrangement of connections; while the large range of regulation enables a satisfactory regulation of acoustic intensity (and an elimination of fading) to be effected with greater ease.

Special Circuits Needed

The new Hexode, of course, calls for special arrangements of circuits and, therefore, cannot be fitted without any change to sets so far in use. However, it is expected that interesting developments in receiver design will follow.

A PRACTICAL TIP

Making a "Remote Control."

IT is sometimes necessary in large cabinets to operate a switch mounted a foot or so from the actual control knob. There are several ways in which this may be accomplished, including those of using a chain or a bowden wire control. Probably the most satisfactory device, however—particularly where the

switch is of the rotary type, e.g. a radiogram switch mounted at the back of a cabinet—is to use a brass track rod.

Easy to Fix

A suitable size sprocket should be mounted on the shaft of the component. Then arrange the track rod so that this slides at right angles to the components spindle. Small U-shaped brackets should also be mounted so as to keep the track rod within the correct limits.

A length of rod fixed to the end of the track rod enables a suitable knob to be attached and also permits the end of the track rod to act as a stop when the knob is pulled out, thus limiting the movement of the switch.



On the TEST BENCH

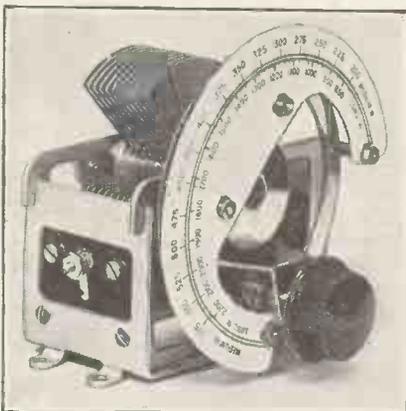
Our comments regarding some interesting new components.

New Telsen Condenser

THE new Telsen variable condenser strikes a very modern note indeed, for its construction embodies features which we have not seen before except in the later gang types.

For example, its construction is on most robust lines; its stout, pressed

ROBUST CONSTRUCTION



The new Telsen tuning condensers in their "single" form embody features usually associated with the most rigidly built "gangs."

frame being built without recourse to screws or even rivets. And the vanes are solidly locked on an exceptionally heavy spindle.

Very little solid dielectric figures in the construction, and what there is has been skilfully positioned.

A first-class slow-motion movement, free from slip or backlash, is an integral part of the design, as is also a conveniently placed dial light.

The scale is calibrated in wavelengths, and provision is made for adjusting the position of this relative

to the requirements of individual sets. Naturally it is necessary to use a Telsen coil in order to obtain the benefits of this wavelength marking.

A very practical feature is the fitting of two terminals for the fixed vanes, one at each side of the component. And the one that is best placed for the shortest and easiest connection can be used.

This Telsen condenser was carefully tested in conjunction with a Telsen coil and found to provide surprisingly close readings. It was also most attractive to handle.

The "Drivermu"

Radio Instruments have entered into the production of "Class B" components with the thoroughness which always hall-marks their activities.

Subsequent to considerable practical research and close co-operation with the valve manufacturers, they have produced a range of "Class B" transformers in which there is an exactly suitable one for each of the different "Class B" valves.

It will be appreciated by all that the requirements of this new method of amplification are vitally critical, and, among other things, it is essential that the "drive" trans-

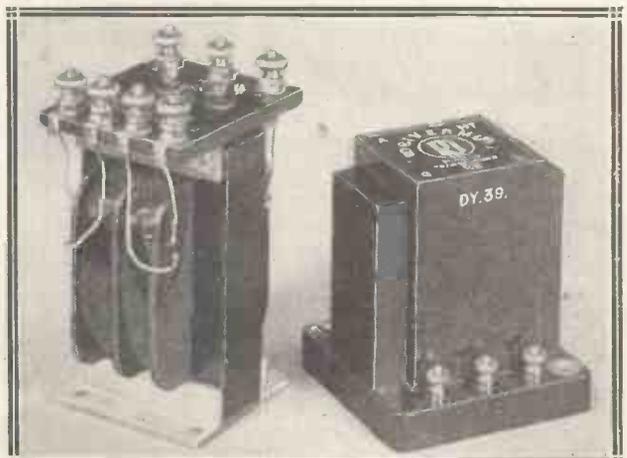
former should possess certain definite characteristics.

These are related to both the "drive" and "Class B" valves, and in this connection it should be noted that all the numerous varying conditions that are likely to be met with in practice by combining the various makes of these valves are clearly tabulated in an excellent R.I. brochure, which also specifies the types of R.I. transformers to employ.

The "Drivermu," as the R.I. "Class B" transformer is styled, is a first-class component, and it possesses exact secondary winding balance and low-resistance and can handle full "driver" valve H.T. without the slightest distress.

For the output, R.I. provide a tapped choke capable of giving a most efficient output coupling. Its low resistance and high inductance

QUALITY COMPONENTS FOR "CLASS B"



The advantages of the "Class B" method of amplification are realised when its special components are of the high technical quality long associated with the name R.I.

The Latest Products of Radio Manufacturers

enable it to bring "Class B" "out of the set" to the best advantage.

Since our photo was taken, this fine choke has been provided with a handsome bakelite cover.

An Electrolytic "Pack"

There have been considerable improvements in the manufacture of electrolytic condensers during the past few years, and they have now been brought to the point where they are sound alternatives to the other types in many instances.

By their very nature, however, they must have limitations as to their use, but for the particular tasks for which they are suited they deserve the closest consideration.

Where they score largely is in size. The high voltage electrolytic "pack" made by Hellesens, and illustrated in the accompanying photo, has a total capacity of 13 mfd. and yet is not vastly larger than a matchbox!

"CARTONED" MFDS.



To compress 13 mfd. of capacity into little more space than is occupied by a matchbox, is an achievement of which Messrs. Hellesens are justly proud.

And as it is of the "dry" type, it can be mounted in any position.

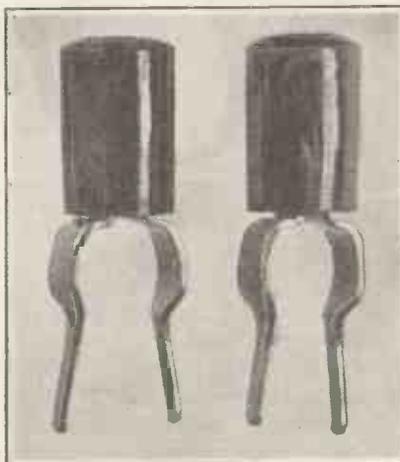
We have carefully tested the samples sent us, and two of them were included in sets. In every case the results showed these little "packs" to be efficient and trustworthy.

It should be noted that although, as we have stated, ordinary electrolytic condensers cannot be used for all purposes, most of the exceptional conditions can be met by means of special designs, and Hellesens are able to supply these.

Useful Plugs

Ward and Goldstone, Ltd., are now manufacturing a new pattern wander-plug known as the "Meteor." Its

WELL CONNECTED



The practical efficiency always connected with Goltone products is well exemplified by the sound design of these wander plugs.

special features are that it has no screws to come loose and is adaptable to widely varying bores of sockets.

It is particularly easy to make the connection to it, for all that has to be done is to push the bared wire into the insulated cap and a secure grip is at once effected.

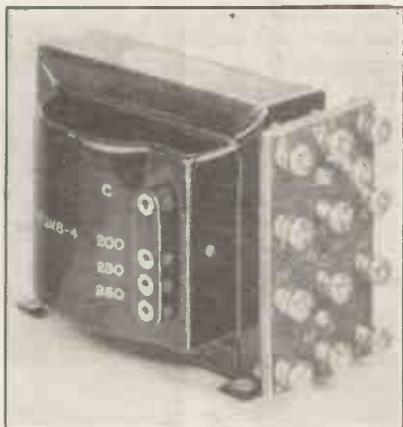
It is a practical and effective device and will no doubt prove very popular.

A Ferranti Mains Transformer

We have recently had the opportunity of testing a Ferranti type S.V.84 mains transformer.

It is designed for a U.12 valve rectifier, and is able to provide an H.T. output of 350 volts at 70 milliamperes. On the L.T. side there are 4 volts 2.5 amperes for the

HIGHLY EFFICIENT



This Ferranti mains transformer is very substantially built and completely shrouded in a sheet steel case.

rectifier, and centre-tapped windings for 4 volts 1 ampere, and 4 volts 5 amperes.

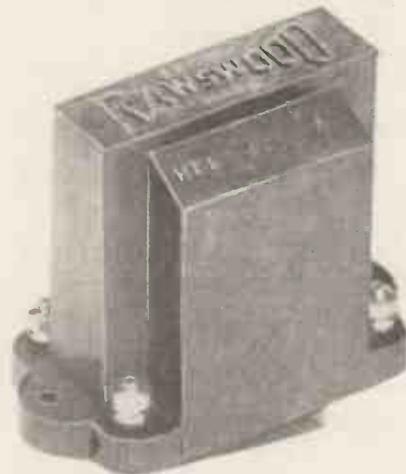
Provision is made for 200-, 230- and 250-volt inputs. The output terminals are clearly marked, and are conveniently grouped for easy wiring.

On test it was observed that there was no noticeable temperature rise, while all the outputs closely conformed to their ratings.

The voltage regulation was excellent on all the windings.

In short, the Ferranti S.V.84 was found to be a highly efficient transformer; but that, after all, was only to be expected in view of the reputation of the manufacturers to whom it is due.

RIGHT TO THE CORE



A patented core is employed in this value-for-money transformer and largely account for its surprisingly good performance.

Rawswood L.F. Transformer

The Rawswood L.F. transformer retails at 4s. 11d. and, bearing the price in mind, it is a quite good little transformer.

It is fitted with a core of "patented silicon iron," and it was designed for direct connection in detector anode circuits and for parallel-feed where heavier H.T. current is encountered.

Tested under the latter conditions, we found it gave perfectly satisfactory results, its response being substantially straight-line from 50 to approximately 4,000 cycles, when there was a slight peak.

In the direct connection, saturation tends to occur at 3 milliamperes.

The Rawswood L.F. transformer is obtainable in either of two ratios: 1 to 3 and 1 to 5.

MY BROADCASTING DIARY



The Music Advisory Board

DISAGREEMENTS in the B.B.C.'s Musical Advisory Committee have resulted, I hear, in Sir Landon Ronald tendering his resignation.

Sir Landon has done a good deal more for broadcast music than most listeners are aware. His association with the Guildhall School of Music has enabled him to bring the B.B.C. into close touch with many of the most famous musicians in the world.

Visitors to this country, of whom the B.B.C. might not otherwise have been aware, are continually being entertained by Sir Landon Ronald, who never fails to suggest to them that they might like to broadcast. In this way many famous musicians reach the microphone, and it will be a loss to broadcasting if Sir Landon is not persuaded to remain on the Music Advisory Board.

Broadcast from Sydney Harbour

The next big Empire relay, following the relay from the top of Table Mountain overlooking Cape Town, last winter, is to be a running commentary on the arrival of the mail boat in Sydney Harbour, as seen from the top of the magnificent Sydney Harbour bridge.

Plans for taking the microphone to the top of the bridge, hundreds of feet above the beautiful harbour, are to be made by Mr. Malcolm Frost, the B.B.C.'s "ambassador," who is at present on an Empire tour. The huge P. and O. or Orient liner will pass beneath the bridge directly under the microphone, and the commentator will even be able to describe what it is like to look down the funnels of the vessel!

It should be a thrilling commentary provided the B.B.C. get the right man for the job, and provided, of course, the technical difficulties of speaking from Australia to England are satisfactorily overcome. The Post Office can be relied upon to see to this, though.

Television and the B.B.C.

Television negotiations between the B.B.C. and various

Our Own Broadcasting Correspondent keeps a critical eye on the affairs of the B.B.C., and each month, for the benefit of listeners, comments frankly and impartially on the policies and personalities controlling British broadcasting.

interested concerns are practically at a deadlock, and I doubt whether any fresh arrangement will be possible until the autumn, when the new administrative machine begins to function at Broadcasting House. I gather that the B.B.C. are quite prepared to give a trial to a new television system, but that by doing so they do not want to create a monopoly for the manufacturer of the television receiving apparatus.

Mr. Ashbridge, the Chief Engineer, is said to look favourably upon the new system, and the Governors are anxious that it should be given a trial. But unless some satisfactory agreement can be come to, the public will see nothing of it.

AT THE EMPIRE TELEPHONE EXCHANGE



The Prince of Wales making a tour of inspection on the occasion of the opening of the Empire telephone exchange. This exchange is situated in Faraday Building and links up with the beam radio stations often used by the B.B.C. for relays from distant parts of the Empire.

Too High-Handed

Since when have the B.B.C. become so financially independent that they can afford to turn away advertising revenue from their programme papers? I hear that they have done this once or twice lately, solely because objection was taken to the wording of the advertisements.

Even one of the national newspapers came under this

Quality Relays from the Continent in the Autumn

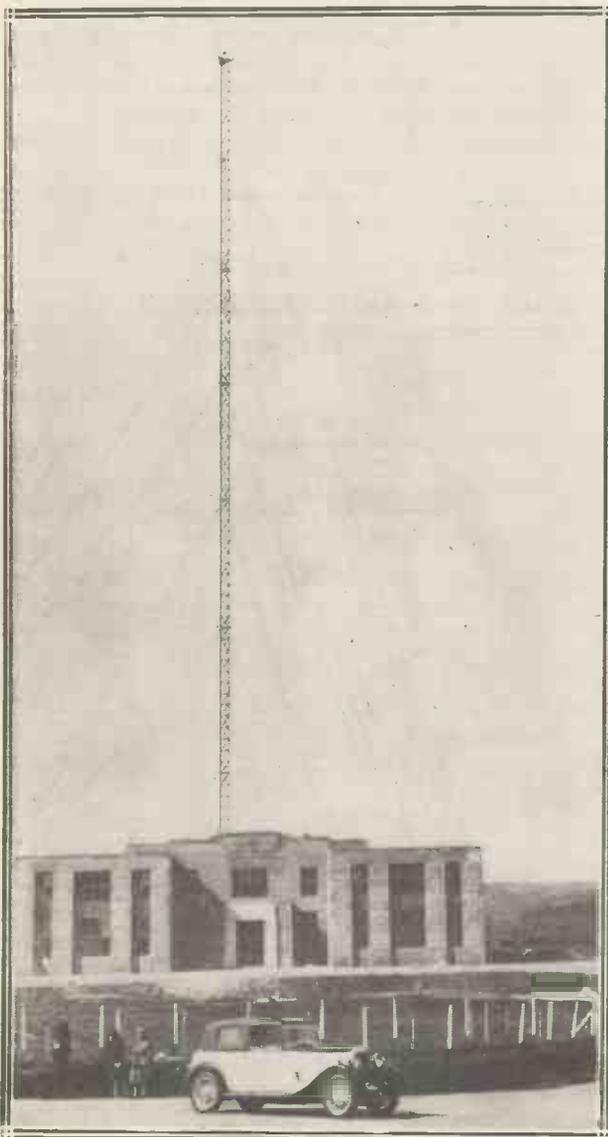
advertisement ban. It appears that the paper in question booked a £200 advertisement to boost a new wireless feature, and that somewhere in Broadcasting House an official took exception to references to B.B.C. programmes and sent the advertisement back to Fleet Street with a request that it be amended.

I am glad to say that the newspaper took the proper course of ignoring the request and withdrawing the advertisement. I believe that this was an unusual case of broadcasting bureaucracy, and that had the newspaper raised its voice loud enough in complaint, the matter would have come to the ears of Sir John Reith. I commend the matter to his attention even now.

The Engineers Do Count

Everyone at Broadcasting House now seems fairly satisfied with the new order of things excepting the

NOW BROADCASTING REGULARLY



A fine view from the front of new the West Regional station, which is now giving a regular broadcast service. The mast is just over 500 feet high.

engineering departments. Both Sir John Reith and the Governors, it is felt, are too ready to regard the engineers as engineers and nothing more.

They seem to forget that the system of broadcasting in this country as it stands to-day was conceived and built by engineers. Moreover, is not Sir John Reith himself an engineer by training? An engineer is every

SIR JOHN AS CLUB PRESIDENT

Sir John Reith was recently made President of the Aldwych Club. He is here seen receiving the insignia of office from Mr. G. Wareham Smith, past President.



bit as creative as a programme organiser—and very much more so judging by the quality of some of the programmes.

B.B.C. and Radio Exhibition

It is good to hear that the B.B.C. are this year linking up very much closer with the Radio Manufacturers' Association during the National Radio Exhibition. I think listeners will get an agreeable surprise when they visit Olympia on August 15th and see the exhibits and demonstrations arranged by the Corporation.

Last year, as in the previous years, the B.B.C. took the view that they were doing the trade a favour by taking a stand there, and nothing would induce them to pay for it. There is a new outlook on things, due very largely, I believe, to political pressure. At all events, the B.B.C.'s part in the Show will be something worthy of British broadcasting.

More International Concerts

Plans are already being pushed ahead for a big new series of International Concerts from all parts of Europe during the coming autumn. New landlines have made it possible to guarantee first-class quality relays from several new Continental music centres, while engineers of the various European postal authorities have co-operated closely in improving the existing landlines.

Mr. Arthur Burrows, tucked away in his office at Geneva, is doing a tremendous amount of work through the International Broadcasting Union, arranging all the administrative details of the concerts and co-ordinating the plans of a dozen nations. If the B.B.C. go wholeheartedly into this year's International relays, we shall gain considerable prestige on the Continent, and for our own part listeners will benefit by a rare supply of musical talent.



IN PASSING

An A. J. Alan-ish Adventure

THIS month, instead of regaling you with my customary acute observations on radio life and affairs, I propose to relate a sort of A. J. Alan-ish adventure which may serve to relieve the tedium of waiting for that boarding-house dinner gong to sound, or to while away the time while the wife concludes her recital, to your landlady, of how the air of the place agreed with her Aunt Charlotte in 1893.

On Shelby's Doorstep

It all began, for me, with a short, sharp discussion with Shelby on Shelby's own doorstep. We had been to some fearfully business-like meeting to hear a man talk about the rights of debenture holders, and so

IN DISTRESS



"Unable to convince the bus-conductor that she was an honest woman."

we just naturally walked homewards in a romantic mood. Shelby, who owned a romantic quantity of debentures, took the lead and declared that all life was romance.

Where Men are Men

I asked whether he included haircuts and unstopping kitchen sinks, and he replied that "romance is where you find it." Then he hurt his

shin on his own door-scraper and we parted, he to eat his solitary, romantic dinner, and I to my club, "where men are men—and women not permitted to enter."

Far From Home

Of course, I didn't get as far as my club. Instead, I came flop upon a damsel in distress. It seemed that she was far from her happy Hampstead home and, having had her handbag rifled of every article of

If you should think that this—or true story is a trifle too much of a coincidence, ask yourselves whether every coincidence isn't just a bit too rich to believe?

value save a solitary cigarette, was unable to convince the bus-conductor that she was an honest woman within the meaning of the Act.

Well—er—I offered her a taxi to Hampstead—I wanted to get rather nearer Whitehall myself—raised and lowered my hat as requisite, and found myself bowling along through absolutely hitherto unknown places towards Hampstead, home and beauty.

Under the Arch

We didn't talk much. She volunteered the information that she had been to hear a literary "lion" spout at a Harrods' book sale. I said that that sort of thing was all right if one liked that sort of thing—what? And so we met on common ground at once. She adored Wells. I worshipped Wallace. And there we were. More or less (*hem*).

Somehow or other, it came out—as we buzzed under Highgate Archway—that her father and mine served together in the Indian Civil. This was highly romantic, but *nothing* compared with what was to follow.

Well, we exchanged stories of curry, rupees, syces, khidmutgars, tigers and what not, until we positively reeked with Anglo-Indianism. I remember calling her a "pukka mem-sahiba"—which, I believe, is not quite correct—and I am sure that she referred to me as a "burra-sahib." Frightfully matey and all that sort of thing.

Meeting Mother

Ah! One thing which she said struck me as—well, peculiar. She said that they kept on the premises a very ancient grandfather, and that, whatever happened, I would kindly take no notice. Of course, I said that I never noticed such things as grandfathers, and so that was all right.

We drew up at a four-storey house—of about the period 1870—and I was haled inside to meet Mother. Mother was as charming as her daughter, and promptly invited me

THE LITERARY LION



"She had been to hear a literary 'lion' spout at a Harrods' book sale."

to stay to dinner. Cocktails were served in a room full of Indian curios, mixed with Swiss and Italian additions, presumably contributed by the children. But Grandpa was not there.

His Anniversary

I met *him* at dinner, and he was the oldest-looking human I have ever seen, though his real age was exactly

The Fatal Changing of the Needle

one hundred years that very day. I congratulated him, and so on, and he surprised me slightly by squeaking something about a needle—or it may have sounded like “beadle.” Still, I took no notice, and brought the talk round to my late father and his late son. Grandpa’s late son, I mean.

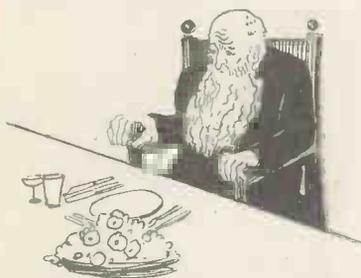
I gathered that there was an eldest grandson in the R.A.F., and a younger one who might blow in at any moment, being of wayward habits. I supposed that he either sold cars on commish or stung Grandpa when necessary.

King of the Air

For Mother’s sake, we went all over the khidmutgar, syce, tiger business again, and, after coffee, retired to the museum once more, where there was a splendiferous radio-gramophone. This they set going, and under cover of some extraordinarily ghastly music I managed to question Daughter about Grandpa.

She said that he had been unduly excited about his 100th birthday, which was natural enough, but that he seemed to attach some special significance to it, and frequently spoke of Robert, the Air Force chap. I looked at Grandpa there and then. He appeared to be dozing peacefully enough, except that his old hands were clenched on the arms of his chair.

ONE HUNDRED YEARS



“The oldest-looking human I have ever seen.”

Mother hovered over the scene like a Madonna, lamenting the absence of the younger son and chanting the glories of Robert, the King of the Air. Presently I suggested that we should tune-in another station, and there was a concerted rush for the dials, resulting in a response from Covent Garden.

“What’s that?” said Mother.

“The funeral march from Siegfried,” answered Sister.

The old man in the shadow by the fire groaned and waggled his white beard, and I noticed that he still gripped the arms of his chair as one does at the dentist’s.

A little later, Rupert, the younger son, elected to enter. Handsome as a film star, he was; a founting, cynical, pampered darling. He took not the slightest notice of me, the stranger within his gates. He strolled forward, lit a cigarette and said, “What an insanitary noise. Why don’t they change the bally needle.”

At these words there was a wounding commotion, caused by Grandpa, who strained in his seat and squeaked, “There it is! The needle! Get ready to bury a Lewin.”

The Mysterious Paper

Rupert retreated and disappeared, whilst daughter and mother strove to compose old Father Time. I suggested that undoubtedly my hostess would prefer that I should leave them, but both mother and daughter begged me to stay. Meanwhile the old man had begun to make signs for something to be unlocked, and at last we understood that he wanted a paper brought to him from his desk.

Well, Miss Lewin found the paper, which he took and put into his pocket, saying, “Read it afterwards. Afterwards, mind ye.” Then we all looked at each other and said, *Phew!* and things like that.

Presently there came the business of putting Grandpa to bed, a process which required the services of an old retainer named Luck. It seemed that there had been Lucks serving Lewins since 1066 or thereabouts. Anyhow, Miss Lewin and I were left alone and we began to puzzle about the Needle idea.

SOS from the Aerodrome

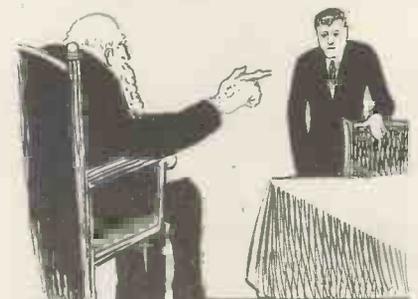
“I expect that the secret is on the document which you found,” I said, but she favoured the theory that her grandfather was a little light-headed and might just as well have said, “Pumpkin.” There was just then a loud call from Mother and the sound of trampling overhead, and Miss Lewin rushed upstairs.

Then—of course—the telephone-bell rang and I answered it. Beyond a superficial thrill, I was really not in the least surprised to hear a voice say, “This is Hexton Aerodrome. Please tell his family that Wing-Commander

N. C. Lewin has crashed and is not expected to live.”

Now that was a nice position for one to be in, all through a pickpocket! But such action as I should have taken was deferred by the return of Miss Lewin to say that her Grandpa had just died. This news naturally cheered me enormously. However, I could not withhold the other tragic news—which wasn’t mine to keep—and so I had to tell her.

A PREMONITION



“There it is! The needle! Get ready to bury a Lewin.”

Thereafter I became very busy, telephoning for doctors and relatives, attending to Mother, who wanted a car for the aerodrome. Keeping old Luck from hysterics and so forth. Finally, I fled the scene at midnight, feeling that I had interloped on a very nasty piece of work.

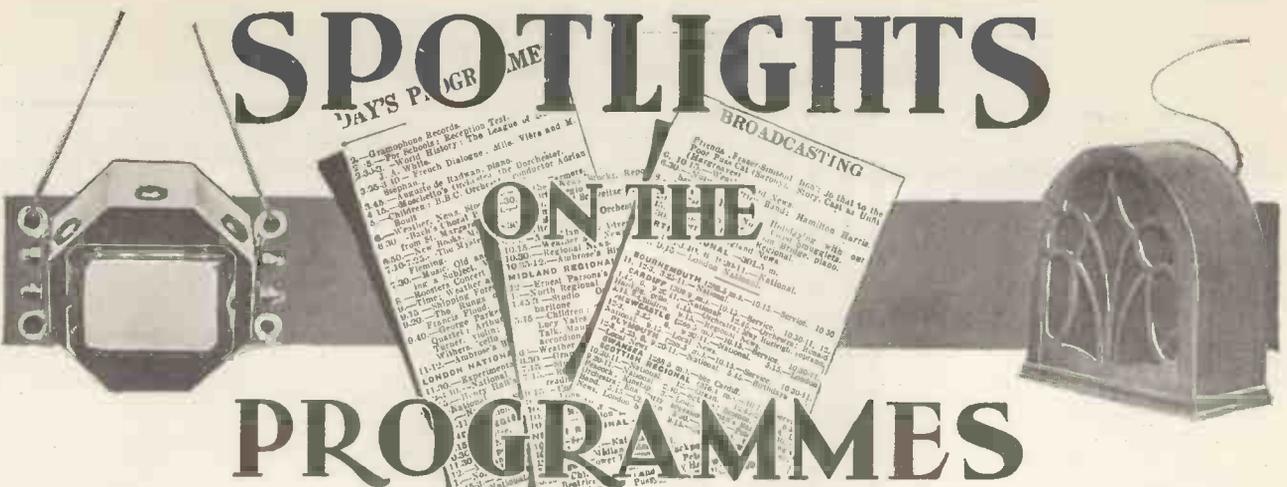
The Aftermath

A few days later young Rupert Lewin called on me—I found out afterwards that his sister had sent him—and told me that his brother was likely to live but that old Luck had suffered a stroke on the night of Grandpa’s death, and he also had died. He said that there was a sort of unspoken inference that he (Rupert) had killed the old man by mentioning the needle.

I said that that couldn’t have been so; people usually died from more important things. However, he went on to say that the paper which Grandpa had been so frightfully keen about contained a series of statements by various Lewins, going back several centuries, and each one recorded the events leading up to the death of a Lewin. In every instance there was some reference to changing a needle.

There were Lewins who had died in battle, in bed, in the hunting-field and the street; one conked out in a duel

(Continued on page 84.)



SPOTLIGHTS ON THE PROGRAMMES

Henry Hall for America

Now that it has been made clear that Henry Hall will be going to America during his holiday, that he is *not* leaving the B.B.C., and that Jack Payne will *not* be returning to Broadcasting House—it's amazing what listeners will believe—we may hope that the visit will have sundry results in Portland Place.

If Henry Hall, in the light of his American experience, can persuade the powers that be that the system which they have over there of allowing no dance number to be broadcast more than once a day should be adopted in England, radio dance music will improve a hundred-fold, and the few really good numbers be able to survive for at least six months.

The present system of "plugging" succeeds in killing any tune, good or bad, in about three weeks, so far as listeners are concerned.

Without Comment

Excerpt from a speech by Sir Walford Davies made at Broadcasting House during a recent musical festival conference: "There are times when I feel that there is no pleasure comparable with turning off the wireless."

Catching Them Young

Complaints from listeners and periodic remarks from the B.B.C. lead us to believe that a great many radio performers, particularly in the variety line, lack the necessary microphone personality.

The time is still far distant when every performer will be a Christopher

Stone, a Stephen King-Hall, or an A. J. Alan. But our friend Philip Ridgeway has got the right idea with the new training school he has started for microphone training.

Experts in various lines are to be engaged for training, but Philip himself will instil the necessary vitality and personality. If the rule that a student who appears hopeless at the first audition will not be allowed to continue is strictly kept, we may yet see an improvement in vaudeville programmes.

A Welcome Return

It was good to hear Miss Cecil Dixon filling in the intervals again



FROM STREET TO STUDIO

Danny Malone, the Irish tenor, who was discovered hungry and unemployed by the B.B.C. and given a chance to "make good." He took the chance with both hands, and he is now often heard in studio programmes.

last month. The inevitable announcing and "business" which attends the playing of a gramophone record to fill up two or three minutes is quite inappropriate, and the everlasting tick-tock is becoming irritating.

Miss Dixon is quiet, unobtrusive and competent. I hope she will not be separated from her piano again.

Dull News is No News

When will the News Editor at Broadcasting House learn to cultivate a sense of proportion?

There may be sufficient people interested in university rowing to justify the recital of a list of 19 "bumps" at the Cambridge May races. I doubt it.

But to include a list of the population figures for Norwich in the first general news bulletin which is being listened to by the whole of the British Isles is going rather too far.

If there isn't any news, then why not say so—and let Miss Cecil Dixon fill up the interval!

Where's the Snag?

The Scotch (*sic*) edition of a daily newspaper recently published the following letter:

"What a big difference it would make to the receipts of the 'good cause' appeals if the post office authorities allowed the contributions to these appeals to go post free, provided the three-halfpenny stamp was enclosed together with the contribution! The Post Office would lose nothing, and the various institutions would gain a great deal!"

While admiring the ingenuity of the gentleman in question, we fear that the Postmaster-General might not be too enthusiastic over the scheme.

The Judge and the Radio

Although a certain civil servant of my acquaintance still cannot find the flaw.

But then, he happens to be in the Income Tax department!

Give Them Their Due

Radio play actors have never been treated very kindly by the B.B.C. as regards publicity.

The author, the translator, the adapter, the producer and the director of the orchestra are all given separate announcements at the beginning of a play, but as often as not the actors themselves are all lumped together in a heap.

Not only is this unfair to the actors themselves, but it is extremely annoying for listeners, and sometimes very awkward for critics.

If isolated stage "stars" who come to the microphone are announced with the parts they are going to play, there is no reason why the hard-working permanent members of the B.B.C.'s company should not receive at least equal courtesy.

cans keep to the right instead of the left, but the new car, the spring air, and other circumstances proved too much for him and he went head-on into another car.

No one was hurt, but the Englishman was hauled off to court. While the judge was listening to the explanations (which are not very different in any country!), an usher stepped up to the bench and announced that it was two minutes to two.

Turning to the defendant, the judge said that his son was "on the air" at two o'clock and would he mind—?

So the wireless was turned on and for fifteen minutes everyone listened. At 2.16 the judge resumed his judicial manner, called the court to order—and fined the Englishman 25 dollars and costs!

Poetry Suggestion

So the B.B.C. has finished reading your poems—all 11,000 of them—and has chosen 28 as being of sufficient merit to be read over the microphone.

number of nonsense verses. As nonsense verses go they are not bad—but as a reader of poetry Mr. Wright is a genius.

I suggest that Mr. Wright, without being removed from the vaudeville department from which he can ill be spared, should be entrusted with some of the evening poetry readings. I know that he will make as good a job of them as anyone has yet.

Relay from Dresden

Relays from the Continent have not been as frequent as they might have been during the last two or three months, and it is good news to hear that July 1st marks the first performance of a new opera by Richard Strauss in Dresden, the first act of which will be relayed by the B.B.C.

It is perhaps a pity that an event of such importance should be limited to one act, but I suppose that we must be thankful even for crumbs in these days of political unrest.



In the Programmes.

FLOTSAM AND JETSAM

Genuine and lasting collaboration between artistes is a rare thing. It has been achieved to perfection by B. C. Hilliam (alias Mr. Flotsam) and Malcolm McEachern (otherwise Mr. Jetsam).

They are hard workers and loyal friends. Each possesses special gifts which the other lacks.

Thus Hilliam, a Canadian, is a wit, a skilful writer of lyrics and a man of extraordinary versatility and invention. He writes and accompanies at the piano the songs that the pair of them have sung to millions of listeners for seven years.

But Flotsam's voice is Jetsam's joke when they run short of things to laugh about while awaiting their "turns"; for both are extremely nervous—believe it or not!

McEachern is the business man. It is he, too, who puts the art into their singing—and his voice is so low that he has to have his telephone in the basement!

An Australian by birth, McEachern began by touring with Melba's concert parties. He is one of our finest bassos, and in New York has shared musical honours with prima donnas.

Flotsam and Jetsam first met in New York. Six years later, in 1926, they again met in London.

For a joke, Hilliam made up an act out of the bits and pieces of his songs which had been rejected. They went on the halls with it and made a great hit.

The same year they came to the microphone—do you remember "Little Joan" and "Maud Marie"?—and ever since then they have remained "Yours very sincerely, Flotsam and Jetsam."



Barbara Couper, Hermione Gingold, Bryan Powley and many of their colleagues are as important to radio as Sybil Thorndike, Edith Evans, or Matheson Lang are to the stage.

Amazing, perhaps, but none the less true.

A Legal Decision!

From America comes the best radio story of the month.

An Englishman, arriving in America and feeling the call of spring, bought a Ford. He remembered that Ameri-

Having secured some new poems, the time has come to secure some new readers. With a few fine exceptions, it seems to be a *sine qua non* of poetry reading that a belligerent and overbearing manner should be coupled with a monotony of tone compared with which the recital of the Fat Stock Prices is a veritable symphony of colour.

The B.B.C. has discovered an excellent variety artiste by the name of Hugh E. Wright. Besides discarding on every topic under the sun, Mr. Wright composes and reads a

Radio Play Festival

In the last few weeks the scheme for the first complete Festival of Radio Drama has emerged from the chrysalis stage and the full list of plays has been announced.

It is hard to explain why "Family Tree" (Philip Wade) and "Ann and Harold" (Louis Goodrich) have been left out, since both these plays are representative of radio drama which confines itself to writing about ordinary people in an ordinary way.

PATRICK CAMPBELL.



QUESTIONS ANSWERED

Shunt Feeding

C. N. (Barnstaple).—“Will you please tell me whether it is desirable to ‘shunt-feed’ an output transformer? By this I mean connecting the transformer primary so that the steady anode current flowing in the output circuit does not pass through the winding.”

It is sometimes desirable to adopt this procedure when there is doubt as to the ability of the output transformer to handle the steady anode current satisfactorily. In such circumstances the anode current should be passed through a choke having an inductance at the normal working current of about 20 henries. The L.F. impulses can then be applied to the output transformer primary via a 2- or 4-mfd. condenser—preferably the latter. The output transformer is thus isolated from the anode current and will, therefore, be free from any troubles from this source.

Ultra-Short Waves

E. M. C. (Walton).—“A friend has been giving me some help in connection with short-wave work on which I am very keen. But he is a little hazy regarding the ultra-short waves round about five metres. What are the special advantages of such short waves?”

The ultra-short wavelengths below seven metres are still the subject of experimental work, and there remains much to be learnt regarding their particular characteristics.

Theoretically the range on these frequencies is restricted to that of the direct ray, since the indirect ray or sky wave is not reflected by the ionised layers above the earth's surface.

It is believed that wavelengths coming within this band pass through both the Heaviside and Appleton layers into outer space.

The direct ray is affected by local shielding, but in the Crystal Palace five-metre tests recently carried out by “Popular Wireless,” the transmissions were received in Yorkshire in spite of the very low power being used.

The B.B.C. is also conducting experiments in seven metres, but the result of this research is not yet available.

We shall probably hear much of these ultra-short waves in the future.

TECHNICAL QUERIES DEPARTMENT

Are You in Trouble With Your Set?

The MODERN WIRELESS Technical Queries Department is in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical.

Full details, including the revised scale of charges, can be obtained direct from the Technical Queries Department, MODERN WIRELESS, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of MODERN WIRELESS should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problem.

London Readers, Please Note: Inquiries should not be made in person or by phone to Fleetway House or Tallis House.

Locating Hum

S. D. C. (Wood Green).—“My A.C. mains receiver has a hum which I am having difficulty in tracing. Curiously enough the sound appears to come from the set itself and not from the loud-speaker. I should welcome any assistance you can give me.”

If you are sure that the hum is not coming from the speaker you should turn your attention to the trans-

formers and chokes in the set. Sometimes the trouble is due to loose laminations, and it is therefore advisable to examine carefully all iron-cored components both in the actual mains circuit and also on the L.F. side.

Trimming H.F. Stages

L. P. N. (Bournemouth).—“Will you please confirm that in adjusting the ganging of a circuit the trimming capacities should be set at the lowest possible value consistent with satisfactory ganging. Incidentally, I was reading an American radio paper in which the term ‘padding’ condenser was used. Am I right in assuming that this is the same as a trimmer?”

With regard to the question of ganging, the trimmers should always be adjusted to the lowest value which will enable the circuits to be brought properly into step. The residual capacity of each trimmer is in parallel with its respective tuning coil, and has an effect upon the minimum wavelength to which the set can be tuned. So it pays to keep this capacity as low as possible.

Yes, a “padding” condenser is the same thing as a trimmer.

“Class B” Output

A. R. (Dover).—“I understand that a ‘Class B’ amplifier needs very similar treatment to a pentode because of its tendency to over-emphasise the high notes. Is this the case, please?”

Yes, it is advisable to apply a little correction to a “Class B” output stage by joining a tone-compensating device across the primary of the output transformer. This can consist of a resistance having a maximum value of about 10,000 ohms in series with a fixed condenser (.005-.01 mfd.).

TROUBLE TRACKING



LAST month I dealt with the question of interference from sources outside the set, but it is nevertheless a fact that very many of the background noises one meets with are due to small faults in the receiver itself.

Troubles of the external variety generally take the form of a hum, or at any rate a noise that is continuous rather than intermittent. One exception is the terrible crackle caused by trams—these sound like bad atmospherics, but the listener is usually pretty sure of the source if he lives near a road along which trams pass.

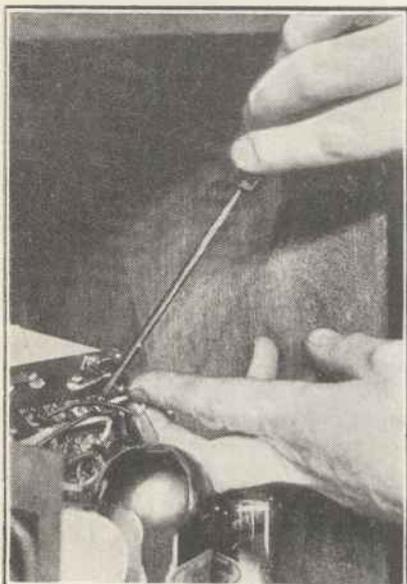
So far as crackles which emanate from the set are concerned, it is a good idea to go over the various rubbing contacts first of all.

Watch the Joints

For instance, the contact between valve legs and their sockets should be perfectly clean and "tight." All wires must be clamped down firmly beneath their terminals.

The possibility of "dry" soldered joints also arises. A good electrical

MAINS MATCHING !



Mains transformers have tapping points on the primary winding to suit the various mains voltages. If you are installing an all-electric receiver, do not forget to connect your mains input leads to the appropriate transformer terminals.

connection is sound mechanically, whereas a "dry" joint will not withstand pulling. Hence, if the various soldered leads are given a sharp tug, any which are faulty will soon show up.

One of the best ways of finding out whether a receiver has a loose connection is to give the panel or cabinet a slap with the palm of the hand. An immediate crackle in the speaker at once proves that there is a bad contact or loose wire.

Every month the Chief of the "M.W." Query Department discusses some of the common difficulties which can often be so troublesome. This time he deals with noises due to faults in the set.

Components occasionally give trouble, and all resistances should be tested. This is not always an easy matter for the listener who does not possess proper testing equipment, but the substitution of each resistance in turn with a spare is a good method.

If the spare is not quite the same value, no harm will be done, since the test is only a brief one to see whether perfect continuity exists.

Sometimes a transformer or choke winding may be the culprit, but modern components of this type rarely give trouble in this direction.

Intermittent Breaks

But I have known of cases where a transformer winding has developed a partial break, producing short spells of crackling interspersed with periods of trouble-free working.

The cause was a break in the middle of the primary winding, and proved to be difficult to trace in view of its occasional nature.

Any inductive winding which is called upon to handle varying potentials, and therefore varying currents, is under a mechanical stress and the turns tend to move, thus putting a strain on the delicate wire with which transformers are wound.

Another factor which has been known to cause breakages is corrosion

due to handling the wire during manufacture.

The problem of mechanical movement of the turns has been overcome in the modern transformer by sectionalising the windings and by interlinking the turns with some cushioning material. Any possibility of trouble due to contact with the hands has been obviated by employing winding machines which, by their robot action, eliminate the personal element altogether.

Loudspeakers and Portables

Loudspeakers which are connected directly in the anode circuit of a power valve may develop a break unless the windings are specially designed to withstand the comparatively heavy current flowing.

It is always safer to isolate the speaker windings by passing the steady current through something more substantial such as an output filter choke or output transformer.

At this time of the year portable sets are deservedly popular, and those who are in the habit of taking these attractive receivers on their summer-time trips into the open should make quite sure that the batteries and valves are absolutely secure because portables often come in for rough handling.

The wander plugs must be of a type which fit snugly and firmly into the battery sockets. The L.T. battery should be one of the genuinely unspillable variety, since the presence of acid on any of the flexible connecting leads may in time result in the "eating away" of the wire. I once met with a case where the speaker leads had been completely "eaten away" by acid, but the L.T. battery was not claimed to be unspillable in this instance, so the owner was really to blame.

THEORY V. PRACTICE

CIRCUITS UNDER THE SEARCHLIGHT

BY Geoffrey Eltringham



IT is sometimes rather chastening to look back on one's reactions to some new invention of a few years ago and see whether our expectations have been justified by events. Chastening, because it teaches us not to be carried away by the "ballyhoo" surrounding the next new idea.

Now, I remember that when differential reaction was first introduced I made myself rather prominent among the cheering crowd, for it seemed to me that it was a really meritorious invention, and its one little "catch" was by no means obvious. All the trouble it has since caused me has been a pretty severe lesson in the difficult art of keeping one's sense of perspective clear in the face of all such deceptively rosy prospects.

A Short-Wave Problem

And what is the "catch" in differential reaction? I will tell you in two words: short waves! Just where a reaction device which does not upset the tuning would be most valuable, the differential system in its ordinary form fails dismally. The reason is rather interesting, and it is really to tell you about it that I am writing this article, for, after all, it doesn't do to be too cynical about new

inventions. My own motto is: try them all as they come along, for that is a great part of the fun of radio; but don't be too pained if they prove to have defects.

Below 25 Metres

Now, at first, differential reaction seemed fairly good on short waves, because in those days (some four years ago) our ideas of "short waves" went down about as far as 40 metres. Anything as low as 20 metres we regarded as ultra-short and calling for a very special set. As time went on, however, we began to expect our

Our contributor's forthright remarks about results from favourite circuits are certain to cause considerable discussion and, perhaps, heated argument. Although we do not necessarily agree with all he says, we have pleasure in presenting his provocative views for our readers' consideration.

ordinary short-wave sets to go down to 20 metres and even a bit lower, say, to 18 metres or thereabouts, and then we discovered that there was something pretty queer about differential reaction.

What happened as like as not was that after making what seemed a perfectly straightforward set we found that it was normal enough down to perhaps 25 metres or so, but below that it simply would not go. With suitable coils plugged in we might get down to, say, 25 metres, about half-way round the dial, and on turning the condenser down lower, things went curiously dead and tests with a wave-meter showed that the wavelength was not being reduced any further.

Reaction Resonance

That upset some of us pretty badly, I can tell you, and made us think there was something really difficult about getting down to what we still secretly regarded as ultra-short waves. What made it particularly galling was that we would very likely come across

some slap-dash fellow with a crudish lash-up which went down far below our cut-off point, perhaps to 15 metres or even lower, without a break and with perfectly normal behaviour all the way!

The only clue was that he wasn't using differential reaction, and after a while we got suspicious about this. We felt that it must have something to do with our troubles, because about that time we were beginning to get a little bit more knowledgeable about these so-called ultra-short waves. One of the things we had discovered was that all sorts of difficulties arose if we allowed our reaction circuit to come into resonance with our tuning circuits, and that, it presently appeared, was just where differential reaction in its ordinary form was leading us up a particularly muddy-garden path.

Getting Sufficient Coupling

The difficulty comes up in this wise: as we go down to the shorter waves we have to use fewer and fewer turns on our tuning coil, and this makes it a little difficult to get sufficient coupling with the reaction winding. Consequently, we have to use reaction windings which are larger in proportion to the grid winding than is normal on other waves.

For example, on the upper band of 40 to 80 metres we might be using a ten-turn grid coil, and with this a

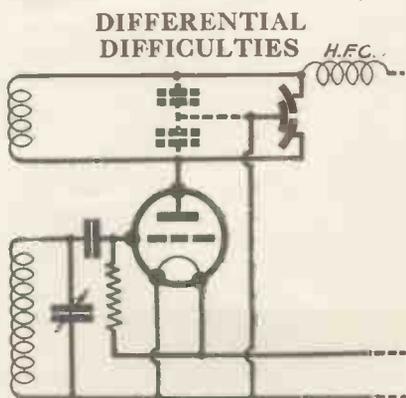


FIG. 1.

The dotted condensers show the equivalent troublesome capacities to which our contributor refers.

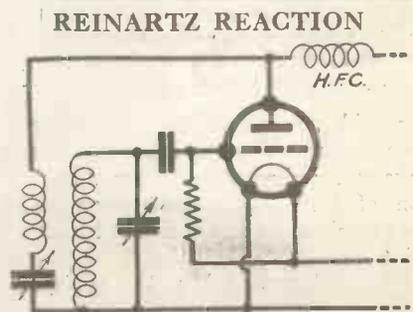


FIG. 2.

One of the Reinartz reaction types of circuit, which gives smooth-tuning effects and freedom from anode-circuit-tuning effects.

reaction coil of five or six turns will often suffice. On the lowest range, however, where we hope to cover perhaps 18 to 30 metres, we shall probably have a three-and-a-half or four-turn grid coil, and to get this to oscillate we may have to use a reaction coil of four turns.

In the first case there is practically no chance of the incidental capacities in the reaction circuit bringing it into resonance with the grid circuit. In the second one, on the contrary, there is every chance of its happening, and an ordinary differential reaction arrangement makes it almost certain to do so.

Anode Tuning

When this occurs, of course, in many circuits the detector valve will perform that annoying trick of falling into oscillation at the wavelength of the anode circuit, and continue to do so even when we tune the grid circuit far below this point in our efforts to get down to a lower wavelength. Putting it rather loosely, what has happened is that the anode circuit has taken on the job of tuning and the grid circuit has become aperiodic, just as the anode circuit is aperiodic when our reaction arrangements are behaving normally.

When this happens, of course, our only means of tuning becomes the differential condenser, and this only shifts the wave a little bit either way.

GOOD FOR SHORT-WAVES

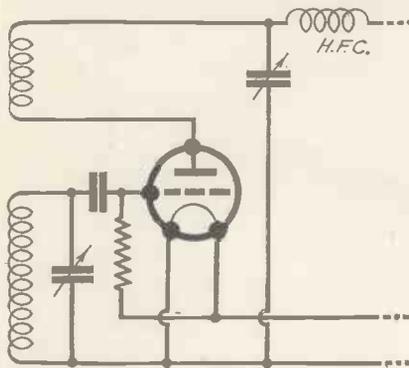


FIG. 3.

Mr. Eltringham greatly prefers this throttle-controlled arrangement to a "dolloed-up" differential!

The grid-circuit condenser has very little effect, which explains why the wave-meter shows no further reduction of wavelength when once we have reached our anode circuit tuning point.

I have drawn in Fig. 1 a typical differential reaction circuit in such a way that the equivalent capacities which cause all the trouble may be traced out. Note the dotted con-

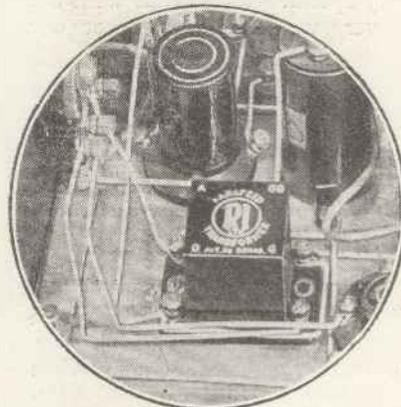
densers which represent the capacities between the two sets of fixed plates and the rotor. You will see that in effect they give us two capacities in series with each other across the reaction coil, and the obvious result is to tune that coil to a certain definite wavelength.

The Whole Trouble

Evidently, if the reaction and grid coils are of equal size it is quite possible that when we go down to the low settings of the grid tuning condenser the capacity across the grid coil may be smaller than that across the reaction winding, and that is just what causes all the trouble. It is unfortunate, but a fact, that when the grid and anode circuits of a valve are tuned to two different short waves the valve will be most likely to oscillate at the longer of those wavelengths.

And there you have in a nutshell the whole trouble with differential reaction; in its normal form it has a tendency on short waves to bring

RESISTANCE-FED



This L.F. transformer was designed especially for resistance-fed circuits, in which no direct current flows through the primary.

the wavelength of the anode circuit up above that of the grid circuit, and so make it impossible for us to get down as low as we should.

A Simple Remedy

And what is to be done about it? Well, various palliatives have been proposed, but for my part I think the simplest remedy is just not to use differential reaction. Whenever I make a set intended to go down really low, I now make a point of fitting one of the other good forms of reaction, such as the true Reinartz type or the throttle-control system. I illustrate these in Figs. 2 and 3, in their best forms for short-wave work, and in my experience it is very much easier to get good result: from

them than from any kind of dolled-up differential arrangement. It is true that they do upset the tuning a bit more than a good differential circuit when it is behaving properly, but the ease with which they give really smooth reaction and their freedom from anode-circuit tuning effects are weighty advantages.

However, I expect the reader will be inclined to think this a rather unsatisfactory way of looking at things, so let us examine some of

JOINED IN PARALLEL

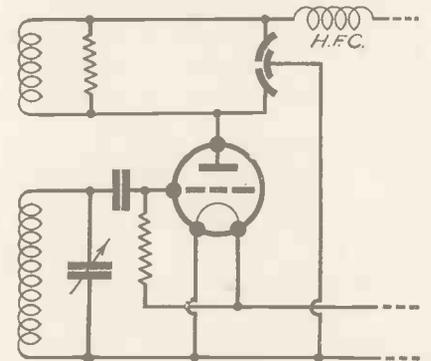


FIG. 4.

In this circuit a resistance is joined permanently in parallel with the reaction coil.

the ways of trying to make a differential circuit behave itself properly on short waves. Since our trouble is a matter of tuning, we must evidently look for some device which will tend to flatten out the tuning of the reaction circuit, and make it as aperiodic as possible. There are various ways of doing this by including resistance in the circuit, either in series with the reaction coil, as in Fig. 5, or in parallel with it, as in Fig. 4, and a certain amount of success can be achieved on these lines.

The Effect of Resistance

When just the right amount of resistance is inserted it is possible to flatten out the anode circuit enough to keep the tuning seated in the grid circuit under favourable conditions, at any rate on one particular band of waves. It is my experience, however, that in many cases it is necessary to impose so much damping that it may become very difficult to get any reaction at all. One is lucky sometimes, of course, so differential enthusiasts may like to try the scheme. For my part, I wish them joy of their job!

There is another and more recent invention which contains such a nasty little catch that I think it qualifies for inclusion in this article, and that is the resistance-fed L.F.

Instability Troubles with Parallel-Feed Coupling

transformer. Now, I have nothing against the resistance-feed system, for it is obviously a valuable scheme, enabling a comparatively cheap transformer to give quality very much like that of an instrument costing twice as much, but I do think people should be warned about the aforesaid "catch."

It is a simple enough matter, and can be circumvented quite readily, but it is absolutely inherent in the normal form of the circuit, and one should be prepared for it. It is just a very strong tendency to produce motor-boating or other forms of low-frequency oscillation, which at first were put down to the increased response to the very low frequencies which is characteristic of this method of coupling.

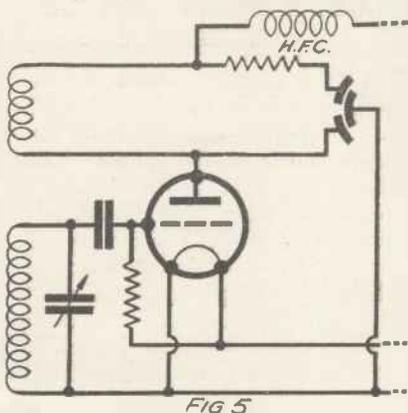


FIG 5

Further experience, however, showed that there was more in it than that, and a critical examination of the circuit reveals that there is actually a very good reason why it should promote L.F. instability. A clue to the reason may be found in the fact that a single valve may on occasion motor-boat with a resistance-fed input circuit. Examine Fig. 6, which shows a valve with a conventional type of output circuit and a resistance-coupled input transformer, and imagine that it is being run from an H.T. source with a comparatively high equivalent resistance.

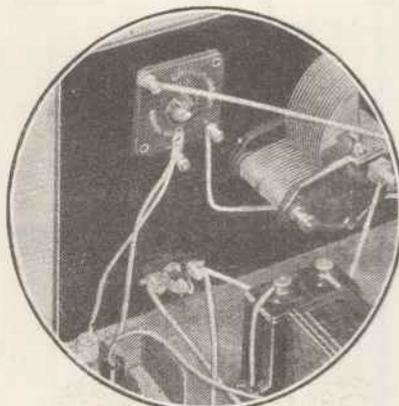
Cause of the Bother

Any A.C. voltages set up across the H.T. source by the output valve will tend to send currents through the parallel path consisting of the coupling resistance R, condenser C, and so down to the filament circuit via the transformer primary. This means that the impulses will make their way to the grid of the valve by way of the transformer secondary, and here we

have the reaction chain which causes all the bother. This feed-back effect, it must be remembered, is in addition to any others which may be present.

It would seem, therefore, that it is advisable to take particular pains with our decoupling arrangements when we employ the resistance-feed system, especially in separating the leads to the output valve and the preceding one—i.e. the resistance-fed valve.

Another characteristic of the resistance method of coupling is that it



REACTION AND INTERACTION

The photograph shows differential reaction in practical form, whilst to the left is a differential circuit with a fixed resistance in series with the reaction coil. Below is the conventional parallel-feed transformer circuit, referred to on this page, whilst Fig. 7 shows a modified form well worth trying.

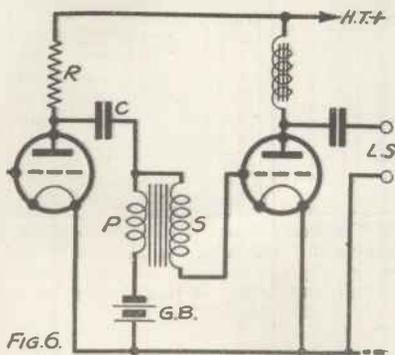


FIG. 6.

tends to accentuate any residual hum in mains sets, and this again is not alone due to its improved response to the lower frequencies. It comes about in exactly the same way as the tendency to promote instability—that is, it results from the fact that the input circuit of the last valve is shunted directly across the H.T. source. Hence, if there is an appreciable A.C. component in the H.T. supply it will send hum impulses

through this parallel path which will be additional to those coming through from the earlier valves in the set. The net result is obviously an increased amount of hum in the set's output.

The Modified Connections

It happens that there is a modified form of resistance-feed which gets over both of these difficulties, and is used not infrequently in commercial sets. It does not seem, however, to be known to many home constructors so perhaps my readers may be interested in some details. The scheme is illustrated in Fig. 7, and it will be seen that it serves the same purpose of keeping the D.C. component of the anode current out of the transformer primary, yet it does not provide the parallel path across the H.T. circuit

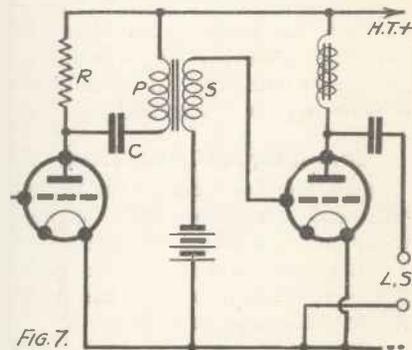


FIG. 7.

which causes the difficulties with the better-known form of the arrangement.

This modified form is well worth trying if you have any trouble in getting satisfactory results from the ordinary type of resistance-feed circuit. The various circuit values remain unaltered, and the functioning of the amplifier seems to be quite satisfactory.

Finally, a brief word or two about one more "pitfall" and then I have done. I refer this time to the metal chassis system of home construction.

The trouble is that the maker of the chassis usually feels that he must put some sort of finish on it, in the form of a coat of cellulose or some other insulating substance, and he is not always very careful about cleaning this off at those places where contact has to be made to the metal for earthing purposes. Probably more chassis sets have failed for this reason than for any other, and I would say as my parting hint: If ever you make one of these sets, clean carefully every spot where you think there should perhaps be an earthing connection!

SOME INTERESTING AERIAL PROBLEMS

Under the Sea—In the Air—Beneath the Earth.

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

A CONSIDERABLE amount of research has been carried out with submarine radio, but progress in it is slow. During the Great War it was freely rumoured that the Germans were able to transmit wireless messages over very long distances from totally submerged submarines.

But that was not the case. Comparatively little submarine wireless was done except in a more or less conventional manner from vessels on the surface.

The greatest difficulty was, and still is, that sea-water is an electrical conductor. Thus it is difficult to arrange an ordinary "L" type aerial so that there is no shorting.

Consistently Received

There have been many experiments with coil and loop type aerials. Sometimes the aerials were arranged in watertight boxes fixed to the deck, and with these success has been achieved in reception.

Signals from a station hundreds of miles distant have been consistently received, with the submarine submerged fairly deeply.

With transmission there has been less advance. I believe the best that can be done is to transmit about twenty miles from an aerial ten feet below the surface of the water.

As the sea is a conductor it acts as a reflector to wireless waves, and the degree of penetration will largely depend upon the wavelength. The shorter the wavelength the less deeply will the radio waves penetrate.

Therefore, it would be an advantage if very long wavelengths, such as 10,000 metres or more, could be used, but that is not practical owing to the impossibility of accommodating a sufficiently large aerial.

Ideal for Radio

Aeroplanes are much better placed. Indeed, they introduce conditions ideal to radio. They work at great heights and are above the majority of terrestrial obstructions.

The usual aeroplane aerial is merely a length of wire with a weight on the

end which is allowed to trail down. The "earth" is, of course, the metal parts of the aeroplane.

There is one snag in the scheme, and that is, that if the pilot has to land in a hurry and forgets or has no opportunity to wind up the aerial, it will almost certainly be broken off and might even cause damage.

An alternative method is to have the aerial built into the wings of the craft, but I do not think this has been found particularly satisfactory.

Another scheme is to have an eight-

MUSIC AWHEEL



Miss Wynne Gibson, the Paramount star, believes in combining her pleasures. On her cycling trips she takes with her a radio set and headphones so that she has radio constantly "on tap."

foot stream-lined rod projecting upwards from the fuselage.

Also coil and frame aerials have been tried. But none of these is as effective as the trailing wire, although because this can only be used while the aeroplane is in flight, it is now sometimes the practice to fit one of the other types as well.

It is claimed that radio communication between points hundreds

of feet below the ground in mines and surface stations has been accomplished. However, this does not necessarily prove that wireless waves can penetrate hundreds of feet of earth.

It is possible, even probable, that the radio waves traverse the shaft of the mine, either directly or via electric cables.

"Effective Height"

An aerial of a certain height above the ground will have a greater "effective" (electrical) height if the ground is dry than if it is damp.

Therefore, those who consider themselves badly placed because, for instance, their soil is laid on well drained, sandy strata, can actually install a superior aerial system so long as they make sure of a good earth, either by digging deeply or by making contact with a main water pipe.

LOUDSPEAKER RATTLE

WHAT is very seldom appreciated is the fact that the output valve itself may cause a rattle in the speaker. The point is one of particular concern to the battery man, who in all faith replaces his perfectly satisfactory cone speaker with one of the larger moving-coil type, anticipating considerably improved reproduction. Frequently a rattle occurs which no amount of patience will cure, and the speaker is finally condemned as being faulty.

Inadequate Voltage

We have to remember that the characteristic curve of a triode valve is such that harmonic distortion occurs when the grid swing rises above a certain figure. This harmonic distortion has a peculiar result of sounding in the speaker just like a mechanical vibration, as might be set up by a loose nut, or a vibrating diaphragm.

More often than not a small output valve is employed and it is, moreover, not uncommon for the voltage applied to the plate of this valve to be no more than, say, 100 volts or so.

This is really inadequate effectively to work any speaker designed to handle large power, and the tendency to overload is inevitable. You are compelled to overload to get sufficient volume.

The remedy is to increase the H.T. voltage until your valve is giving its maximum rated output, or if this is still inadequate, to replace your present small valve with a larger one.

H. C.

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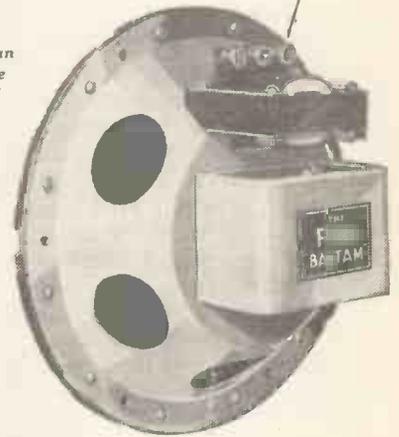
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MORE ABOUT THE "CATKINS"

Some of the advantages of the new all-metal method of construction.

WHEN the Marconi "Catkin" was first announced, one feature was seized upon above all others, as the predominant advantage offered by this revolutionary construction. "The Unbreakable Valve" is a title which appeals at once to everyone's imagination, and so much so that it has entirely overshadowed the other equally important benefits conferred upon "Catkin" users. Of course, unbreakability can be demonstrated in spectacular fashion, but calmer thought brings out the fact that we do not, after all, throw our valves about with such abandon, and that although robustness is of great value in packing and transit, once the valve is in its socket the danger of breakage is small.

At this point, then, we feel that it is well to draw attention to some of the points which may not be quite as clear as they should be in our readers' minds.

Greater Uniformity

When designing an "M.W." circuit, great care is taken to see that the valves used are representative. It is obvious that in valve manufacture, as in all other engineering, each individual item of a class cannot be exactly alike to every other, and certain tolerances are bound to exist. With valves, these limits are fairly wide, because of their very complex nature, and a design based on valves selected at the top limit would give poor results if the goddess of chance handed out to you, off your dealer's shelves, a set of low-limit valves. Conversely, if we adjusted matters for low-limit valves, and you picked up a set of valves all of which were above normal, you might be led to complain of hopeless instability.

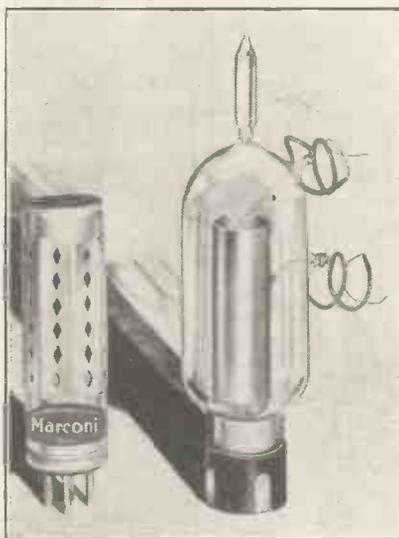
The Marconi "Catkin" relieves this position very considerably by its closer adherence to published figures, and will enable us to screw the last ounce of magnification from our laboratory model with the assurance that your own will give identical results.

More Accurate Calibration

Again, in these days of sharply-tuned multi-circuit designs the prob-

lem of ganging is serious. The anode earth capacity of valves may vary to an extent which makes re-ganging

NEW AND OLD



Here is a "Catkin" alongside one of the old Marconi-Round valves, which some of our readers who served in the great war will no doubt remember. One of the features of the Marconi-Round valve was that its pip had frequently to be warmed with a lighted match in order to make the valve function properly.

necessary whenever a screen-grid is changed. The "Catkin," although having a higher anode-earth capacity than the glass-valve, is more uniform, and so removes the difficulty. Further, as the total circuit capacity is more uniform, the calibration of your model should be closer to that of our laboratory tuning scale.

Less Noise

Modern valve manufacture calls for the use of magnesium and barium "gettering" during the pumping process. This results in the silvery or black deposit on the glass bulb. When the valve gets hot, some of the "getter" vaporises, and as it cools settles on the mica distance pieces, etc., forming a high resistance leak across the electrodes. A valve suffering from this trouble is liable to be noisy in operation, the effect resembling that of bad atmospherics.

A cure is not difficult, and is already applied in such cases as the Marconi M.H.4, which has a special directed

getter." But the "Catkin" sweeps away the whole trouble by its air-cooled anode, which does not permit the "getter" to vaporise and so kills the danger at its source. You will find "Catkins" quieter than other glass valves in this respect, as well as from the microphonic point of view.

Talking of microphony, we put a Marconi "Catkin" M.H.4 as a detector in a set and hit it with a ruler as it was working. The only effect noticed via the loudspeaker was a slight noise, which may have been due to the valve pins shifting in the socket. There was no interruption of the music!

Reliability

The "Catkin" has a heater and cathode just like the glass valve, and is therefore not everlasting. Most of us do not object to this as long as we get reasonable service; what we do not like is the valve which fails before its allotted span. It is therefore good news to hear that extensive life tests prove that early failures are far fewer with "Catkins" than with glass. This is due partly to an improved heater, but also to the generally cooler operation, more robust construction, and less severe heating during the pumping processes.

With these features in mind—and there are yet two or three we have no space to deal with—you will agree that when "M.W." and "P.W." hailed the "Catkin" with exclusive articles, as one of the most important radio developments for 1933, we were fully justified.

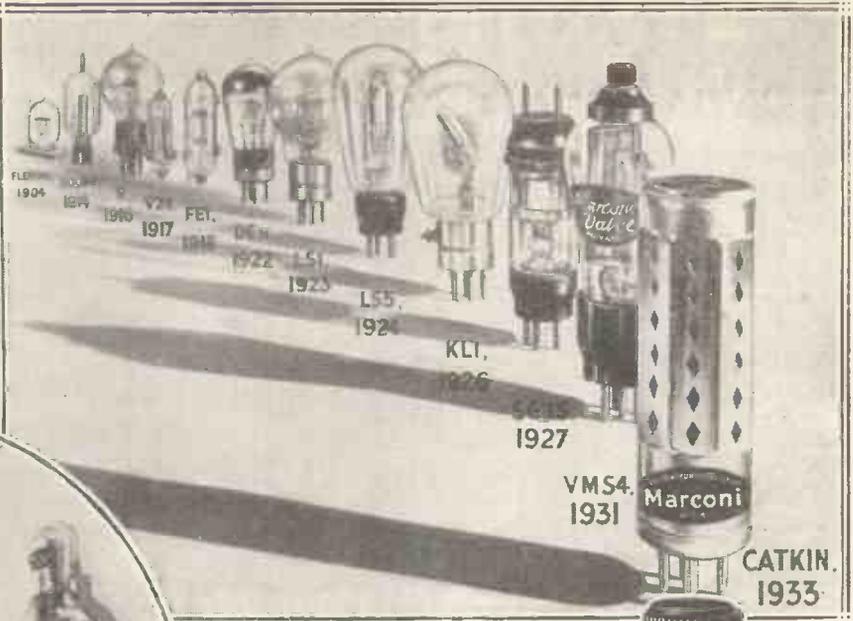
SHOWING THE SIZE



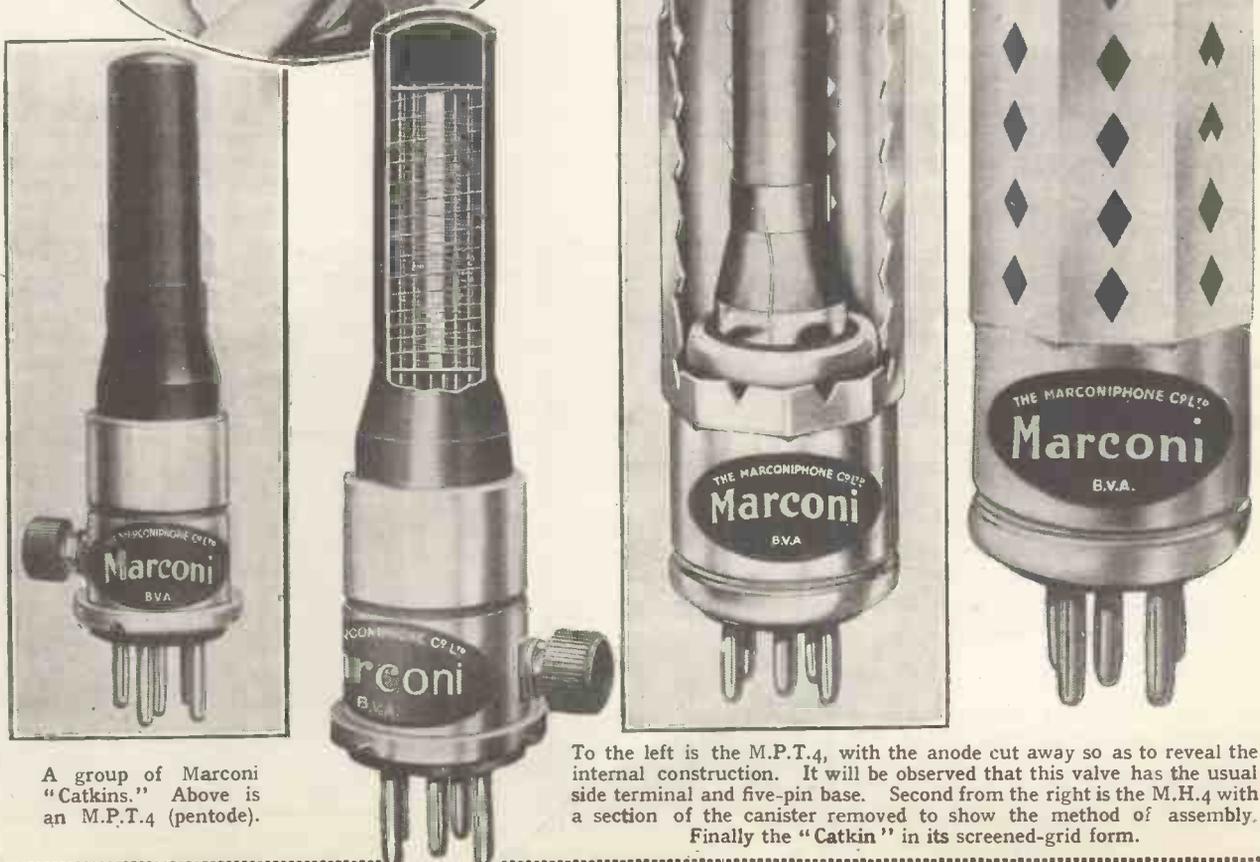
Nothing could illustrate better the remarkably small dimensions of "Catkin" valves than this photograph showing one side by side with a tube of toothpaste.

PROGRESS IN VALVE TECHNIQUE

The photograph on the right exemplifies the history of valve development from the days of the early Fleming two-electrode valve to the latest "Catkin."



One of the advantages of the "Catkin" is its freedom from microphonic noises. The size of the new valve can be judged by comparison with the normal glass bulb type.

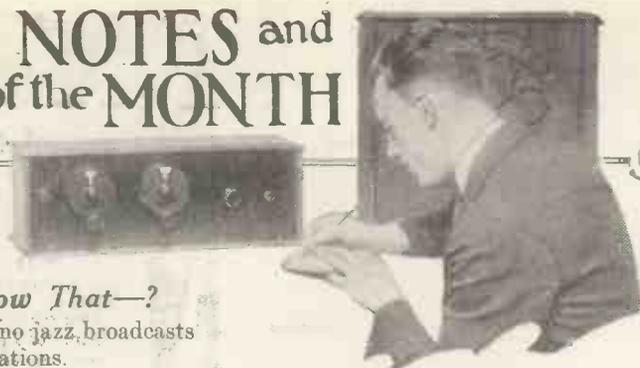


A group of Marconi "Catkins." Above is an M.P.T.4 (pentode).

To the left is the M.P.T.4, with the anode cut away so as to reveal the internal construction. It will be observed that this valve has the usual side terminal and five-pin base. Second from the right is the M.H.4 with a section of the canister removed to show the method of assembly. Finally the "Catkin" in its screened-grid form.

RADIO NOTES and NEWS of the MONTH

By G.B.



Do You Know That—?

There are no jazz broadcasts from the Italian stations.

The Spanish Government's latest broadcasting plans allow for a new 100 kw. station at Madrid.

The new Vienna station has a theme tune taken from characteristic bars of Strauss' "Blue Danube" Waltz.

The first six notes of Poste Parisien's musical theme opening are from Charpentier's "Louise."

Statistics compiled by the Board of Trade on exports and imports for the first four months of 1933 show a balance of over £214,000.

The major portion of the export trade was in the valve section, an average of 100,000 valves being sent overseas every month.

Australia and New Zealand are our best customers for wireless apparatus. Together during April they purchased approximately 15,000 valves, 200 receiving sets and 300 radio-gramophones.

France is also a good market for Britain's wireless goods, for during April she purchased goods to the value of about £6,000, the apparatus including 24,000 valves.

America's Latest

America has got power on the brain—as regards broadcasting. A new station, W L W, is projected for the city of Cincinnati, Ohio.

The aerial mast is likely to be 830 feet high, and the power of the station 500 kw., giving it a theoretical radius of 5,000 miles.

Our Radio Dictator

Colonel Dawnay, who has just been appointed Controller of Output for the B.B.C., has been described by one newspaper as a Radio Dictator for Great Britain. Certainly he will have

a good deal of power over the entertainment side of broadcasting.

The Seven Heads

His appointment becomes effective on September 1st. At the moment, programme policy is directed by the Board of Control—which, of course, is distinct from the Board of Governors—and it comprises heads of the departments and Admiral Carpendale, in all a total of seven.

When Colonel Dawnay takes over, he will have the powers of an autocrat. Let's hope he keeps an eye on the Sunday programmes and does something to brighten them up a bit.

Mechanised Music

Sir John Reith, the Director-General of the B.B.C., had something to say about mechanised music when addressing the National Conference at the British Federation of Musical Competition Festivals recently.

"The B.B.C.," said Sir John, "is a convenient peg—if ever there was one—on which to hang every conceivable kind of complaint and grievance. But the B.B.C. is well

accustomed to this, and does not mind."

A Nation of Listeners

Sir John Reith went on to say that although things were bad in the musical world, they might be much worse, and certainly would not be improved if the activities of the B.B.C. were stopped; also that a charge had been made that the B.B.C. was creating a nation of listeners.

But in his view it was better to listen than not; and if individuals were discouraged from making music by the extent and manner of the B.B.C.'s activities, well, the B.B.C. regretted it.

Dr. Boulton on Opera

Dr. Adrian Boulton also had something to say. He referred to the fact that the B.B.C. was catering daily for 15,000,000, and that if listeners wanted opera, Wagnerian opera could only be adequately sent out to listeners by being broadcast from Covent Garden or elsewhere. Hence the justification for an opera subsidy.

Coming Events

The Radio Exhibition at Olympia is drawing near. Already more than £30,000 worth of stand space has been taken by radio firms. The exhibition opens on August 15th and closes on August 24th. Glasgow begins its exhibition on September 1st, and Manchester on September 27th.

MODERN WIRELESS, of course, will have a stall in association with its contemporaries, "Popular Wireless" and "The Wireless Constructor." So look out for us at Olympia, Glasgow, and Manchester.

DISTINGUISHED RADIO GATHERING IN LONDON



The Marchesa Marconi (left) with her husband and other distinguished guests at a dinner arranged by the Marconi International Communication Co., Ltd.

A SWASTIKA LOUDSPEAKER FRET

By H. T. SAVAGE

If you are in the fashion, and have an occasional ticket in a sweep-stake, you doubtless appreciate a lucky charm. Here are designs of a swastika for the fret of a loudspeaker.

For the first one, the square of plywood which forms the front of the speaker is ruled so that the top and sides are divided into nine equal spaces, making eighty-one squares. By glancing at the diagram, it will be seen to be an easy matter to draw in

WHITE ON BLACK

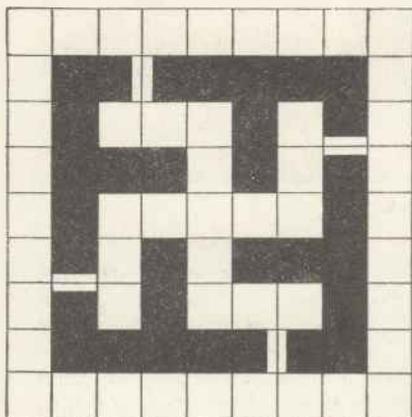


Fig. 1, showing the connecting links.

the swastika and to cut out the portions as shaded with a fret or keyhole saw, being careful, of course, to leave intact the four short connecting links to the outer border.

In Diagram No. 2 the swastika is actually cut out, and in this case the board is ruled so that the top and sides are divided into seven spaces, Fabric should be placed behind the fret to show the pattern in relief.

THE REVERSE METHOD

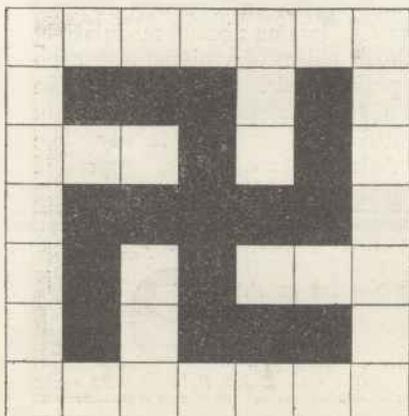


Fig. 2, indicating how the swastika itself is cut out.

THE FIRST FLOATING AERIAL BASE

—continued from page 5

- (1) A high-power receiver with a wave-range of 300-40,000 metres;
- (2) A high-grade three-circuit receiver covering the range of 120-4,000 metres; and
- (3) A short-wave receiver of special design with a range of 10-150 metres.

The transmitters and receivers have been installed close to one another in the same room. In view of the very active telegram service to be anticipated (the two transmitters and various receivers will have to work simultaneously without interfering with each other), the transmitters and receivers, as well as the aerial pipes and all leads, are armoured very strongly. Trial trips have shown that the wireless station perfectly complies with all the requirements of the case and completely permits the simultaneous operation of the transmitting and receiving plant.

"Landing" on the Sea

An emergency transmitter and a direction-finding plant on the Telefunken system have likewise been provided, the latter being particularly important as the plane is approaching and endeavouring to find its bearings. In fact, planes cruising over the ocean will receive signals keeping the pilot informed of the distance to be covered and the direction to be followed, even by night and in dense fog.

In the case of an emergency "landing" on the open sea, the vessel will be able to assist the plane in every possible way, finding her bearings by wireless and coming to the rescue.

The fortnightly seaplane service is to be supplemented by a—likewise fortnightly—Zeppelin service between Friedrichshafen, Germany, and Pernambuco, Brazil, thus providing once a week an air-mail service between Germany and South America.

B.B.C. AND "PHOTOGRAPHIC PUBLICITY"

We are informed by the B.B.C. that the statement in our June issue to the effect that the B.B.C. charges newspapers for the reproduction fee of photographs given to it free of charge by its artists, is incorrect. It appears that the B.B.C. only charges newspapers the reproduction fees of photographs in which it holds the copyright.

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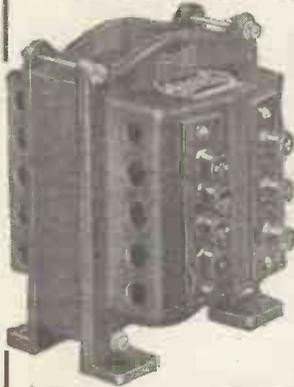


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MORE ABOUT THE FUTURE OF "POSITIVE DRIVE"

—continued from page 57

output valves. High internal resistance means a big voltage drop whatever type of valve is used. It is the penalty of old age. "Class B" does not permit high-tension batteries to be used past the period of senility; but it does claim to postpone senility by reducing the average drain—for a given useful output.

The prime merit of "Class B" is not that it definitely reduces high-tension consumption, but that for a given consumption (and within limits the consumption is exactly what the listener chooses to make it) a greater proportion represents audio-frequency power than with ordinary output valves biased to the mid-point of the grid base.

In other words, with ordinary amplifiers you are taking a constant steady drain from your H.T. whether you are getting big volume, small volume, or no signals at all; with "Class B" the high-tension consumption is large when volume is large, small when volume is small, and negligible when no signals are being received—you pay for what you receive, and for nothing more, and what can be fairer than that?

Those Ruined Valves

Mr. Woodward pessimistically anticipates a big crop of ruined valves and H.T. batteries due to sets being left fully tuned during the period of the tuning note. Of course, several minutes overload of this nature may quite easily do irreparable injury to both, but this is an accident which is not likely to happen. After all, if people are careless enough to leave their sets running unattended in this way it is their own fault, and if they really enjoy hearing a 2-watt tuning note, they ought to be prepared to pay for the privilege pretty heavily.

The prognostications anent the ultimate translation of "Class B" to the realms of A.C. mains radio are very interesting, and I am far from

saying that they will not be fulfilled in one form or another—one day. But it is not likely that such A.C. "positive drive" valves will be of the 2-watt order. The saving in cost of the power pack consequent upon a reduction of anode voltage to 150 instead of 250 would not be considerable, and might even be non-existent in view of the fact that the total demands for mains equipment would have to be shared between the 250-volt and 150-volt outfits.

To my mind, mains radio already suffers heavily because the total demand for components at present is too small to justify large scale manufacture, and a new complication at this stage would further postpone the time of really low-priced apparatus.

But when we come to outputs of the order of 10 or 20 watts, I think that positive drive may be able to effect real economies both in first cost and in operating power.

The Reserve of Power

Of course, an output of 20 watts is far beyond the need of any domestic equipment, but for public address work, relays and talking pictures such a valve would have a very useful field of application. There is yet another aspect. The ordinary A.C. receiver or radiogram fitted with an output valve, giving an undistorted power up to about 3 watts, is not really powerful enough for dancing, and I am told that there are some listeners who manage to dance to radio dance bands in spite of the fact that they do not always play dance music. Ten or twenty watts of more or less undistorted audio-frequency power ought to give sufficient noise for these terpsichorean performances. If so, I shall be glad I am living in a detached bungalow.

But, happy thought! Perhaps the listener of the future may want a 20-watt output valve merely to take a watt or two on normal modulation, with the object of avoiding distortion on peak signals. Perhaps, with the aid of these valves, the final crash of cymbals will sound faintly like cymbals and not like a suppressed sneeze. Well, roll along the day!

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THE "ATTACK" ON TRANSIENTS

—continued from page 61

must be generous, because after all it is quality we are seeking, and the only way to get it at any volume is to use a good big output valve. Therefore be sure to provide yourself with either such a valve as the Osram or Marconi P.X.4 and 250 volts of H.T., or even one of the 400-volt valves like the Mullard D.O.25, Mazda P.P.5/400 and Marconi or Osram P.X.25.

For the first stage a valve with an amplification factor of between 30 and 50 is desirable, examples being the Mazda A.C./H.L., and the Mullard 354V. An anode resistance of 50,000 ohms should be used with these valves, and it should then be possible to get a full load on to the grid of the output valve with an input to the amplifier of something rather less than 1 volt.

The circuit can therefore be tried out with any reasonably sensitive gramophone pick-up, or it can be fed direct from the output of any detector valve of the modern type which works with a fairly large H.F. input to its grid. The coupling between the detector and the first valve of the amplifier can be of the conventional R.C. type. Suitable values for the average detector valve are: anode resistance, 50,000 ohms; grid condenser, .01 mfd.; grid leak, 1 meg.

Backing-Off Battery

The bias battery for backing-off purposes should be of 100 volts, with a 9-volt G.B. unit in series with it for fine adjustment purposes. Start off with only 1½ volts in circuit and note the reading of the milliammeter. It will probably be zero or thereabouts, so switch off the H.T. and increase the backing-off voltage by a few volts. Proceed in this way, increasing the voltage by small steps, and *always* remembering to switch off the H.T. while doing it, until the milliammeter reads the normal current for the particular valve you are using in the output stage. Once more, *never* forget to switch off the H.T. when adjusting the backing-off voltage, or something disastrous will happen to your output valve.

Similarly, when you have finished the adjustment and the amplifier is working correctly, see to those battery plugs and make sure that they fit tightly in their sockets, with no chance of jumping out later on. Remember, too, what I said about the need for a thermal delay switch, and be sure to

fit one in its proper place, which is in the H.T. negative lead, well back in the eliminator circuit.

What you will think of the performance of the amplifier I do not know. Much depends on the type of loud-speaker used, for the proper appreciation of transients certainly demands an instrument of the highest quality, with a really good response to the higher frequencies. I feel pretty sure, however, that no one who gives the scheme a fair trial can fail to be impressed by its possibilities.

Worth Watching

So far as my own ear is concerned, I can certainly say that no amplifiers have impressed me so much by their realism as certain direct-coupled ones I have heard. It is true that the scheme is still in its very early stages and requires development, but I believe its potentialities are such that it should be watched by every keen, quality enthusiast.

MAINS-ENERGISED SPEAKERS

Points to remember when going over to this type of instrument.

MOVING-COIL speakers of the mains-energised type must be supplied with fairly well-smoothed direct current at a voltage which varies according to the resistance of the field winding.

If you have ever thought about going over to one of these speakers, you may have wondered how to set about the matter.

If you are on D.C. mains it is more or less simple and obvious, and you have only to choose a speaker with a field winding designed to work on the same voltage as your mains, and connect the mains to the field. Then if the mains ripple is audible a fixed condenser across the supply usually completes the job.

Rectification Needed

With A.C. mains the problem is more complicated. First you must obviously change the alternating current into direct current, and some form of rectifier must be used. The simplest type for this purpose is the Westinghouse metal type.

Now, mains-energised speakers may be classified roughly into two divisions—those having high resistance fields and those having low resistance fields.

In the first class the field resistance may range between 2,000 and 6,500 ohms, or more, and require inputs of 110 to 250 volts D.C. Thus, to quote a typical case from a range of well

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known speakers, a 2,000-ohm field works on 110 to 175 volts D.C., and a 4,700-ohm field works on 150 to 200 volts D.C., and so on.

If, therefore, 200- to 250-volt A.C. mains are available, it is possible for a metal rectifier to be used to provide a suitable D.C. voltage to the speaker field without the necessity of a mains transformer. In this case the rectifier would be used in a half-wave circuit.

With 100- to 120-volt mains a voltage doubler circuit can be used to obtain a suitable output without using a transformer for the same type of speakers.

In the second class of speaker—namely, those having low resistance fields—the field current is nearly always large and the voltage low. Thus the rectifier for this sort of speaker must be of the type usually employed for L.T. chargers giving, say, 1 amp. at about 10 volts. It is clear that no mains are available with a sufficiently low voltage to work the rectifier directly, and a suitable mains transformer must be used.

The output from a rectifier is of a pulsating nature, and although the high inductance of the field winding tends to smooth the current, it is usually not likely to be satisfactory without a reservoir condenser.

H. C

IN PASSING

—continued from page 68

and one was hanged. But the needle always cropped up. Sometimes the wife or mother had pricked herself—and changed the needle; sometimes the victim had died by a needle—one took blood-poisoning from a rusty sail-maker's needle which he had been told to change; and another changed the doctor's hypodermics, got a shot of the wrong stuff, and died in knots.

Adding to the Mystery

Again—to add to the mystery—these fatalities always happened on

brother crash?"

"Eight forty-seven," he replied. I hunted for a "Radio Times," and turned up the programmes for that fateful evening.

"Look here," I said, "when you made that remark about the needle they had just begun the *Venusberg Music* from *Tannhauser*. Look at this! The concert began at a quarter to nine, and this was the first piece. There you are! Needle—and crash. Together!"

A Coincidence

"But he wasn't killed," said Rupert.

"No, but Grandpa died and old Luck died soon after. Are there any more Lucks?"

"M.W.'s" RECORD REVIEW

—continued from page 6.

There is a fine selection of *Merry Widow* songs on Imperial Z145. The Palace Opera Company sing well together and have a splendid soprano who sings *Vilja*.

Hear Raymond Kinsey, a boy soprano of great gifts, in *Let The Bright Seraphim* and *Rejoice Greatly*, two amazingly difficult arias, on H.M.V. C2556.

The Modern Ballad

The modern ballad, with few exceptions, has a short life. Often the singers do not take a great deal of trouble with them. But if you have not heard The Hon. W. Brownlow, do so at once.

There is a sustained artistry in his singing which, I think, is quite exceptional.

His latest—*When I Think of You* and *This Lovely Rose* (the first especially) are a pleasure to listen to, from both vocal and technical stand-points.

A New Instrument

The new Bechstein is indeed a puzzle. It is a fascinating instrument, but not a piano as we know it. I ask you to hear John Hunt play Chopin's *Prelude in C Minor* and Debussy's *Clave de Lune*. They are very delightfully done.

Old Numbers

If, as a souvenir, you want to preserve for posterity the voices of two notable cricketers, you will find the Larwood-F. R. Foster duet about "*Leg Theory*" on Columbia DB1140. Ronald Frankau is always good. His latest gibe—*The Preparatory School, The Public School and The Varsity*—on Parlophone R1515 is caustic enough for the most sophisticated.

T.

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the birthday of the oldest living member of the family, and this probably accounted for Grandpa's agitation, for he was pretty sure that he wouldn't have another birthday—so something *had* to happen that day to keep the pot boiling.

"By rights it should have been Robert that pegged out," said Rupert. "It looks as though the curse has gone wrong."

The Critical Time

That gave me a thrill. "By the way," I said, "at what time did your

"No."

"Just as I thought. The Luck of the Lewins has changed!"

"But where does this wretched needle come in," complained Rupert.

"So far as I can see it's an irrelevant but misleading detail. As Miss Lewin remarked, 'It might just as well have been a pumpkin!'"

But I am not so sure about that.

Anyhow, I warned you at the beginning that my story would concern a coincidence and that the essence of coincidence is that it wants believing!

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